BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY

Department of Electrical and Electronic Engineering

Course No: EEE 414

Course Title: Electric Service Design Laboratory

Project Report

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Section: C1

Group No: 04

Submiddion Date: 25 January,2023

Floor Plan(Ground Floor):

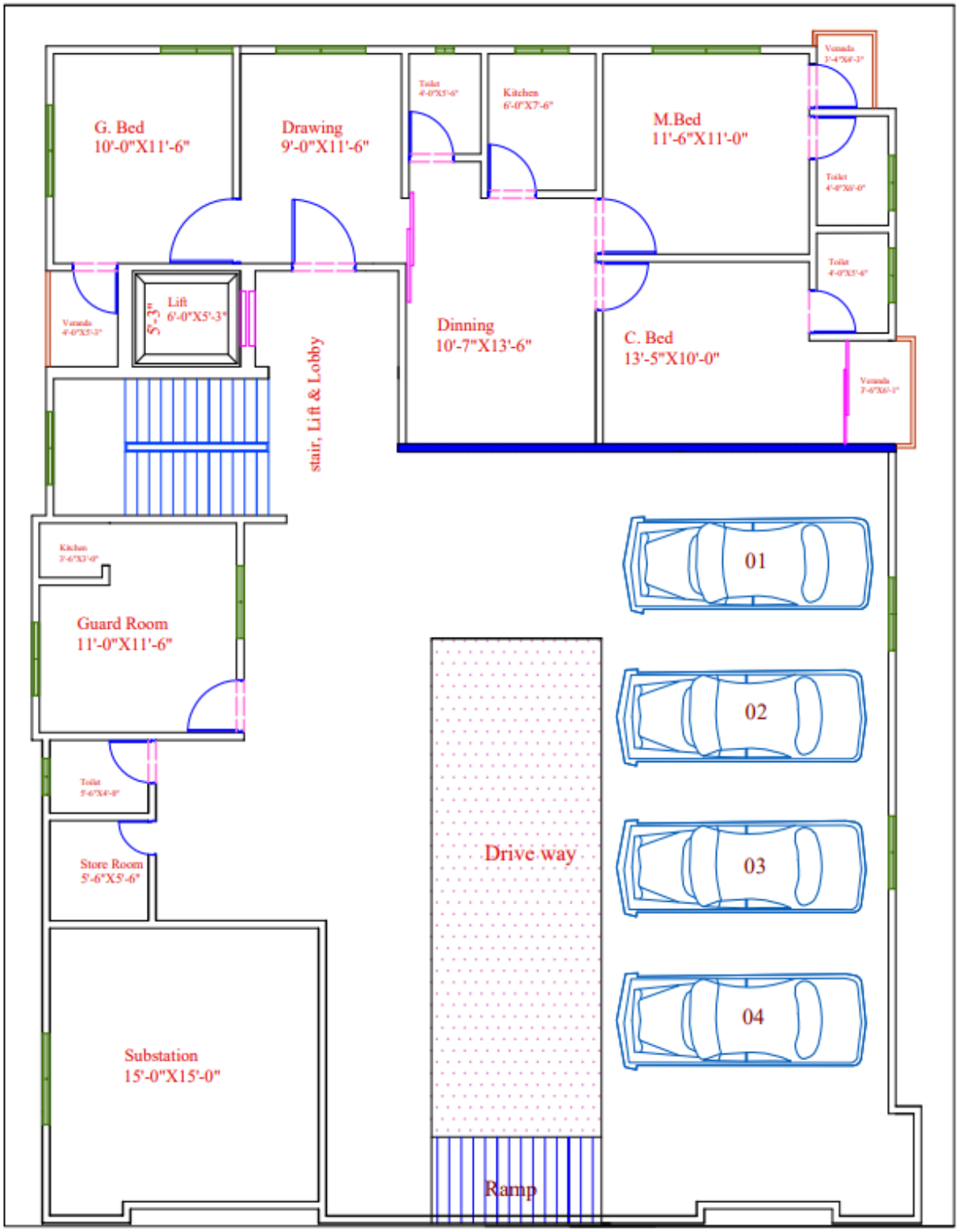

Fig: Floor Plan (Ground Floor)

Fittings and Fixture (Ground Floor):

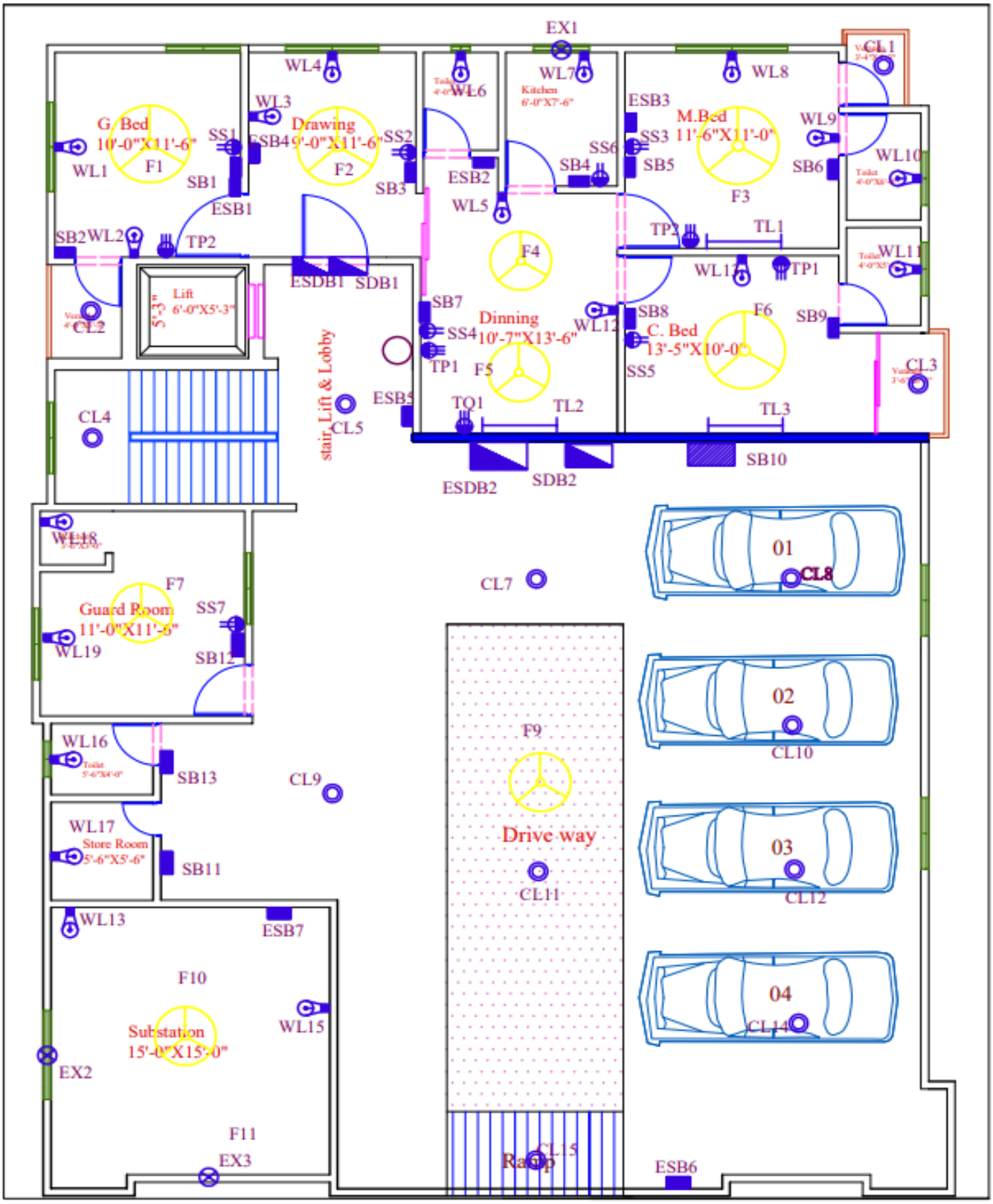

Fig: Fittings Fixtures (Ground Floor)

Wiring Diagram (Ground Floor):

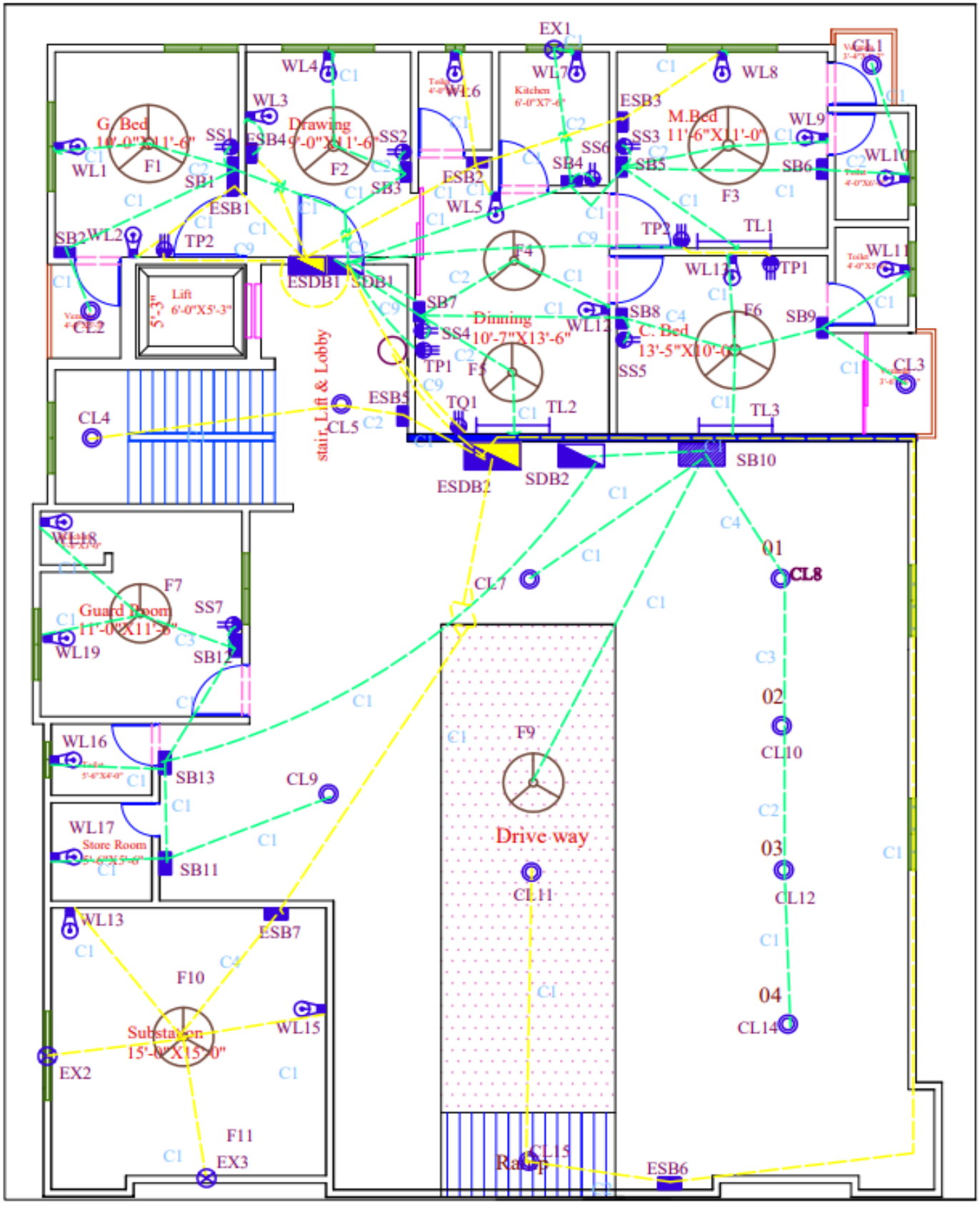

Fig: Wiring Diagram (Ground Floor)

Floor Plan(First Floor and the Other Floors):

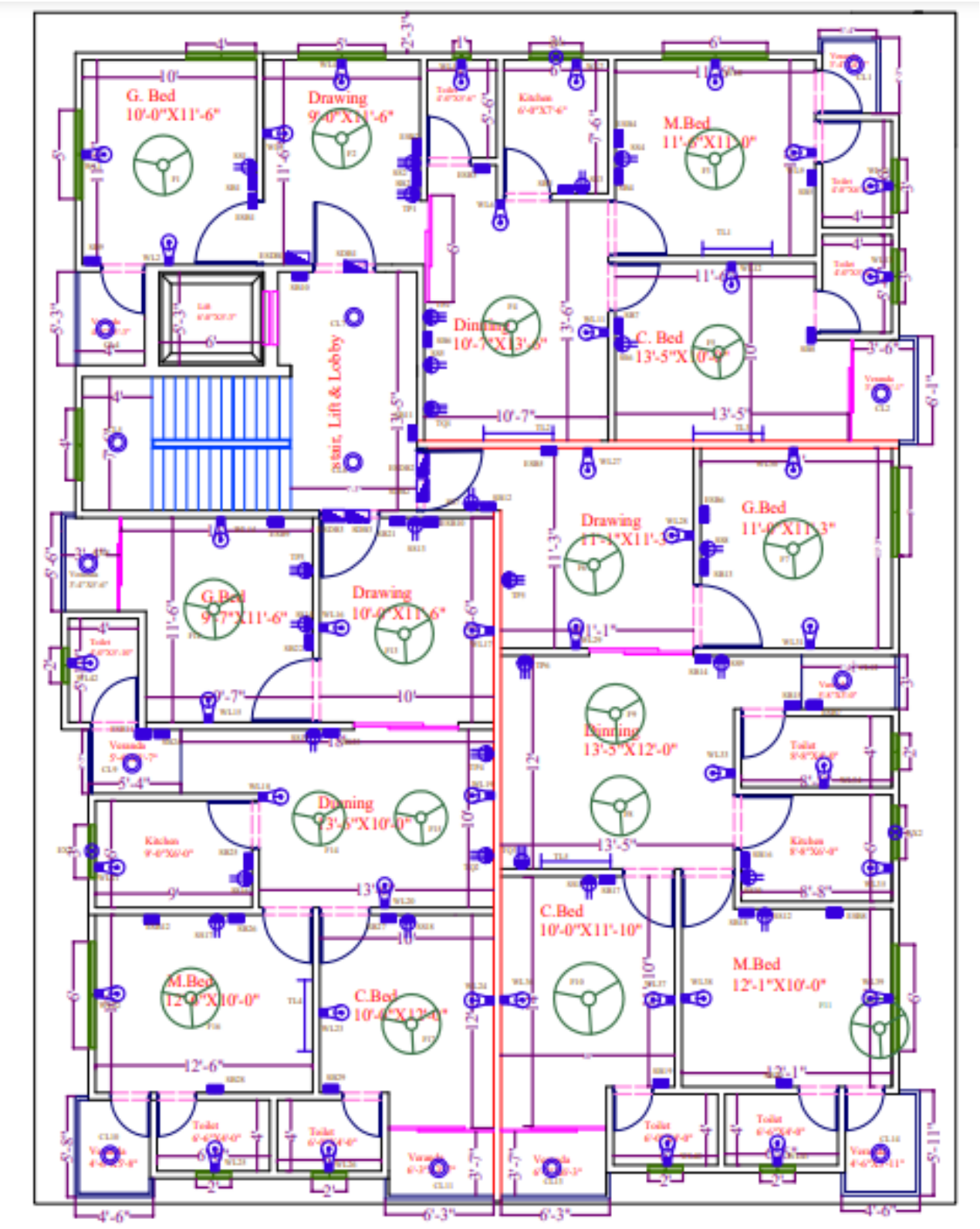

Fig: Floor Plan (1st to 5th Floor)

Fittings and Fixture (First Floor and the Other Floors):

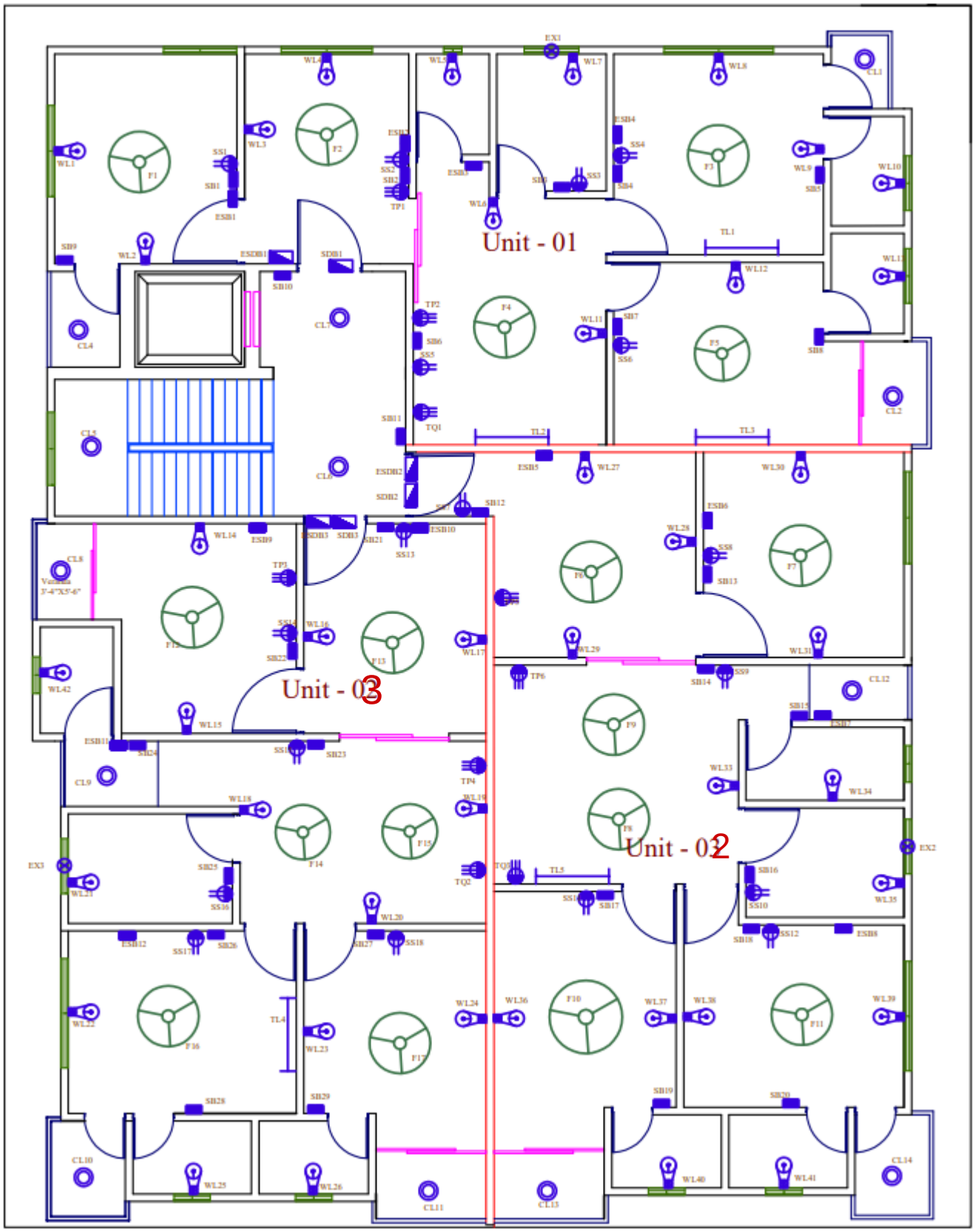

Fig: Fittings and Fixture (1st to 5th Floor)

Wiring Diagram (First Floor and the Other Floors):

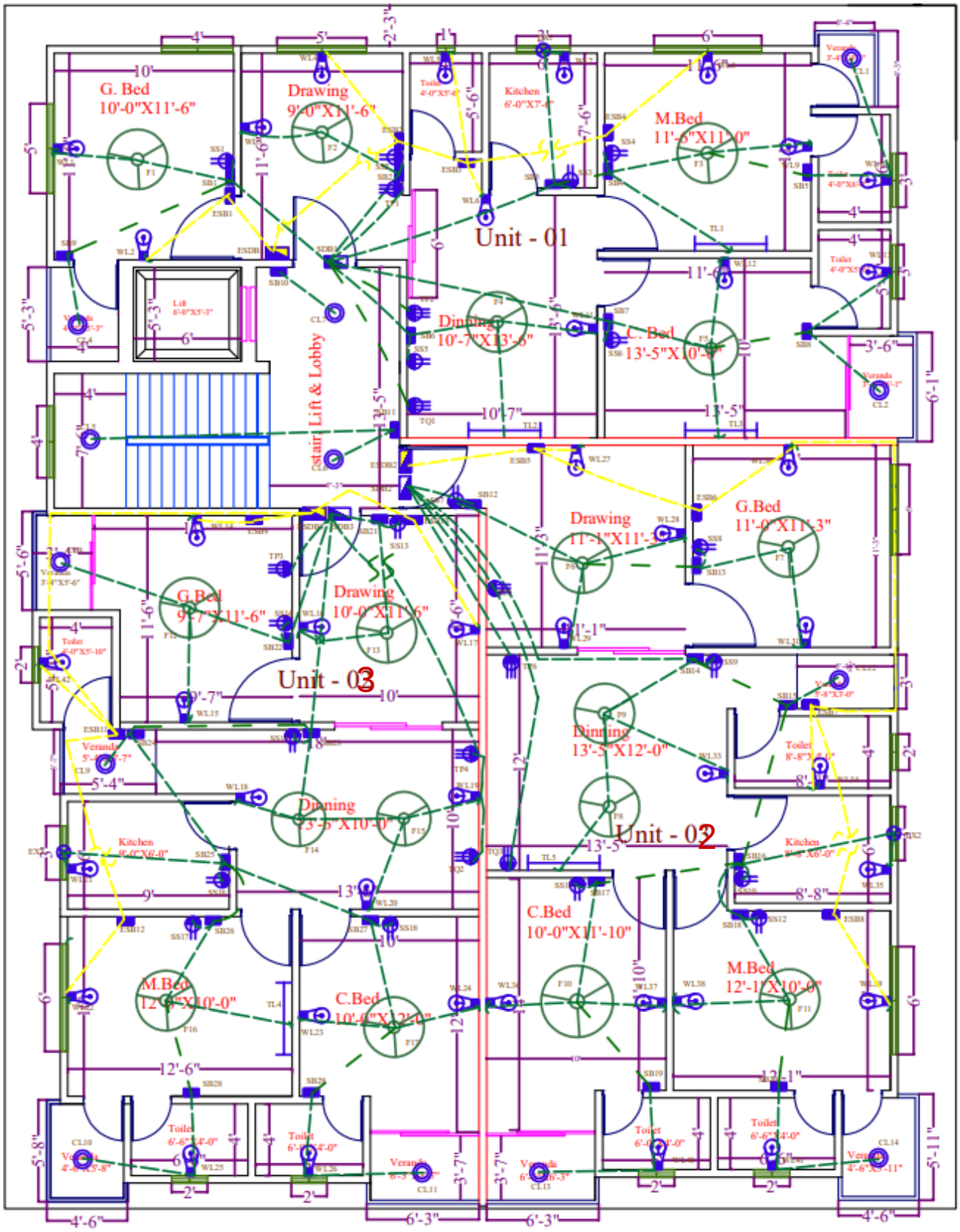

Fig: Wiring Diagram (1st Floor)

Number of Light & Fan Calculation:

Room Index = (Length * Width)/ Mounting height* (Length+ Width)

Illuminance, E = (n*N*UF*LLF*F) / A

Here, we assumed Mounting height to be 2m.

Ground Floor:

Unit1:

Dinning:

Length = 10’7” =3.23m

Width =13’6” =4.11m

Reflectance, Ceiling =0.5, Walls= 0.3, Roof= 0.2

LLF= 0.9

F= 1800lumen (20W light)

E=150 lumen/m^2

Room Index = 0.9

UF = 0.35

According to formula, N=3.51

4 lights need to be installed.

Number of fan = 1.4

1 fan need to be install.

C-bed:

Length = 13’5” =4.09m

Width =10’ = 3.05m

Reflectance, Ceiling =0.5, Walls= 0.3, Roof= 0.2

LLF= 0.9

F= 1800lumen (20W light)

E=100 lumen/m^2

Room Index = 0.9

UF =0.34

According to formula, N=2.27

3 lights need to be installed.

Number of fan = 1.34

1 fan need to be install.

M-Bed:

Length = 11’6” = 3.51m

Width =11’ = 3.353m

Reflectance, Ceiling =0.5, Walls= 0.3, Roof= 0.2

LLF= 0.9

F= 1800lumen (20W light)

E=100 lumen/m^2

Room Index = 0.9

UF = 0.34

According to formula, N=2.25

3 lights need to be installed.

Number of fan = 1.27

1 fan need to be install

G-Bed:

Length = 10’ =3.05m

Width =13’6” =3.51m

Reflectance, Ceiling =0.5, Walls= 0.5, Roof= 0.2

LLF= 0.9

F= 1800lumen (20W light)

E=150 lumen/m^2

Room Index = 0.82

UF = 0.33

According to formula, N=2.003

2 lights need to be installed.

Number of fan = 1.15

1 fan need to be install

Drawing:

Length = 9’=2.74m

Width =11’6” =3.51m

Reflectance, Ceiling =0.5, Walls= 0.5, Roof= 0.2

LLF= 0.9

F= 1800lumen (20W light)

E=150 lumen/m^2

Room Index = 0.8

UF = 0.32

According to formula, N=2.78

3 lights need to be installed.

Number of fan = 1.03

1 fan needs to be install

Guard Room:

1 fan and 1 light is needed.

1st Floor:

Unit 1:

Dinning:

Length = 10’7” =3.23m

Width =13’6” =4.11m

Reflectance, Ceiling =0.5, Walls= 0.3, Roof= 0.2

LLF= 0.9

F= 1800lumen (20W light)

E=150 lumen/m^2

Room Index = 0.9

UF = 0.35

According to formula, N=3.51

4 lights need to be installed.

Number of fan = 1.4

1 fan need to be install.

C-bed:

Length = 13’5” =4.09m

Width =10’ = 3.05m

Reflectance, Ceiling =0.5, Walls= 0.3, Roof= 0.2

LLF= 0.9

F= 1800lumen (20W light)

E=100 lumen/m^2

Room Index = 0.9

UF =0.34

According to formula, N=2.27

3 lights need to be installed.

Number of fan = 1.34

1 fan need to be install.

M-Bed:

Length = 11’6” = 3.51m

Width =11’ = 3.353m

Reflectance, Ceiling =0.5, Walls= 0.3, Roof= 0.2

LLF= 0.9

F= 1800lumen (20W light)

E=100 lumen/m^2

Room Index = 0.9

UF = 0.34

According to formula, N=2.25

3 lights need to be installed.

Number of fan = 1.27

1 fan need to be install

G-Bed:

Length = 10’ =3.05m

Width =13’6” =3.51m

Reflectance, Ceiling =0.5, Walls= 0.5, Roof= 0.2

LLF= 0.9

F= 1800lumen (20W light)

E=150 lumen/m^2

Room Index = 0.82

UF = 0.33

According to formula, N=2.003

2 lights need to be installed.

Number of fan = 1.15

1 fan need to be install

Drawing:

Length = 9’=2.74m

Width =11’6” =3.51m

Reflectance, Ceiling =0.5, Walls= 0.5, Roof= 0.2

LLF= 0.9

F= 1800lumen (20W light)

E=150 lumen/m^2

Room Index = 0.8

UF = 0.32

According to formula, N=2.78

3 lights need to be installed.

Number of fan = 1.03

1 fan needs to be install

Unit 2:

G-Bed:

Length = 9’7” =2.921

Width =11’6” =3.51m

Reflectance, Ceiling =0.5, Walls= 0.3, Roof= 0.2

LLF= 0.9

F= 1800lumen (20W light)

E=100 lumen/m^2

Room Index = 0.9

UF = 0.32

According to formula, N=1.9

2lights need to be installed.

Number of fan = 1.1

1 fan need to be install

Drawing:

Length = 10’= 3.04m

Width =11’6” =3.51m

Reflectance, Ceiling =0.5, Walls= 0.3, Roof= 0.2

LLF= 0.9

F= 1800lumen (20W light)

E=150 lumen/m^2

Room Index = 0.9

UF = 0.32

According to formula, N=3.08

3 lights need to be installed.

Number of fan = 1.14

1 fan need to be install

Dinning:

Length = 13’5” =4.12m

Width =10’ = 3.04m

Reflectance, Ceiling =0.5, Walls= 0.3, Roof= 0.2

LLF= 0.9

F= 1800lumen (20W light)

E=150 lumen/m^2

Room Index = 0.9

UF = 0.34

According to formula, N=3.41

4 lights need to be installed.

Number of fan = 1.34

1 fan need to be install

M-Bed:

Length = 12’6” =3.81m

Width =10’ =3.04m

Reflectance, Ceiling =0.5, Walls= 0.5, Roof= 0.2

LLF= 0.9

F= 1800lumen (20W light)

E=100 lumen/m^2

Room Index = 0.9

UF = 0.335

According to formula, N=2.13

3 lights need to be installed.

Number of fan = 1.24

1 fans need to be install

C-Bed:

Length = 10’ =3.04m

Width =12’ =3.65m

Reflectance, Ceiling =0.5, Walls= 0.5, Roof= 0.2

LLF= 0.9

F= 1800lumen (20W light)

E=100 lumen/m^2

Room Index = 0.9

UF = 0.33

According to formula, N=2.01

2 lights need to be installed.

Number of fan = 1.19

1 fans need to be install.

UNIT 3

C- Bed:

Length = 10’ =3.04m

Width =11’10” =3.61m

Reflectance, Ceiling =0.5, Walls= 0.5, Roof= 0.2

LLF= 0.9

F= 1800lumen (20W light)

E=100 lumen/m^2

Room Index = 0.9

UF = 0.33

According to formula, N=2.05

2 lights need to be installed.

Number of fan = 1.18

1 fans need to be install

Dinning:

Length = 13’5” =4.1m

Width =12’ =3.7m

Reflectance, Ceiling =0.5, Walls= 0.5, Roof= 0.2

LLF= 0.9

F= 1800lumen (20W light)

E=150 lumen/m^2

Room Index = 0.9

UF = 0.37

According to formula, N=3.79

4 lights need to be installed.

Number of fan = 1.63

2 fans need to be install

Drawing:

Length = 11’1” =3.38m

Width =11’3” =3.43m

Reflectance, Ceiling =0.5, Walls= 0.5, Roof= 0.2

LLF= 0.9

F= 1800lumen (20W light)

E=150 lumen/m^2

Room Index = 0.9

UF = 0.34

According to formula, N=3.2

4 lights need to be installed.

Number of fan = 1.24

1 fans need to be install

G-Bed:

Length = 11’ =3.35m

Width =11’3” =3.43m

Reflectance, Ceiling =0.5, Walls= 0.5, Roof= 0.2

LLF= 0.9

F= 1800lumen (20W light)

E=100 lumen/m^2

Room Index = 0.9

UF = 0.34

According to formula, N=2.08

2 lights need to be installed.

Number of fan = 1.24

1 fans need to be install

M-Bed:

Length = 12’1” =3.683m

Width =10’= 3.048m

Reflectance, Ceiling =0.5, Walls= 0.5, Roof= 0.2

LLF= 0.9

F= 1800lumen (20W light)

E=100 lumen/m^2

Room Index = 0.9

UF = 0.33

According to formula, N=2.1

3 lights need to be installed.

Number of fan = 1.2

1 fans need to be install

Switch Board Diagram:

First to Fifth Floor:

Unit 1:

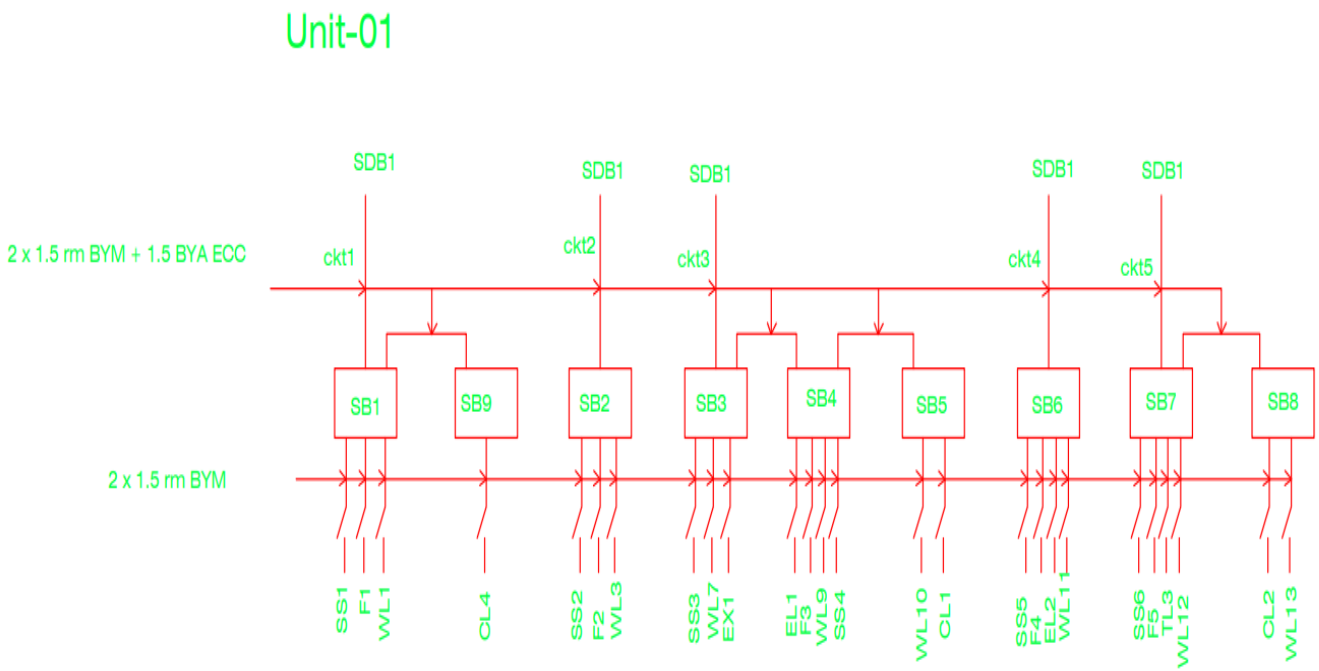

Fig: Unit -1 SB Diagram

Unit 2:

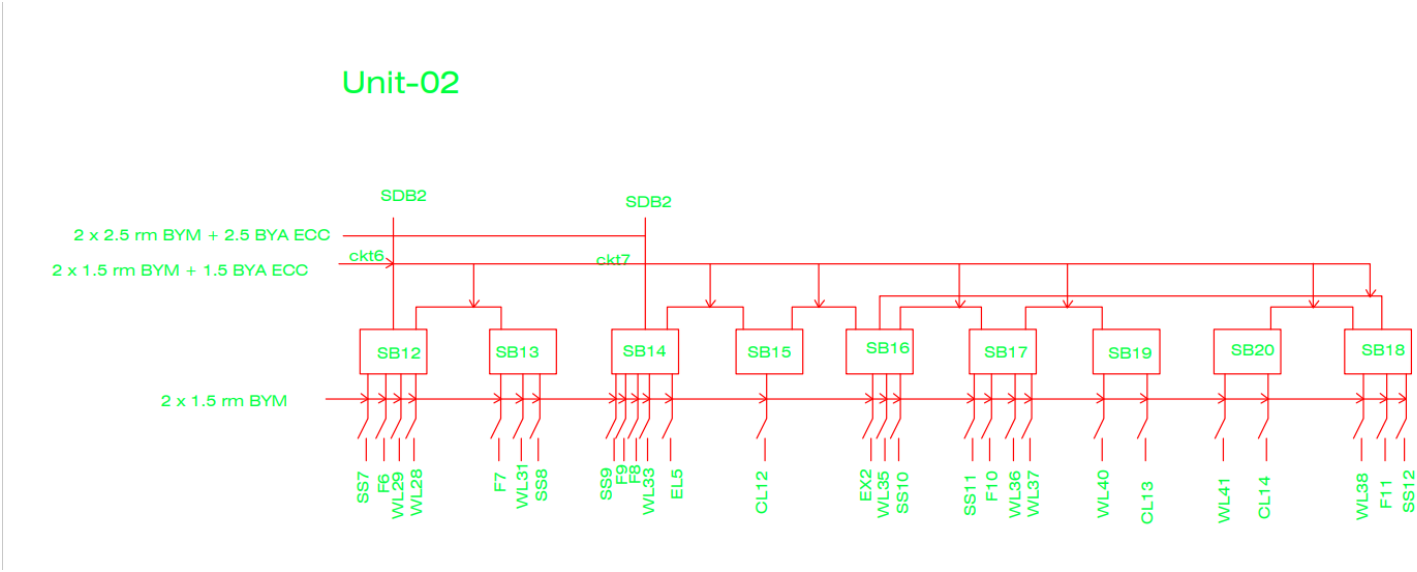

Fig: Unit -2 SB Diagram

Unit 3:

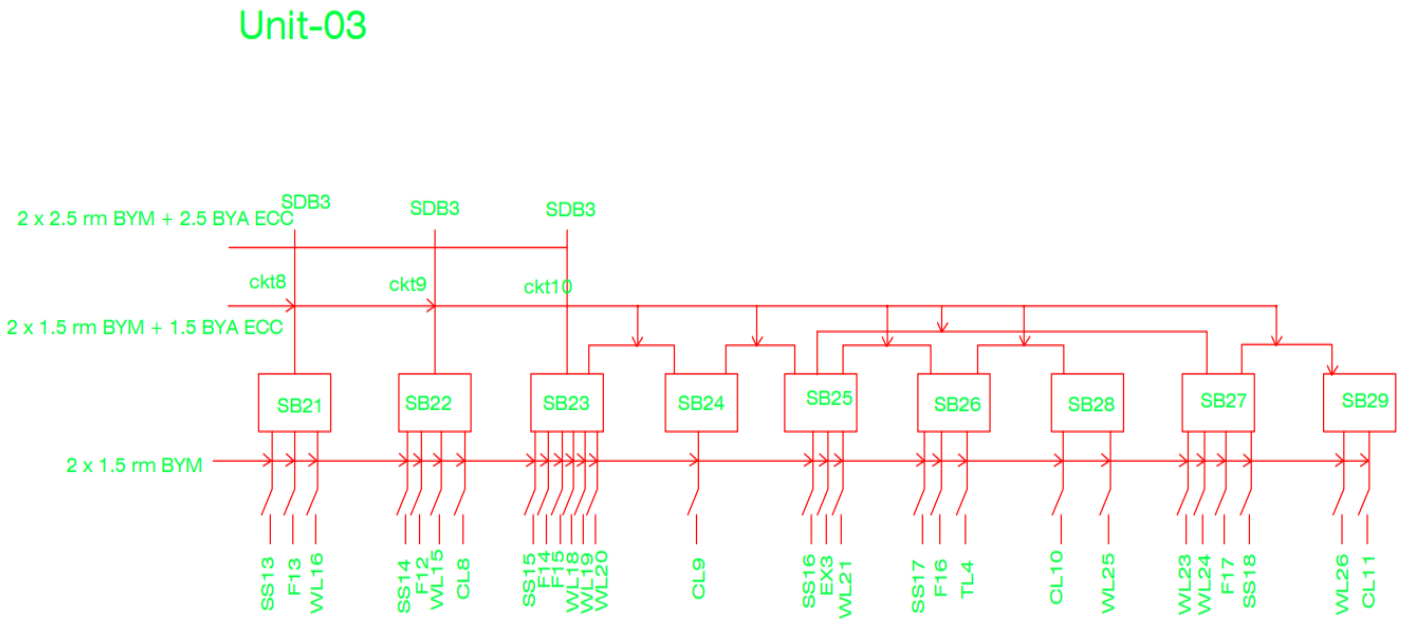

Fig: Unit -3 SB Diagram

Emergency Switch Board Diagram:

First to fifth Floor:

Unit 1:

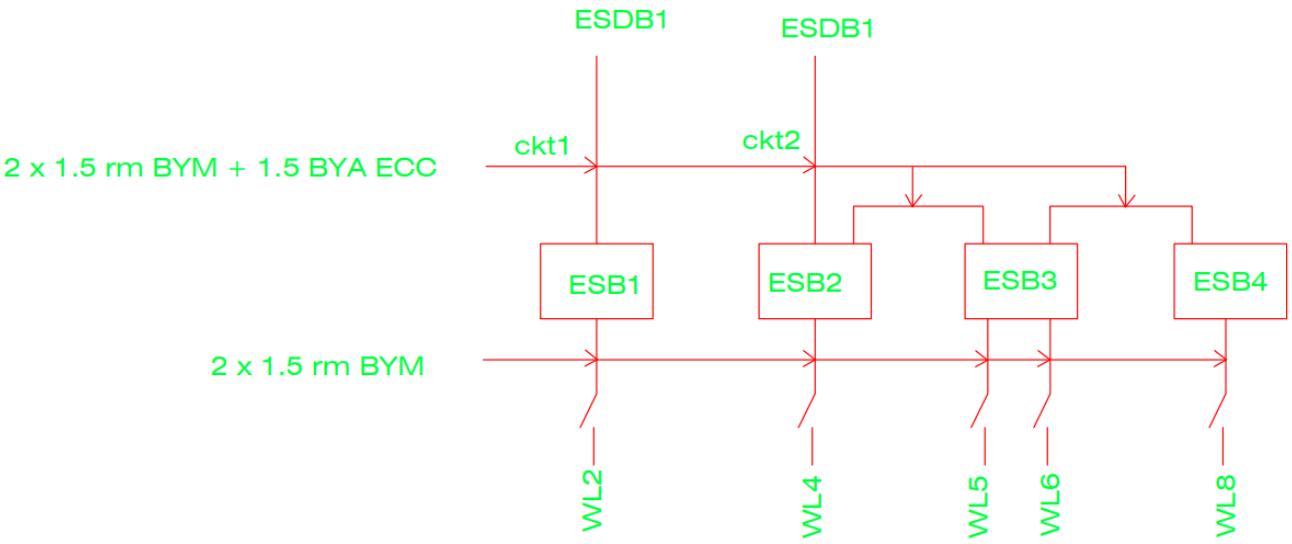

Fig: Unit -1 ESB Diagram

Unit 2:

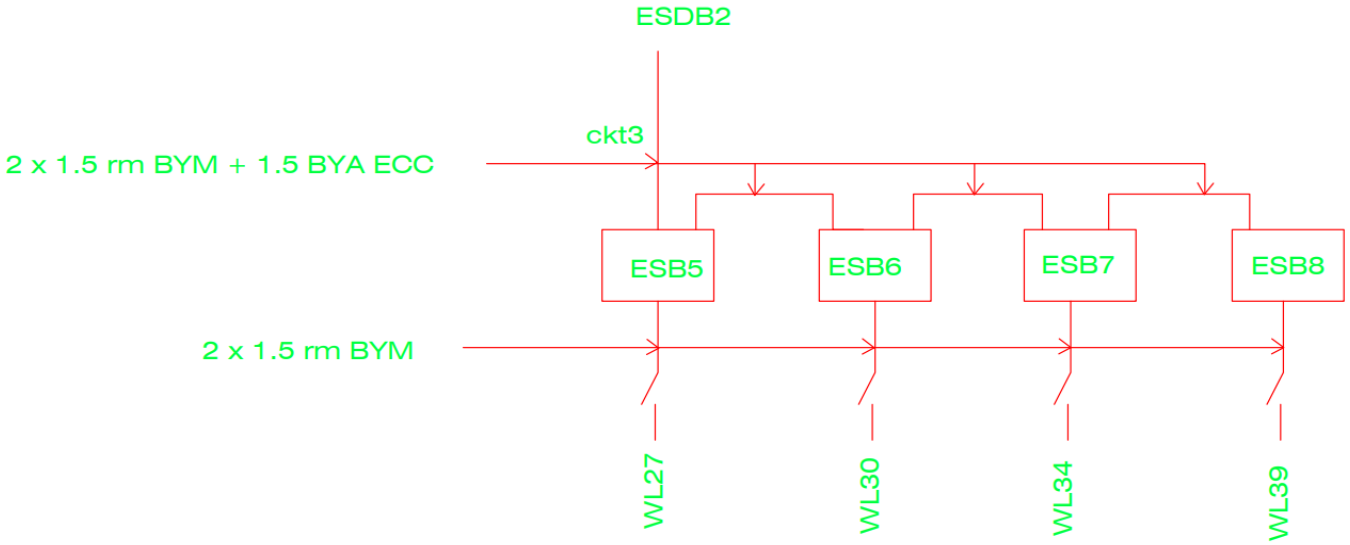

Fig: Unit -2 ESB Diagram

Unit 3:

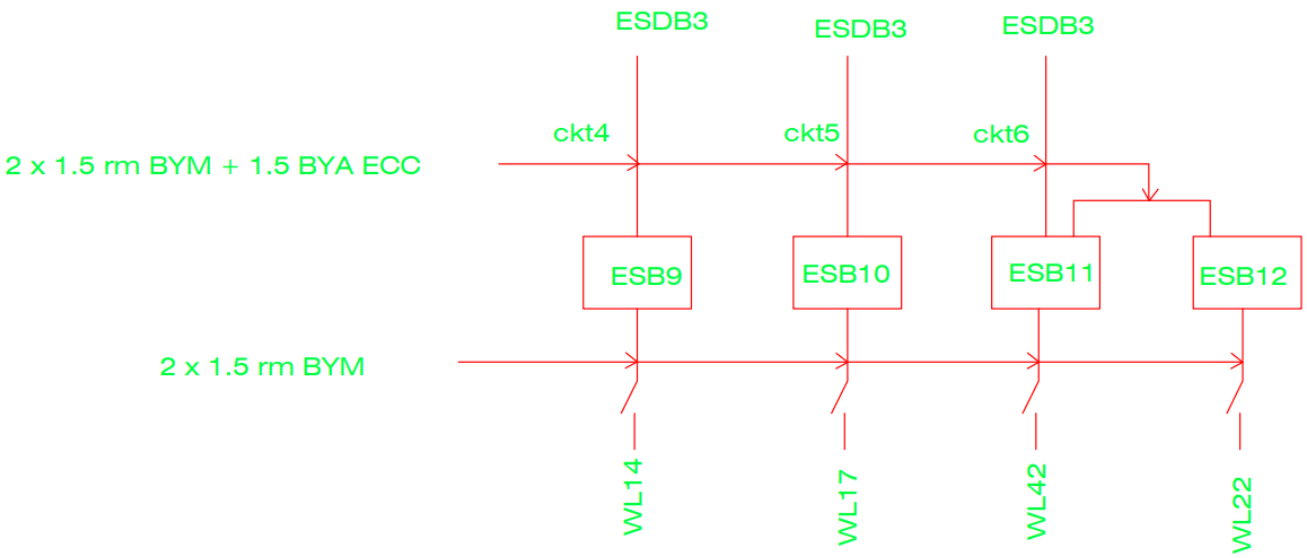

Fig: Unit -3 ESB Diagram

Switch Board Diagram:

Ground Floor:

Unit 1:

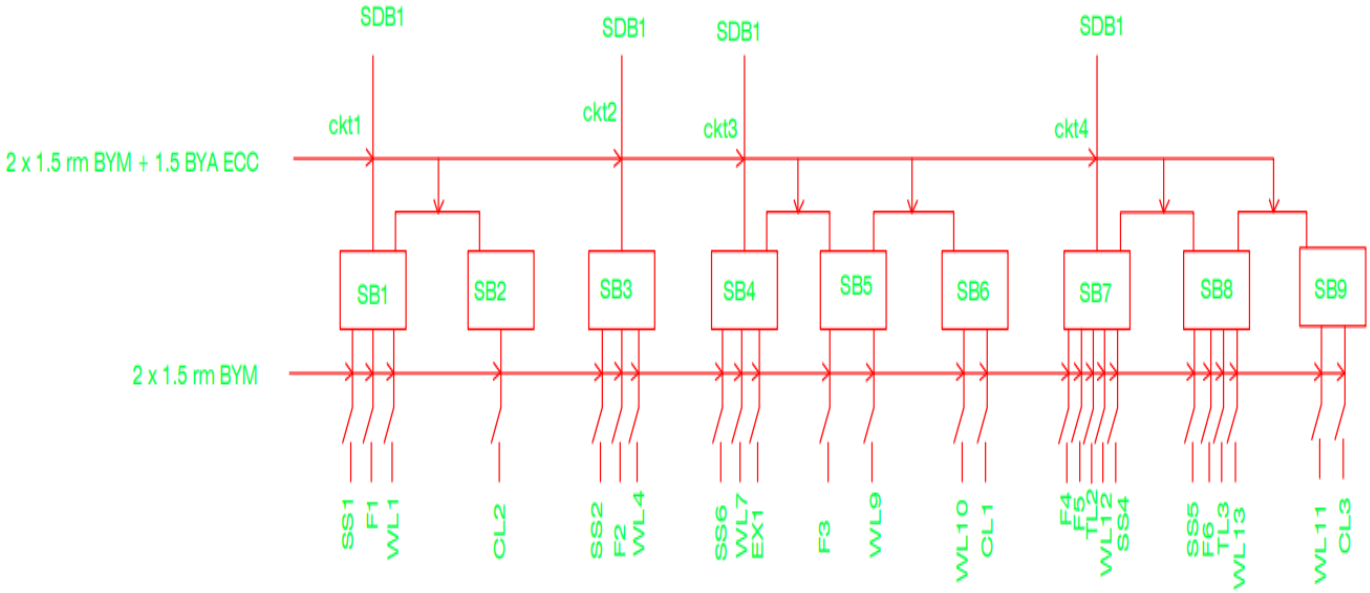

Fig: Unit -1 SB Diagram

Other Equipments:

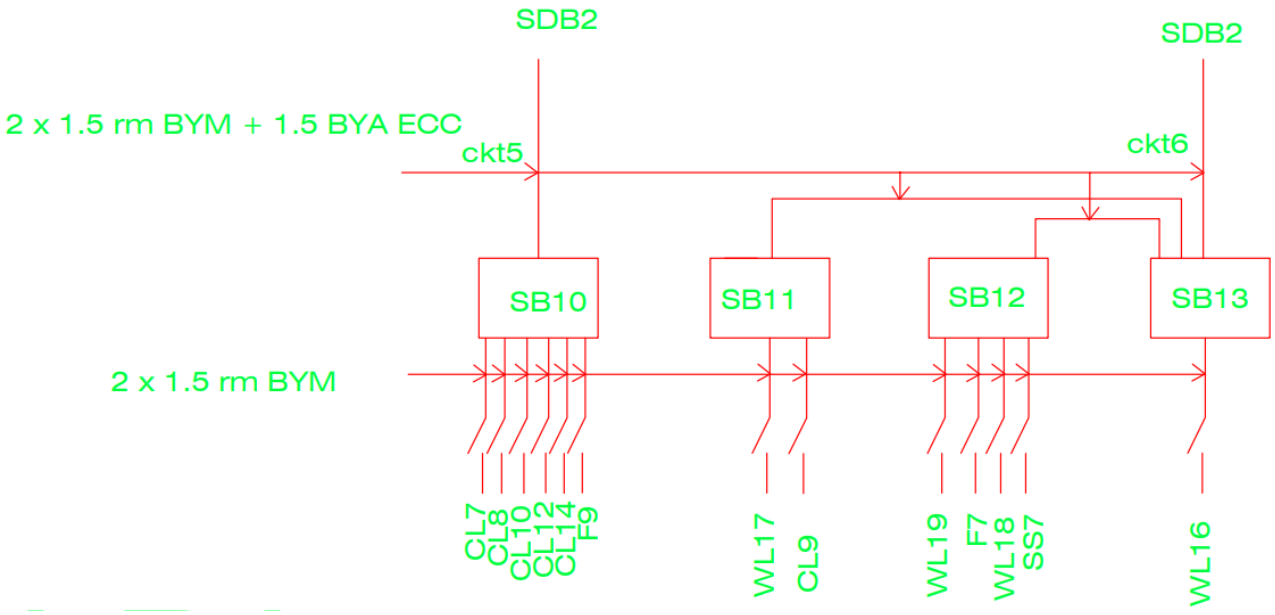

Fig: Others SB Diagram

Emergency Switch Board Diagram:

Ground Floor:

Unit 1:

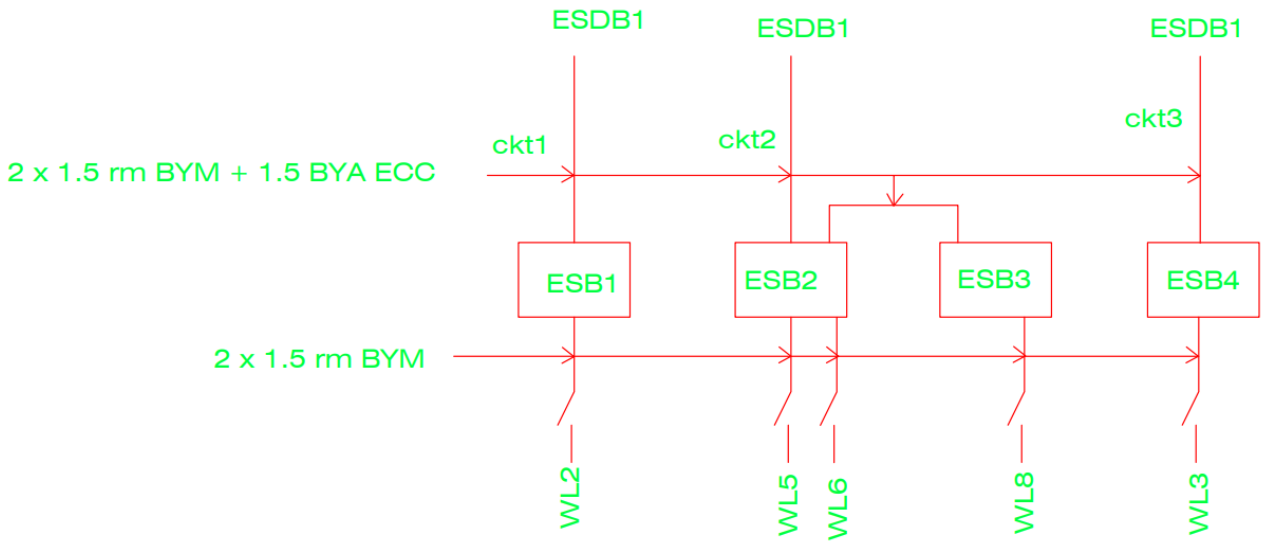

Fig: Unit -1 ESB Diagram

Others:

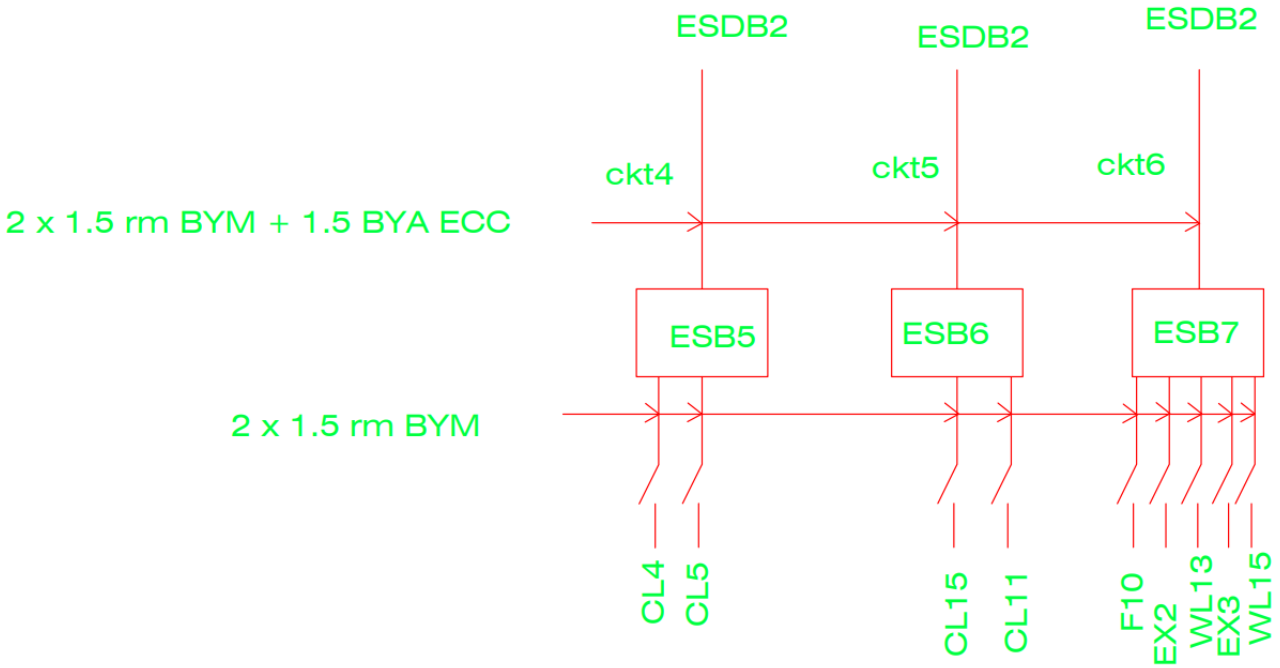

Fig: Other ESB Diagram

SDB to MDB Diagram:

First to Fifth Floor:

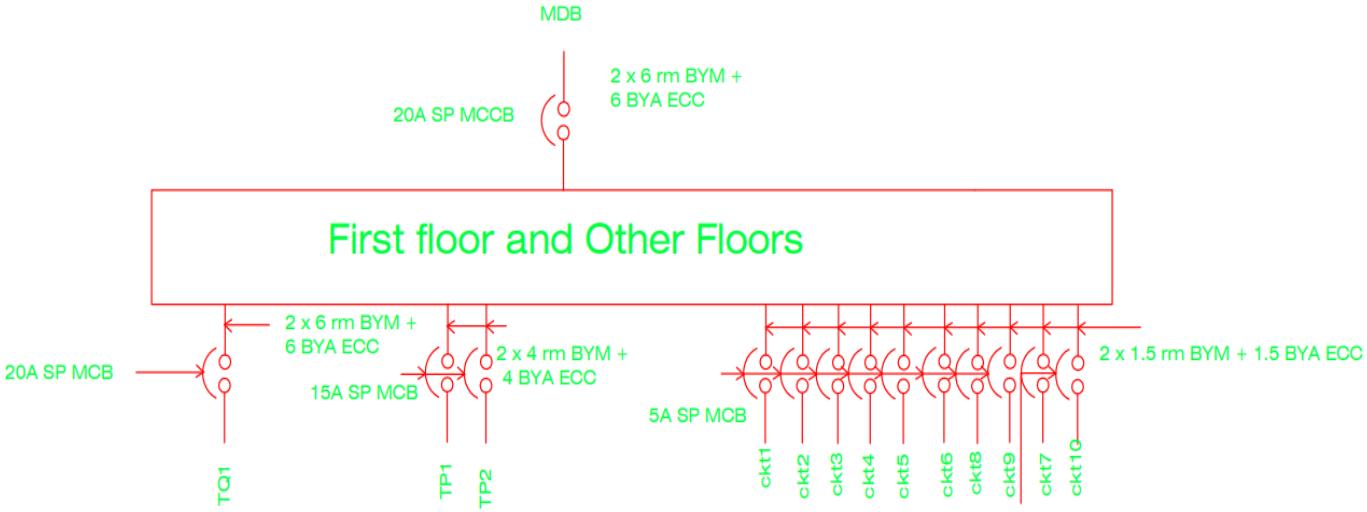

Fig: SDB to MDB Diagram (1st to 5th Floor)

Ground Floor:

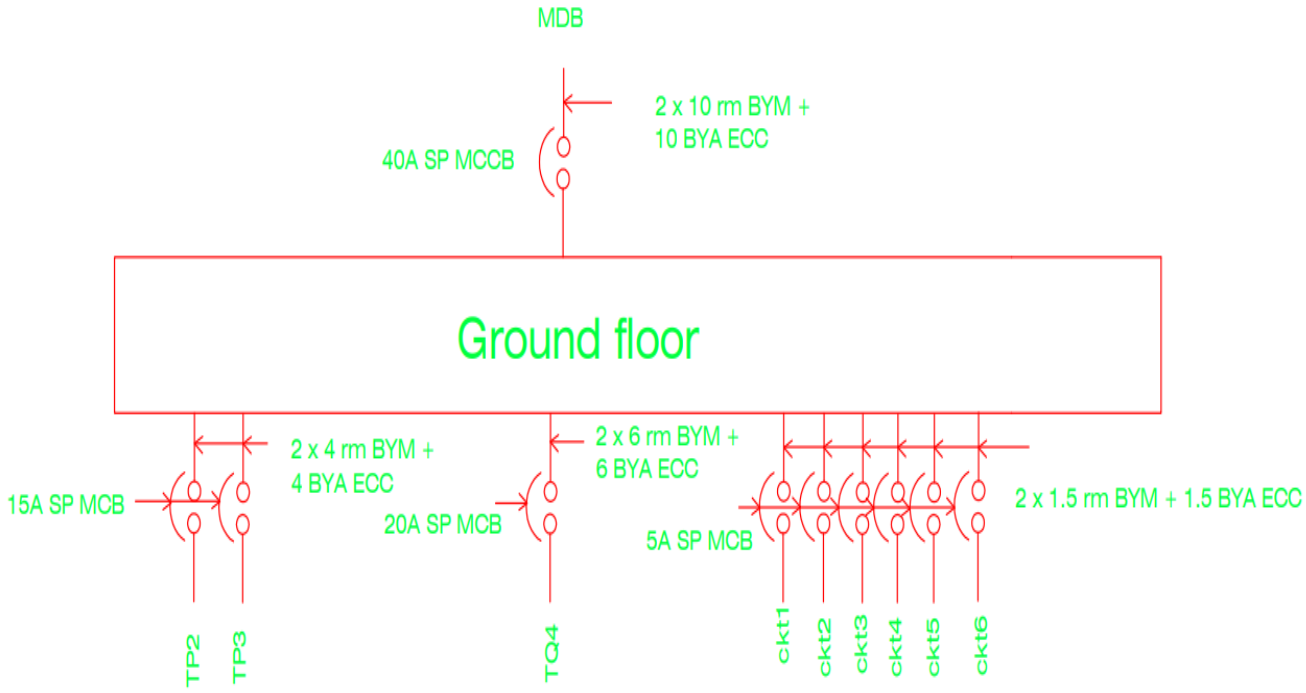

Fig: SDB to MDB Diagram (Ground Floor)

Emergency Main Distribution Board Diagram:

First to Fifth Floor:

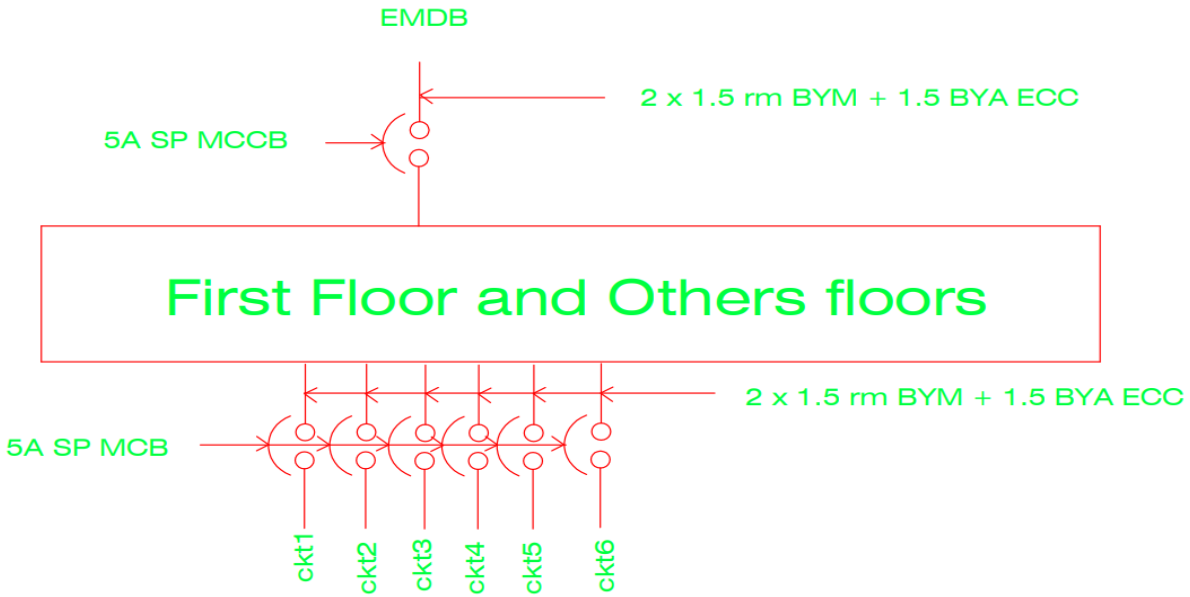

Fig: ESDB to EMDB Diagram

Ground Floor:

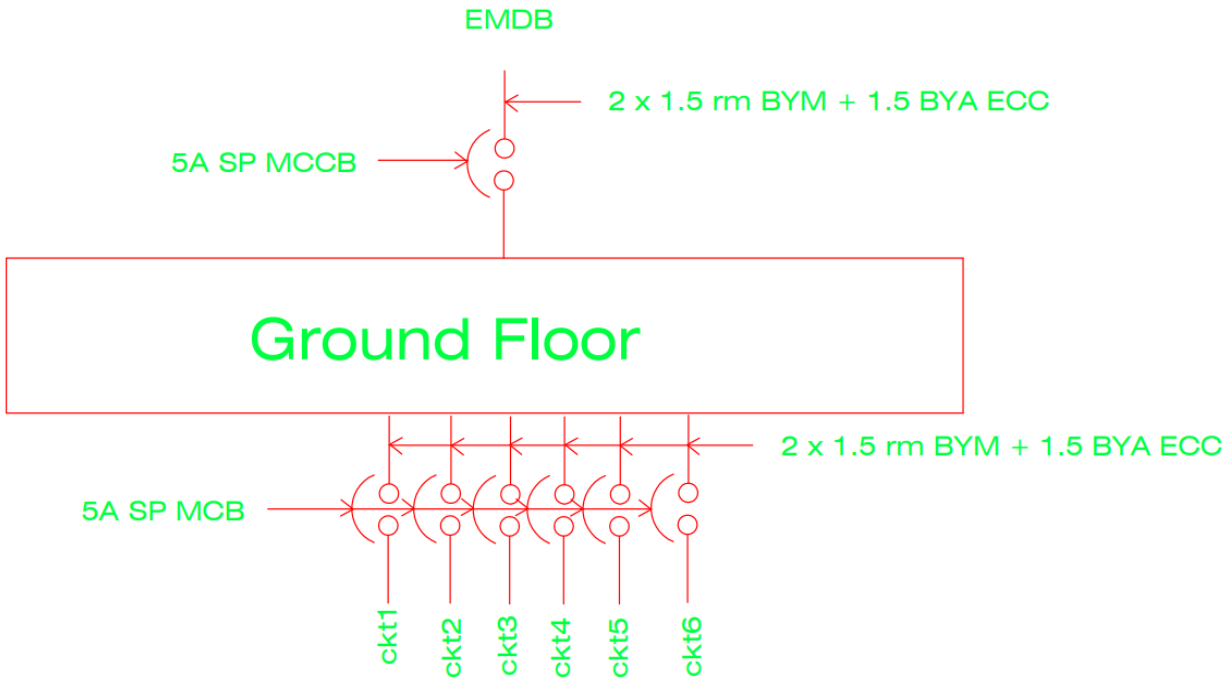

Fig: ESDB to EMDB Diagram

Main Distribution Board (MDB) Diagram:

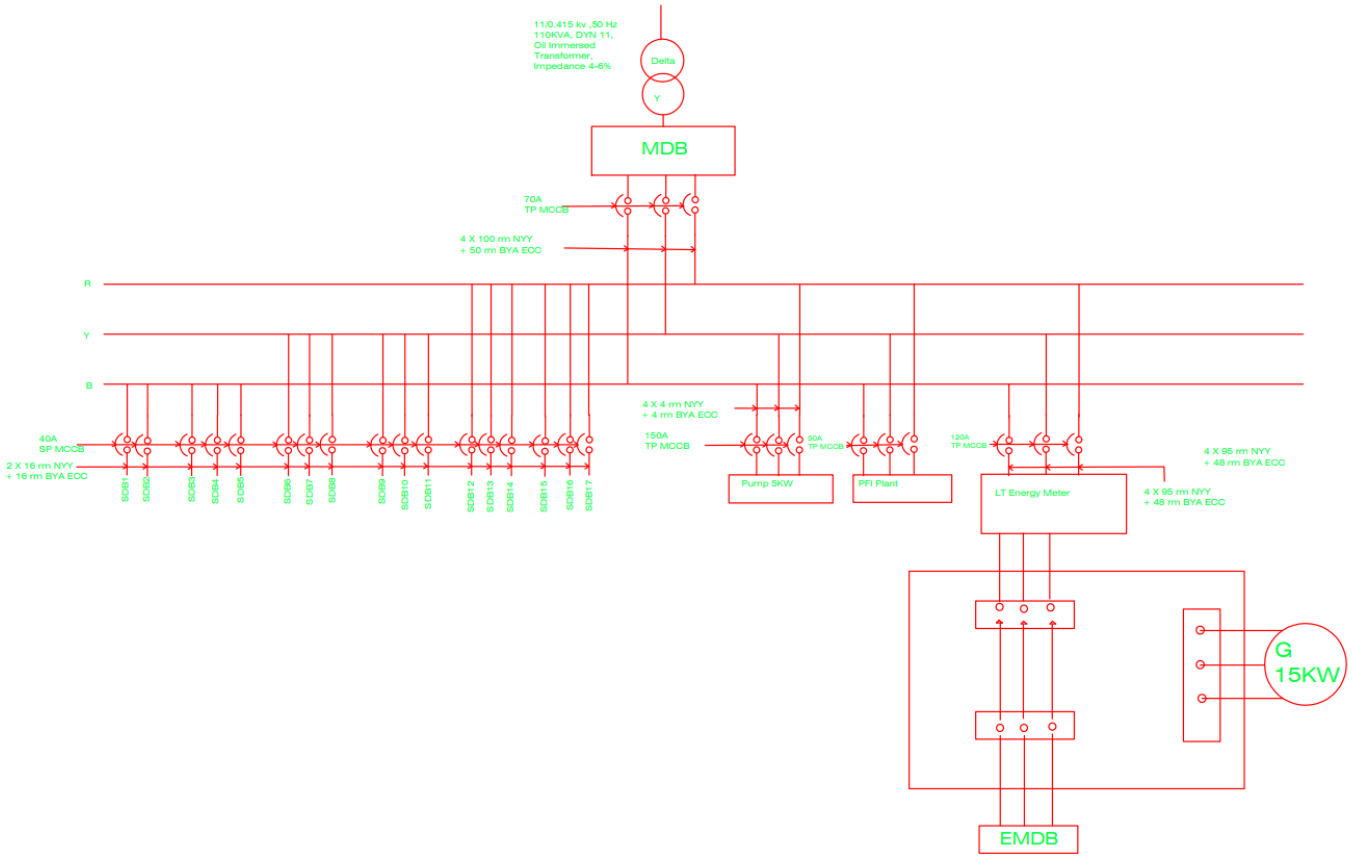

Fig: MDB Diagram

Emergency Main Distribution Board (EMDB) Diagram:

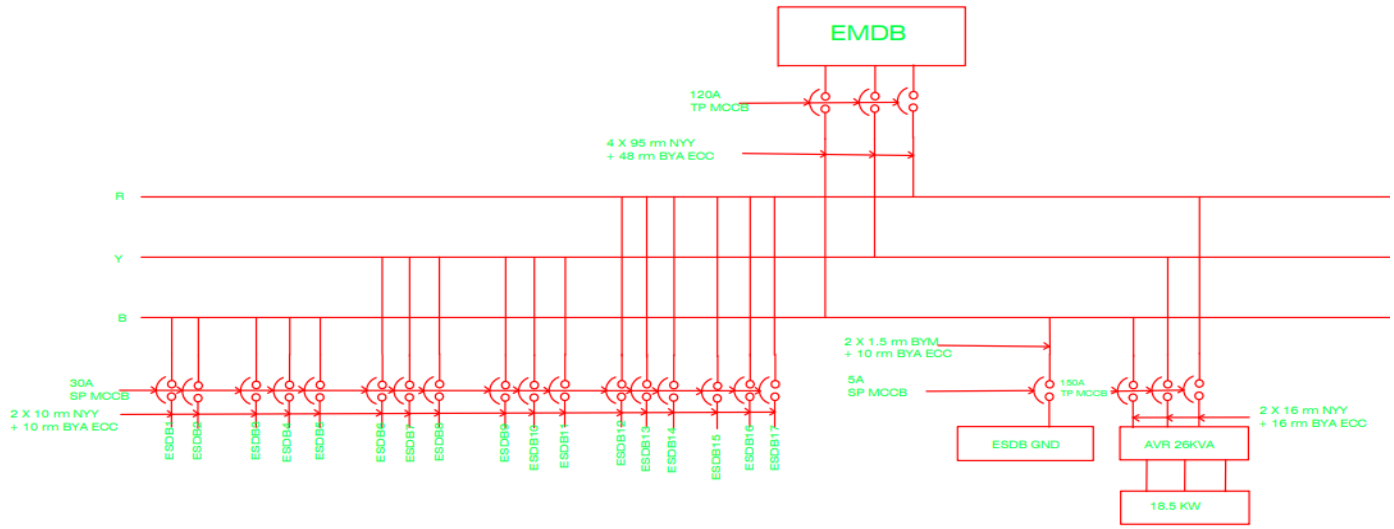

Fig: EMDB Diagra

CALCULATION OF CURRENT:

The formula to calculate power is:

P=V*I*(p.f)

or, I= $\frac{P}{V*p.f}$

where,P=Power, I=Current, V=Voltage, p.f=Power Factor

We take the following values into consideration:

p.f=0.7

Voltage=220 V

Power drawn by Fan=100 W

Power drawn by Socket=100 W

Power drawn by Light=20 W

Power drawn by Exhaust Fan=40 W

SDB1 Power Calculation:

For CKT1(SB1,SB9),

SB1 goes to SS1,F1,WL1.

SB9 goes to CL4.

$$I = \frac{P}{V*p.f} = \frac{(100+100+20+20)}{(220*0.7)} = 1.558 \text{ A}$$

For CKT2(SB2),

SB2 goes to SS2,F2,WL3.

I= $\frac{P}{V*p.f}$=$\frac{(100+100+20)}{(220*0.7)}$)=1.428 A

For CKT3(SB3,SB4,SB5),

SB3 goes to SS3,WL7,EX1.

SB4 goes to EL1,F3,WL9,SS4.

SB5 goes to WL10,CL1.

$I=\frac{P}{V*p.f}=\frac{(100+20+40+20+100+20+100+20+20)}{(220*0.7)}$ =2.857 A

For CKT4(SB6),

SB6 goes to SS5,F4,EL2,WL11.

$I=\frac{P}{V*p.f}=\frac{(100+100+20+20)}{(220*0.7)}$ =1.558 A

For CKT5(SB7,SB8),

SB7 goes to SS6,F5,TL3,WL12.

SB8 goes to CL2,WL13.

$I=\frac{P}{V*p.f}=\frac{(100+100+20+20+20+20)}{(220*0.7)}$ =1.818 A

So, total current in SDB1=(1.558+1.428+2.857+1.558+1.818)=9.219 A

SDB2 Power Calculation:

For CKT1(SB12,SB13),

SB12 goes to SS7,F6,WL29,WL28.

SB13 goes to F7,WL31,SS8.

$I=\frac{P}{V*p.f}=\frac{(100+100+20+20+100+20+100)}{(220*0.7)}$=2.987 A

For CKT2(SB14,SB15,SB16,SB17,SB18,SB19,SB20),

SB14 goes to SS9,F9,F8,WL33,WL32,EL5.

SB15 goes to CL12.

SB16 goes to EX2,WL35,SS10.

SB17 goes to SS11,F10,WL36,WL37.

SB18 goes to WL38,F11,SS12.

SB19 goes to WL40,CL13.

SB20 goes to WL41,CL14.

$$I=\frac{P}{V*p.f}=\frac{(100+100+100+20+20+20+20+40+20+100+100+100+20+20+20+20+20+20+20+100+100)}{(220*0.7)}$$

= 6.08A

So, total current in SDB2=(2.987+7.013)=10 A

SDB3 Power Calculation:

For CKT1(SB21),

SB21 goes to SS13,F13,WL16.

$$I=\frac{P}{V*p.f}=\frac{(100+100+20)}{(220*0.7)}$$ =1.428 A

For CKT2(SB22),

SB22 goes to SS14,F12,WL15,CL8.

$$I=\frac{P}{V*p.f}=\frac{(100+100+20+20)}{(220*0.7)}$$ =1.558 A

For CKT3(SB23,SB24,SB25,SB26,SB27,SB28,SB29),

SB23 goes to SS15,F14,F15,WL18,WL19,WL20.

SB24 goes to CL9.

SB25 goes to SS16,EX3,WL21.

SB26 goes to SS17,F16,TL4.

SB27 goes to WL23,WL24,F17,SS18.

SB28 goes to CL10,WL25.

SB29 goes to WL26,CL11.

$$I=\frac{P}{V*p.f}=\frac{(100+100+100+20+20+20+20+100+40+20+100+100+20+20+20+20+20+100+100+20+20)}{(220*0.7)}$$

=7.013 A

So, total current in SDB3=(1.428+1.558+7.013)=9.999 A

ESDB1 Power Calculation:

For CKT1(ESB1),

ESB1 goes to WL2.

$$I=\frac{P}{V*p.f}=\frac{(20)}{(220*0.7)}$$ =0.130 A

For CKT2(ESB2,ESB3,ESB4),

ESB2 goes to WL4.

ESB3 goes to WL5,WL6.

ESB4 goes to WL8.

I= $\frac{P}{V*p.f}$=$\frac{(20+20+20+20)}{(220*0.7)}$ =0.519 A

So, total current in ESDB1=(0.130+0.519)=0.649 A

ESDB2 Power Calculation:

For CKT3(ESB5,ESB6,ESB7,ESB8),

ESB5 goes to WL27.

ESB6 goes to WL30.

ESB7 goes to WL34.

ESB8 goes to WL39.

I= $\frac{P}{V*p.f}$=$\frac{(20+20+20+20)}{(220*0.7)}$ =0.519 A

So, total current in ESDB2=0.519 A

ESDB3 Power Calculation:

For CKT4(ESB9),

ESB9 goes to WL14.

I= $\frac{P}{V*p.f}$=$\frac{(20)}{(220*0.7)}$ =0.130 A

For CKT5(ESB10),

ESB10 goes to WL17.

I= $\frac{P}{V*p.f}$=$\frac{(20)}{(220*0.7)}$ =0.130 A

For CKT6(ESB11,ESB12),

ESB11 goes to WL42.

ESB12 goes to WL22.

I= $\frac{P}{V*p.f}$=$\frac{(20+20)}{(220*0.7)}$ =0.259 A

So, total current in ESDB3=(0.130+0.130+0.259)=0.519 A

Ground FLOOR UNIT 1 CALCULATIONS:

SDB1 POWER CALCULATION:

For CKT1(SB1,SB2),

SB1 goes to SS1,F1,WL1.

SB2 goes to CL2.

I= $\frac{P}{V*p.f}$=$\frac{(100+100+20+20)}{(220*0.7)}$=1.558 A

For CKT2(SB3),

SB3 goes to SS2,F2,WL4.

I= $\frac{P}{V*p.f}$=$\frac{(100+100+20)}{(220*0.7)}$=1.428 A

For CKT3 (SB4,SB5,SB6),

SB4 goes to SS6,WL7,EX1.

SB5 goes to F3,WL9.

SB6 goes to WL10,CL1.

I= $\frac{P}{V*p.f}$=$\frac{(100+20+40+100+20+20+20)}{(220*0.7)}$=2.078 A

For CKT4 (SB7,SB8,SB9),

SB7 goes to F4,F5,TL2,WL12,SS4.

SB8 goes to SS5,F6,TL3,WL13.

SB9 goes to WL11,CL3.

I= $\frac{P}{V*p.f}$=$\frac{(100+100+20+20+100+100+100+20+20+20+20)}{(220*0.7)}$=4.026 A

So, total current for SDB1=(1.558+1.428+2.078+4.026)=9.09 A

ESDB1 POWER CALCULATION:

For CKT1(ESB1),

ESB1 goes to WL2.

I= $\frac{P}{V*p.f}$=$\frac{(20)}{(220*0.7)}$ =0.130 A

For CKT2(ESB2,ESB3),

ESB2 goes to WL5,WL6.

ESB3 goes to WL8.

I= $\frac{P}{V*p.f}$=$\frac{(20+20+20)}{(220*0.7)}$=0.389 A

For CKT3(ESB4),

ESB4 goes to WL3.

I= $\frac{P}{V*p.f}$=$\frac{(20)}{(220*0.7)}$ =0.130 A

So, total current in ESDB1=(0.130+0.389+0.130)=0.649 A

Ground FLOOR OTHERS CALCULATIONS:

SDB2 POWER CALCULATION:

For CKT1(SB10),

SB10 goes to CL7,CL8,CL10,CL12,CL14,F9.

I= $\frac{P}{V*p.f}$=$\frac{(20+20+20+20+20+100)}{(220*0.7)}$=1.298 A

For CKT2(SB11,SB12,SB13),

SB11 goes to WL17,CL9.

SB12 goes to WL19,F7,WL18,SS7.

SB13 goes to WL16.

I= $\frac{P}{V*p.f}$=$\frac{(20+20+20+100+20+100+20)}{(220*0.7)}$=1.948 A

So, total current for SDB2=(1.298+1.948)=3.246 A

ESDB2 POWER CALCULATION:

For CKT4(ESB5),

ESB5 goes to CL4,CL5.

I= $\frac{P}{V*p.f}$=$\frac{(20+20)}{(220*0.7)}$=0.259 A

For CKT5(ESB6),

ESB6 goes to CL15,CL11.

I= $\frac{P}{V*p.f}$=$\frac{(20+20)}{(220*0.7)}$=0.259 A

For CKT6(ESB7),

ESB7 goes to F10,F11,WL13,WL14,WL15,EX2, EX3.

I= $\frac{P}{V*p.f}$=$\frac{(100+40+40+20+20)}{(220*0.7)}$=1.688 A.

So, total current of ESDB2=(0.259+0.259+1.688)=2.206 A

Calculation for SDB:

ESDB Load = Total Load * 0.7 + Total P Socket Load * 0.5 + Total Q Load * 0.3

Total Load =1420W[For SDB 1]

P Load = 1500W

Q Load = 1000W

Voltage = 220V

Power Factor = 0.7

SDB Load = 1420*0.7 + 1500* 0.7 + 1000 * 0.3 = 2044W

ESDB Current = 2044 /(220*0.7) = 13.27A

So, 20A SP MCCB is Needed from SDB to MDB.

Calculation for ESDB:

ESDB Load = Total Load * 0.7 + Total P Socket Load * 0.5 + Total Q Load * 0.3

Total Load = 5*20 = 100W

P Load = 0W

Q Load = 0W

ESDB Load = 100*0.7 = 70W

ESDB Current = 70 /(220*0.7) = 0.45A

So, 5A SP MCCB is Needed from ESDB to EMDB.

Calculation for ESDB Gnd = (120*0.7)/(220*0.7) = .545A

So 5A MCCB is needed from ESDB Gnd to EMDB.

Calculation for EMDB:

EMDB Load = Total ESDB Load X 0.7 + Total Lift Load X 0.7

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

Phase Voltage = 220V

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

Power Factor = 0.7

Total Load = Total 36 CKT Load for 6 stories Building

Ground Floor Total Load = 100 + 11*20 + 2 * 40 = 400W

First floor Total Load = 13* 20 = 260W

Total Load = 400 + 260 * 5 = 1700W

Lift Load = $\sqrt{3}$ * 220V *40* 0.7 = 18480W

EMDB Load = 1700* 0.7 + 18480*0.7+ 120*0.7 = 14KW

EMDB Current = $\frac{1700*0.7+18480*0.7}{\sqrt{3}*381.05*0.7}$ + $\frac{120*0.7}{220*0.7}$ = 31.12A

So , A 40A TP MCCB is needed.

A 15 KW generator is used to supply the EMDB load through ATS.

<u>Calculation for MDB:</u>

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

Total SDB Load = 18 *SDB Load

MDB Current== $\frac{MDB\ Load}{\sqrt{3}*Line\ voltage*pf}$

Phase Voltage=220

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

Power Factor , Pf=0.95(Due to PFI plant)

SDB Load=36792W

Pump Load=5000 W

MDB Load=36792*0.7+(5000+14000)*0.7=39KW

MDB Current =$\frac{39000}{\sqrt{3}*381.05*0.95}$=62A

So, 70 A TP MCCB is needed from MDB to Main Line

Calculation for PFI Plant

Cos θ=0.7, Sin θ=$\sqrt{1-(cos\,\theta)2}$ = 0.714

Q=3VI Sin θ = Ptan θ = 29.216KVAR

After Pf improvement sin θ=1

I = $\frac{Q}{3*V*Sin\theta}$ = 44A

SO 50A TP MCCB is needed from PFI to MDB

Calculation for Transformer

S=3VI=3*220*62 = 41KVA

So, 11/0.415 KV, 50 Hz, 50KVA, DYN 11, Oil immersed Transformer with 4-6% Impedance is needed

Index Feature Associated with Lightening Protection Design:

Index A: Use of Structure	Index
Houses and similar buildings	2
Houses and similar buildings with outside aerial	4
Small and medium size factories, workshops and laboratories	6
Big industrial plants, telephone exchanges, office blocks, hotels, blocks of flats	7
Places of assembly, for example, places of workshop, halls, theatres, museums, exhibitions, department stores, post offices, stations, airports, stadiums	8
Schools, hospitals, children's homes and other such structures	10

We have taken for our project,

Use of Structure:
Index A = 4

Index B: Type of Construction	
Steel framed encased with nonmetal roof[a]	1
Reinforced concrete with nonmetal roof	2
Brick, plain concrete, or masonry with nonmetal roof	4
Steel framed encased or reinforced concrete with metal roof	5
Timber formed or clad with any roof other than metal or thatch	7
Any building with a thatched roof	10

We have taken for our project,

Type of Construction:
Index A = 4

Index C: Contents or Consequential Effects

Ordinary domestic or office building, factories and workshops not containing valuable materials	2
Industrial and agricultural buildings with specially susceptible[b] contents	5
Power stations, gas works, telephone exchanges, radio stations	6
Industrial key plants, ancient monuments, historic buildings, museums, art galleries	8
Schools, hospitals, children's and other homes, places of assembly	10

[b] This means specially valuable plant or materials vulnerable to fire or the results of fire.

We have taken for our project,

Contents or Consequential effects:
Index C = 2

Index D: Degree of Isolation

Structure located in a large area having structures or trees of similar or greater height, e.g. a large town or forest	2
Structure located in an area with a few other structures or trees of similar height	5
Structure completely isolated or exceeding at least twice the height of surrounding structures or trees	10

We have taken for our project,

Degree of Isolation:
Index D= 5

Index E: Type of Terrain

Flat terrain at any level	2
Hilly terrain	6
Mountainous terrain 300 m and above	8

We have taken for our project,

Type of Terrain:
Index E = 2

Index F: Height of Structure	
Up to 9 m	2
9-15 m	4
15-18 m	5
18-24 m	8
24-30 m	11
30-38 m	16
38-46 m	22
46-53 m[C]	30

[C] Structures higher than 53 m require protection in all cases

Height of structure:

(10*6)ft =

60 ft =

18.3 meter.

We have taken for our project,

Index F = 8

Index G: Lightning Prevalence	
Number of thunderstorm days per year :	
Up to 3	2
4-6	5
7-9	8
10-12	11
13-15	14
16-18	17
19-21	20
Over 21	21

We have taken for our project,

Lightning Prevalence: Index G = 8

Lightening Protection Index Summary:

Use of Structure:	Index A = 4
Type of Construction:	Index B = 4
Contents or Consequential effects:	Index C = 2
Degree of Isolation:	Index D= 5
Type of Terrain:	Index E = 2
Height of structure: (10*6)ft=60 ft = 18.3 meter.	Index F = 8
Lightning Prevalence:	Index G = 8
	Total = 33

Total index = 33< 40 so lightening protection is not mandatory for this structure but we have designed it for increasing safety of this building.

ROOFTOP LIGHTNING PROTECTION SYSTEM :

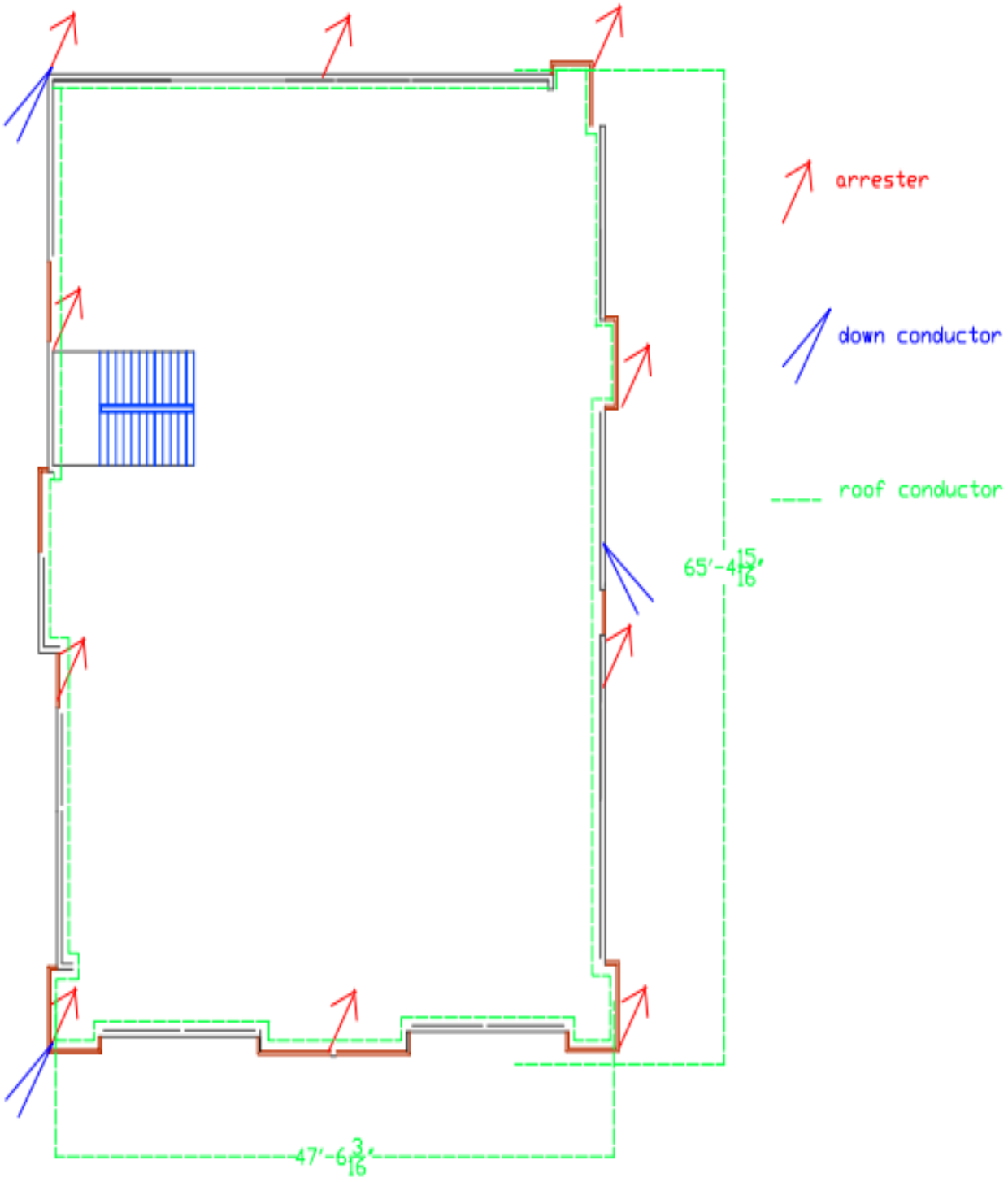

Fig: ROOFTOP LIGHTNING PROTECTION SYSTEM

Lightening Arresters:

Total Length = 65.4’

Total Width = 47.5’

The arresters can be 25’ apart at maximum.

We have used 1 arresters at each of the 4 corners of the roof.

As the length is 65.07’. We have placed (65.4’/25’) = 2.6. we have placed 2 arrester in between.

As the width is 48.6’. We have placed (47.5’/25’) = 1. 9. We have placed 1 arrester in between

So Total arresters are (4+2*2+ 1*2) =10.

Down Conductors:

Area = 65.4* 47.5 = 3106 ft^2 = 290 m^2

Number of down conductors = (290/100) =2.9.

So we have placed 3 down conductors at equilateral spacing.

Legends:

	fan
	exhaust fan
	wall light
	ceiling light
	3 pin socket(15A)
	2 pin socket(5A)
	tube light
	switch board
	Emergency Switch board
	Sub Distribution Board
	Emergency Sub Distribution Board

References:

BANGLADESH UNIVERSITY OF ENGINEERING & TECHNOLOGY

Course No. EEE-230

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 (mm)	C (A)	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		853

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

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