

ISLAMIC UNIVERSITY OF TECHNOLOGY

Course No: EEE 4418

Course Name: Electrical Services Design

Project : Electrical Wiring System for Residential Building

Submitted by:

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Abstract:

This lab report presents the electrical wiring system design for a three-storied residential building consisting of four units.

The project focuses on the electrical plans for

- The ground floor
- First floor
- Second floor (Same as the first floor design)
- Third Floor (Same as the first floor design)
- Roof plan.

Detailed information regarding the floor plans, fittings, conduits, switch board connections, and calculations for lights and fans are provided. The report aims to ensure the proper and efficient electrical wiring installation for the residential building.

Floorplan:

1. **Ground Floor plan:**

- 12 Garage spaces
- 1 small unit as living room for Caretaker/Guard/Rent
- 1 generator room
- 1 service room

2. **Each unit contains:**

- 1 drawing and dinning
- 2 bedrooms
- 1 attached bathroom and 1 common bathroom
- 1 kitchen
- 2 veranda

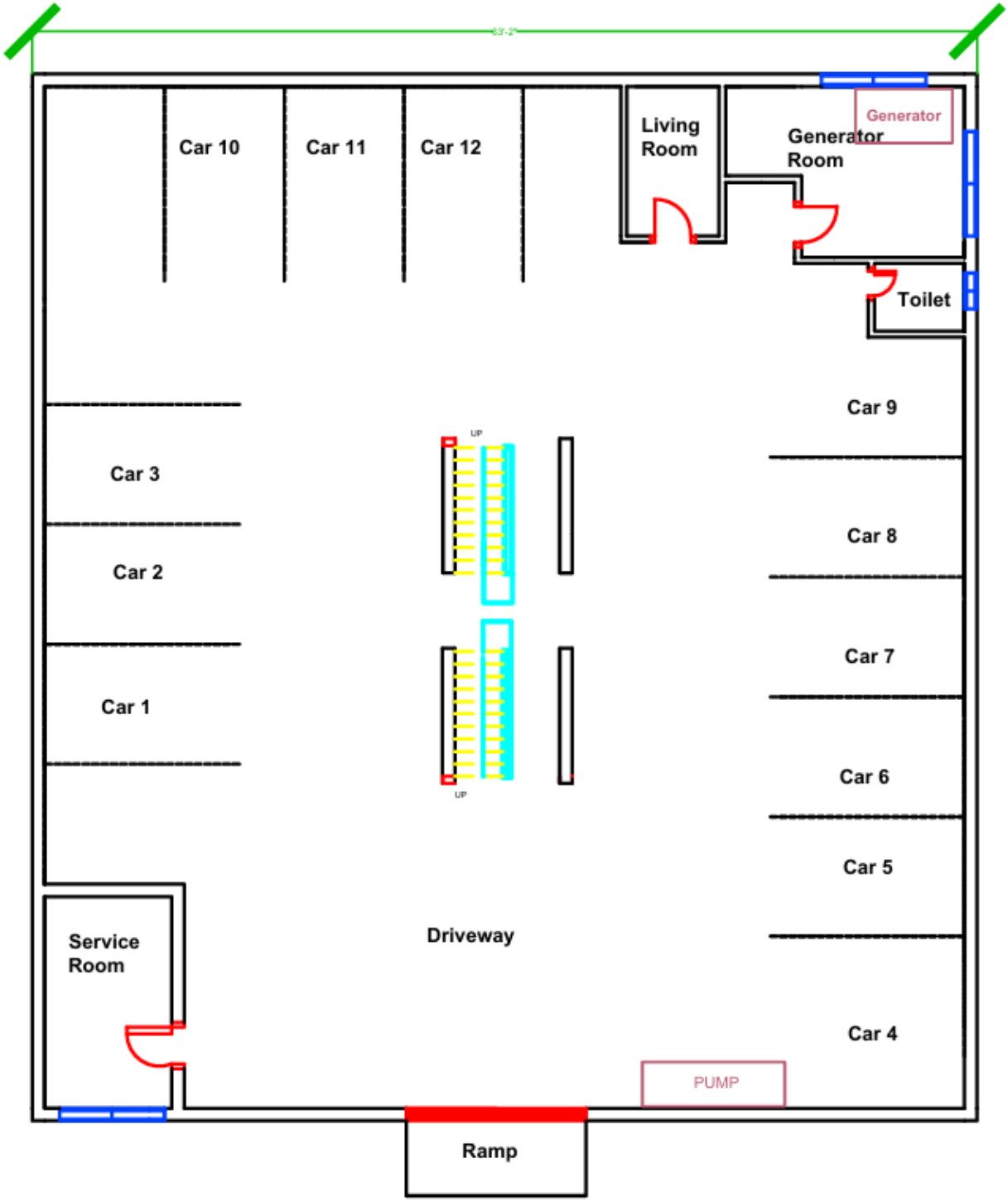
The floor plan for 1st, 2nd and 3rd floor are the same in size and design. All the units are symmetrical and have electric connections.

3. **Rooftop:**

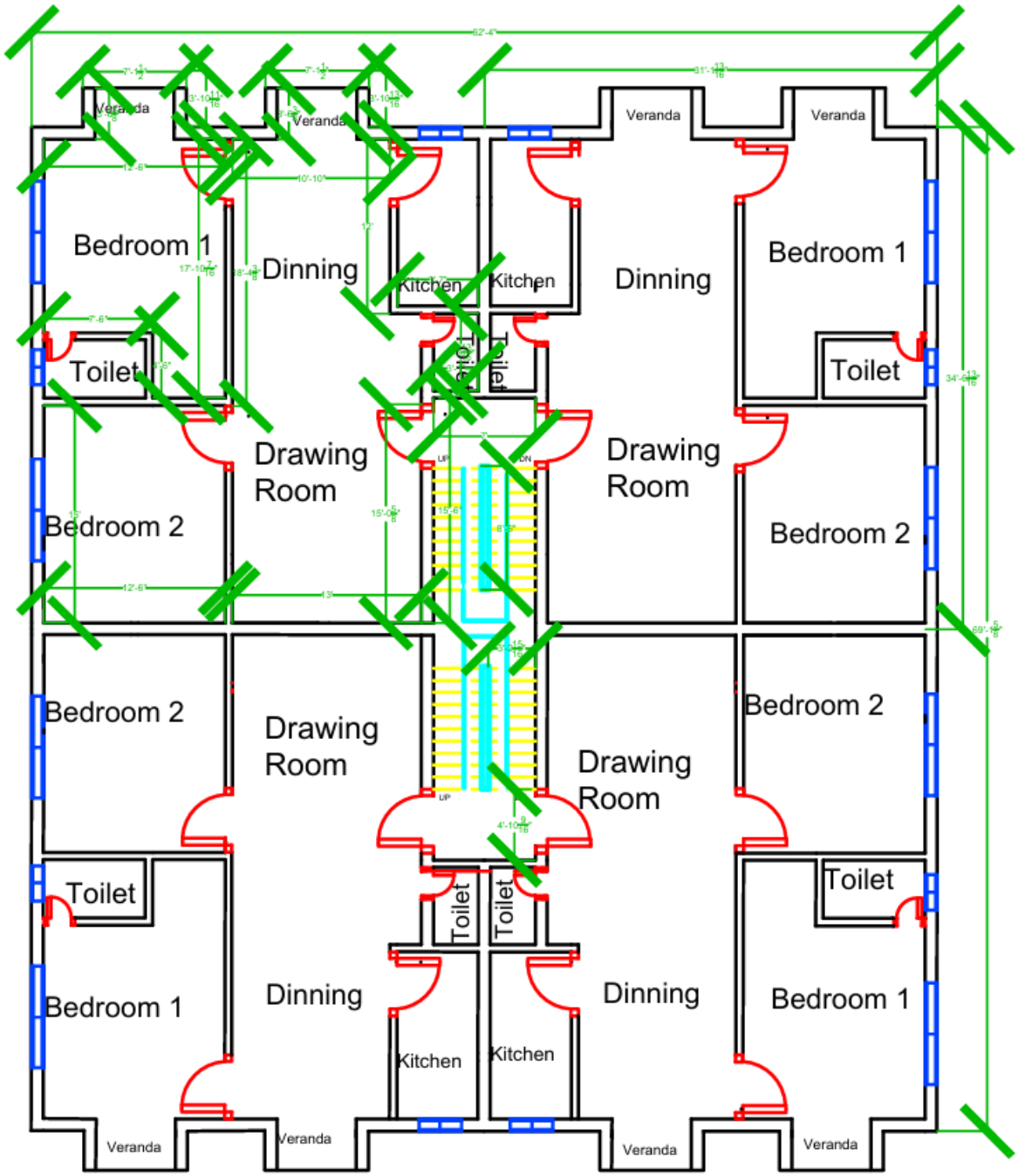
- 13 Lightning arrestors
- Water tank

The roof plan is kept plain and simple.

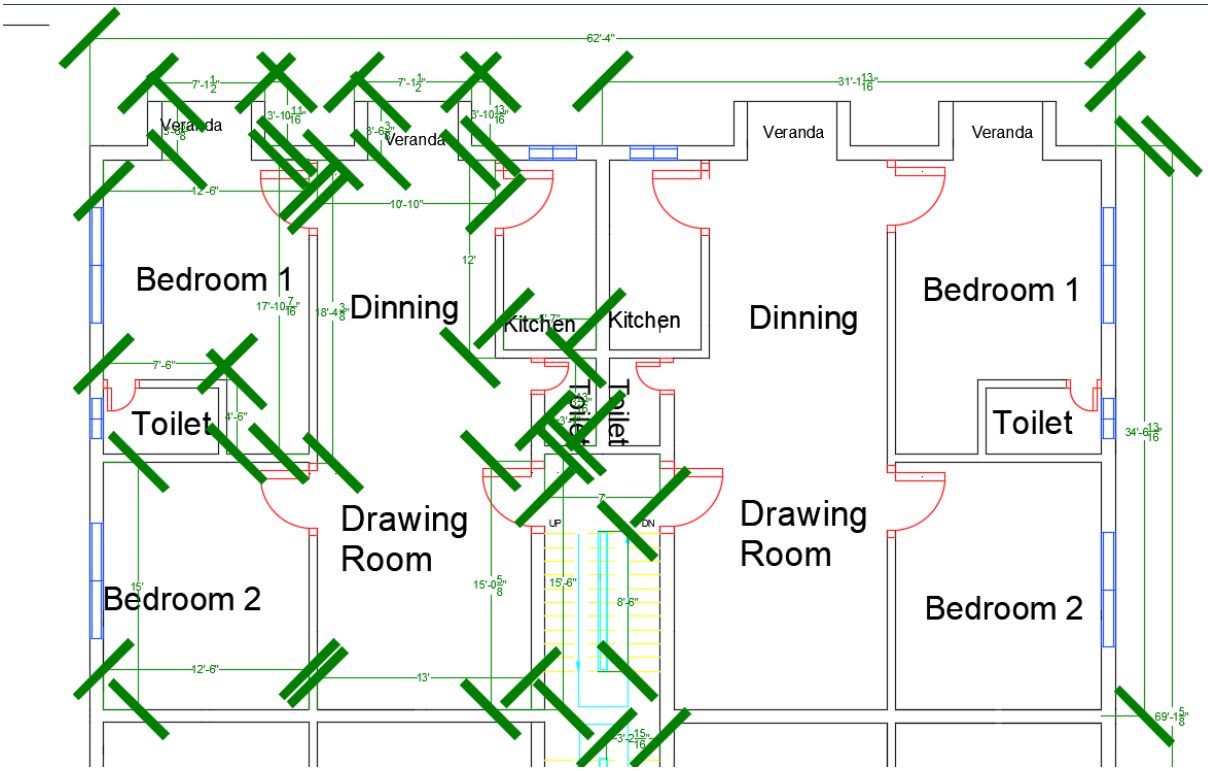
Ground Floor Parameters



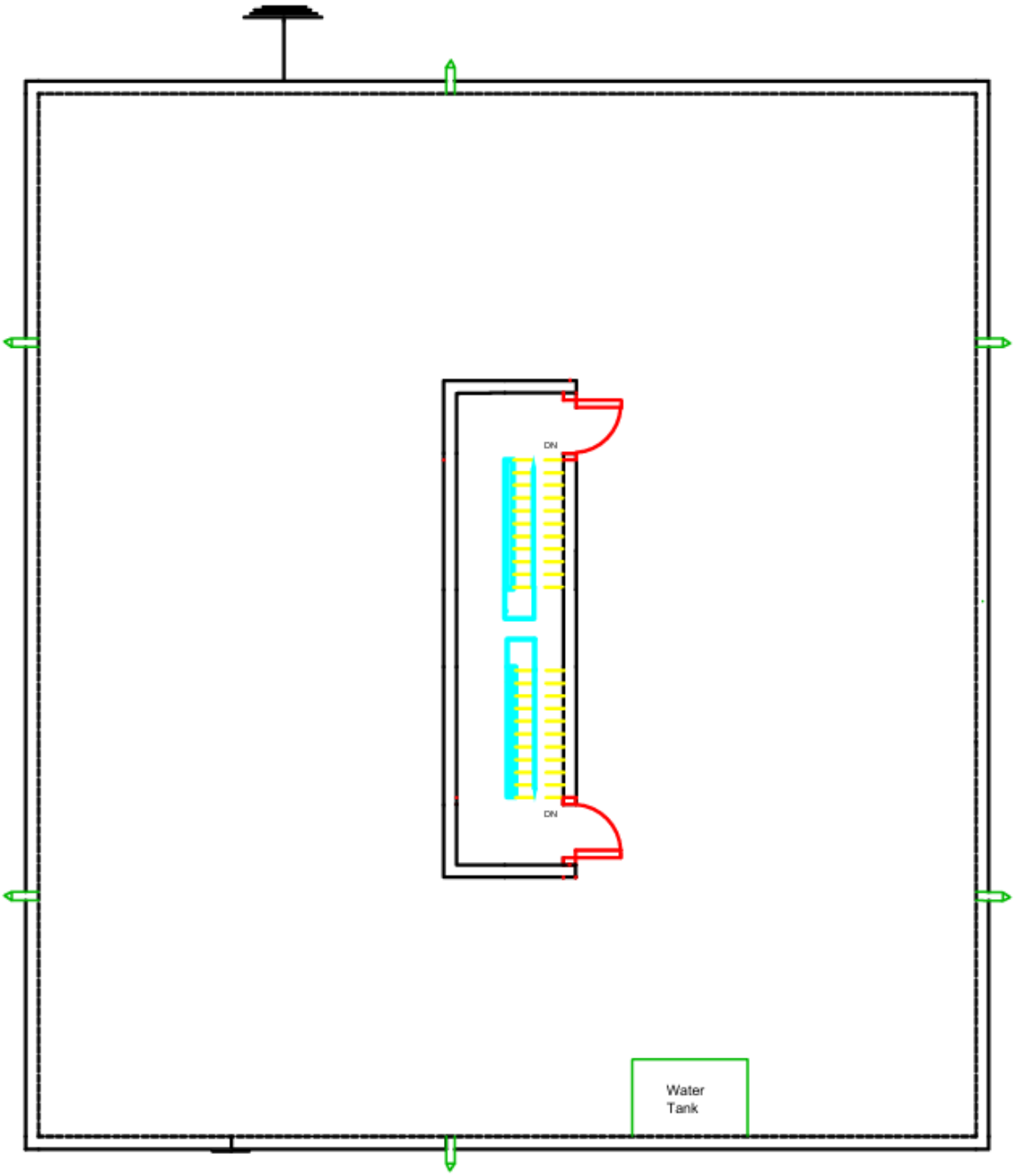
Floor Parameters



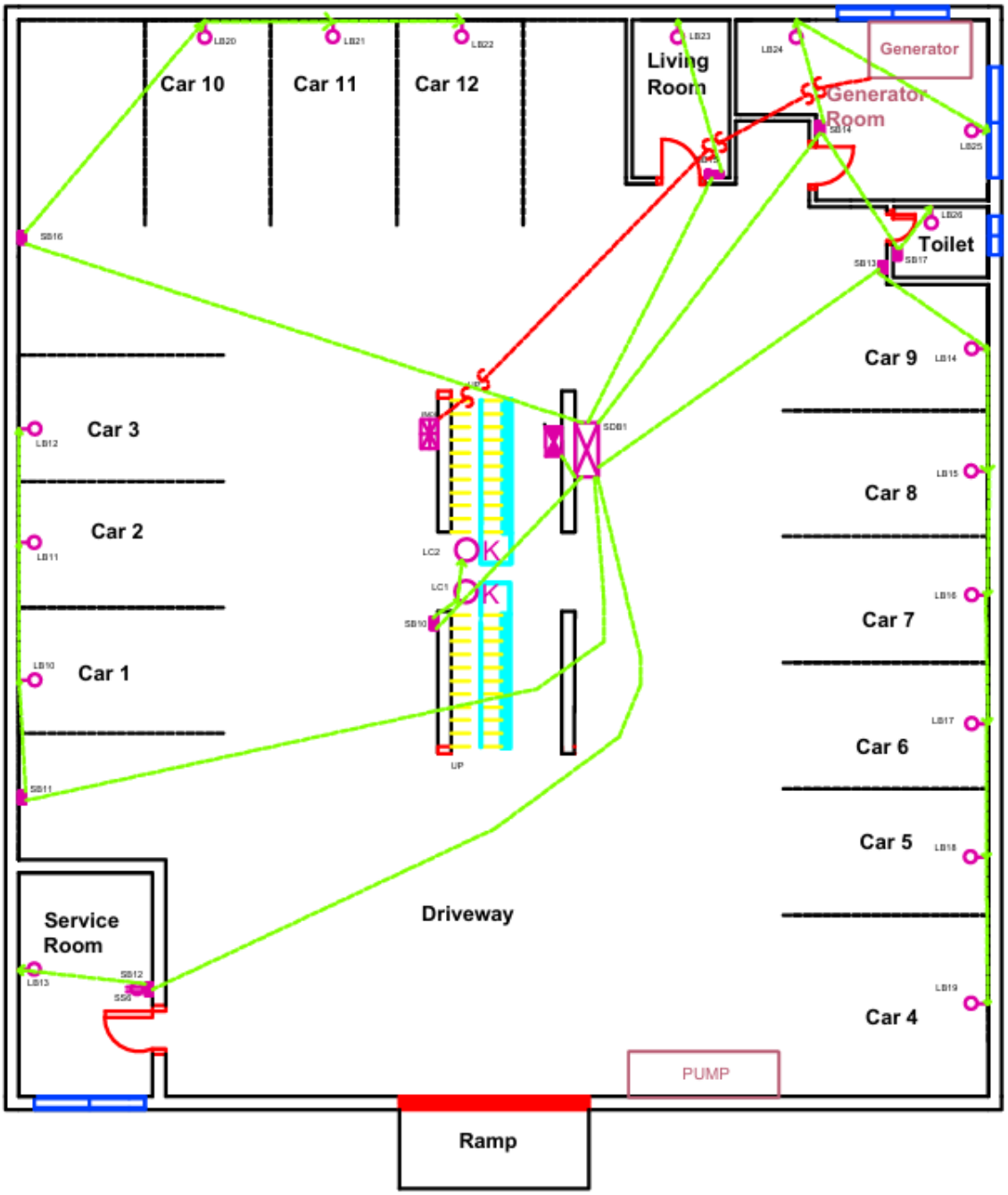
Floor Parameters (One unit):



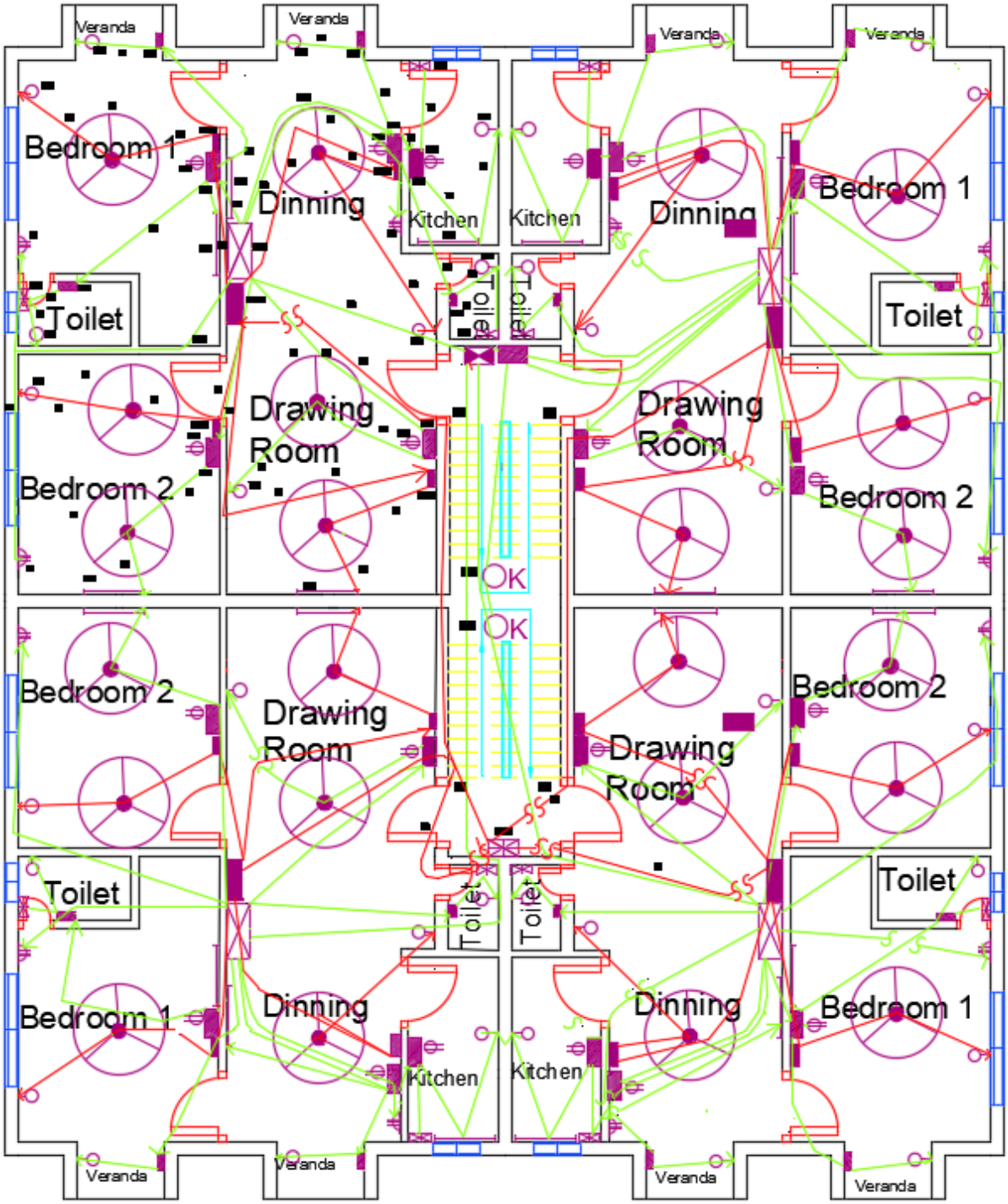
Rooftop Parameters



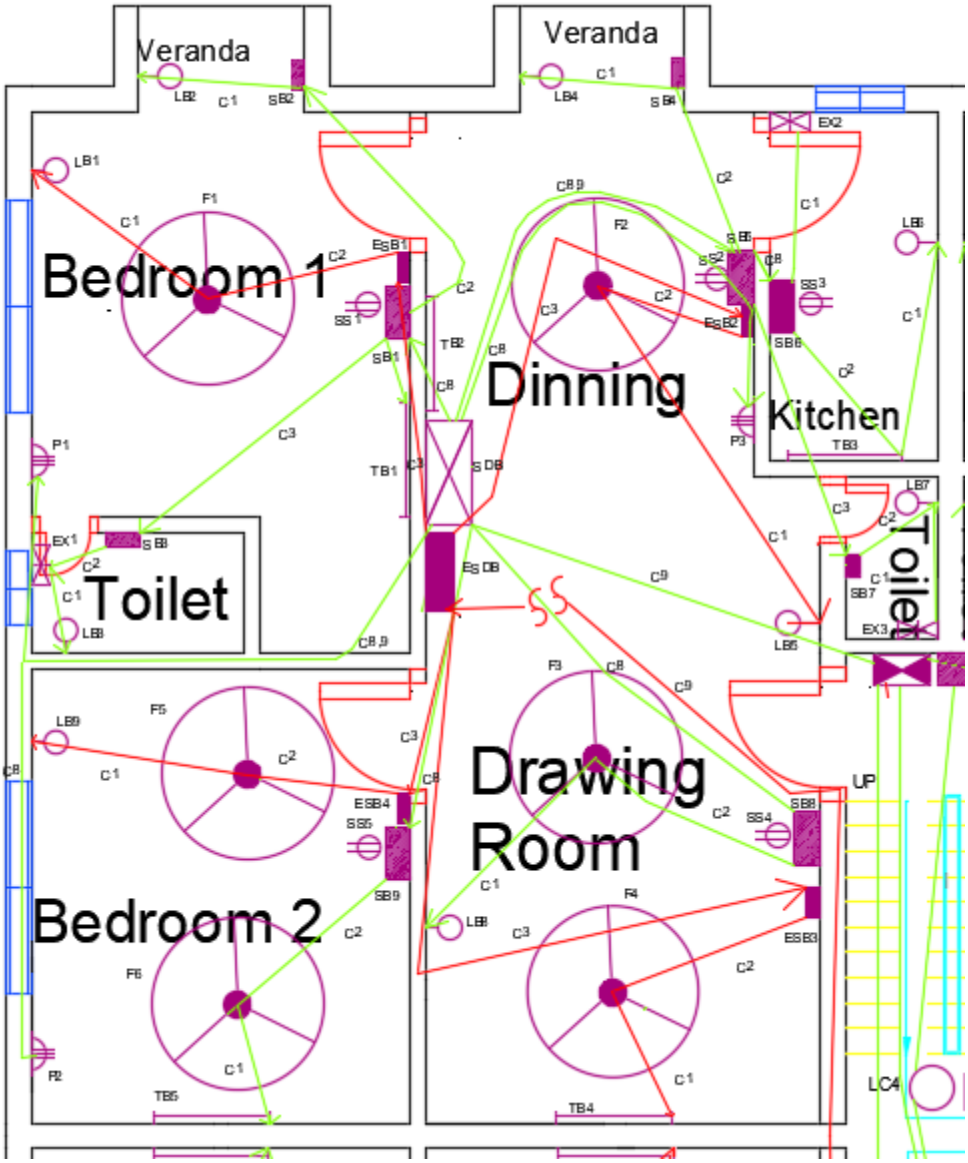
Ground Floor Fittings And Conduits



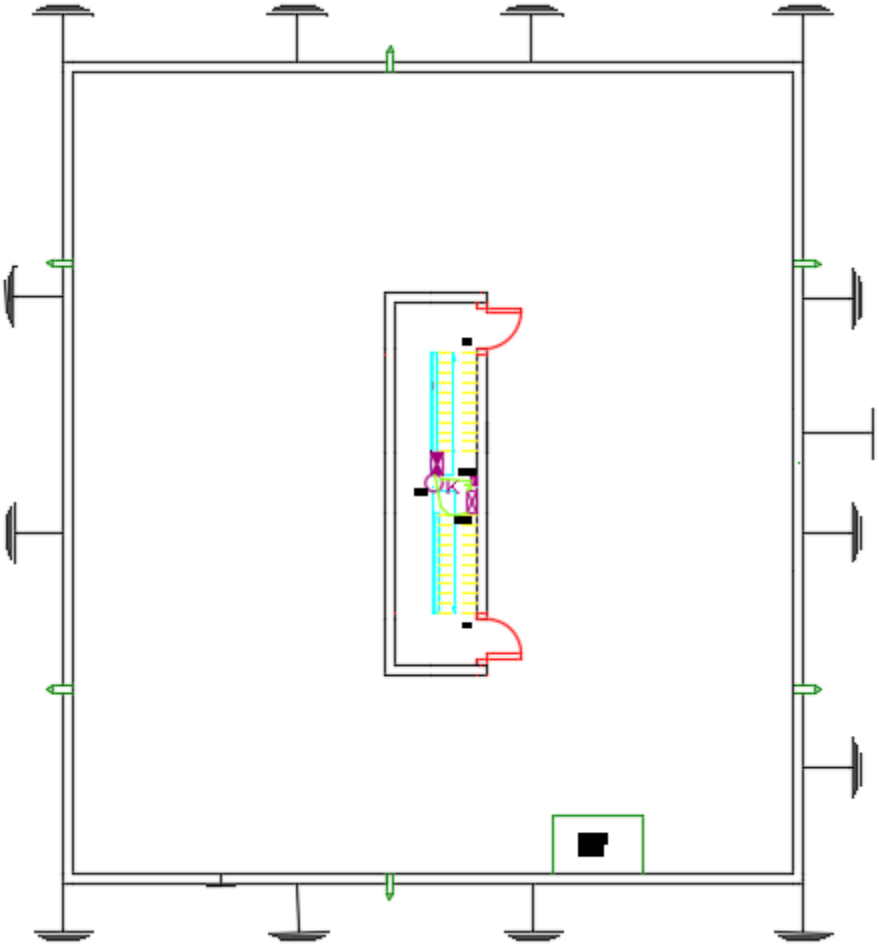
Floor Fittings And Conduits

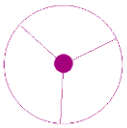


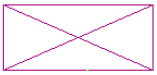
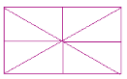
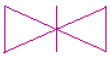
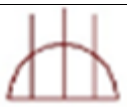
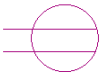
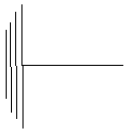
Floor Fittings And Conduits (One Unit):



Rooftop Fittings And Conduits



LEGENDS			
DESCRIPTION CAPTION	**HEIGHT**	**SYMBOL**	
4’-20W wall-mounted Fluorescent tube light	Lintel	TB	
20W Fluorescent light tube	Lintel	LB	
20W Fluorescent ceiling tube	Ceiling	LC	
56” 70 W sweep fan	Ceiling	F	
Switch Board	Mid Wall	SB	
Emergency Switch Board	Mid Wall	ESB	

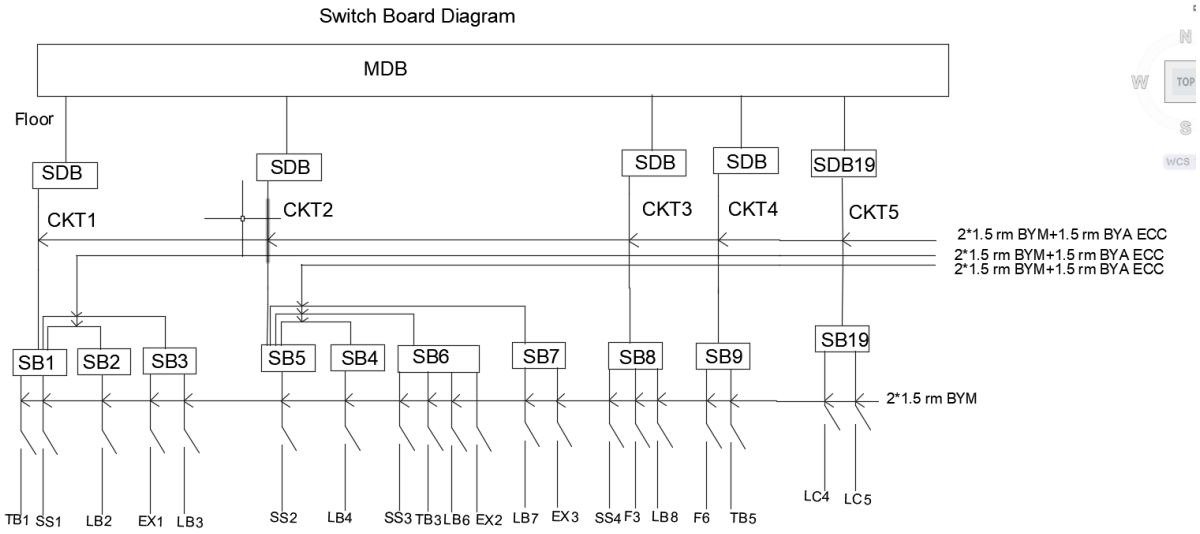
LEGENDS			
Sub distribution Board	Lintel	SDB	
Emergency Sub distribution Board	Lintel	ESDB	
Emergency Main Distribution Board	Lintel	EMDB	
Main Distribution Board	Lintel	MDB	
Exhaust Fan	Lintel	EX	
Power Socket for PC	Lower Wall	P	
Switch Socket	Lower Wall	SS	
Arresters	Edge of wall	Arrester	

Legends for conduits:

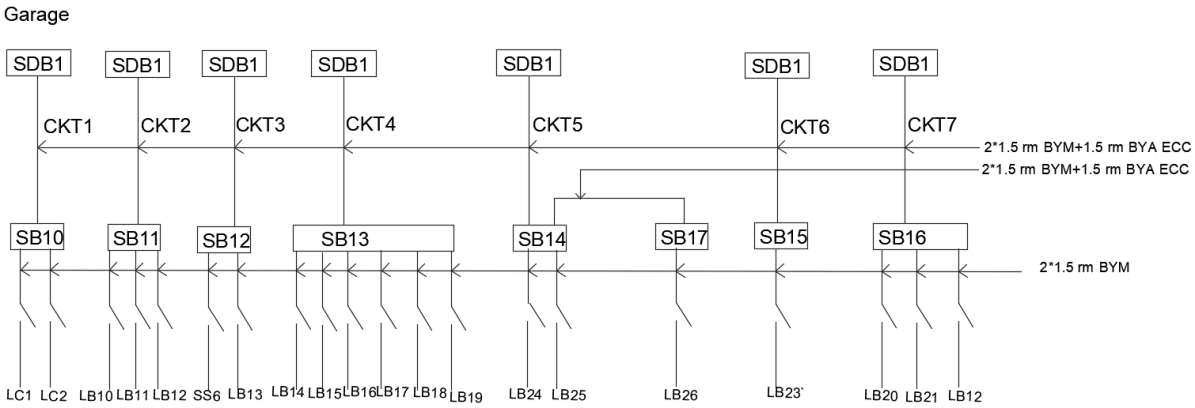
Legends for conduits	Conduit Size
C1= 2×1.5 rm BYM	¾”
C2= 4×1.5 rm BYM	¾”
C3= 6×1.5 rm BYM	¾”
C4= 2×1.5 rm BYM + 1.5 rm BYA ECC	¾”
C5= 2×1.5 rm BYM + 1.5 rm BYA ECC	¾”
C6= 2×4 rm BYM + 4 rm BYA ECC	¾”
C7= 2×6 rm BYM + 6 rm BYA ECC	¾”
C8= 4×4 rm BYM + 4 rm BYA ECC	¾”
C9= 4×6 rm BYM + 6 rm BYA ECC	¾”

Switch Board Connection Diagram

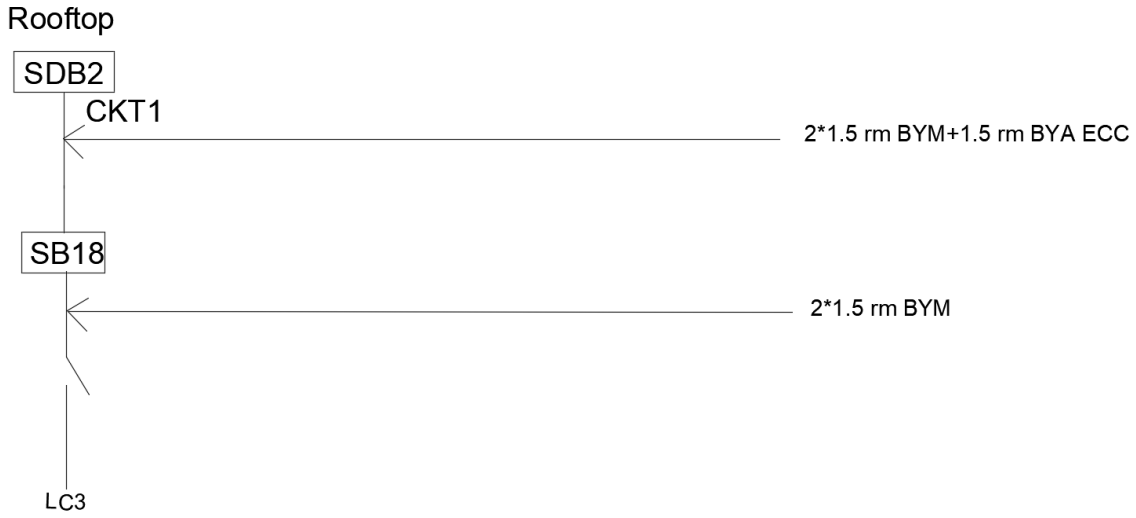
Floor:



Garage:

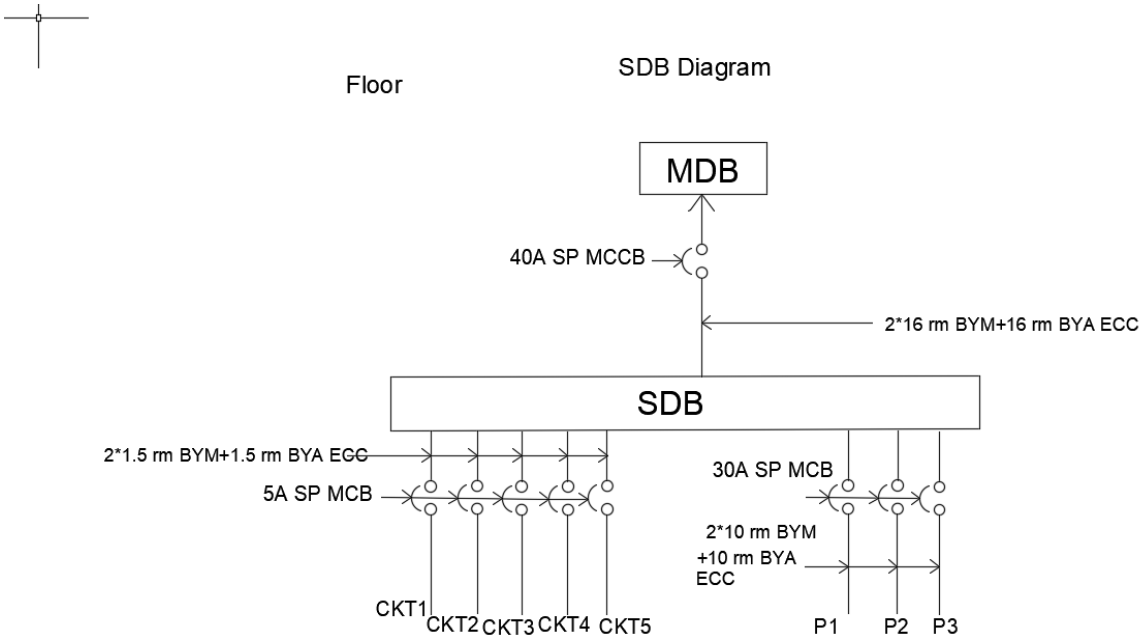


Rooftop:

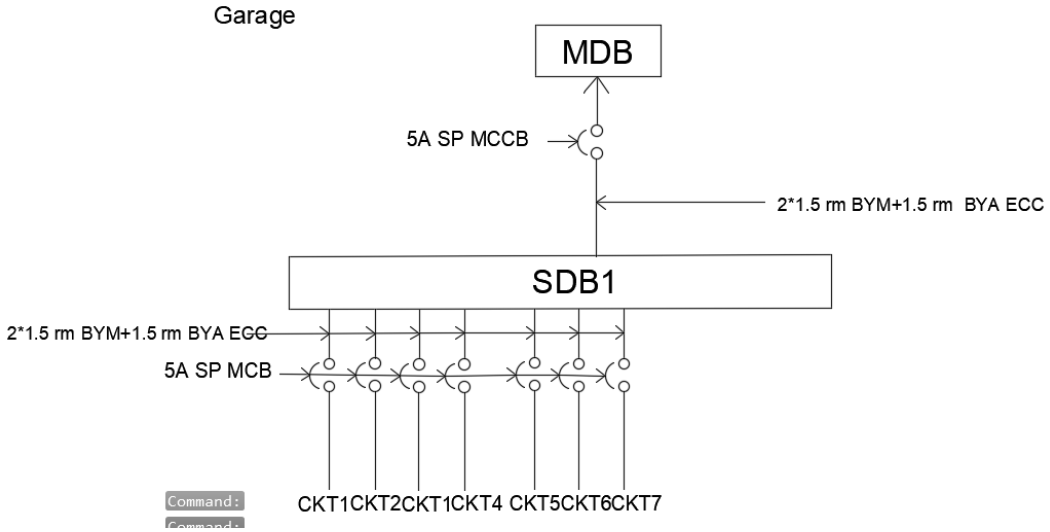


Sub Distribution Board Diagram

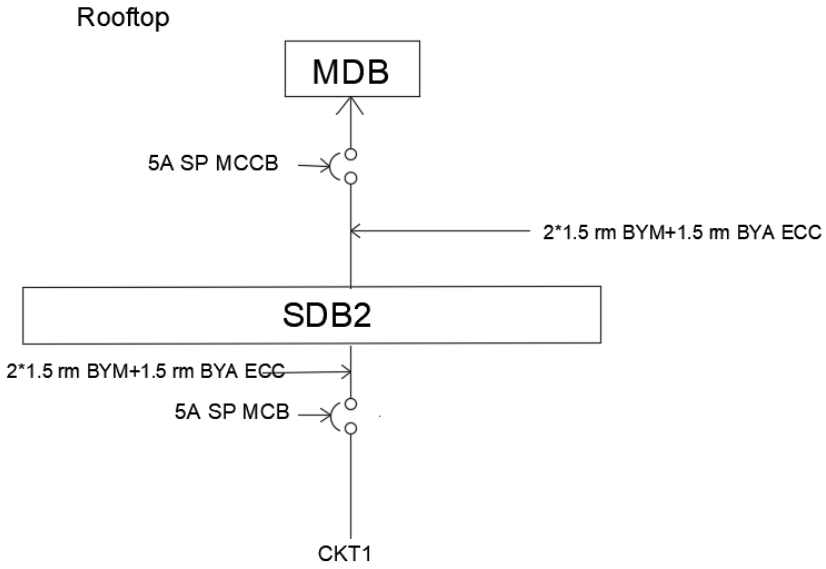
Floor:



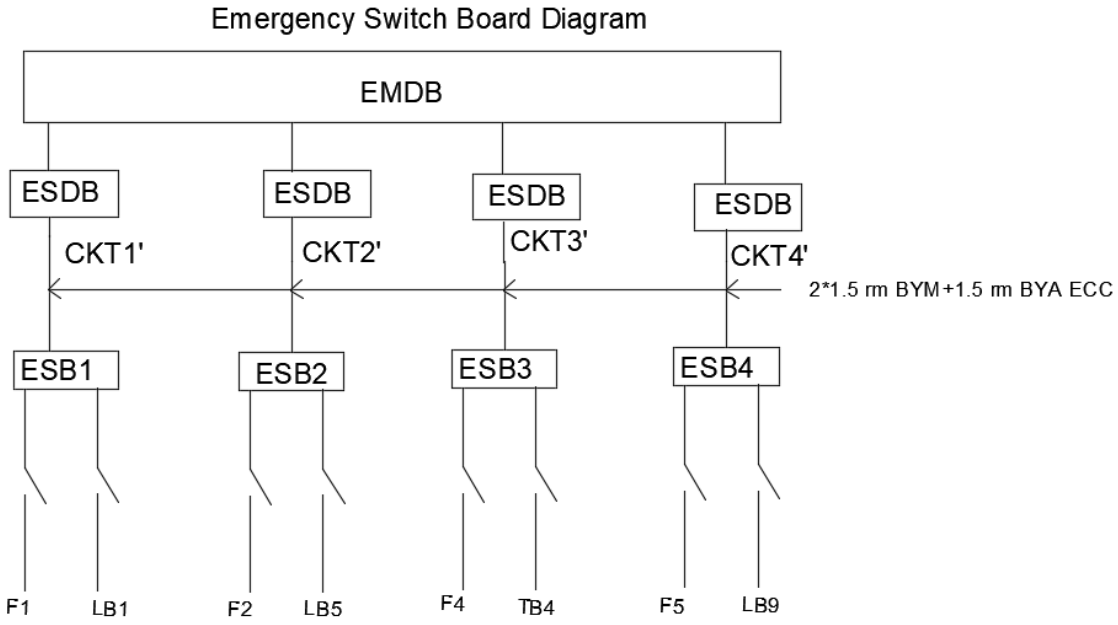
Garage:



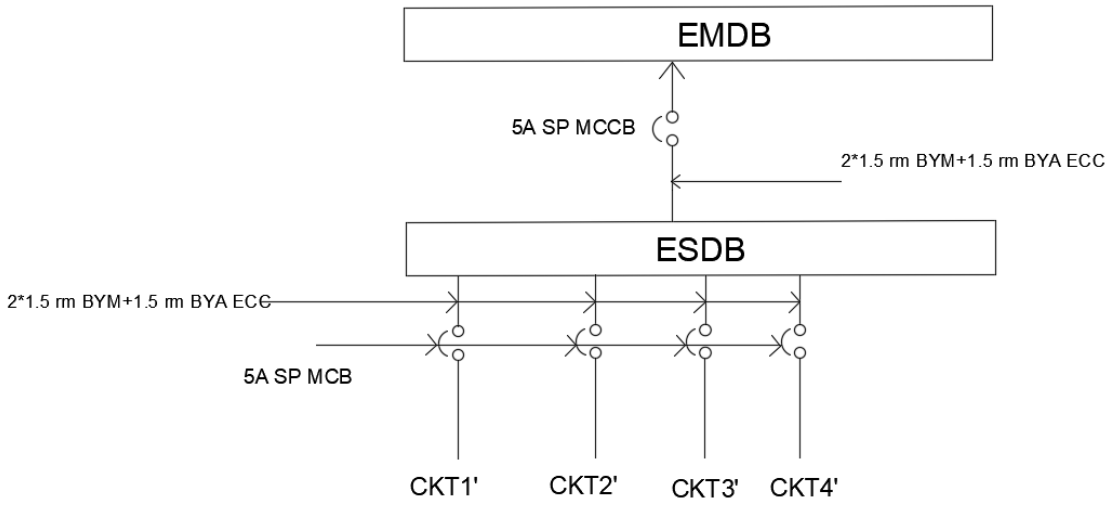
Rooftop:



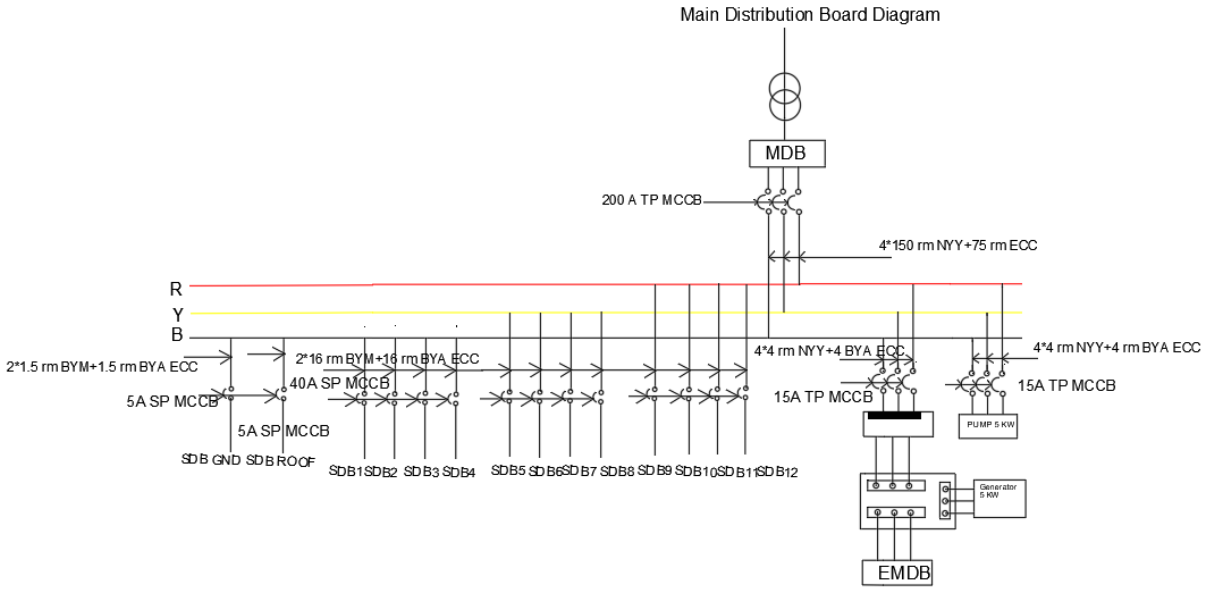
Emergency Switch Board Diagram



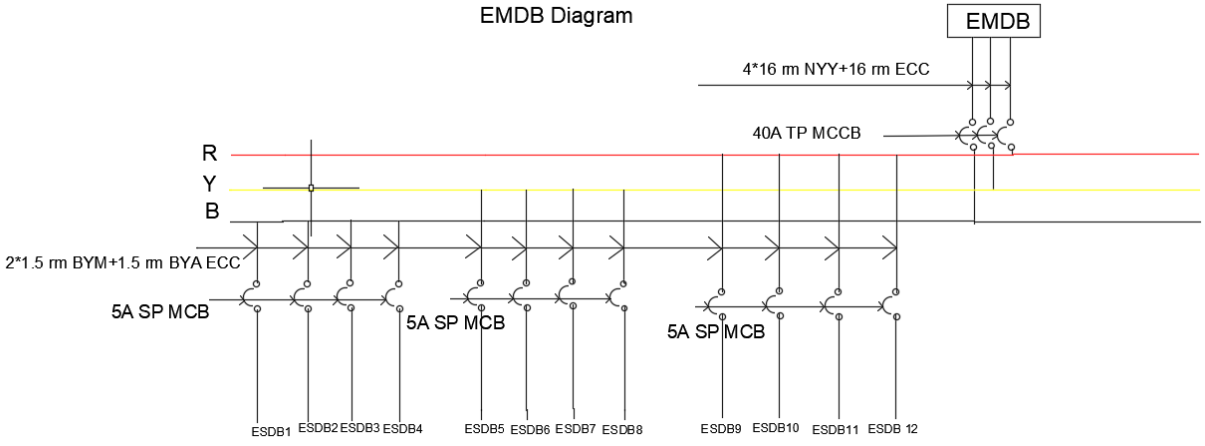
Emergency Sub Distribution Board Diagram



Main Distribution Board Diagram



Emergency Main Distribution Board Diagram



Calculation for Light & Fan:

For light,

E=(n*N*F*UF*LLF)/A (A in m^2)

Illuminance, E = 100 Lumen/m^2

Light Loss Factor & Utilization Factor, LLF*UF = 0.7

Number of Lights per Illuminaire, n = 1

Number of Lights = N

For Fan,

One 56” diameter fan is needed for every 100 sqft.

N = (A in sqft)

1st , 2nd, 3rd Floor

1. **Bedroom-1:**

a. **Light:**

Area= 12′6″*10′167/16″ = 12.62 m^2

Flux = 1200 Lumen

So, Number of Lights, N =1.502 ≈ 2

So, **1 Light bulb and 1 Tube Light** are needed.

b. Fan:

N= 12.5*10.87/100

=1.36

So, Number of fans, N = ≈ 1

2. Bedroom-2:

· **Light:**

Area= 15′*12′6″ = 17.42m^2

Flux = 1200 Lumen

So, Number of Lights, N = 2.07 ≈ 2

So, **1 Light bulb and 1 Tube Light** are needed.

· **Fan:**

N = 15*12.5/100

=1.875

So, Number of fans, N = ≈ 2

3. Dining

A=18′27/8″*10′10″ = 18.5m^2

Flux = 1400 Lumen

So, Number of Lights, N = 1.88 ≈ 2

So 1 tube light and 1 bulb is needed

- **Fan**

N = 10.83*12/100

= 1.3

So, Number of fans, N ≈ 1

4. Drawing Room

A=15′5/8″*13′ = 18.227m^2

Flux = 1400 Lumen

So, Number of Lights, N = 1.86 ≈ 2

So 1 tube light and 1 bulb is needed

- **Fan**

N = 15.05*13/100

= 1.96

So, Number of fans, N ≈ 2

Kitchen

a.Light

A= 12′*5′7″ = 6.247m^2

Flux = 200 Lumen

N=1.05 ≈ 1

So 1 Tube light is needed

- **Fan**

N = 5.58*12/100

=0.67

So,number of fans N ≈1

Toilet 01

A=7′6″*4′6″ = 3.1355m^2

Flux = 350 Lumen

N = 1.28 ≈ 1

So 1 bulb is required

Toilet 02 (Dinning)

A=5′61/16″*3′1″ = 1.5237m^2

Flux = 350 Lumen

N = 0.622 ≈ 1

So 1 bulb is required

Veranda

A=5′11/2″*3′51/8″ = 1.79m^2

Flux = 350 Lumen

N = 0.73 ≈ 1

So 1 bulb is required

STAIRCASE

Number of lights = 2 (per floor)

Number of lights = 1 (rooftop)

Ground Floor

Service Room:

A=2.5908*4.318= 11.187m^2

Flux = 1200 Lumen

N = 1.33 ≈ 1

Living Room:

A=5′7″*10′ = 5.187m^2

Flux = 900 Lumen

N = 0.6175 ≈ 1

Generator Room:

A=16′*11′6″= 17.094m^2

Flux = 900 Lumen

N = 2.035 ≈ 2

Lightening Arrester Calculation

Dimension:

69′11″ = 69.917′

63′2″ = 63.167′

Perimeter = 2* (69.917′+63.167′) = 266.17′

Number of lightening arresters = 266.17′/20 = 13

Switch Board Calculation

Floor

CKT1,

SB1=Tb1 + SS1= 100+20=120W

SB2=LB2=20W

SB3=EX1 + LB3 = 60W + 20 W= 80 W

Total Load = 220W

CKT2,

SB5= SS2 = 100W

SB4=LB4 = 20W

SB6= SS3+TB3+LB6+EX2 = 100+20+20+60 = 200 W

SB7= LB7 + EX3 = 20+60 = 80 W

Total Load = 400W

CKT3,

SB8= SS4+ F3 + LB8 = 100+100+20 = 220w

Total Load = 220W

CKT4,

SB9= F6+ TB5 = 100+20=120W

Total Load =120W

CKT5,

SB19=LC4+LC5=20 +20=40W

Total Load =40W

Current , I = P/V*pf

CKT1, I=220/220*0.7=1,42A (2 x 1.5 rm BYM +1.5 rm BYA ECC)

CKT2, I=400/220*0.7=2.6A (2 x 1.5 rm BYM +1.5 rm BYA ECC

CKT3, I=1.42A (2 x 1.5 rm BYM +1.5 rm BYA ECC)

CKT4,I=120/220*0.7=0.77A (2 x 1.5 rm BYM +1.5 rm BYA ECC)

CKT5,I=40/220*0.7=0.26 A (2 x 1.5 rm BYM +1.5 rm BYA ECC)

Garage:

CKT1,

SB10=LC1 + LC2= 20+20=40W

CKT2,

SB11= LB10+LB11+LB12 = 20+20+20W= 60W

CKT3,

SB13= LB13+SS6 = 100+20 = 120w

CKT4,

SB13= LB14+LB15+LB16+LB17+LB18+LB19

= 20+20+20+20+20+20= 120 W

CKT5,

SB14+ SB17= LB24+LB25+LB26 = 20+20+20W= 60W

CKT6,

SB15= LB23=20W

CKT7,

SB16= LB20+LB21+LB22 = 20+20+20W= 60W

Current , I = P/V*pf

CKT1, I=40/220*0.7=0.259A (2 x 1.5 rm BYM +1.5 rm BYA ECC)

CKT2, I=60/220*0.7=0.389A (2 x 1.5 rm BYM +1.5 rm BYA ECC

CKT3, I= 120/220*0.7=0.77A (2 x 1.5 rm BYM +1.5 rm BYA ECC)

CKT6,I=20/220*0.7=0.129A (2 x 1.5 rm BYM +1.5 rm BYA ECC)

CKT4,I=0.77A (2 x 1.5 rm BYM +1.5 rm BYA ECC)

CKT5,I=0.389A (2 x 1.5 rm BYM +1.5 rm BYA ECC)

CKT6,I=0.129A (2 x 1.5 rm BYM +1.5 rm BYA ECC)

CKT7,I=0.389A (2 x 1.5 rm BYM +1.5 rm BYA ECC)

Rooftop Calculation:

CKT1,

SB18= LC3 = 20W

I=20/220*0.7=0.129A (2 x 1.5 rm BYM +1.5 rm BYA ECC)

Emergency switch board calculation:

$ESB_1 = ESB_2 = ESB_3 = ESB_4 = 120$ W

I=4*120/220*0.7=3.12 A (2 x 1.5 rm BYM +1.5 rm BYA ECC)

SDB Calculation:

SDB load = total load * 0.7 + total P socket load *0.5

= 1000 * 0.7 + 3 * 3000*0.5

= 5200 W

I = 5200/(220*0.7) = 33.76A (2 x 16 rm BYM +16 rm BYA ECC)

40A SP MCCB

ESDB calculation:

$CKT_1' = 120/220*0.7 = 0.78$ A

$CKT_2' = CKT_3' = CKT_4' = 0.78$ A (2 x 1.5 rm BYM +1.5 rm BYA ECC)

5A SP MCCB for ESDB to EMDB

5A SP MCCB for ESB to ESDB

EMDB calculation:

Total EMDB load **=** 12*****4*120*0.7 = 4.032 kW

So 5kW generator is used.

I = EMDB load/ 220*0.7*3 =

= 480*12*0.7/220*0.7*3

= 8.72 A (4 x rm rm NYY +16 rm ECC)

40 A TP MCCB

Main distribution board calculation:

Total MDB load = 12*5200 + 4032 + 5000*0.7

= 69932 W

I = 69932/3*220*0.7 = 151.38 A (4 x 150 rm NYY +75 rm ECC)

200 A TP MCCB

Conclusion:

In conclusion, our university project on building conduits has successfully achieved its objectives and provided us with valuable insights into the world of electrical installations. Through careful planning, design, and implementation, we have constructed a reliable conduit system that meets the specific requirements of our project.

The lab report presents a comprehensive electrical wiring system design for a four-unit, three-storied residential building. Detailed floor plans, fittings, conduits, switch board connections, and calculations for lights and fans are provided. The report ensures proper understanding and implementation of the electrical wiring system to meet the building's requirements.

Throughout this project, we have gained practical experience in conduit installation techniques, which will undoubtedly benefit us in our future careers as electrical engineers. We have learned to adapt and make informed decisions to ensure the integrity and functionality of the conduit system.