Bangladesh University of Engineering and Technology

DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

EEE 414 (January 2024)

Electrical Service Design Laboratory

Section: A1 Group: 01

Electrical Services Design of a 10 Storied, 2 Unit Residential Building

Course Instructors:

Mrinmoy Kundu, Lecturer
Nure Alam Dipu, Part-Time Lecturer

Signature of Instructor: _____

Academic Honesty Statement:

IMPORTANT! Please carefully read and sign the Academic Honesty Statement, below. Type the student ID and name, and put your signature. *You will not receive credit for this project experiment unless this*

"In signing this statement, We hereby certify that the work on this project is our own and that we have not copied the work of any other students (past or present), and cited all relevant sources while completing this project. We understand that if we fail to honor this agreement, We will each receive a score of ZERO for this project and be subject to failure of this course."

Signature: _____ **Full Name: Anudwaipaon Antu** **Student ID: 1906001**	**Signature: _____** **Full Name: Sabbir Ahmed** **Student ID:1906004**
Signature: _____ **Full Name: Aranya Saha** **Student ID:1906010**	**Signature: _____** **Full Name: B. M. Emroj Hossain** **Student ID: 1906013**
Signature: _____ **Full Name: Junayet Hossain** **Student ID:1906026**	**Signature: _____** **Full Name: Vivek Chowdhury** **Student ID:1906031**
Signature: _____ **Full Name: A. S. M. Abrar Tanvir Toki** **Student ID:1806029**	

Project Objectives:

The objectives of this project is to:

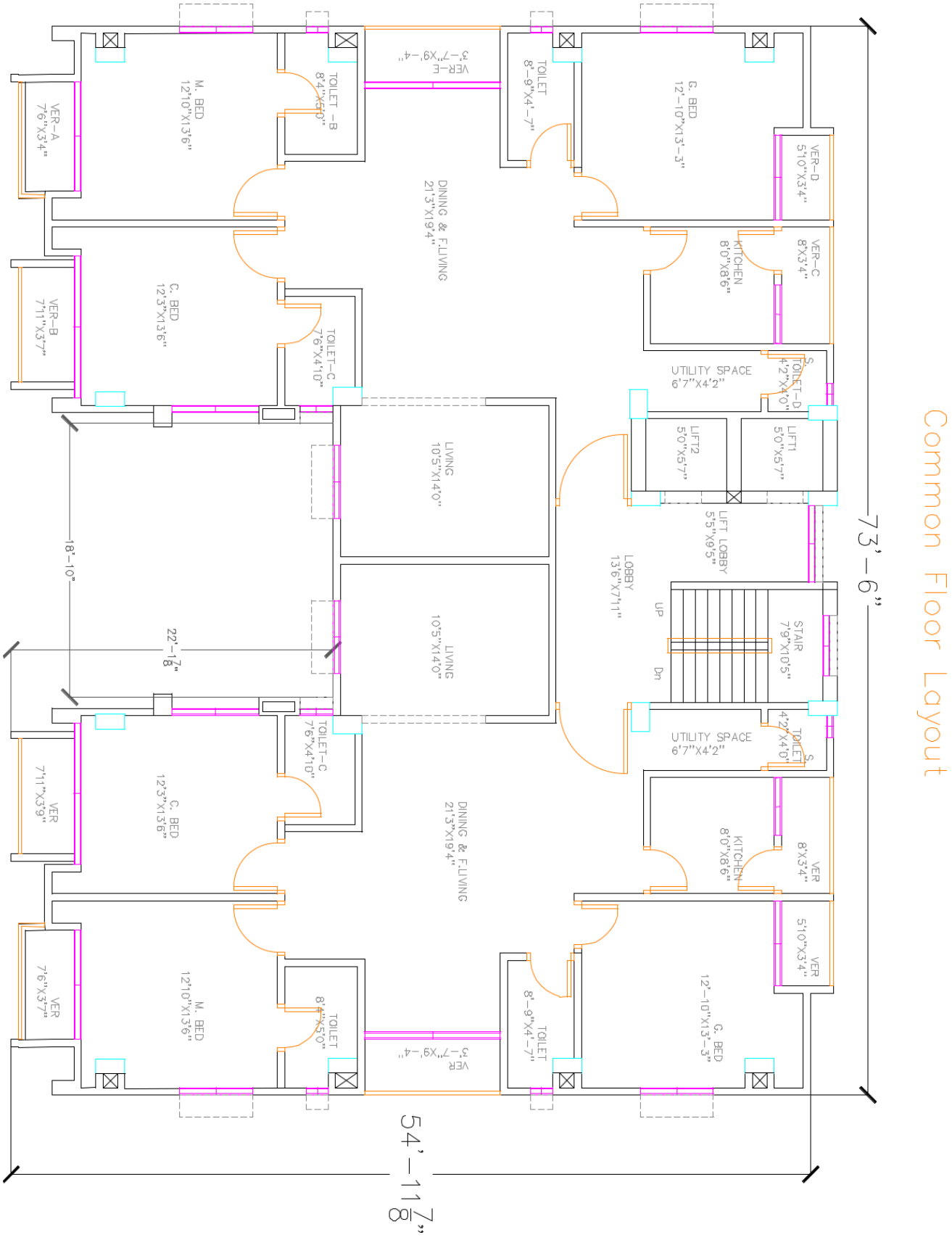
- Understand the floor planning of a multi-storied residential building.
- Familiarize with fittings, fixtures, and appliances used in each compartment.
- Design conduit layouts systematically.
- Understand switchboard connections and calculate suitable components.
- Draw single-line diagrams of the electrical components.
- Calculate circuit breakers, transformer, and generator ratings and place them in appropriate positions.
- Design an effective lightning protection system.

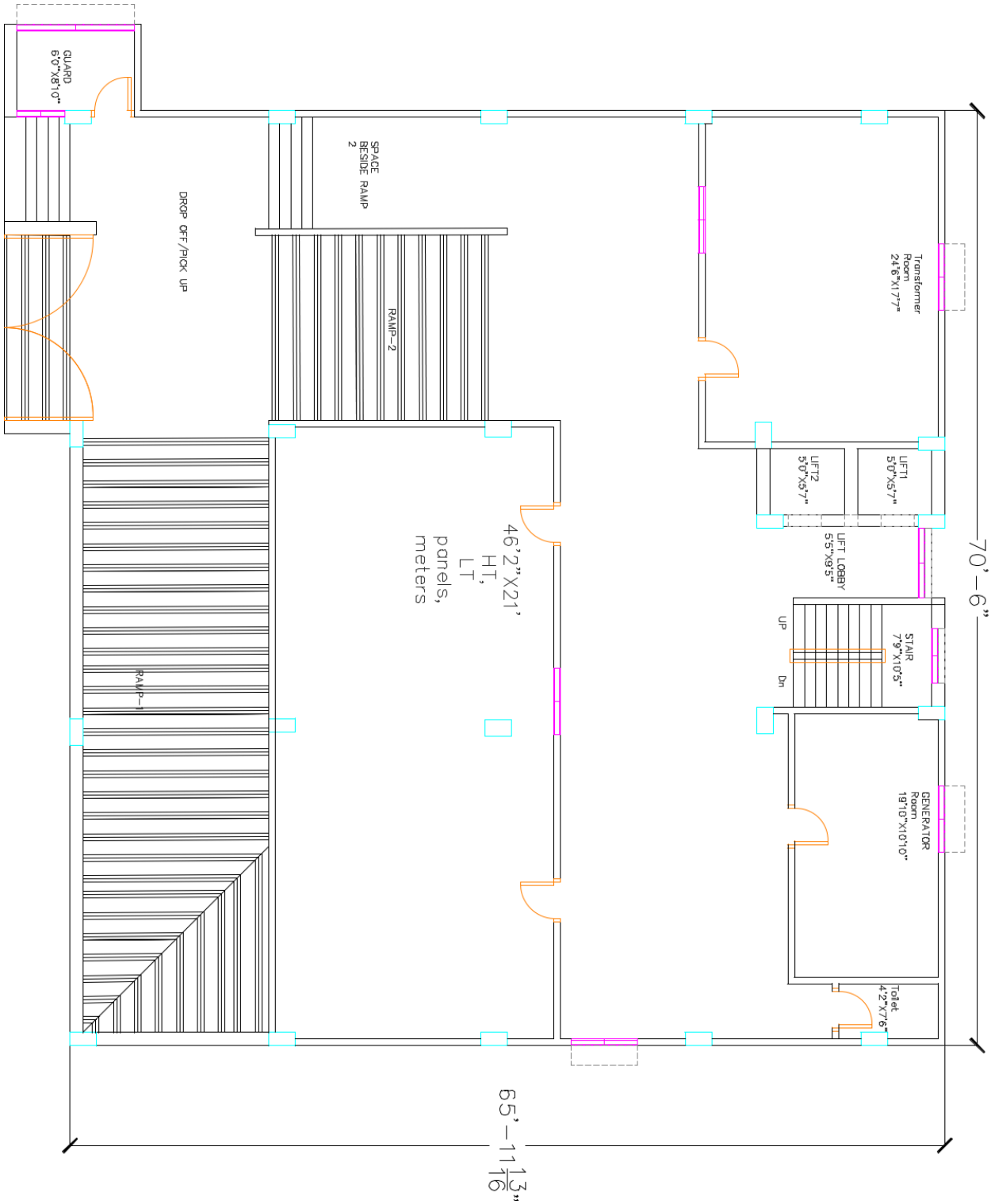
Design Steps:

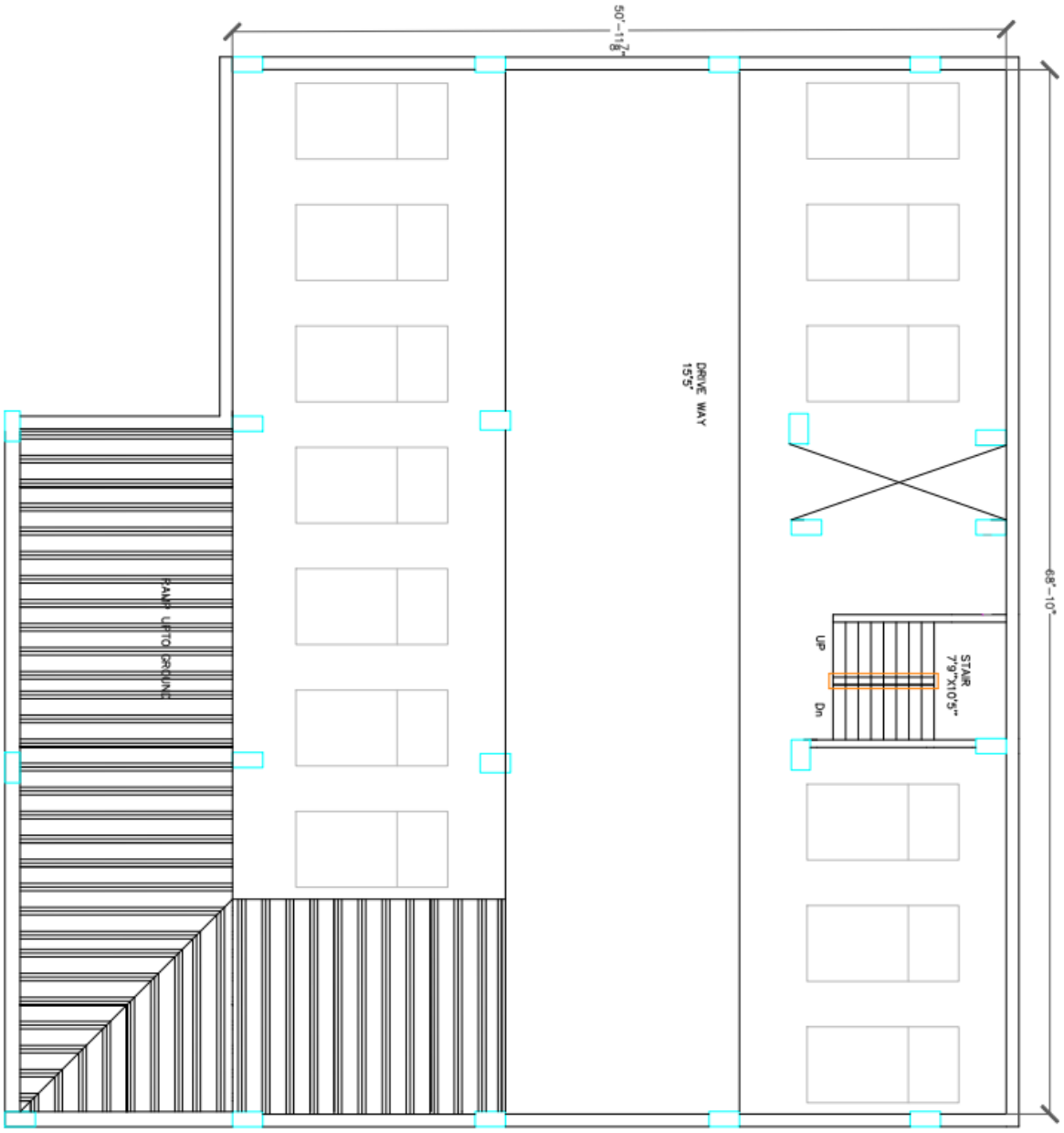
The project was carried out according to the following design steps:

1) Ground floor, typical floor, rooftop, underground floor plan of a ten-storied building.
2) Fittings and fixtures for each floor.
3) Conduit calculation and place for each floor.
4) Switchboard and distribution board diagram.
5) Transformer, generator design and add rooms for appropriate rating.
6) Lightening protection system design.

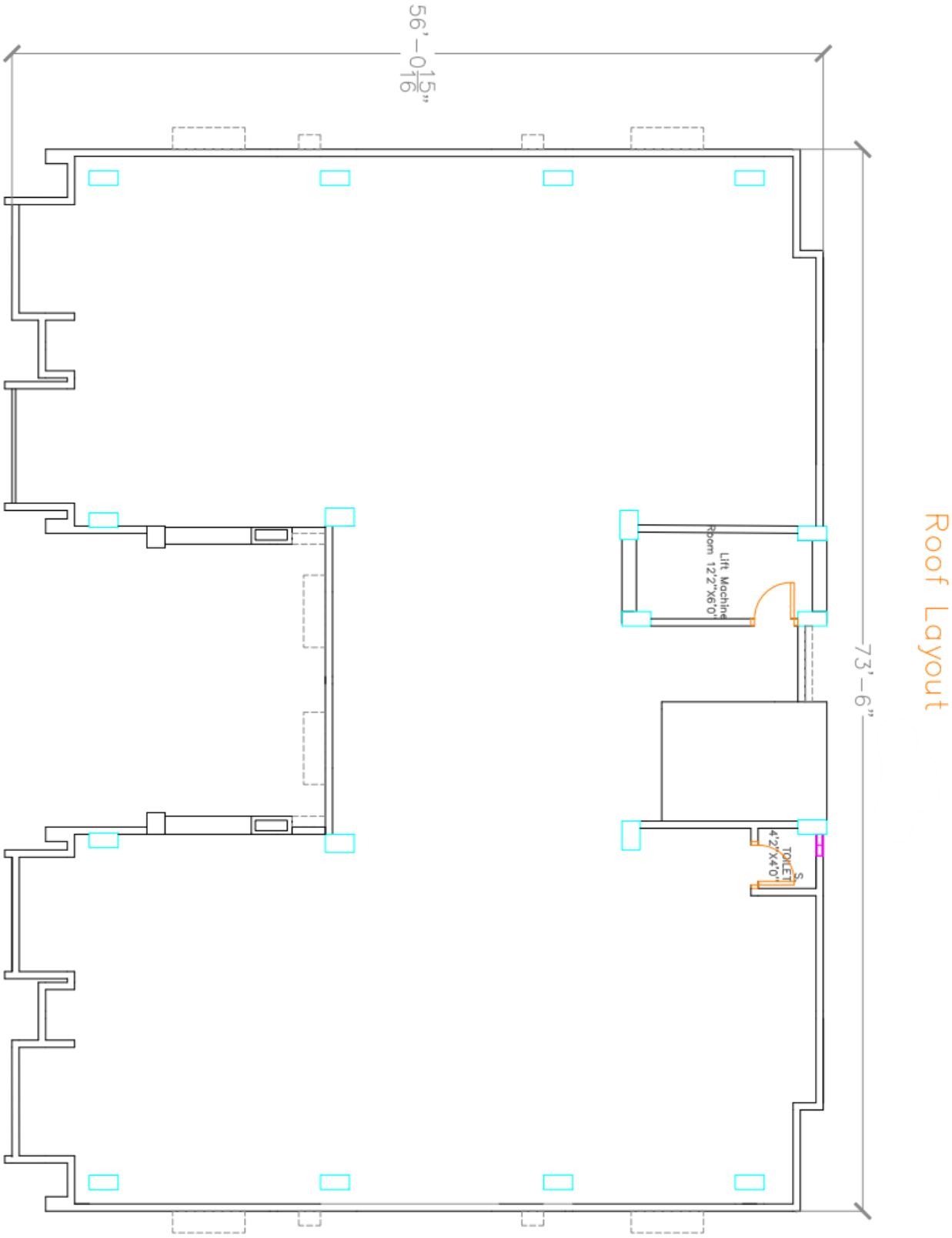
Floorplans:


Common Floor Layout
73'-6"
54'-11 7/8"
18'-10"
22'-7 1/8"
M. BED 12'10"X13'6"
TOILET -B 8'4"X4'0"
VER-A 7'6"X3'4"
VER-E 3'-7"X9'-4"
TOILET 8'-9"X4'-7"
G. BED 12'-10"X13'-3"
VER-D 5'10"X3'4"
DINING & F.LIVING 21'3"X19'4"
KITCHEN 8'0"X8'6"
VER-C 8'X3'4"
C. BED 12'3"X13'6"
VER-B 7'11"X3'7"
TOILET-C 7'6"X4'10"
UTILITY SPACE 6'7"X4'2"
TOILET-D 4'2"X4'0"
LIFT2 5'0"X5'7"
LIFT1 5'0"X5'7"
LIFT LOBBY 5'5"X9'5"
LIVING 10'5"X14'0"
LOBBY 13'6"X7'11"
UP
Dn
STAIR 7'9"X10'5"
VER 7'11"X3'9"
VER 7'6"X3'7"
VER 8'X3'4"
VER 5'10"X3'4"

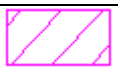
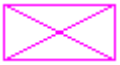
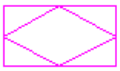

GUARD
6'0"X8'10"
DROP OFF/PICK UP
SPACE BESIDE RAMP 2
RAMP-2
RAMP-1
46'2"X21' HT, LT panels, meters
Transformer Room
24'6"X17'7"
LIFT2
5'0"X5'7"
LIFT1
5'0"X5'7"
LIFT LOBBY
5'5"X9'5"
UP
Dn
STAIR
7'9"X10'5"
GENERATOR Room
19'10"X10'10"
Toilet
4'2"X7'6"
70'-6"
65'-11 13/16"
Ground Floor



Under Ground Layout



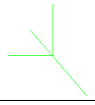
Fixture legend (general):

Description	Height	Caption	Symbol	Power
Wall Mounted Light	Lintel	LLA / LLB		LLA = 12W LLB = 18W
Ceiling Light	Ceiling	CLA/CLB		CLA = 12W CLB = 18W
Wall Mounted Tube Light	Lintel	TLA		20W
Ceiling Mounted Tube Light	Ceiling	TLB		40W
Fan (56" diameter)	Ceiling	F		75W
Switch Board	Mid wall	SB		---
Sub Distribution Board	Mid wall	SDB		---
Main Distribution Board	Mid wall	MDB		---
Exhaust Fan (8" diameter)	Lintel	Ex(40W)		40W
2 Pin Socket	Mid Wall	SS(100W)		100W
2 Pin TV Socket	Lower	TS(120W)		120W
3 Pin Socket 20A	Lintel	Q(4000W)/P(3000 W)		Q = 4000W P = 3000W

Fixture legend (Emergency):

Description	Height	Caption	Symbol
Emergency Switch Board	Mid wall	ESB	
Emergency Sub Distribution Board	Mid wall	ESDB	
Emergency 2 Pin Socket	Mid Wall	ESS	
Emergency Main Distribution Board	Mid Wall	EMDB	

Lightning Protection System

Description	Height	Symbol
Air Terminal	Rooftop	
Down Conductor	Rooftop	
Roof Conductor	Rooftop	

- 100 lumen/watt is considered for each light.

Required LUX rating:

Place	LUX Requirement
Bedroom	90
Kitchen	200
Drawing Room and F Living	100
Living Room	100
Bathroom	100
Veranda	50
Utility Spaces	100
Generator Room	120
Transformer Room	120
HT, LT panels, meter Room	110
Guard Room	100
Drive Way	100
Car Parking	100

Sample Calculations:

Calculating fixtures:

Total light flux = $\frac{Area(m^2) \times LUX}{UF}$ $lumen$

The number of lights is set as of total lumen requirement in a room is fulfilled by the lights. Each light emits 100 lumen/W.

Total number of fans ≈ $\frac{Area(ft^2)}{100}$

Regular Unit:

- **G. Bedroom:**

Length = $12'10"$

Width = $13'3"$

Area = 170.4 $ft^2 = 15.7972\ m^2$

Lux requirement = 90

UF = 0.6

Light flux = $\frac{15.7972 \times 90}{0.6} = 2369\ lumen$

Therefore, we can select 1 TLA (2000 $lumen$) and 1 LLA (1200 $lumen$)

Number of fans = $\frac{170.4}{100} \approx 2$

G. Bedroom

Length(ft)	Width(ft)	Area(ft2)	Area(m^2)	LUX	UF	Lumen	Light	No. of Fans
12'10"	13'3"	170.04	15.7972	90	0.6	2369.584	1 LLA, 1 TLA	2

- **M. Bedroom:**

Length = $12'10"$

Width = $13'6"$

Area = 173.25 $ft^2 = 16.0954\ m^2$

Lux requirement = 90

UF = 0.6

Light flux = $(16.0954 \times 90)/0.6 = 2414\ lumen$

Therefore, we can select 1 TLA (2000 $lumen$) and 1 LLA (1200 $lumen$)

Number of fans = $\frac{173.25}{100} \approx 2$

M. Bedroom

Length(ft)	Width(ft)	Area(ft2)	Area(m^2)	LUX	UF	Lumen	Light	No. of Fans
12'10"	13'6"	173.25	16.0954	90	0.6	2414	1 LLA, 1 TLA	2

- **C. Bedroom:**

Length = $12'10"$

Width = $13'6"$

Area = 173.25 $ft^2 = 16.0954\ m^2$

Lux requirement = 90

UF = 0.6

Light flux = $(16.0954 \times 90)/0.6 = 2414\ lumen$

Therefore, we can select 1 TLA $(2000\ lumen)$ and 1 LLA $(1200\ lumen)$

Number of fans = $(173.25)/100 \approx 2$

C. Bedroom

Length(ft)	Width(ft)	Area(ft2)	Area(m^2)	LUX	UF	Lumen	Light	No. of Fans
12'10"	13'6"	173.25	16.0954	90	0.6	2414	1 LLA, 1 TLA	2

- **Dining and F. Living:**

Length = $21'3"$

Width = $19'4"$

Area = 410.833 $ft^2 = 38.1676\ m^2$

Lux requirement = 100

UF = 0.6

Light flux = $(38.1676 \times 100)/0.6 = 6361.27\ lumen$

Therefore, we can select 2 TLA $(2000\ lumen)$ and 2 LLA $(1200\ lumen)$

Number of fans = $410.833/100 \approx 3$

Dining and F. Living

Length(ft)	Width(ft)	Area(ft2)	Area(m^2)	LUX	UF	Lumen	Light	No. of Fans
21'3"	19'4"	410.833	38.1676	100	0.6	6361.27	2 LLA, 2 TLA	3

- **Living:**

Length = $10'5"$

Width = $10'5"$

Area = $10'5" \; ft^2 = 10'5" \; m^2$

Lux requirement = 100

UF = 0.6

Light flux = $(13.5483 \times 100)/0.6 = 10^{\wedge\prime} \; 5" \; lumen$

Therefore, we can select 1 TLA (2000 $lumen$) and 1 LLA (1200 $lumen$)

Number of fans = $145.833/100 \approx 2$

Living

Length(ft)	Width(ft)	Area(ft2)	Area(m^2)	LUX	UF	Lumen	Light	No. of Fans
$10'5"$	$10'5"$	$10'5"$	$10'5"$	100	0.6	$10'5"$	1 LLA, 2 TLA	2

- **Toilet A:**

Length = $8'9"$

Width = $4'7"$

Area = 40.104 $ft^2 = 3.7257 \; m^2$

Lux requirement = 100

UF = 0.6

Light flux = $(3.7257 \times 100)/0.6 = 620.96 \; lumen$

Therefore, we can select 1 LLA (1200 $lumen$)

Toilet A

Length(ft)	Width(ft)	Area(ft2)	Area(m^2)	LUX	UF	Lumen	Light	No. of Fans
$8'9"$	$4^{\wedge\prime}$ 7"	40.104	3.7257	100	0.6	620.96	1 LLA	0

- **Toilet B:**

Length = $8'4"$

Width = $4'$

Area = 41.67 $ft^2 = 3.8712\ m^2$

Lux requirement = 100

UF = 0.6

Light flux = $(3.7257\ \times 100)/0.6 = 620.96\ lumen$

Therefore, we can select $1\ LLA\ (1200\ lumen)$

Toilet B

Length(ft)	Width(ft)	Area(ft2)	Area(m^2)	LUX	UF	Lumen	Light	No. of Fans
$8'9''$	4^′ 7"	40.104	3.8712	100	0.6	645.21	1 LLA	0

- **Toilet C:**

Length = $7'6''$

Width = $4'10''$

Area = 36.25 $ft^2 = 3.3677\ m^2$

Lux requirement = 100

UF = 0.6

Light flux = $(3.7257\ \times 100)/0.6 = 561.289\ lumen$

Therefore, we can select $1\ LLA\ (1200\ lumen)$

Toilet C

Length(ft)	Width(ft)	Area(ft2)	Area(m^2)	LUX	UF	Lumen	Light	No. of Fans
$7'6''$	$4'$	36.25	3.3677	100	0.6	561.289	1 LLA	0

- **Toilet D:**

Length = $7'6''$

Width = $4'10''$

Area = 36.25 $ft^2 = 3.3677\ m^2$

Lux requirement = 100

UF = 0.6

Light flux = $(3.7257 \times 100)/0.6 = 561.289\ lumen$

Therefore, we can select $1\ LLA\ (1200\ lumen)$

Toilet D

Length(ft)	Width(ft)	Area(ft2)	Area(m^2)	LUX	UF	Lumen	Light	No. of Fans
7′6″	4′	36.25	3.3677	100	0.6	561.289	1 LLA	0

- **Lobby:**

Length = 13′6″

Width = 7′11″

Area = 106.875 $ft^2 = 9.92\ m^2$

Lux requirement = 100

UF = 0.6

Light flux = $(9.92 \times 100)/0.6 = 1654.835\ lumen$

Therefore, we can select $1\ CLB\ (1800\ lumen)$

Lobby

Length(ft)	Width(ft)	Area(ft2)	Area(m^2)	LUX	UF	Lumen	Light	No. of Fans
13′6″	7^′ 11"	106.875	9.92	100	0.6	1654.835	1 CLB	0

- **Lift Lobby:**

Length = 5′5″

Width = 9′5″

Area = 51 $ft^2 = 4.738\ m^2$

Lux requirement = 100

UF = 0.6

Light flux = $(4.738 \times 100)/0.6 = 789.6755\ lumen$

Therefore, we can select $1\ CLA\ (1200\ lumen)$

Lift Lobby

Length(ft)	Width(ft)	Area(ft2)	Area(m^2)	LUX	UF	Lumen	Light	No. of Fans
5′5”	9^′ 5"	51	4.738	100	0.6	789.6755	1 CLA	0

- **Stairs:**

Length = 7′9”

Width = 10′5”

Area = 80.73 $ft^2 = 7.5\ m^2$

Lux requirement = 120

UF = 0.6

Light flux = $(7.5 \times 120)/0.6 = 1500\ lumen$

Therefore, we can select $1\ CLA\ (1200\ lumen)$

Stairs

Length(ft)	Width(ft)	Area(ft2)	Area(m^2)	LUX	UF	Lumen	Light	No. of Fans
7′9”	10^′ 5"	80.73	7.5	120	0.6	1500	1 CLB	0

- **Kitchen:**

Length = 8′

Width = 8′6”

Area = 68 $ft^2 = 6.317\ m^2$

Lux requirement = 200

UF = 0.6

Light flux = $(6.317 \times 200)/0.6 = 2105\ lumen$

Therefore, we can select $2\ LLA\ (2400\ lumen)$

Kitchen

Length(ft)	Width(ft)	Area(ft2)	Area(m^2)	LUX	UF	Lumen	Light	No. of Fans
8′	8^′ 6"	68	6.317	200	0.6	2105	2 LLA	0

- **Veranda A:**

Length = $7'$

Width = $3'7''$

Area = 25 $ft^2 = 2.332\ m^2$

Lux requirement = 50

UF = 0.6

Light flux = $(2.332 \times 50)/0.6 = 219.638\ lumen$

Therefore, we can select $1\ CLA\ (1200\ lumen)$

Veranda A

Length(ft)	Width(ft)	Area(ft2)	Area(m^2)	LUX	UF	Lumen	Light	No. of Fans
7′	3^′ 7"	25	2.332	50	0.6	219.638	1 CLA	0

The rest 4 Verandas (Veranda B, Veranda C, Veranda D, Veranda E) are of almost same dimension and so we can add one CLA for each veranda like this one.

- **Veranda A:**

Length = $7'9''$

Width = $10'5''$

Area = 80.73 $ft^2 = 7.5\ m^2$

Lux requirement = 100

UF = 0.6

Light flux = $(7.5 \times 100)/0.6 = 1250.01\ lumen$

Therefore, we can select $1\ CLB\ (1800\ lumen)$

Veranda A

Length(ft)	Width(ft)	Area(ft2)	Area(m^2)	LUX	UF	Lumen	Light	No. of Fans
7′9"	10^′ 5"	7.5	7.5	100	0.6	1250.01	1 CLB	0

Underground:

- **Car Parking - 1 :**

Length = 68′8”

Width = 18′

Area = 1235.88 $ft^2 = 114.8175\ m^2$

Lux requirement = 100

UF = 0.6

Light flux = $(114.8175 \times 100)/0.6 = 19136.24\ lumen$

Therefore, we can select $5\ TLB\ (20000\ lumen)$

Car Parking - 1

Length(ft)	Width(ft)	Area(ft2)	Area(m^2)	LUX	UF	Lumen	Light	No. of Fans
68′8"	18′	1235.88	114.8175	100	0.6	19136.24	5 TLB	0

Similarly, we can find,

Car Parking - 2

Length(ft)	Width(ft)	Area(ft2)	Area(m^2)	LUX	UF	Lumen	Light	No. of Fans
29′9"	17′7"	523.1	48.597	100	0.6	8099.62	2 TLB	0

Car Parking - 3

Length(ft)	Width(ft)	Area(ft2)	Area(m^2)	LUX	UF	Lumen	Light	No. of Fans
21′8"	17′7"	380.97	35.393	100	0.6	5898.901	2 TLB	0

Drive way

Length(ft)	Width(ft)	Area(ft2)	Area(m^2)	LUX	UF	Lumen	Light	No. of Fans
68′8"	18′5"	1264.61	117.4866	100	0.6	19581	5 TLB	0

Roof Top:

- **Lift Machine Room :**

Length = $6'$

Width = $12'2"$

Area = 73 $ft^2 = 6.7819\ m^2$

Lux requirement = 200

UF = 0.6

Light flux = $(6.7819 \times 200)/0.6 = 2260.649\ lumen$

Therefore, we can select $2\ LLA\ (2400\ lumen)$

Lift Machine Room

Length(ft)	Width(ft)	Area(ft2)	Area(m^2)	LUX	UF	Lumen	Light	No. of Fans
$6'$	$12'2"$	73	6.7819	200	0.6	2260.649	2 LLA	0

- **Toilet :**

Length = $4'2"$

Width = $4'$

Area = 16.67 $ft^2 = 1.5487\ m^2$

Lux requirement = 100

UF = 0.6

Light flux = $(1.5487 \times 100)/0.6 = 258.116\ lumen$

Therefore, we can select $1\ LLA\ (1200\ lumen)$

Toilet

Length(ft)	Width(ft)	Area(ft2)	Area(m^2)	LUX	UF	Lumen	Light	No. of Fans
$4'2"$	$4'2"$	16.67	1.5487	100	0.6	258.116	1 LLA	0

Roof Top:

- **Toilet :**

Length = $4'2"$

Width = $4'$

Area = 16.67 $ft^2 = 1.5487\ m^2$

Lux requirement = 100

UF = 0.6

Light flux = $(1.5487 \times 100)/0.6 = 258.116\ lumen$

Therefore, we can select $1\ LLA\ (1200\ lumen)$

Toilet

Length(ft)	Width(ft)	Area(ft2)	Area(m^2)	LUX	UF	Lumen	Light	No. of Fans
$4'2"$	$4'2"$	16.67	1.5487	100	0.6	258.116	1 LLA	0

Ground:

- **Transformer Room:**

Length = $24'6"$

Width = $17'7"$

Area = 429 $ft^2 = 40\ m^2$

Lux requirement = 120

UF = 0.6

Light flux = $(40 \times 120)/0.6 = 7971.11\ lumen$

Therefore, we can select $2\ TLB\ (8000\ lumen)$

Number of fans = $429/100 \approx 5$

Transformer Room

Length(ft)	Width(ft)	Area(ft2)	Area(m^2)	LUX	UF	Lumen	Light	No. of Fans
$24'6"$	$17'7"$	429	40	120	0.6	7971.11	2 TLB	5

- **Generator Room:**

Length = 19′10”

Width = 10′10”

Area = 216.9 $ft^2 = 20\ m^2$

Lux requirement = 120

UF = 0.6

Light flux = $(20 \times 120)/0.6 = 4030.335\ lumen$

Therefore, we can select $2\ LLB\ (3600\ lumen), 1\ LLA(1200\ lumen)$

Number of fans = $216/100 \approx 2$

Generator Room

Length(ft)	Width(ft)	Area(ft2)	Area(m^2)	LUX	UF	Lumen	Light	No. of Fans
19′10"	10′10	216.9	20	120	0.6	4030	2 LLB, 1 LLA	2

- **LT, HT meters and panels:**

Length = 42′2”

Width = 21′

Area = 885.15 $ft^2 = 82\ m^2$

Lux requirement = 110

UF = 0.6

Light flux = $(82 \times 110)/0.6 = 15076.13\ lumen$

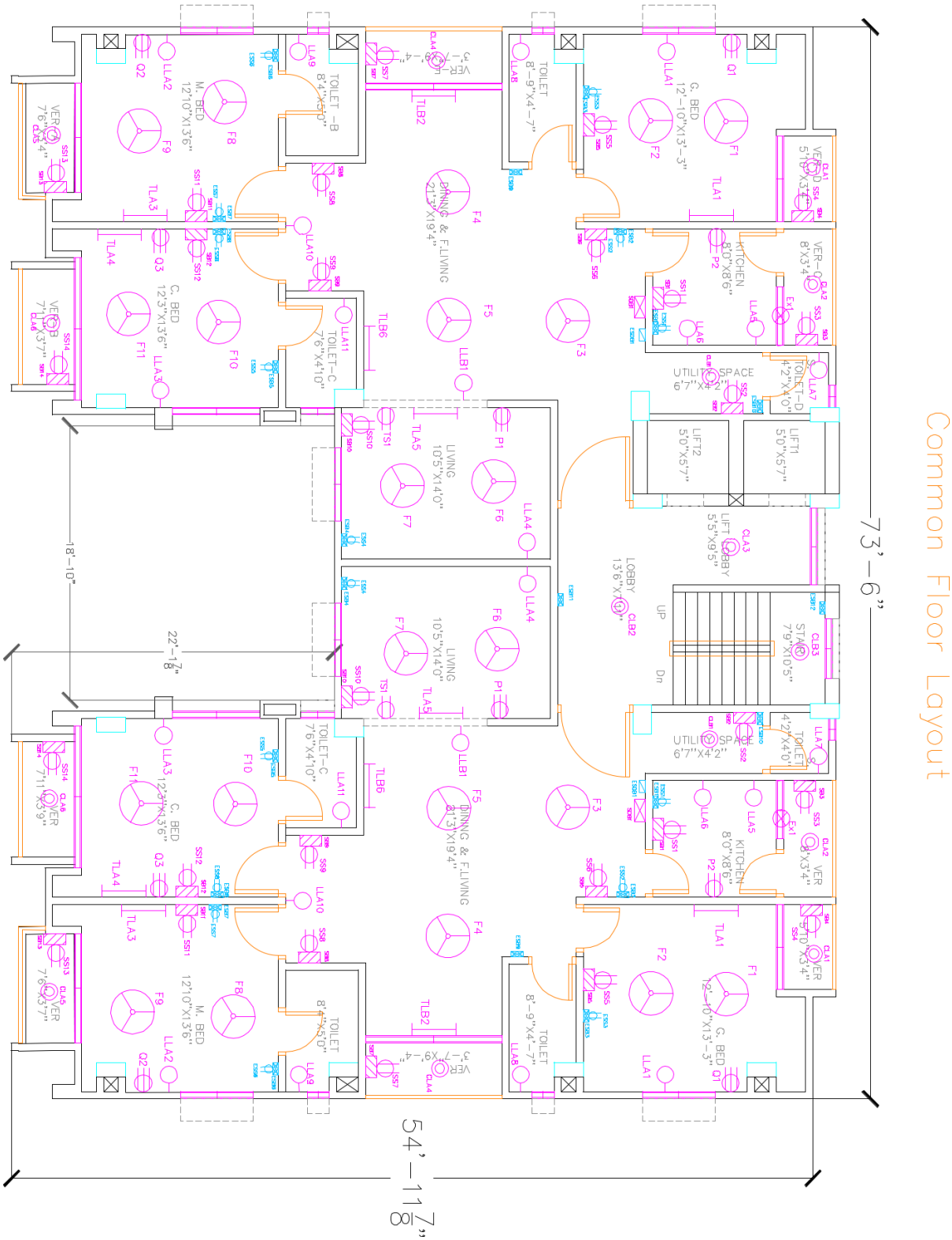
Therefore, we can select $4\ TLB\ (16000\ lumen)$

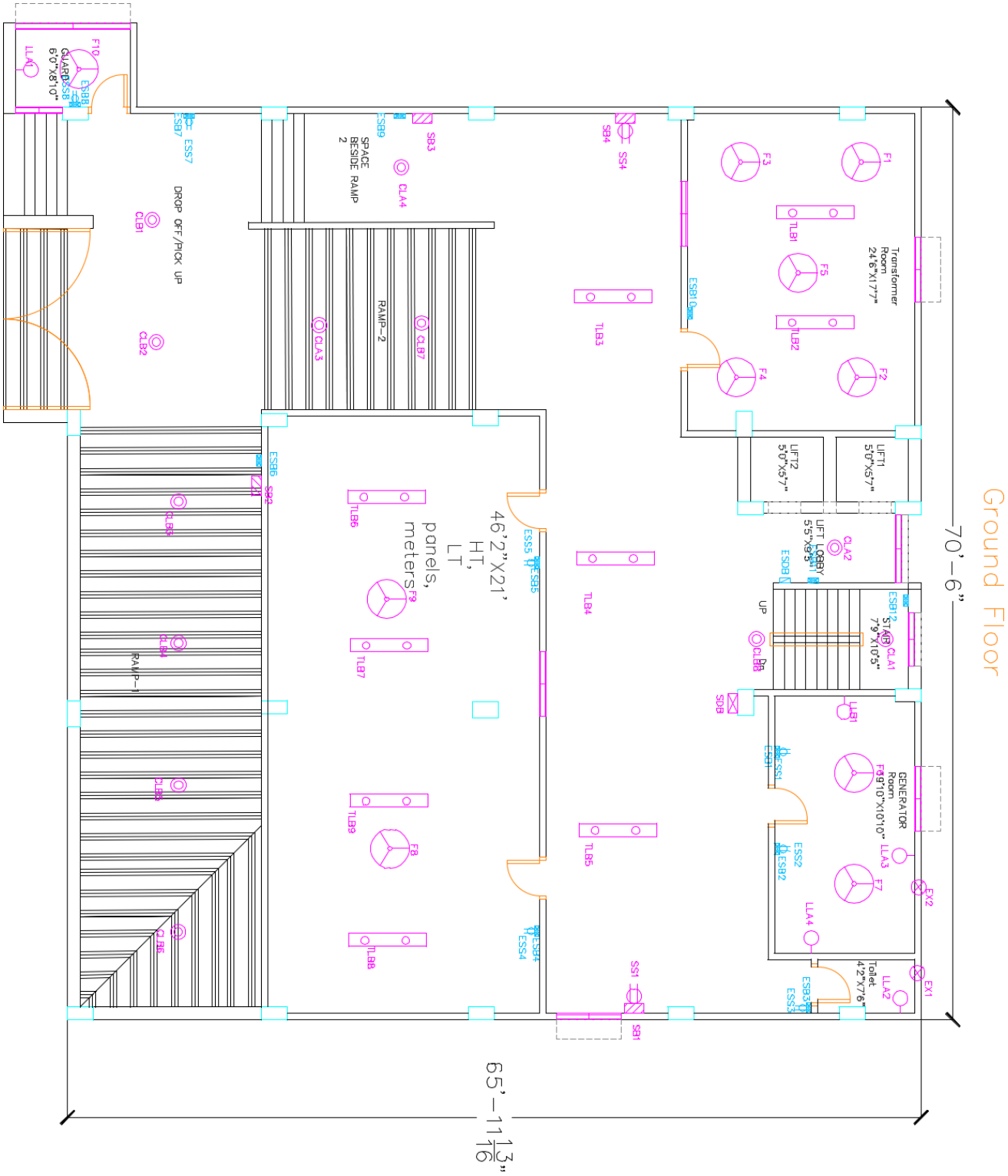
Number of fans = $2\ (Not\ much\ fans\ needed\ here)$

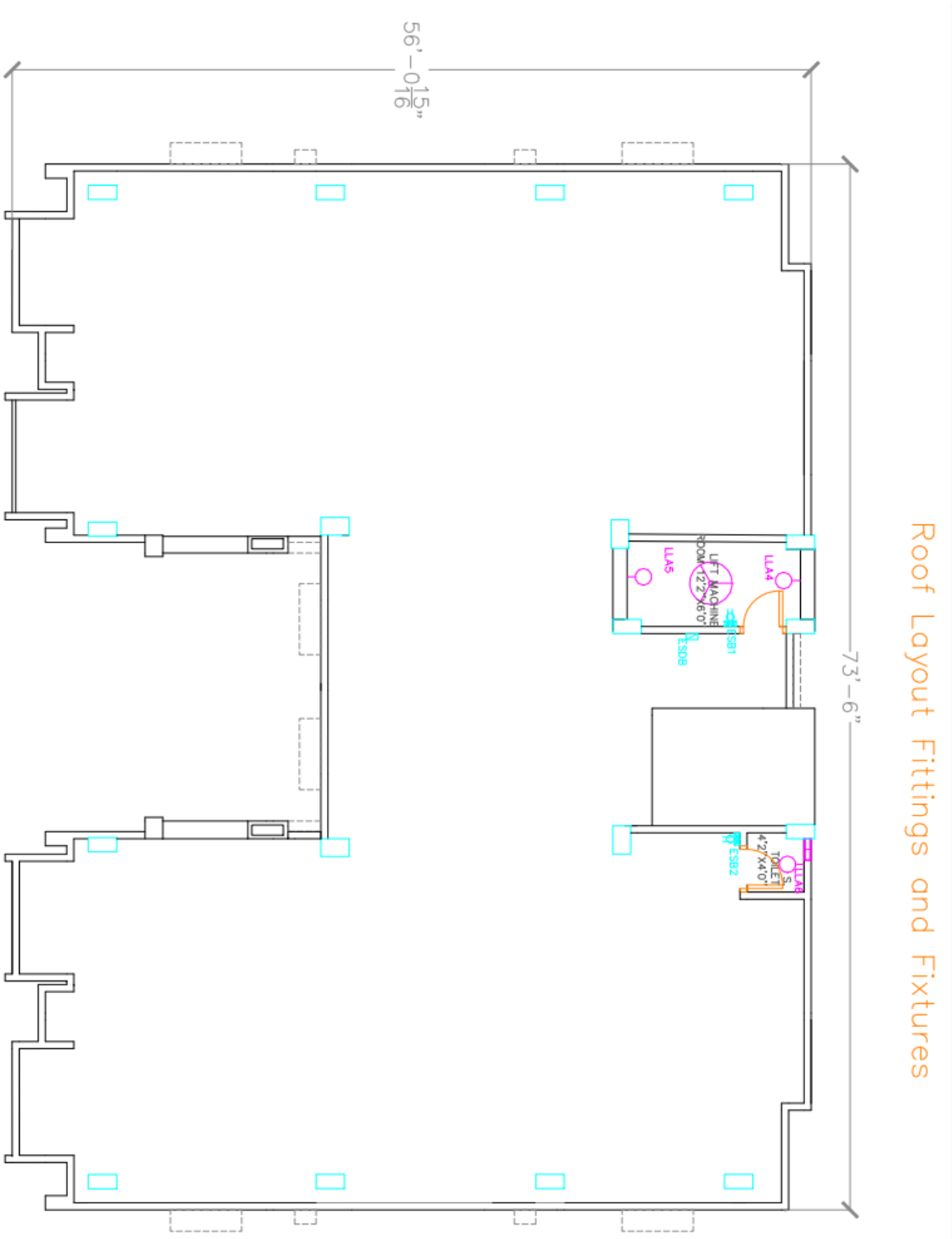
LT, HT meters and panels

Length(ft)	Width(ft)	Area(ft2)	Area(m^2)	LUX	UF	Lumen	Light	No. of Fans
42′2"	21′	885.15	82	110	0.6	15076	4 TLB	2

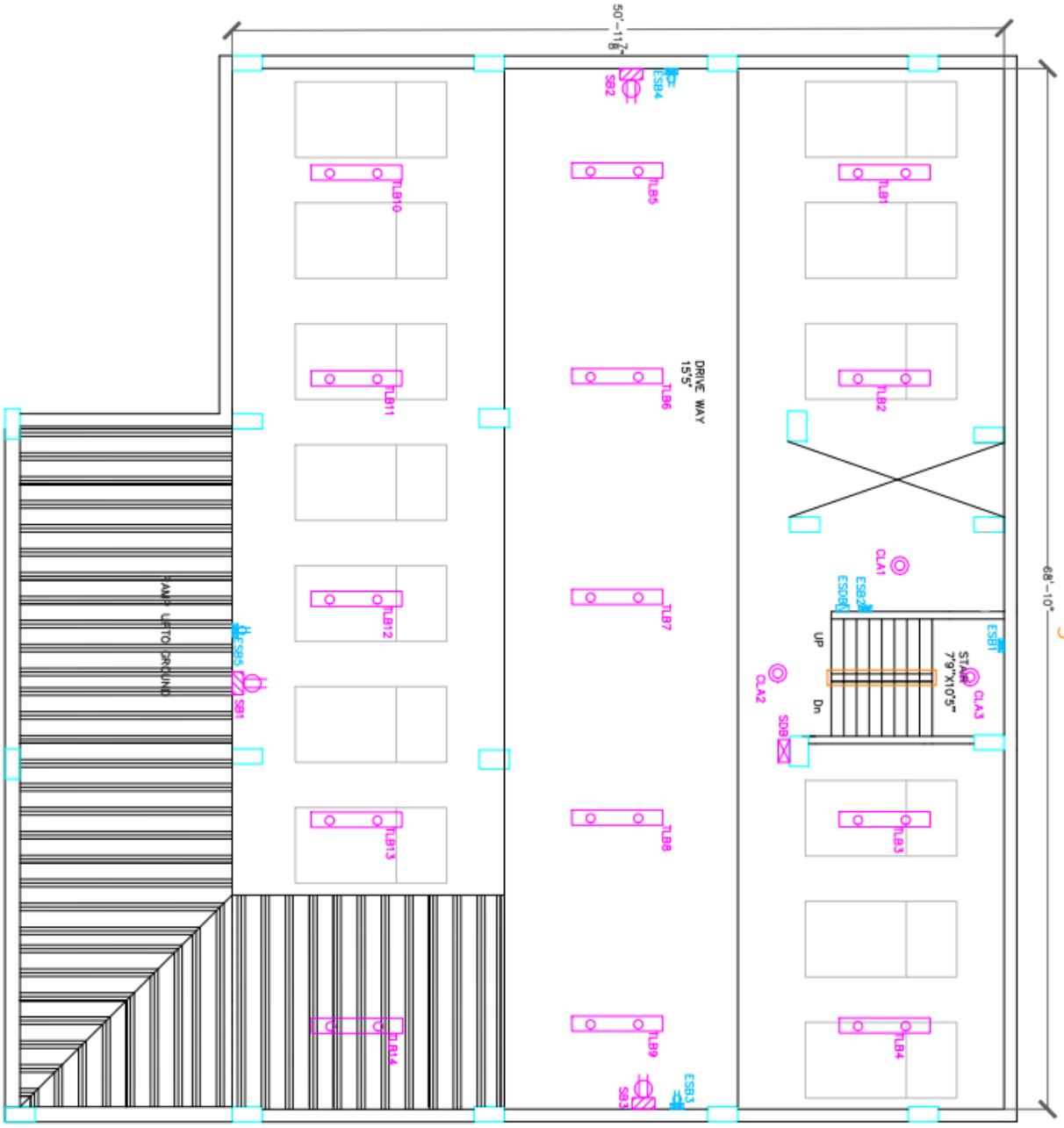
Fittings and Fixtures:




Ground Floor
70'-6"
65'-11 13/16"
Transformer Room 24'6"X17'7"
GENERATOR Room 9'10"X10'10"
Toilet 4'2"X7'6"
LIFT1 5'6"X5'7"
LIFT2 5'0"X5'7"
LIFT LOBBY 5'5"X9'3"
STAIR 7'9"X10'5"
SPACE BESIDE RAMP 2
RAMP-2
RAMP-1
DROP OFF/PICK UP
46'2"X21' HT, LT panels, meters
GUARD 6'0"X8'10"
UP



Roof Layout Fittings and Fixtures


Under Ground Fittings and Fixtures
50'-11 7/8"
68'-10"
DRIVE WAY
15'5"
RAMP UP TO GROUND
STAIR
7'9"X10'5"
UP
Dn
TLB1
TLB2
TLB3
TLB4
TLB5
TLB6
TLB7
TLB8
TLB9
TLB10
TLB11
TLB12
TLB13
TLB14
CLA1
CLA2
CLA3
SB1
SB2
SB3
ESB1
ESB2
ESB3
ESB4
ESB5
ESB6
SDB

Conduit Calculations:

Regular Floor:

Formula for Ampere Rating, I=P/(V*pf)
pf=0.8 is considered here.
Tube Light=20W(TLA)
Tube Light=40W(TLB)
Ceiling Fan=75W
Switchboard Socket=100W
LED light=12W
All internal wires are below 5A rating, so 2 X 1.5 rm BYM is used in all internal wiring.

To Sub Distribution Board(SDB):

CKT1 Rating:
$I=\frac{(100+12+40)+(100+18)+(100+12)+(100+12)}{0.8*220}$=2.806A <5A
So, 2 X 1.5 rm BYM+1.5 BYA ECC are used.
CKT2 Rating:
$I=\frac{(100+75+75+40+40)+(100+75+20)+(100+12)+(100+12)}{0.8*220}$ =4.823A <5A
So, 2 X 1.5 rm BYM+1.5 BYA ECC are used.
CKT3 Rating:
$I=\frac{(100+120+75+20)+(75+20)+(100+75+20)+(100+12)+(100+12)}{0.8*220}$=4.710A <5A
So, 2 X 1.5 rm BYM+1.5 BYA ECC are used.

Calculations for SDB:
SDB Load=Total load x 0.7 + Total P socket load x 0.5 + Total Q socket load x 0.3
Total load = CKT1 load+ CKT2 load+ CKT3 load
SDB Current=SDB Load/(V*pf)
P Load=3000 W
Q Load=4000 W

CKT1 load=$(100 + 12 + 40) + (100 + 18) + (100 + 12) + (100 + 12)$ = 494W
CKT2 load=$(100 + 75 + 75 + 40 + 40) + (100 + 75 + 20) + (100 + 12) + (100 + 12)$ =749W

CKT3 load=$(100 + 120 + 75 + 20) + (75 + 20) + (100 + 75 + 20) + (100 + 12) +$
$(100 + 12)$= 829W

Total load=2072 W
SDB Load=2072 x 0.7 + 2 x 3000 x 0.5 + 3 x 4000 x 0.3=8050.4 W
SDB Current=$\frac{8050.4}{0.8*220}$ =45.74 A
So, 50 A SP MCCB is needed from SDB to MDB.

To Emergency Sub Distribution Board(ESDB):

CKT1 Rating:

$I=\frac{(100+12)}{0.8*220}$=0.636A <5A
So, 2 X 1.5 rm BYM+1.5 BYA ECC are used.

CKT2 Rating:
$I=\frac{(100+12+75)}{0.8*220}$=1.0625A <5A
So, 2 X 1.5 rm BYM+1.5 BYA ECC are used.

CKT3 Rating:
$I=\frac{(12)}{0.8*220}$=0.068A <5A
So, 2 X 1.5 rm BYM+1.5 BYA ECC are used.

CKT4 Rating:
$I=\frac{(100+18+75)+12+(100+12)+(100+12)+(100+12+75)+(100+12+75)}{0.8*220}$=4.562A <5A
So, 2 X 1.5 rm BYM+1.5 BYA ECC are used.

Calculations for ESDB:
ESDB Load=Total load x 0.7 + Total P socket load x 0.5 + Total Q socket load x 0.3
Total load = CKT1 load+ CKT2 load+ CKT3 load+CKT4 load
ESDB Current=ESDB Load/(V*pf)

CKT1 load=$(100 + 12)$ = 112W
CKT2 load=$(100 + 12 + 75)$ =187W
CKT3 load=12W
CKT4 load=$(100 + 18 + 75) + 12 + (100 + 12) + (100 + 12) + (100 + 12 + 75) + (100 + 12 + 75) = 803$W

Total load=1114 W
ESDB Load=1114 x 0.7 + 0 x 3000 x 0.5 + 0 x 4000 x 0.3=779.8 W
ESDB Current=$\frac{779.8}{0.8*220}$ =4.43 A
So, 5 A SP MCCB is needed from ESDB to EMDB.

Underground:

Formula for Ampere Rating, I=P/(V*pf)
pf=0.8 is considered here.
Tube Light=40W(TLB)
Switchboard Socket=100W
All internal wires are below 5A rating, so 2 X 1.5 rm BYM is used in all internal wiring.

To Sub Distribution Board(SDB):
CKT1 Rating:
$I=\frac{(100+40*2)}{0.8*220}$=1.022A <5A
So, 2 X 1.5 rm BYM+1.5 BYA ECC are used.

CKT2 Rating:

I=$\frac{(100+40*2)}{0.8*220}$=1.022A <5A

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

CKT3 Rating:

I=$\frac{(100+40*2)}{0.8*220}$=1.022A <5A

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

Calculations for SDB:

Total load = (180 × 3 × 0.7) = 378 W

Current, I = $\frac{378}{220 \times 0.8}$ = 2.1477 < 5A

So, 5 A SP MCCB is needed.

To Emergency Sub Distribution Board(ESDB):

CKT1 Rating:

I=$\frac{(12)+(12)}{0.8*220}$=0.13636A <5A

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

CKT2 Rating:

I=$\frac{(100+40*2)}{0.8*220}$=1.022A <5A

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

CKT3 Rating:

I=$\frac{(100+40*2)}{0.8*220}$=1.022A <5A

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

CKT4 Rating:

I=$\frac{(100+40*3)}{0.8*220}$=1.25A <5A

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

Calculations for ESDB:

Total load = 604 × 0.7 = 422.8 W

Current, I = $\frac{422.8}{0.8 \times 220}$ = 2.402 < 5A

So, 5 A SP MCCB is needed.

Rooftop:

Formula for Ampere Rating, I=P/(V*pf)

pf=0.8 is considered here.

Switchboard Socket=100W

Ceiling Fan=75W

LED light=12W

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

To Emergency Sub Distribution Board(ESDB):

ESB1 Rating:

$I=\frac{(12)+(12)+(75)}{0.8*220}$=0.5625A <5A

So, 2 X 1.5 rm BYM are used.

ESB2 Rating:

$I=\frac{(12)}{0.8*220}$=0.06818A <5A

So, 2 X 1.5 rm BYM are used.

Calculations for ESDB:

Total Load = 111W

Total Current = $\frac{111}{0.8\times220}$ = 0.6306 < 5A

So, 5 A SP MCCB is needed.

Ground:

Formula for Ampere Rating, I=P/(V*pf)
pf=0.8 is considered here.
Light bulb(LLA) = 12 W
Light bulb(LLB) = 18 W
Fan = 75 W
2 pin socket = 100 W
Tube light(TLB) = 40 W
Exhaust Fan = 40 W
Ceiling Light(CLA) = 12 W
Ceiling Light(CLB) = 18 W
All internal wires are below 5A rating, so 2 X 1.5 rm BYM is used in all internal wiring.

To Sub Distribution Board(SDB):

CKT-1 load = 180 W

Current, I = $\frac{180}{0.8\times220}$ = 1.02 < 5 A

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

CKT-2 load = 194 W

Current, I = $\frac{194}{0.8\times220}$ = 1.10 < 5 A

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

Calculations for SDB:

Total load = (180 + 194) × 0.7 = 261. 8 W

Current, I = $\frac{261.8}{0.8\times220}$ = 1.49 < 5A

So, 5 A SP MCCB is needed.

To Emergency Sub Distribution Board(ESDB):

CKT-1 load = 1006 W

Current, I = $\frac{1006}{0.8\times220}$ = 5.72 < 10A

So, 2 X 2.5 rm BYM+1.5 BYA ECC are used. (C8)

CKT-2 load = 794 W

Current, I = $\frac{794}{0.8\times220}$ = 4.51 < 5A

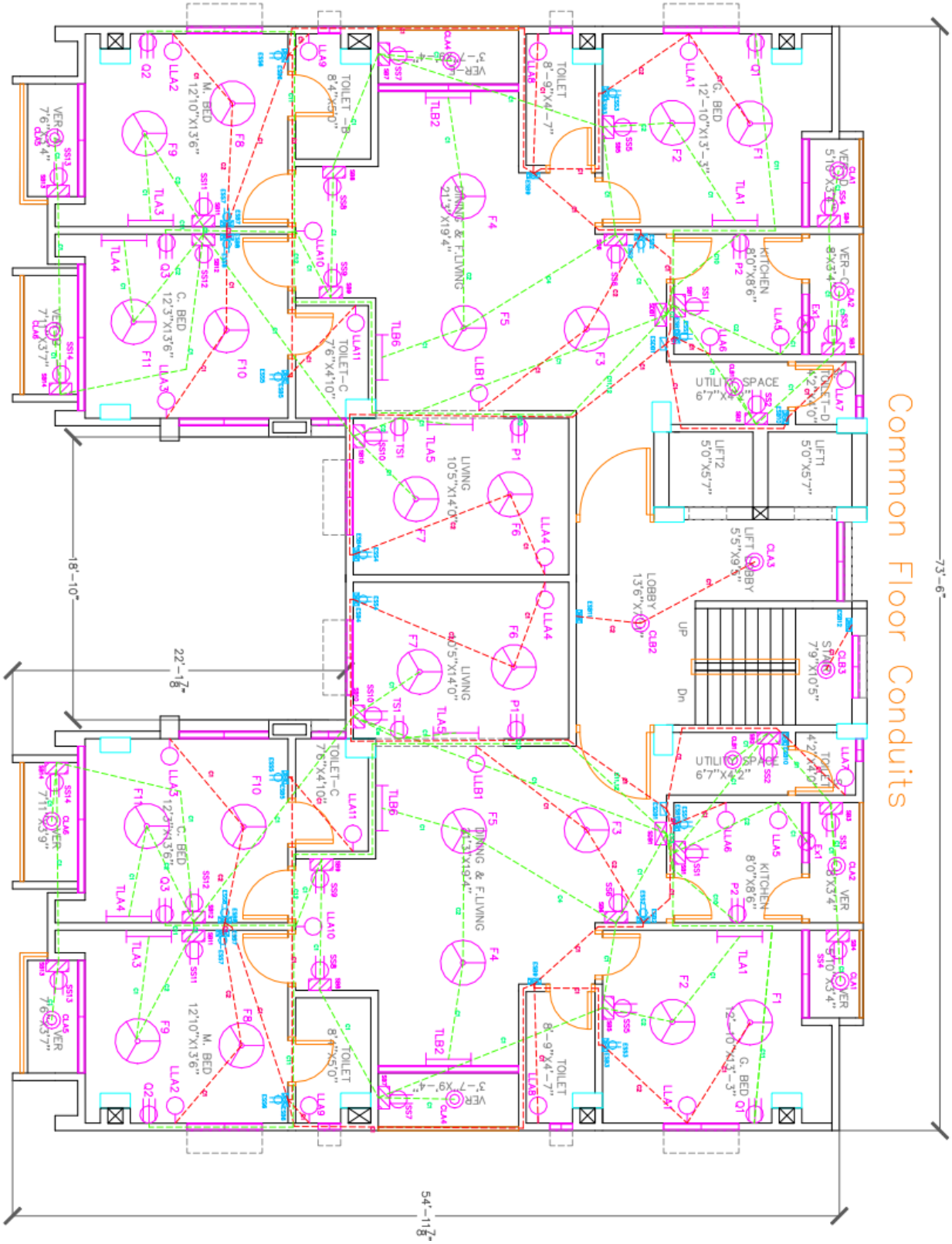
So, 2 X 1.5 rm BYM+1.5 BYA ECC are used.

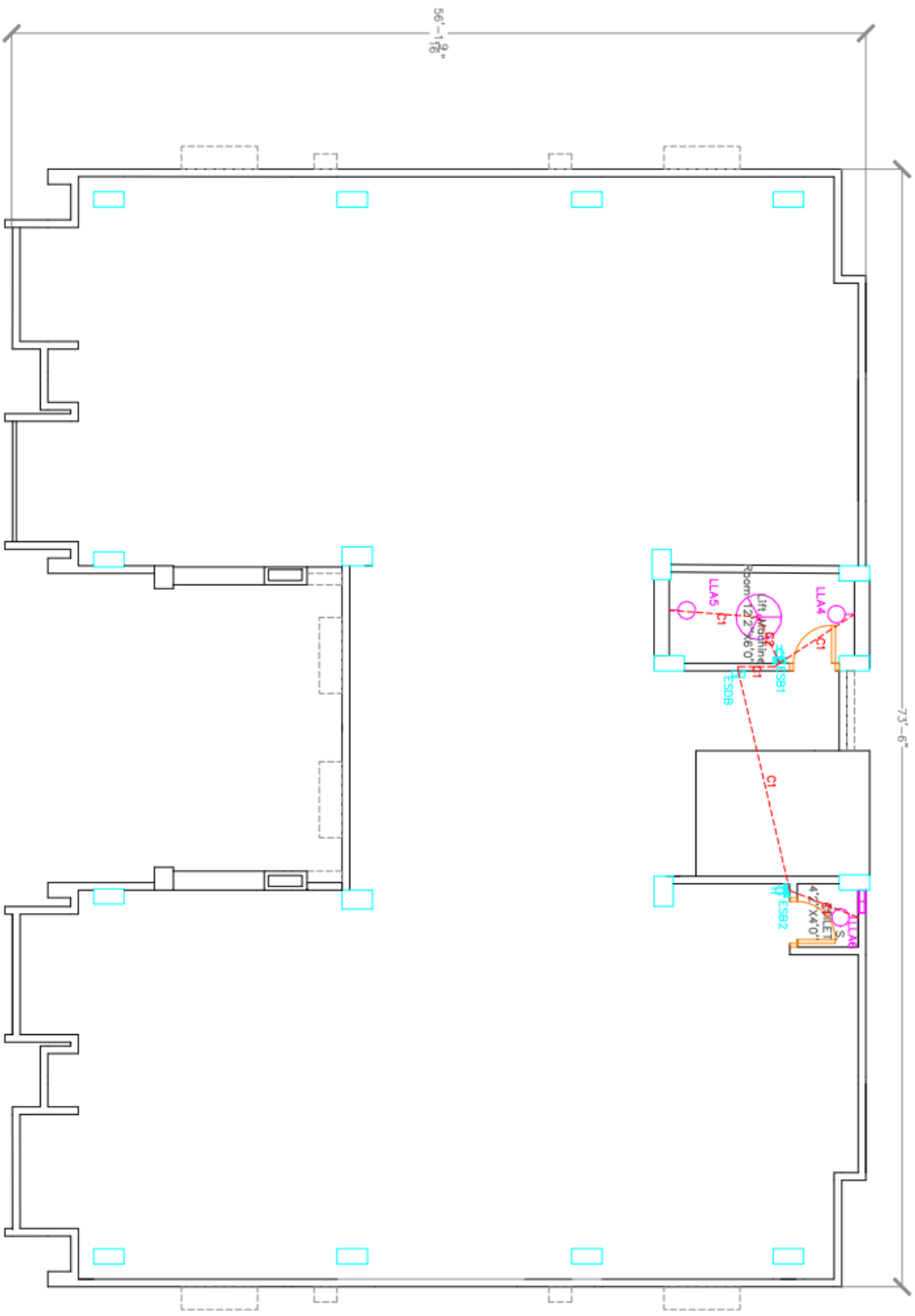
CKT-3 load = 42 W
Current, I = $\frac{42}{0.8 \times 220}$ = 0.24 < 5A
So, 2 X 1.5 rm BYM+1.5 BYA ECC are used.

CKT-4 load = 480 W
Current, I = $\frac{480}{0.8 \times 220}$ = 2.727< 5A
So, 2 X 1.5 rm BYM+1.5 BYA ECC are used.

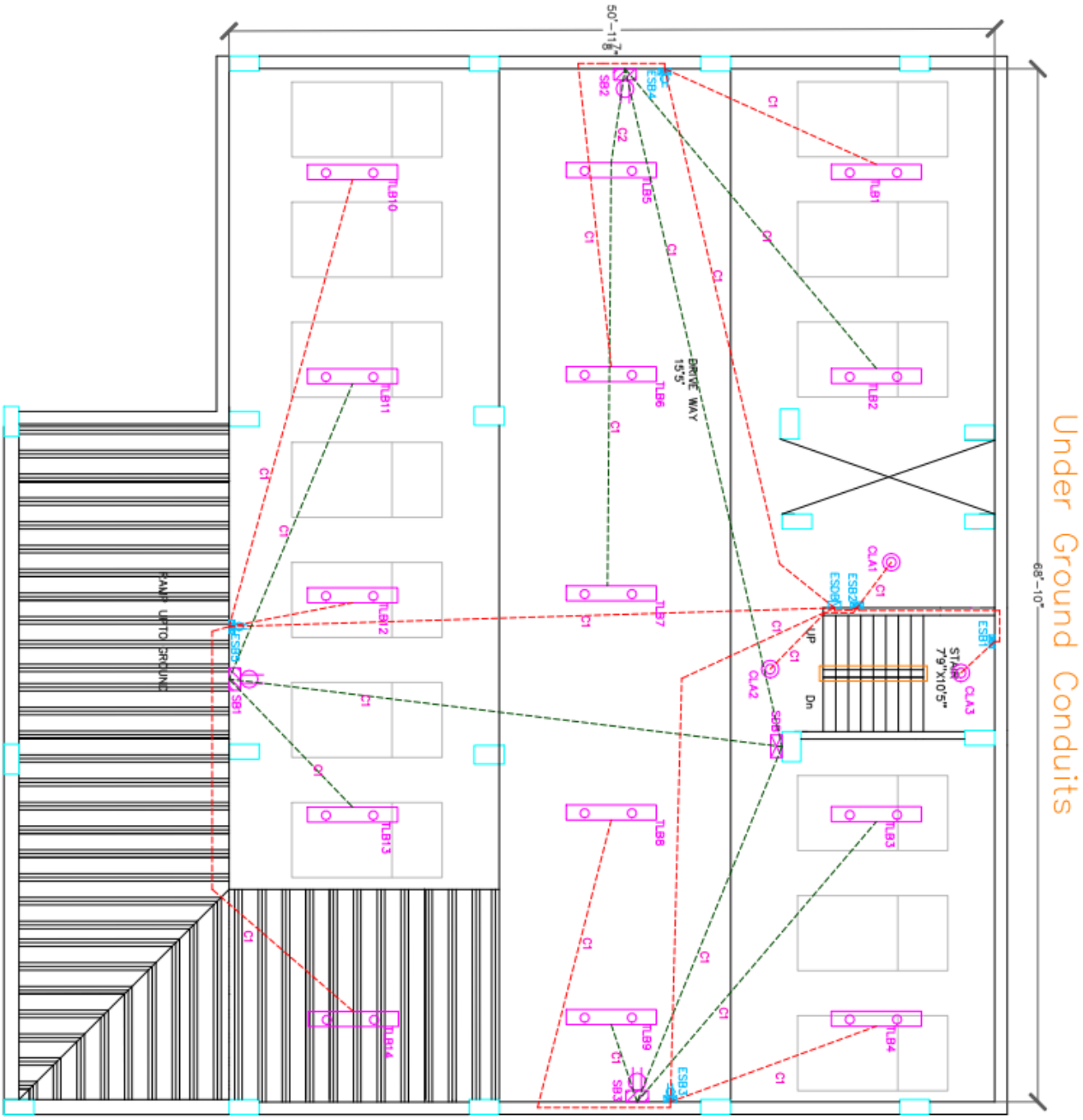
Calculations for ESDB:
Total load = (1006 + 42 + 794 + 480) × 0.7 = 1625.4 W
Current, I = $\frac{1625.4}{0.8 \times 220}$ = 9.24 < 10 A
So, 10 A SP MCCB is needed.

Conduits:


Common Floor Conduits
G. BED
12'-10"X13'-3"
M. BED
12'10"X13'6"
C. BED
12'3"X13'6"
LIVING & F.LIVING
21'3"X19'4"
KITCHEN
8'0"X8'6"
TOILET
8'-9"X4'-7"
TOILET-B
8'4"X5'0"
TOILET-C
7'6"X4'10"
TOILET-D
4'2"X4'0"
UTILITY SPACE
6'7"X4'5"
LIFT1
5'0"X5'7"
LIFT2
5'0"X5'7"
LOBBY
13'6"X10'0"
SHAFT
7'9"X10'5"
LIVING
10'5"X14'0"
73'-6"
54'-11 7/8"
22'-7 7/8"
18'-10"


56'-1 9/16"
73'-6"
LLA5
C1
LLA4
C1
Lift Machine Room 12'2"x6'0"
ESDB
ESB1
C1
ESB2
4'2"x4'0"
LLA6
S
Roof Layout Conduit


Ground Floor Conduits
70'-6 5/16"
50'-11 7/8"
14'-11 15/16"
Transformer Room 24'6"X17'7"
LIFT1 5'0"X5'7"
LIFT2 5'0"X5'7"
LIFT LOBBY 5'5"X9'3"
GENERATOR Room 9'10"X10'10"
Toilet 4'2"X7'8"
SPACE BESIDE RAMP 2
RAMP-2
DROP OFF/PICK UP
46'2"X21'
HT, LT, panels, meters


50'-11"
68'-10"
Under Ground Conduits
RAMP UP TO GROUND
STAIR
7'9"X10'5"
UP
Dn
PARTIE WAY
15'5"
TLB1
TLB2
TLB3
TLB4
TLB5
TLB6
TLB7
TLB8
TLB9
TLB10
TLB11
TLB12
TLB13
TLB14
ESB1
ESB2
ESB3
ESB4
ESB5
SB1
SB2
SB3
CLA1
CLA2
CLA3
C1
C2

PUMP CALCULATION

Pump power = 4000W

Current = $\frac{4000}{\sqrt{3}\times(220\times\sqrt{3})\times 0.8} A$ = $7.57A$

10A TP MCCB is needed.

2 X 2.5 rm BYM+2.5 BYA ECC are used.

LIFT CALCULATION

Lift power = 5000W

Current = $\frac{5000}{\sqrt{3}\times(220\times\sqrt{3})\times 0.8} A$ = $9.47A$

10A TP MCCB is needed.

2 X 2.5 rm BYM+2.5 BYA ECC are used.

LIFT (AVR) CALCULATION

Lift power = 5000W

Current = $\frac{3000}{\sqrt{3}\times(220\times\sqrt{3})\times 0.8} A$ = $9.47A$

The AVR should be rated for at least the apparent power (VA) of the LIFT. The AVR should also be able to handle slight overload conditions and adjust for variations in the supply voltage

The AVR chosen is 6.25 KVA

GENERATOR CALCULATION

Required Generator power

= $(20 \times 779.8 + 422.8 + 1625.4 + 111) \times 0.7 + (2 \times 5000 \times 0.7) W = 19428.64$ W

So, 20kW generator is needed.

Current= $\frac{19428.64\ \text{W}}{\sqrt{3}\times(220\times\sqrt{3})\times 0.8}$ = 36.8 A < 40 A

40A TP MCCB is needed.

2 X 16 rm BYM+16 BYA ECC are used.

CALCULATIONS FOR EMDB

EMDB LOAD = $Total\ ESDB\ Load \times 0.7 + Lift\ Load \times 0.7$ $Total\ ESDB\ Load = ESDBG + ESDBUG + 20 * ESDB + ESDBR$

ESDBG = 1625.4 W

ESDBUG = 422.8 W

ESDB = 779.8 W

ESDBR = 111 W

EMDB Current= $\frac{Total\ EMDB\ Load}{\sqrt{3}\times Line\ Voltage \times 0.8}$

Phase voltage =220

EMDB Load = $(20 \times 779.8 + 422.8 + 1625.4 + 111) \times 0.7 + (2 \times 5000 \times 0.7) W =$

19428.64 W

EMDB Current=$\frac{19428.64\ \text{W}}{\sqrt{3}\times(220\times\sqrt{3})\times0.8}$ = 36.8 A < 40 A

40A TP MCCB is needed.

CALCULATIONS FOR MDB:

MDB LOAD = $Total\ SDB\ Load\ \times 0.7 + (EMDB\ Load + Pump)\ \times 0.7$

SDBG = 261.8 W

SDBUG = 378 W

Total SDB Load=$(SDBG + SDBUG + SDB \times 20) = (8050.4 \times 20 + 378 + 261.8)W = 161647.8W$

Total MDB Load=$161647.8 \times 0.7 + (19428.64 + 4000) \times 0.7 = 129553.51\text{W}$

MDB Current= $\frac{Total\ MDB\ Load}{\sqrt{3}\times Line\ Voltage\times0.8} = \frac{129553.51\text{W}}{\sqrt{3}\times(220\times\sqrt{3})\times0.8} = 245.37\text{A}$

250A TP MCCB is needed.

So, 2 X 185 rm BYM+185 BYA ECC are used.

CALCULATIONS FOR Transformer:

11KV/0.415KV rating transformer

Current =245.37 A

KVA rating = $\frac{\sqrt{3}\times245.37\times415}{1000}\ KVA = 176.37\ KVA \approx 200\ KVA$

Room Calculation for Transformer, Generator and LT, HT panels, meters:

Table 8.1.23: Recommended Area for Transformer and 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

As we have three phase 200 KVA transformer, room area should be 40 m^2

Corresponding LT, HT panels and meter room should be (130-40) = 90 m^2

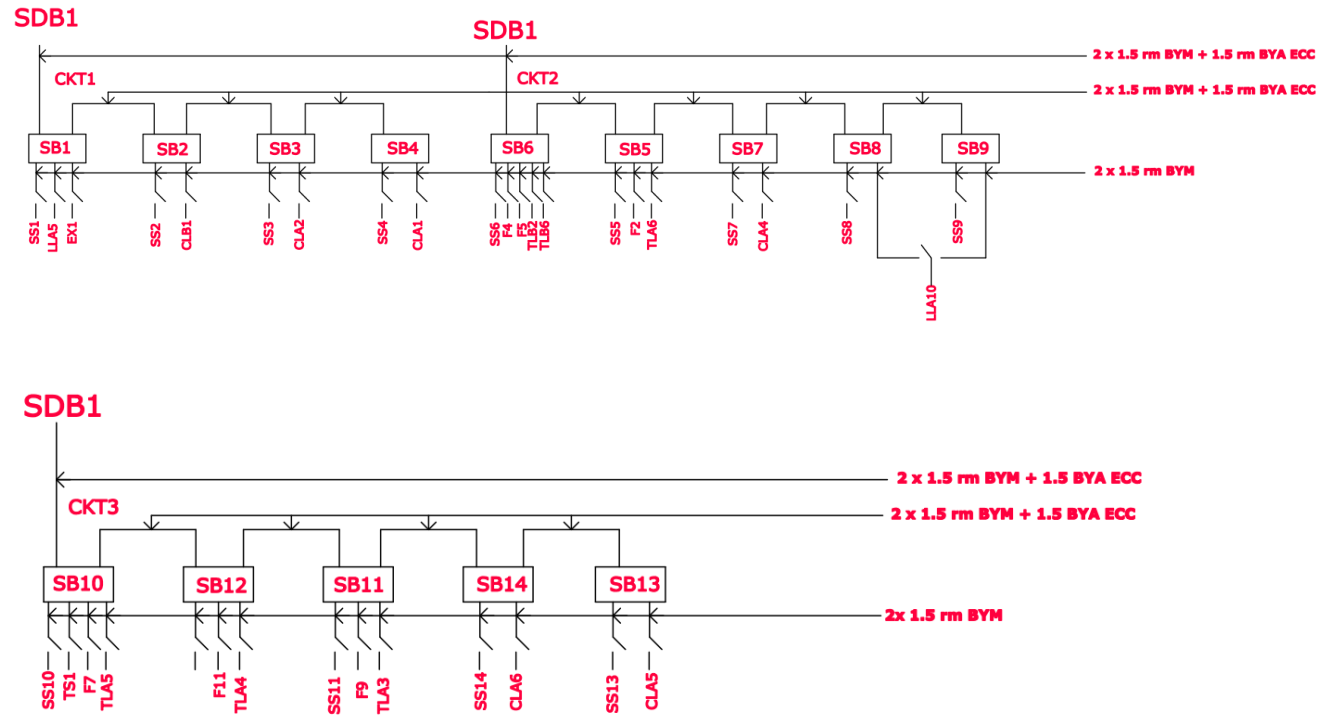
Table 8.1.24: Recommended Area for Standby Generator Room

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

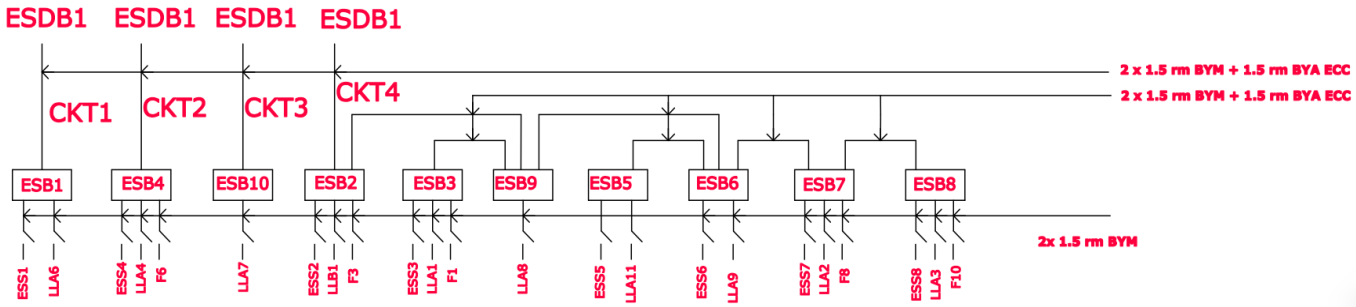
As our generator is 20 KW, the area of the room should be 20 m^2

Single Line Diagrams:

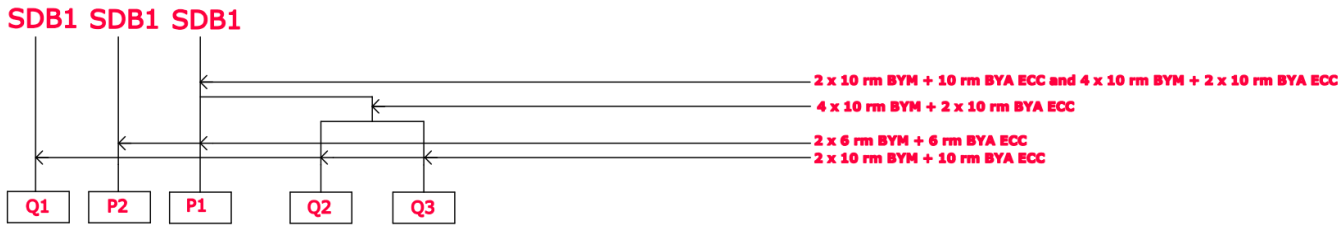
Regular Unit:



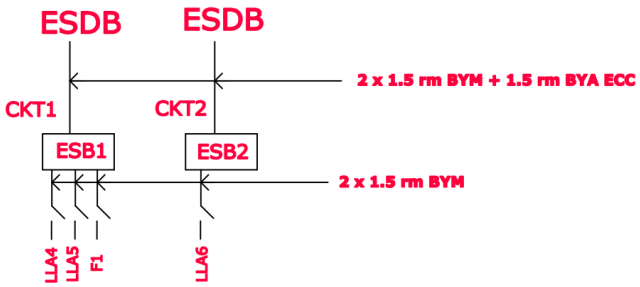
Regular Unit: (emergency)



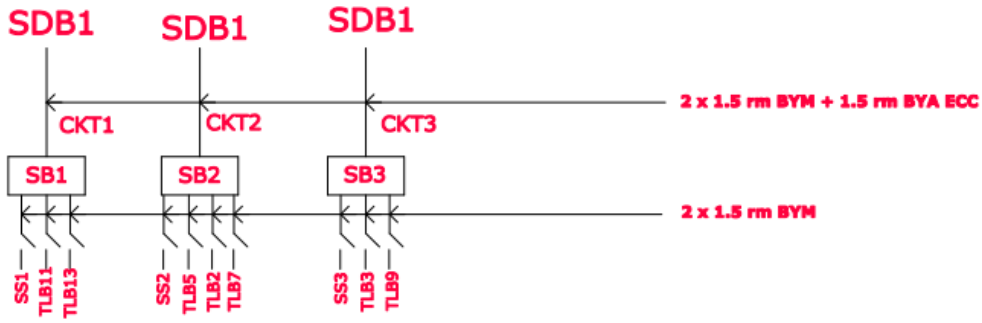
Regular Unit: (P and Q load)



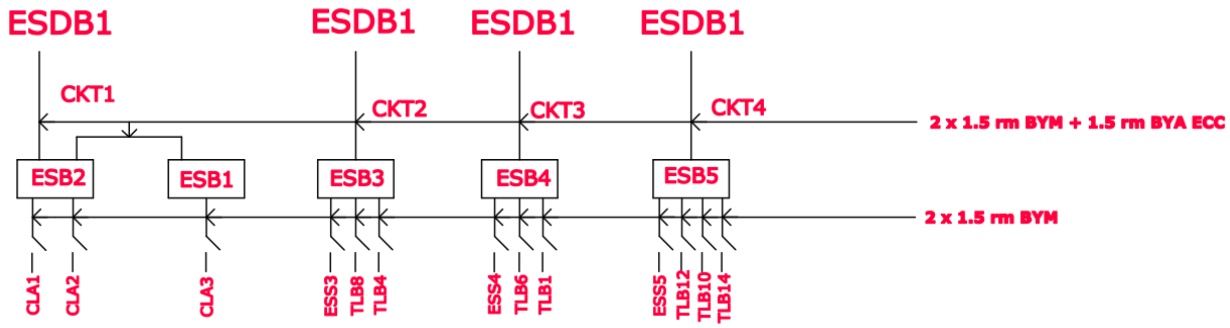
Roof Top(emergency):



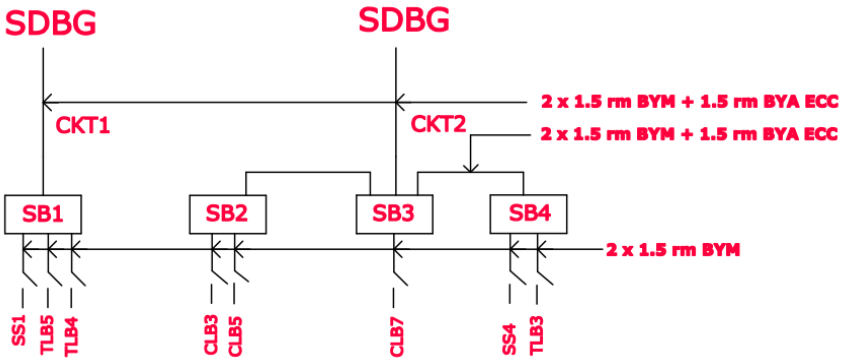
Under-ground:



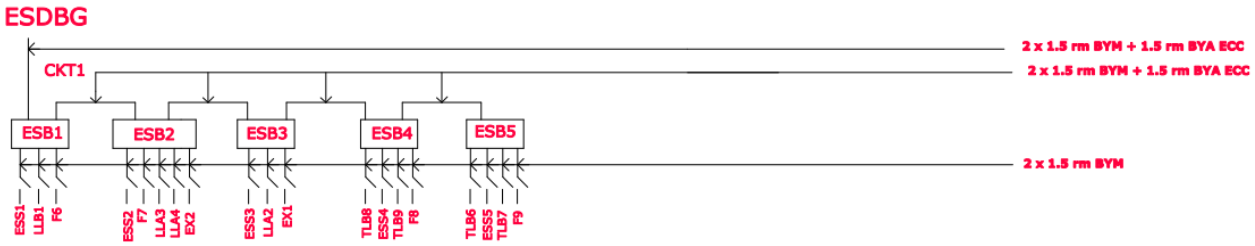
Under-ground (emergency):

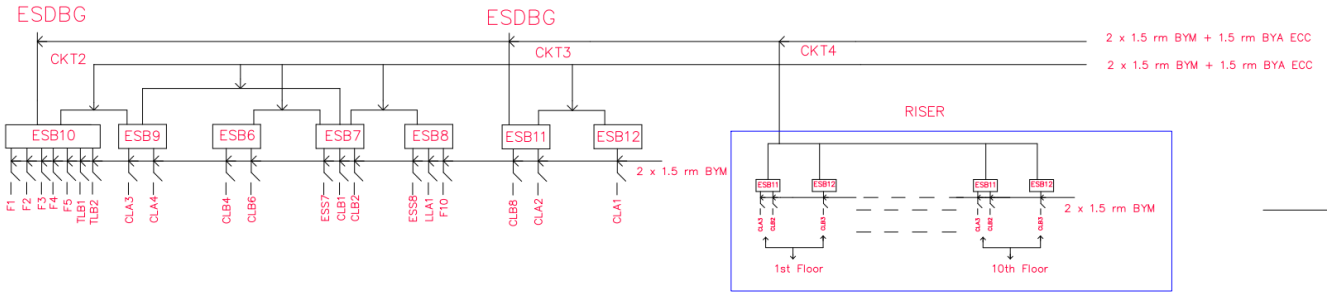


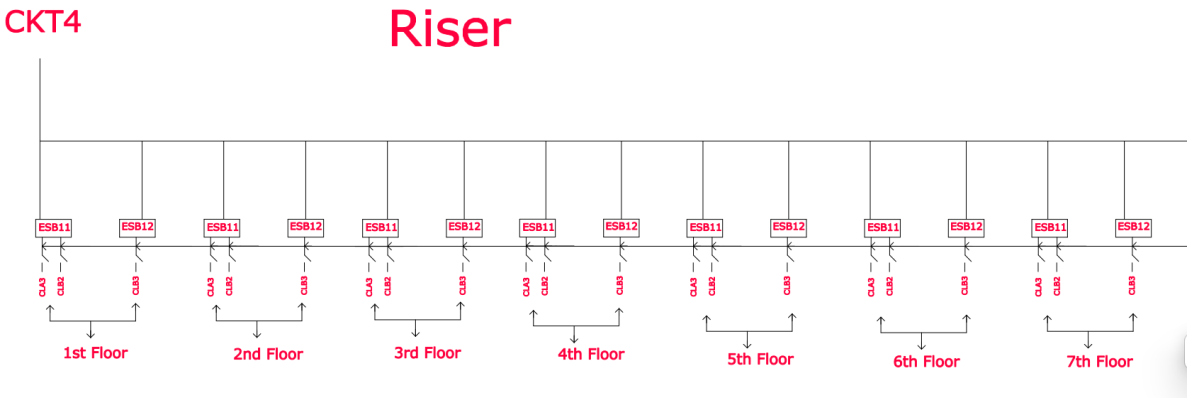
Ground:

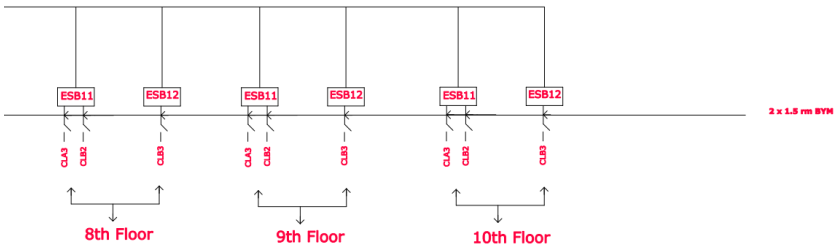


Ground(emergency):



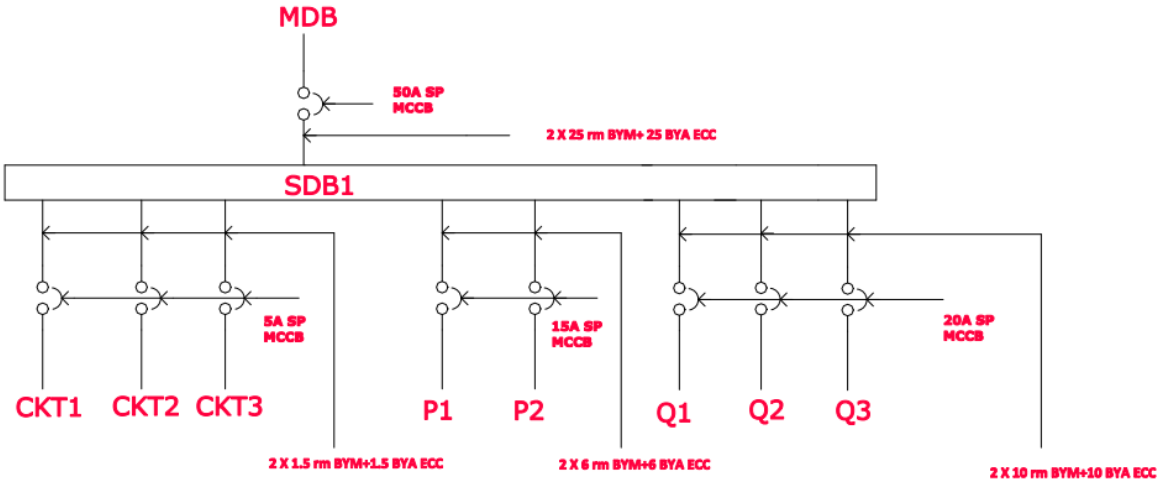




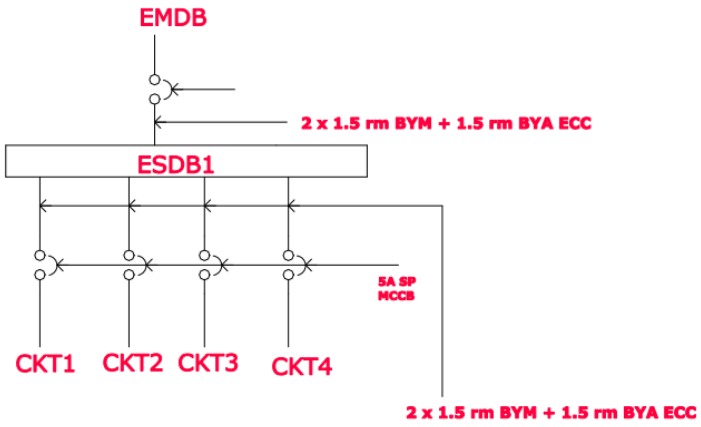


MDB and EMDB Connection Diagram:

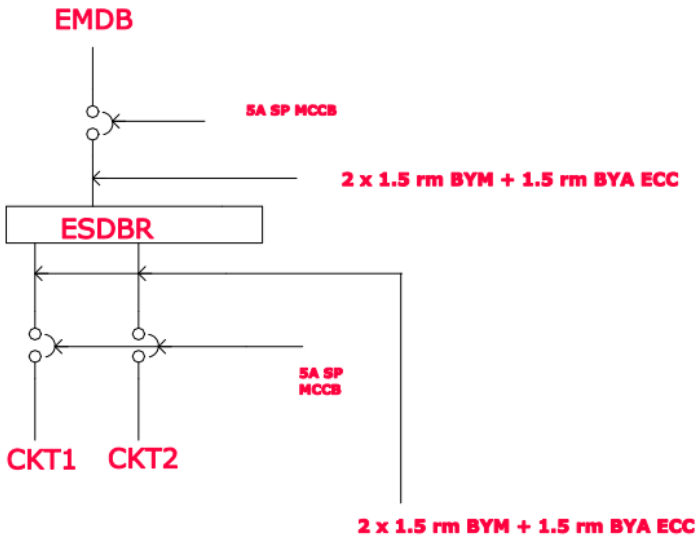
Regular Unit:



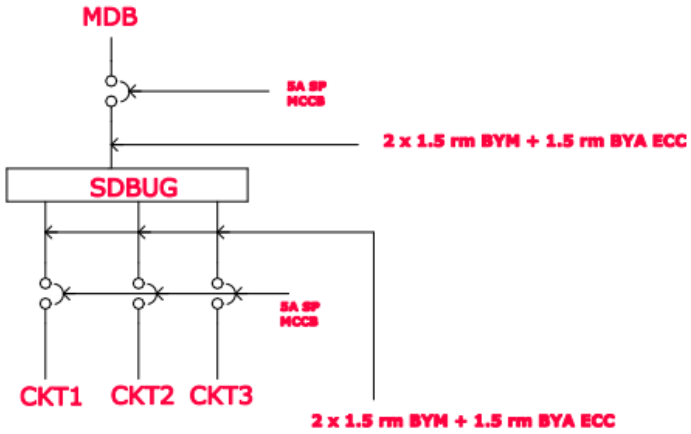
Regular Unit(emergency):



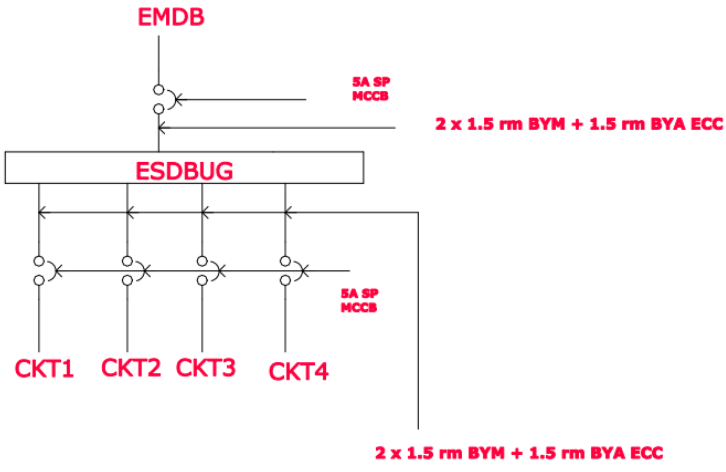
Rooftop(emergency):



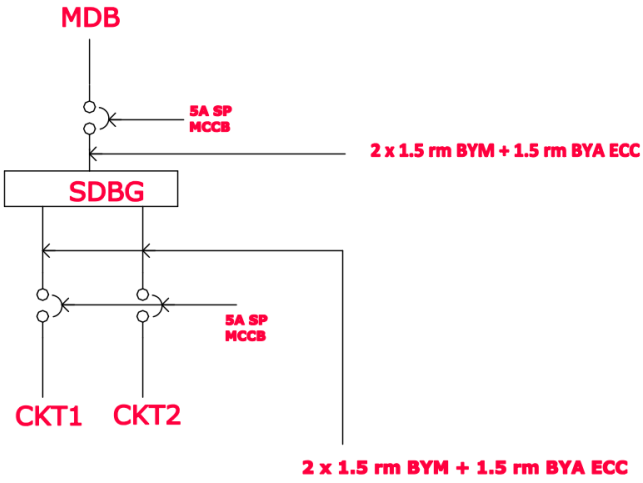
Underground:



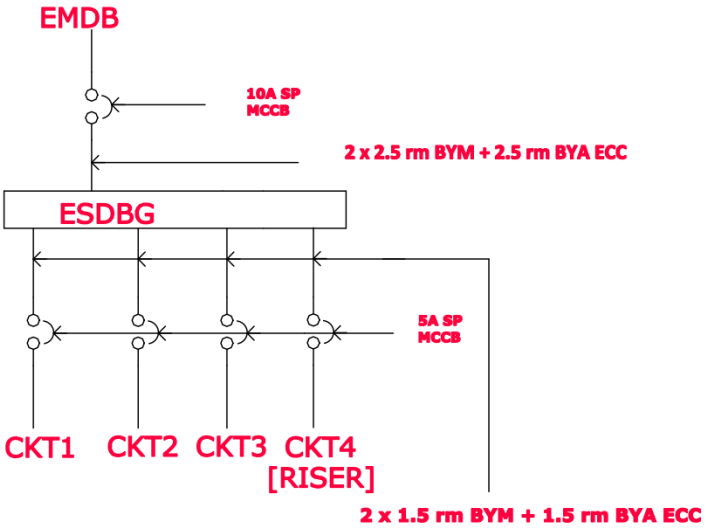
Underground(emergency):



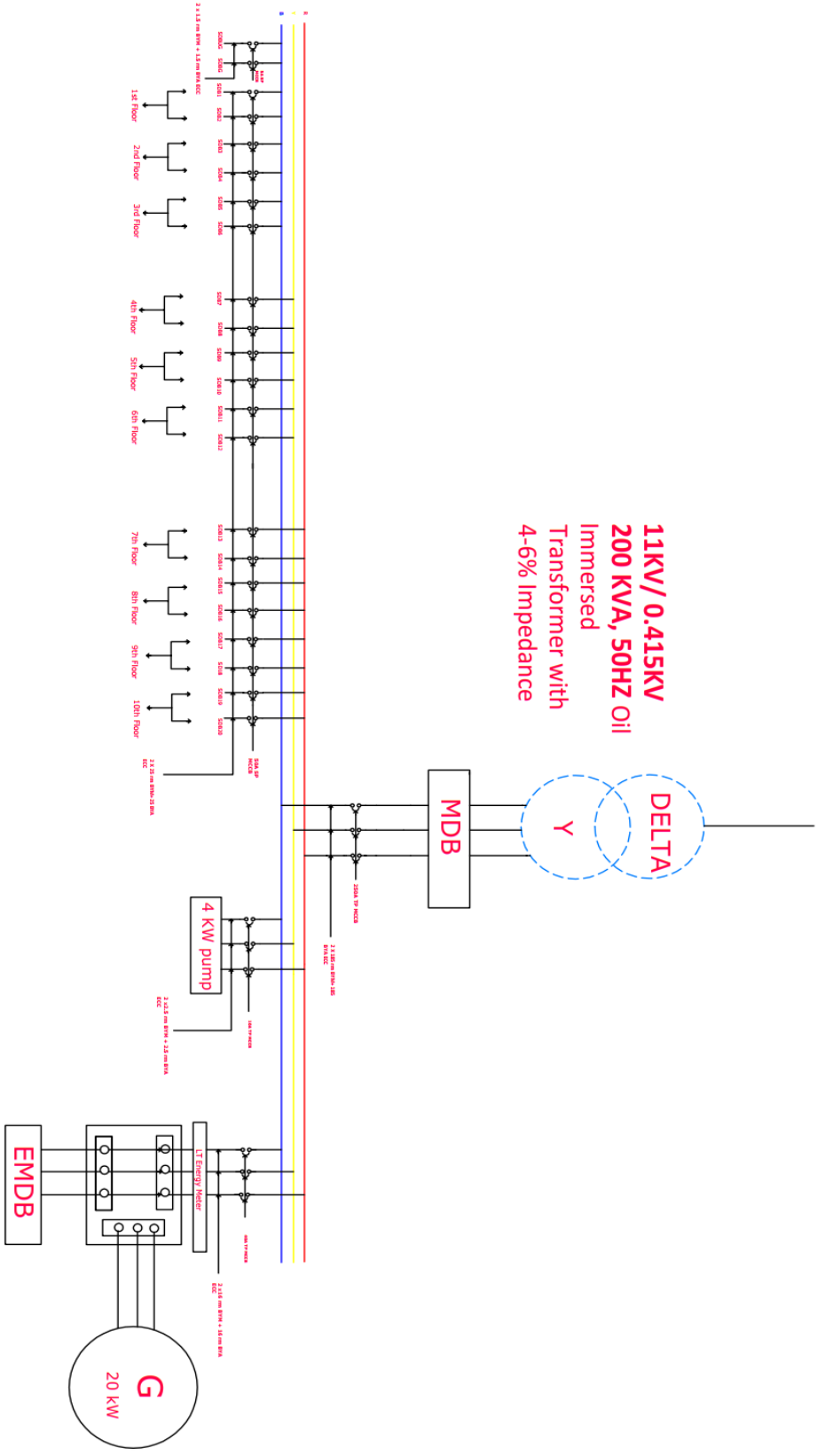
Ground:

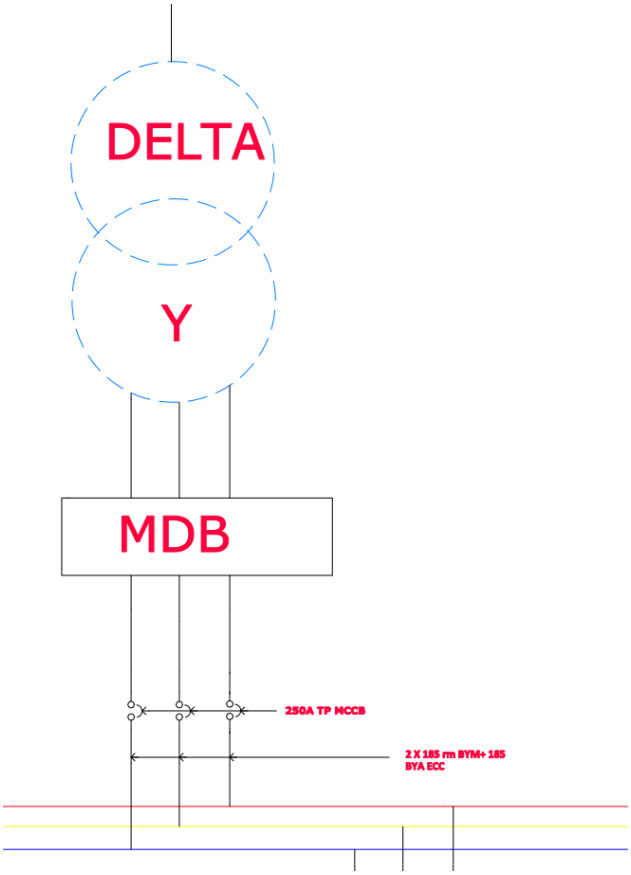


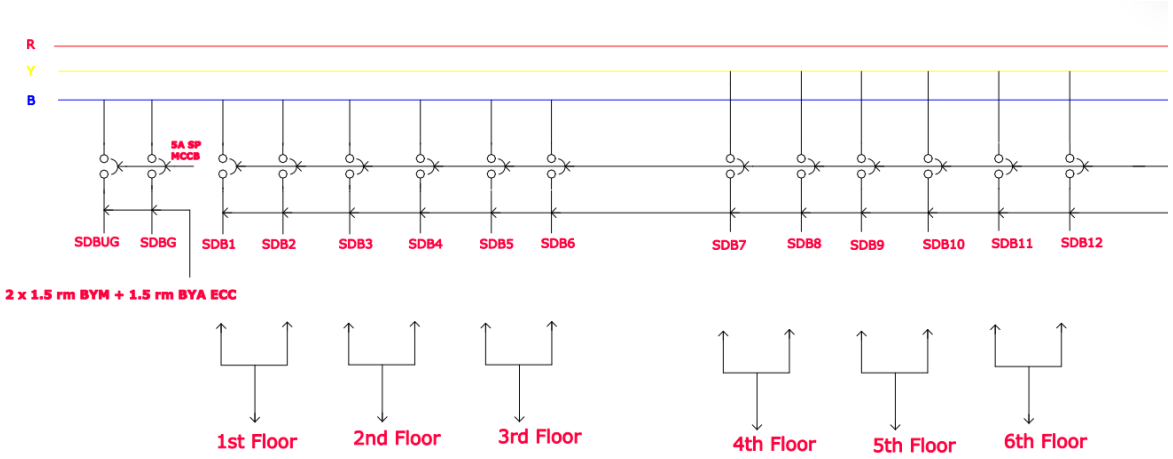
Ground (emergency):

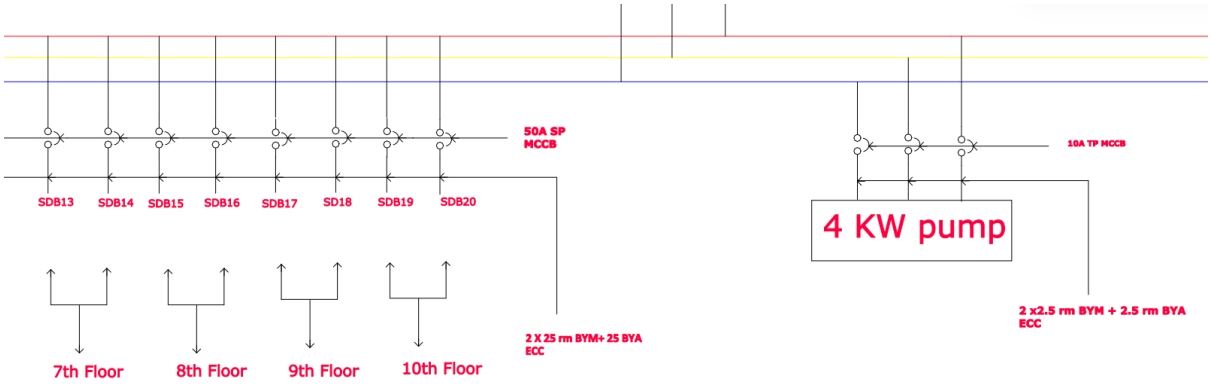


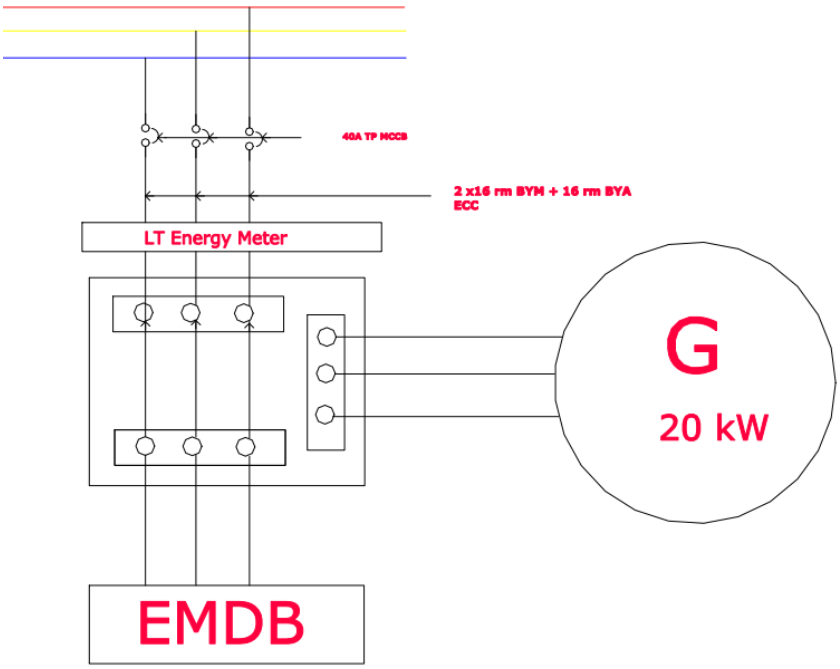
Main Distribution Board:



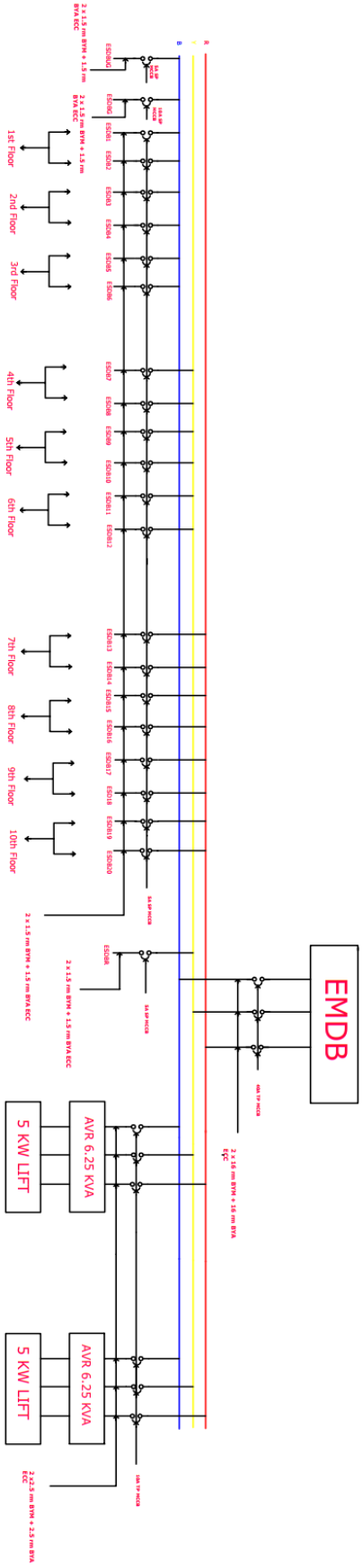

DELTA
Y
MDB
250A TP MCCB
2 X 185 rm BYM+ 185 BYA ECC

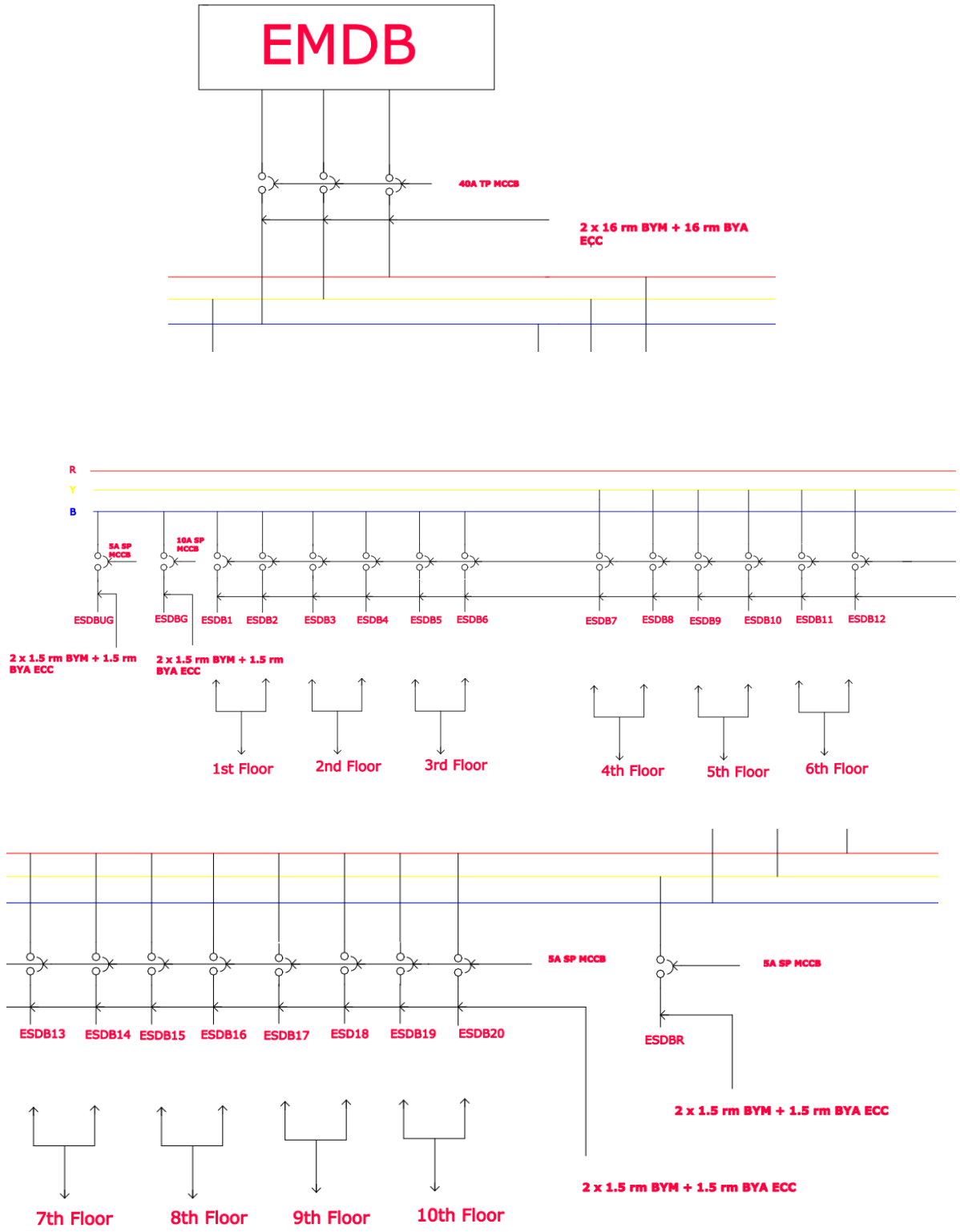

R
Y
B
5A SP MCCB
SDBUG
SDBG
SDB1
SDB2
SDB3
SDB4
SDB5
SDB6
SDB7
SDB8
SDB9
SDB10
SDB11
SDB12
2 x 1.5 rm BYM + 1.5 rm BYA ECC
1st Floor
2nd Floor
3rd Floor
4th Floor
5th Floor
6th Floor

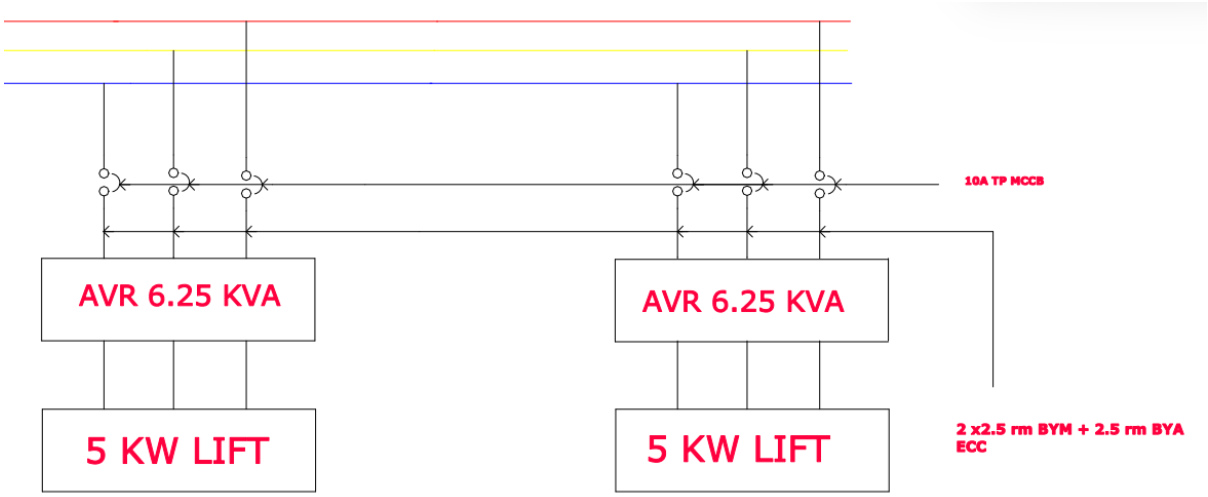

50A SP
MCCB
SDB13
SDB14
SDB15
SDB16
SDB17
SD18
SDB19
SDB20
2 X 25 rm BYM+ 25 BYA
ECC
7th Floor
8th Floor
9th Floor
10th Floor
10A TP MCCB
4 KW pump
2 x2.5 rm BYM + 2.5 rm BYA
ECC


40A TP MCCB
2 x16 rm BYM + 16 rm BYA
ECC
LT Energy Meter
G
20 kW
EMDB

Emergency Main Distribution Board:




EMDB
40A TP MCCB
2 x 16 rm BYM + 16 rm BYA ECC
R
Y
B
5A SP MCCB
10A SP MCCB
ESDBUG
ESDBG
ESDB1
ESDB2
ESDB3
ESDB4
ESDB5
ESDB6
ESDB7
ESDB8
ESDB9
ESDB10
ESDB11
ESDB12
2 x 1.5 rm BYM + 1.5 rm BYA ECC
2 x 1.5 rm BYM + 1.5 rm BYA ECC
1st Floor
2nd Floor
3rd Floor
4th Floor
5th Floor
6th Floor
5A SP MCCB
5A SP MCCB
ESDB13
ESDB14
ESDB15
ESDB16
ESDB17
ESD18
ESDB19
ESDB20
ESDBR
2 x 1.5 rm BYM + 1.5 rm BYA ECC
2 x 1.5 rm BYM + 1.5 rm BYA ECC
7th Floor
8th Floor
9th Floor
10th Floor



Living Rooms

Room	Circuit	Switch Board	Appliances	Power
G.Bedroom	CKT2	SB5	1 TLA, 1 Fan, 1 3-pin(Q), 1 2-pin	4195
G.Bedroom(E)	E.CKT4	ESB3	1 LLA, 1 2-pin, 1 fan	187
M.Bedroom	CKT3	SB11	1 TLA, 1 Fan, 1 3-pin(Q), Two 2-pin	4295
M.Bedroom(E)	E.CKT4	ESB7	1 LLA, 1 2-pin, 1 fan	187
C.Bedroom	CKT3	SB12	1 TLA, 1 Fan, 1 3-pin(Q), Two 2-pin	4295
C.Bedroom(E)	E.CKT4	ESB8	1 LLA, 1 2-pin, 1 fan	187
Dining & F.Living	CKT2	SB6	1 LLB, Two TLA, Three Fan, Two 2-pin	583
Dining & F.Living(E)	E.CKT4	ESB2	1 LLB, 1 2-pin, 1 fan	193
Living	CKT3	SB10	1 TLA, 1 Fan, 1 3-pin(P)	3195

			1 2-pin TV Set	
Living(E)	E.CKT2	ESB4	1 LLA, 1 2-pin, 1 fan	187

Common Spaces

Room	Circuit	Switch Board	Appliances	Power
Lobby(E)	E.CKT4	ESB11	1 CLB	18
Lift Lobby(E)	E.CKT4	ESB11	1 CLA	12
Stairs(E)	E.CKT4	ESB12	1 CLB	18

Bathrooms

Room	Circuit	Switch Board	Appliances	Power
Toilet A(E)	E.CKT4	ESB9	1 LLA	12
Toilet B(E)	E.CKT4	ESB6	1 LLA	12
Toilet C(E)	E.CKT4	ESB5	1 LLA	12
Toilet D(E)	E.CKT3	ESB10	1 LLA	12

Kitchen & Veranda

Room	Circuit	Switch Board	Appliances	Power
Kitchen	CKT1	SB1	1 LLA, 1 3-pin(P), 1 2-pin, 1 Exhaust Fan	3152
Kitchen(E)	E.CKT1	ESB1	1 LLA, 1 2-pin	112
Veranda A	CKT3	SB13	1 CLA, 1 2-pin	112
Veranda B	CKT3	SB14	1 CLA, 1 2-pin	112
Veranda C	CKT1	SB3	1 CLA, 1 2-pin	112
Veranda D	CKT1	SB4	1 CLA, 1 2-pin	112
Veranda E	CKT2	SB7	1 CLA, 1 2-pin	112
Utility Space	CKT1	SB2	1 CLB, 1 2-pin	118

Ground Floor

Room	Circuit	Switchboard	Appliances	Power
Lift Lobby	E.CKT3	ESB11	2 CLA	24
Stairs	E.CKT3	ESB12	1 CLA	12
Generator Room	E.CKT1	ESB1	1 2-pin 1 LLB 1 Fan	193
	E.CKT1	ESB2	1 2-pin 2 LLA 2 Fan 1 Exhaust Fan	314
Transformer Room	E.CKT2	ESB10	2 TLB 5 Fan	455
Space beside ramp	E.CKT2	ESB9	1 CLA	12
Toilet	E.CKT1	ESB3	1 LLA 1 Exhaust Fan	52
Guard Room	E.CKT2	ESB8	A 2-pin 1 LLA 1 Fan	187
HT,LT Panels	E.CKT1	ESB4	1 2-pin 2 TLB 1 Fan	255
	E.CKT1	ESB5	1 2-pin 2 TLB 1 Fan	255
Ramp-1	CKT1	SB2	2 CLB	36
	E.CKT2	ESB6	2 CLB	36
Drop off	E.CKT2	ESB7	1 2-pin 2 CLB	136
Ramp-2	CKT2	SB3	1 CLB	18
	E.CKT2	ESB9	1 CLA	12
Driveway	CKT2	SB4	1 TLB 1 2-pin	118
	CKT1	SB1	2 TLB 1 2-pin	136

Roof-Top

Room	Circuit	Switchboard	Appliances	Power
Lift Machine	E.CKT	ESB1	2 LLA 1 Fan	99
Toilet	E.CKT	ESB2	1 LLA	12

Underground

Room	Circuit	Switchboard	Appliances	Power
Underground	CKT1	SB1	1 2-pin Two TLB	180
	CKT2	SB2	1 2-pin 3 TLB	220
	CKT3	SB3	1 2-pin Two TLB	180
	E.CKT1	ESB1	1 CLA	12
	E.CKT1	ESB2	2 CLA	24
	E.CKT2	ESB3	1 2-pin Two TLB	180
	E.CKT2	ESB4	1 2-pin Two TLB	180
	E.CKT3	ESB5	1 2-pin 3 TLB	220

Lightning Arrestor Calculations:

Perimeter of roof = 2*(73'6" + 56' 1.5625" + 21'4.875") = 302.07 ft

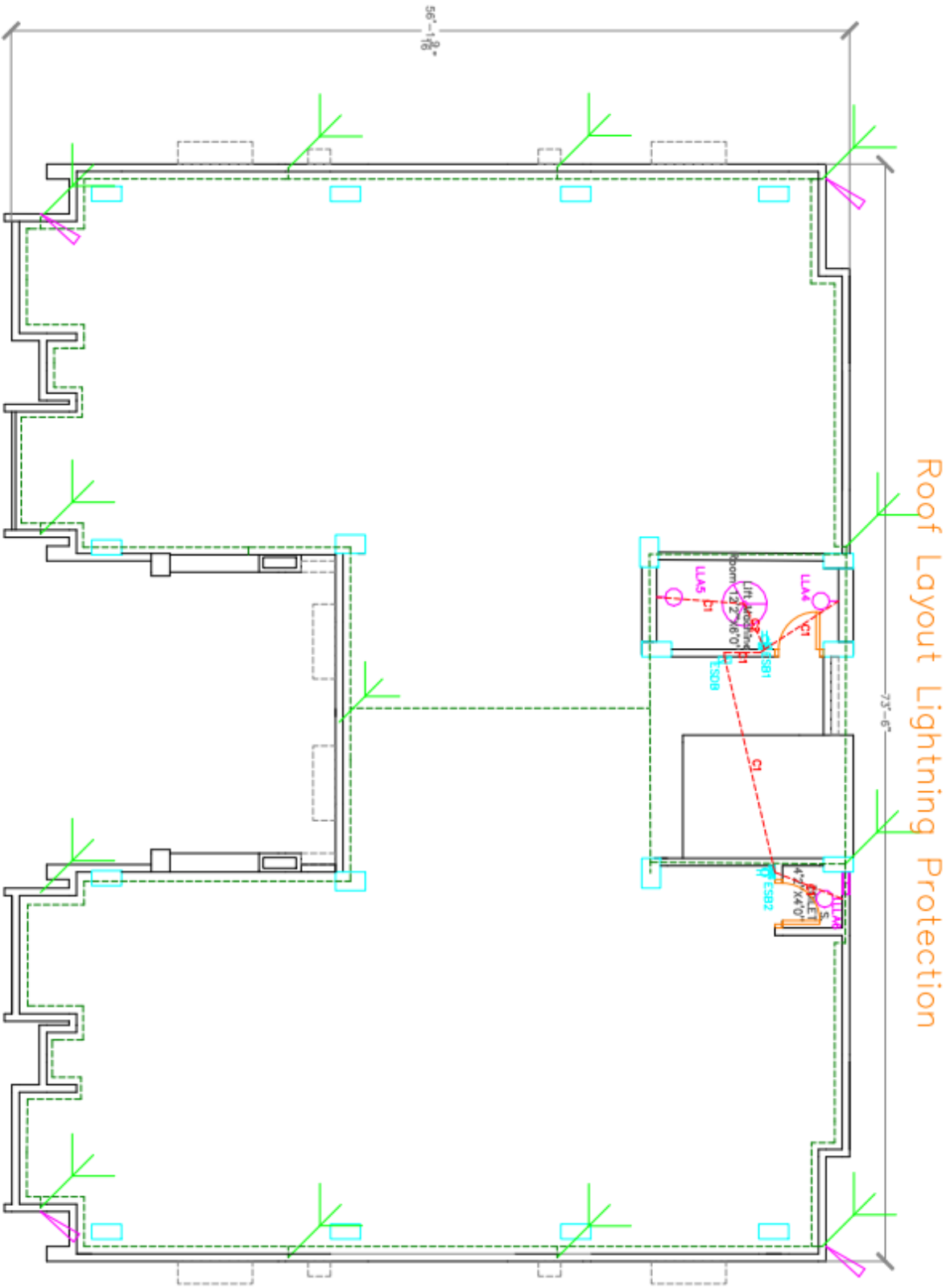
Arrestor Number = $302.07/25 = 12.08 \sim 13$

Roof Area =$56.13 * 73.5 - 21.41 * 21.33$ = 3753 ft^2= 348.6651 $m^2 \sim$ 349 m^2

For first 80 m^2, 1 down-conductor
For rest , (349-80) = 269 m^2

Down conductors number = 1+ 269/100 = 3.69 ~ 4

Roof conductors are 6" away from the railing.


Roof Layout Lightning Protection

Conclusion:

In conclusion, the culmination of this project report for the Electrical Services Design course represents a significant milestone in our academic journey. Through the application of AutoCAD software, we systematically designed the electrical layout for a 10-story residential building, addressing key components such as lighting, fan placement, and conduit calculations. This project provided invaluable hands-on experience, reinforcing theoretical concepts learned in class and enhancing our understanding of the practical implications of electrical engineering in building design. As we conclude this endeavor, we reflect on the importance of rigorous analysis, attention to detail, and collaborative effort in achieving successful project outcomes. These lessons will undoubtedly inform our future academic pursuits and professional endeavors in the field of engineering.

Conduit Specifications and Labelling:

`Conduit Name	Dimension
C1	2 x 1.5 rm BYM
C2	4 x 1.5 rm BYM
C3	6 x 1.5 rm BYM
C4	8 x 1.5 rm BYM
C5	10 x 1.5 rm BYM
C6	12 x 1.5 rm BYM
C7	14 x 1.5 rm BYM
C8	2 x 2.5 rm BYM
C9	2 x 4 rm BYM+4 rm BYA ECC
C8,9	2 x 2.5 rm BYM and 2 x 4 rm BYM
C10	2 x 6 rm BYM + 6 rm BYA ECC
C11	2 x 10 rm BYM + 10 rm BYA ECC
C12	4 x 10 rm BYM + 2 x 10 rm BYA ECC
C11,12	2 x 10 rm BYM + 10 rm BYA ECC and 4 x 10 rm BYM + 2 x 10 rm BYA ECC

Table 8.1.5: Recommended Values of Illumination for Residential Buildings

Area or Activity	Illuminance (lux)	Area or Activity	Illuminance (lux)
Dwelling Houses		**Hotels**	
Bedrooms		Entrance halls	150
General	70	Reception and accounts	300
Bed-head, Dressing table	250	Dining rooms (tables)	150
Kitchens	200	Lounges	150
Dining rooms (tables)	150	Bedrooms	
Bathrooms		General	100
General	100	Dressing tables, bed heads, etc.	250
Shaving, make-up	300	Writing rooms (tables)	300
Stairs	100	Corridors	70
Lounges	100	Stairs	100
Garages & Porches	100	Laundries	200

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Table for Cables, Conduits, ECC, EL, Voltage drop and Current ratings of different specifications as per Manual of Eastern Cables, BICC cables and Tables, Electrical Conductors (International Standard Sizes) etc. :

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

References:

1. https://www.anirbaan.com/apartment/niyamah.html
2. https://www.displayspecifications.com/en/model-power-consumption/78e8d13
3. https://vision.com.bd/fan/exhaust-fan/vision-exhaust-fan-8-en-2/

Contribution:

ID: 1806029

- Room-wise appliances calculations for all floorplans.
- Adding dimensions, texts in all floorplans.
- Slide preparation for presentation.

ID: 1906001

- Underground floorplan drawing.
- Room-wise appliances calculations for all floorplans.
- Single line diagram (SDB and ESDB).
- Placing fittings in underground floorplan.
- Conduit drawing in underground floorplan.
- Report writing.

ID: 1906004

- Ground floorplan drawing.
- Room-wise appliances calculations for all floorplans.
- Placing fittings in ground floorplan.
- Conduit drawing in ground floorplan.
- Transformer and generator ratings related calculations and area allocations in ground.
- Report writing.

ID: 1906010

- Rooftop floorplan drawing.
- Placing fittings in rooftop floorplan.
- Conduit drawing in rooftop floorplan.
- Lightning Protection System (LPS) related calculations.
- Implementing LPS in rooftop floorplan.
- Crosschecking the conduit labelling.

ID: 1906013

- Circuit-wise calculations for all floorplans.
- Making the table of captions and symbols.
- Making the table of room, circuit, switchboard, appliances, power.
- Crosschecking all the floorplans and updating them.
- Placing fittings in typical floorplan.
- Report writing.

ID: 1906026

- Typical floorplan drawing.
- Placing fittings in typical floorplan.
- MDB, EMDB and lift related calculations.
- MDB and EMDB related connection diagrams.
- Crosschecking the calculations of all floorplans.
- Slide preparation for presentation.

ID: 1906031

- Typical floorplan drawing.
- Conduit labelling and forming the conduit table.
- Conduit drawing in typical floorplan.
- Labelling conduits in most of the floorplans.
- Some parts of single line diagram (SDB and ESDB).
- Slide preparation for presentation.