EAST WEST UNIVERSITY
DEPARTMENT EEE

Section: 01
Course Code: EEE300
Course Title: Electrical Services Design

PROJECT

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Lecture, EWU

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ELECTRICAL WIRING INSTALLATION & COST ESTIMATION (CONSIDERING SAFETY ISSUES)

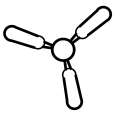
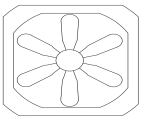
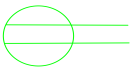
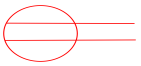
A residential building will be electrified with C.T.S. wiring the details of the fittings required are given below. We have to calculate approximate cost for the wiring system

Si. No	ROOM	SIZE	FOOT CANDLE NEEDED	FAN	EXHAUSTED FAN	AC PLUG PT	PLUG PT.
01	Master Bedroom-01	13’x10’	60	1	0	1	1(IRON)+1(PC)+1(TV)+ 1(Home Theater)
02	Master Bedroom-02	11’x9’5’’	60	1	0	1	1(IRON)+1(PC)+1(TV)+ 1(Sound System)
03	Bedroom-01	13’x10’	60	1	0	1	1(IRON)+1(PC)
04	Bedroom-02	11’x12’	60	1	0	1	1(IRON)+1(PC)
05	Toilet-01	4’x6’3’’	30	0	0	-	1(Geyser)
06	Toilet-02	4’x6’3’’	30	0	0	-	1(Geyser)
07	Toilet-03	6’8’’x9’5’’	30	0	0	-	1(Geyser)
08	Kitchen	7’3’’x6’3’’	100	0	1	-	1(Kitchen Hood)+1(Microwave oven)+1(Rice cooker)+1(Blender machine)
09	Dining / Sitting Room	16’1’’x17’8’’	60	2	-	2	1(Refrigerator)+1(Router) +1(TV)+ 1(Aquarium)
10	Porch-01	3’3’’x5’4’’	20	0	-	-	-
11	Porch-02	3’11’’x9’2’’	20	0	-	-	-
12	Porch-03	10’3’’x2’9’’	20	0	-	-	-

Assumptions

- Utilization factor = 0.6
- Depreciation factor = 0.85
- Illumination
- Lumen per watt = 100 lumen
- The switch boards are 4 feet above from the ground.
- Building height 10 feet
- Conduit and wire calculation with 5% extra quantity.
- The estimation for the building where the temperature will not cross the range of 30 degree to 40 degree Celsius.
- Load calculation with 20% additional load.
- Power Consumptions:
    - ❖ PC=150W
    - ❖ Iron=1000W
    - ❖ Lamp=30 W
    - ❖ LED TV=80W
    - ❖ Refrigerator=200W
    - ❖ Fan=75W
    - ❖ Microwave Oven=2000W
    - ❖ Geyser=1500W
    - ❖ Router=10W
    - ❖ Blender Machine=500W
    - ❖ Exhaust fan=60W
    - ❖ Rice cooker=700W
    - ❖ AC=1200W
    - ❖ Aquarium=100W
    - ❖ Kitchen Hood=150W
    - ❖ Home theater=100W
    - ❖ Sound system=50W

Symbols

Symbols	Labels
	Ceiling Mounted Light
	Ceiling Fan
	Wall Mounted Light
	Exhausted Fan
	Plug Point
	Plug Point(AC)
	Main Conduit
	Sub Conduit
	Conduit (Internet Cable)
	Conduit (Dish Cable)
	Switchboard
	Meter
	Dish Box
	Distribution Box

Light/Fan/Plug Position

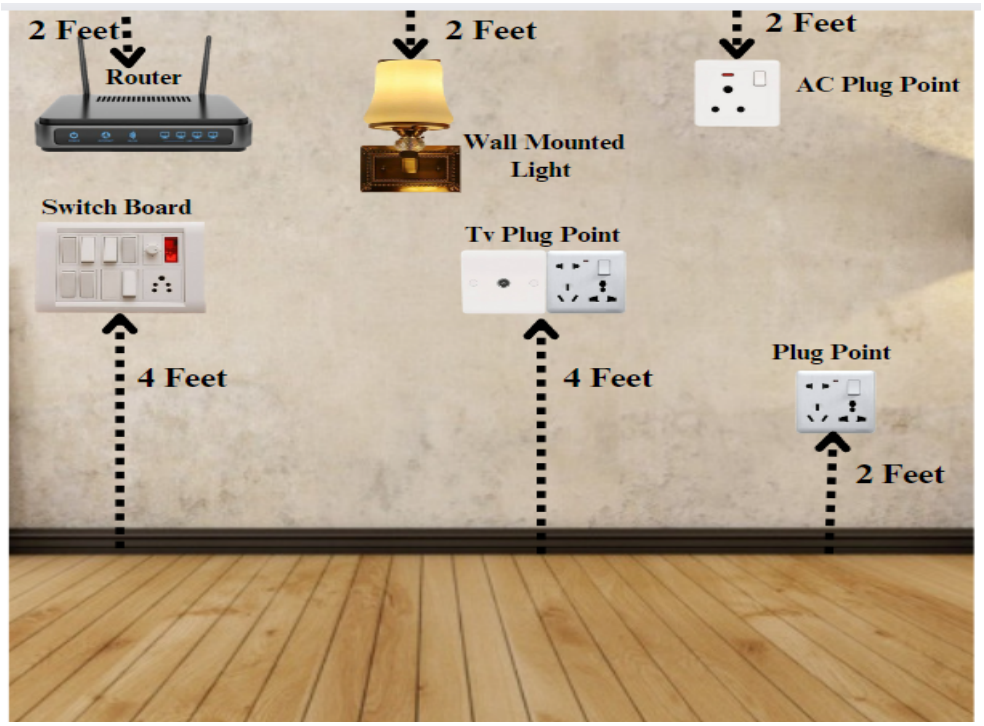


Figure 01: Light and Plug points position for Rooms

Figure 02: Light and Plug points position for Toilets

Figure 03: Light and Plug points position for Kitchen

D.B Position
For Every Function

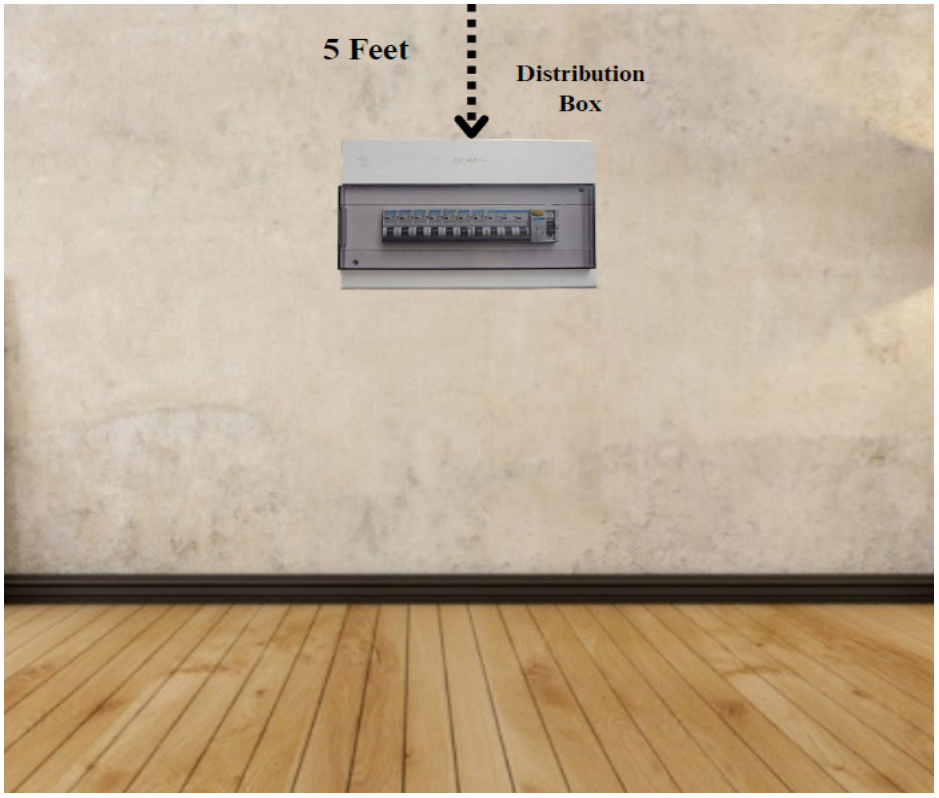


Figure 04: Distribution Box position for every functions

Floor Plan with Furniture Arrangement

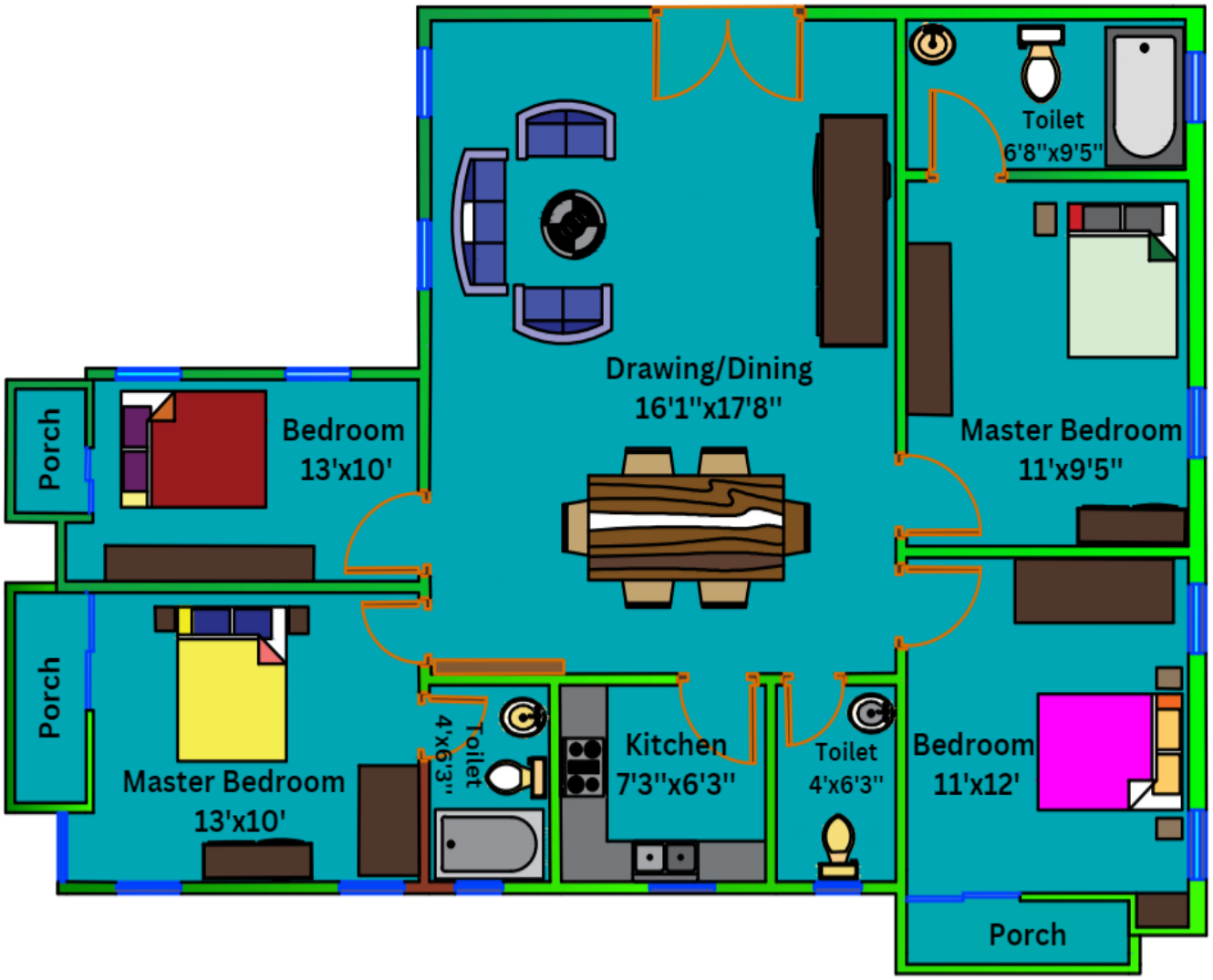


Figure 05: Floor Plan with Furniture Arrangement

Step-1(Number of Light Calculation)
Number of Light Calculation

★ Master Bedroom-01:

Total lumens required $=\frac{13\times10\times60}{0.6\times0.85}$,$\cong$15294 lumens

Power required $=\frac{15294}{100}=152.94$ watts $\cong 153$ watts

So, we can use 2 lights each of 60W and one of 40W to fulfill the criteria.

So total power $=(60\times2)+40=160$W

★ Master Bedroom-02:

Total lumens required $=\frac{11\times9.5\times60}{0.6\times0.85}$,$\cong$12294 lumens

Power required $=\frac{12294}{100}$watts $\cong 123$ watts

So, we can use 2 lights of 40W, one of 30W and one of 15W to fulfill the criteria.

So total power $=(40\times2)+30+15=125$W

★ Bedroom 01:

Total lumens required $=\frac{13\times10\times60}{0.6\times0.85}$,$\cong$15294 lumens

Power required $=\frac{15295}{100}$ watts $\cong 153$ watts

So, we can use 2 lights each of 60W and one of 40W to fulfill the criteria.

So total power $=(60\times2)+40=160$W

★ Bedroom 02:

Total lumens required $=\frac{11\times12\times60}{0.6\times0.85}$,$\cong$15529 lumens

Power required $=\frac{15530}{100}$ watts $\cong 155$ watts

So, we can use 2 lights each of 60W and one of 40W to fulfill the criteria.

So total power $=(60\times2)+40=160$W

★ Toilet-01:

Total lumens required $=\frac{4\times6.3\times30}{0.6\times0.85}$,$\cong$1482 lumens

Power required $=\frac{1482}{100}$watts $\cong$ 14.82 watts

So, we can use 1 light of 15W to fulfill the criteria.

So total power =(1×15)= 15W

★ Toilet-02:

Total lumens required =$\frac{4\times6.3\times30}{0.6\times0.85}$,≅1482 lumens

Power required =$\frac{1482}{100}$ watts ≅14. 82 watts

So, we can use 1 light of 15W to fulfill the criteria.

So total power =(1×15)= 15W

★ Toilet-03:

Total lumens required =$\frac{6.8\times9.5\times30}{0.6\times0.85}$,≅3800 lumens

Power required =$\frac{3800}{100}$watts ≅38 watts

So, we can use 1 light of 40W to fulfill the criteria.

So total power =(1×40)= 40W

★ Kitchen:

Total lumens required =$\frac{7.3\times6.3\times100}{0.6\times0.85}$,≅9018 lumens

Power required =$\frac{9018}{100}$watts ≅91 watts

So, we can use 2 lights of 40W and one of 15W to fulfill the criteria.

So total power =$(40 \times 2) + 15$= 95W

★ Dining / Sitting Room:

Total lumens required =$\frac{16.1\times17.8\times60}{0.6\times0.85}$,≅33716 lumens

Power required =$\frac{33716}{100}$watts ≅338 watts

So, we can use 5 lights of 60W and one of 40W to fulfill the criteria.

So total power =$(60 \times 5) + 40$= 340W

★ Porch-01:

Total lumens required =$\frac{3.3\times5.4\times20}{0.6\times0.85}$,≅699 lumens

Power required =$\frac{699}{100}$watts ≅7 watts

So, we can use 1 lights of 10W to fulfill the criteria

So total power =(10×1)= 10W

★ Porch-02:

Total lumens required $=\frac{3.11\times9.2\times20}{0.6\times0.85}$,≅1122 lumens

Power required $=\frac{1122}{100}$watts ≅12 watts

So, we can use 1 lights of 15W to fulfill the criteria

So total power =(15×1)= 15W

★ Porch-03:

Total lumens required $=\frac{10.3\times2.9\times20}{0.6\times0.85}$,≅1172 lumens

Power required $=\frac{1172}{100}$watts ≅12 watts

So, we can use 1 lights 15W to fulfill the criteria

So total power =(15×1)= 15W

Plan With Light/Fan/Plug Arrangement

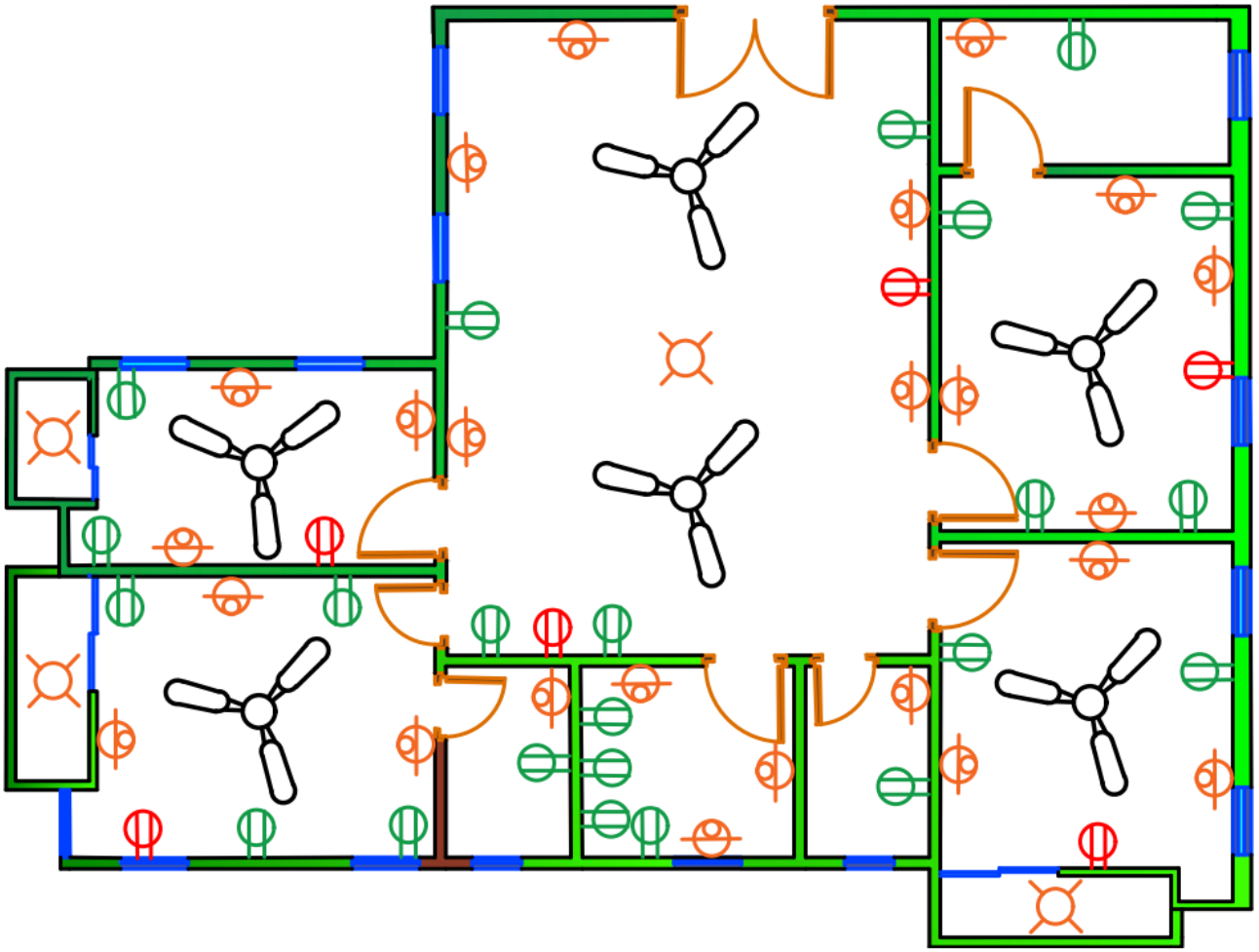


Figure 06: Floor Plan with Fan, Light & Plug Points

Step 2(Conduit Calculation)
Plan With Main Conduit Arrangement

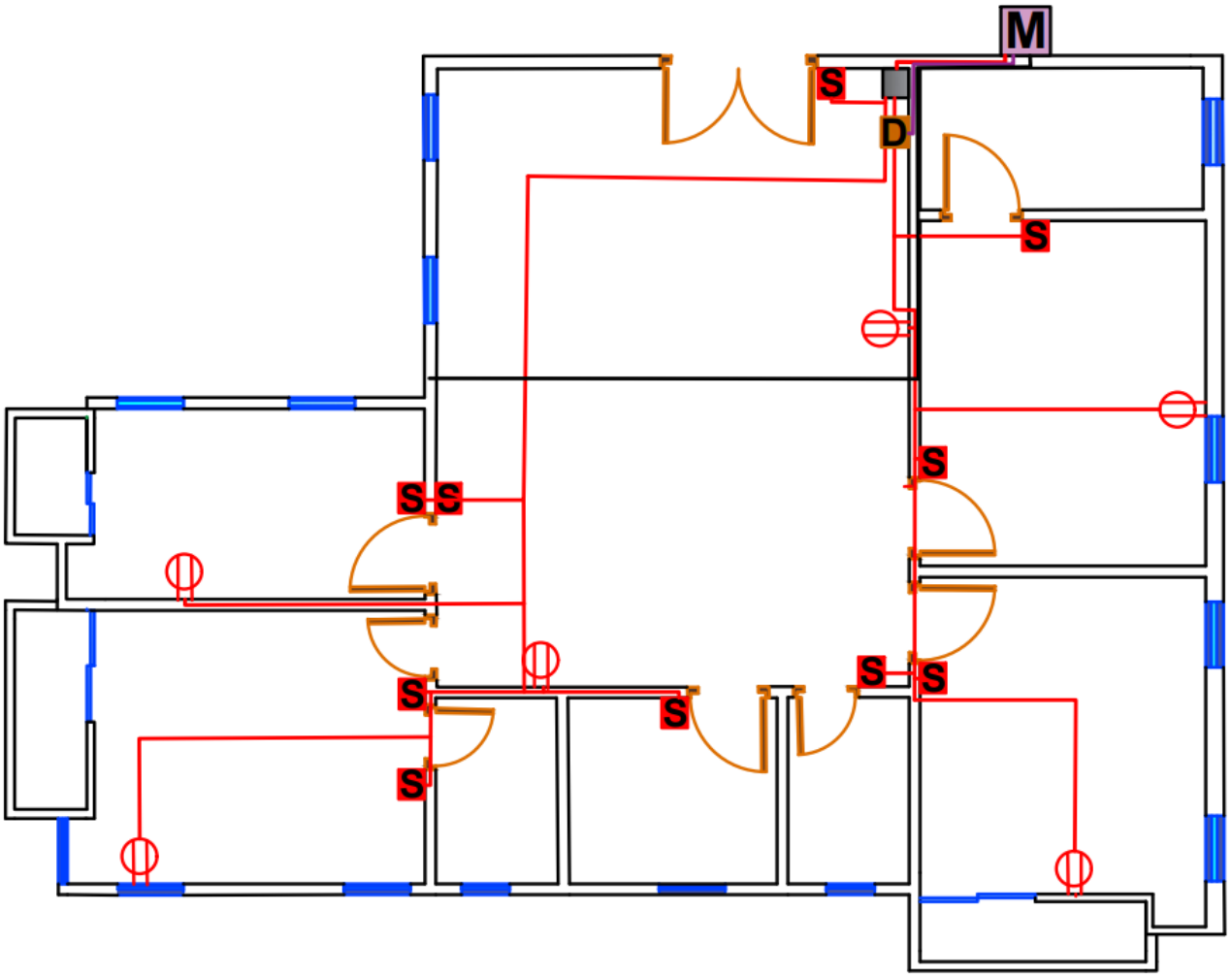


Figure 07: Floor Plan With Main Conduit Arrangement

Plan With Sub Conduit Arrangement

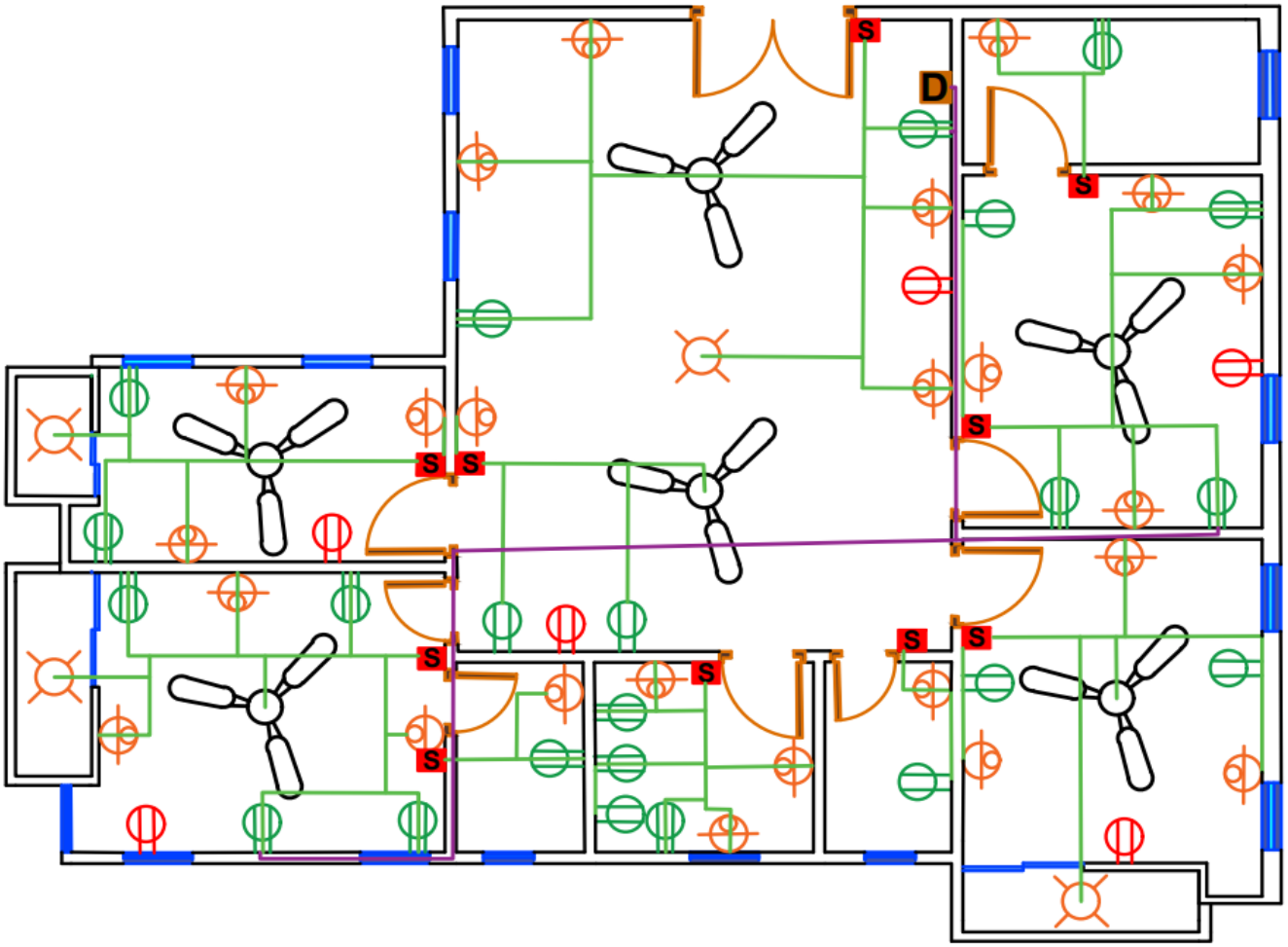


Figure 08: Floor Plan With Sub Conduit Arrangement

Detailed Plan With Main Conduit Measurement

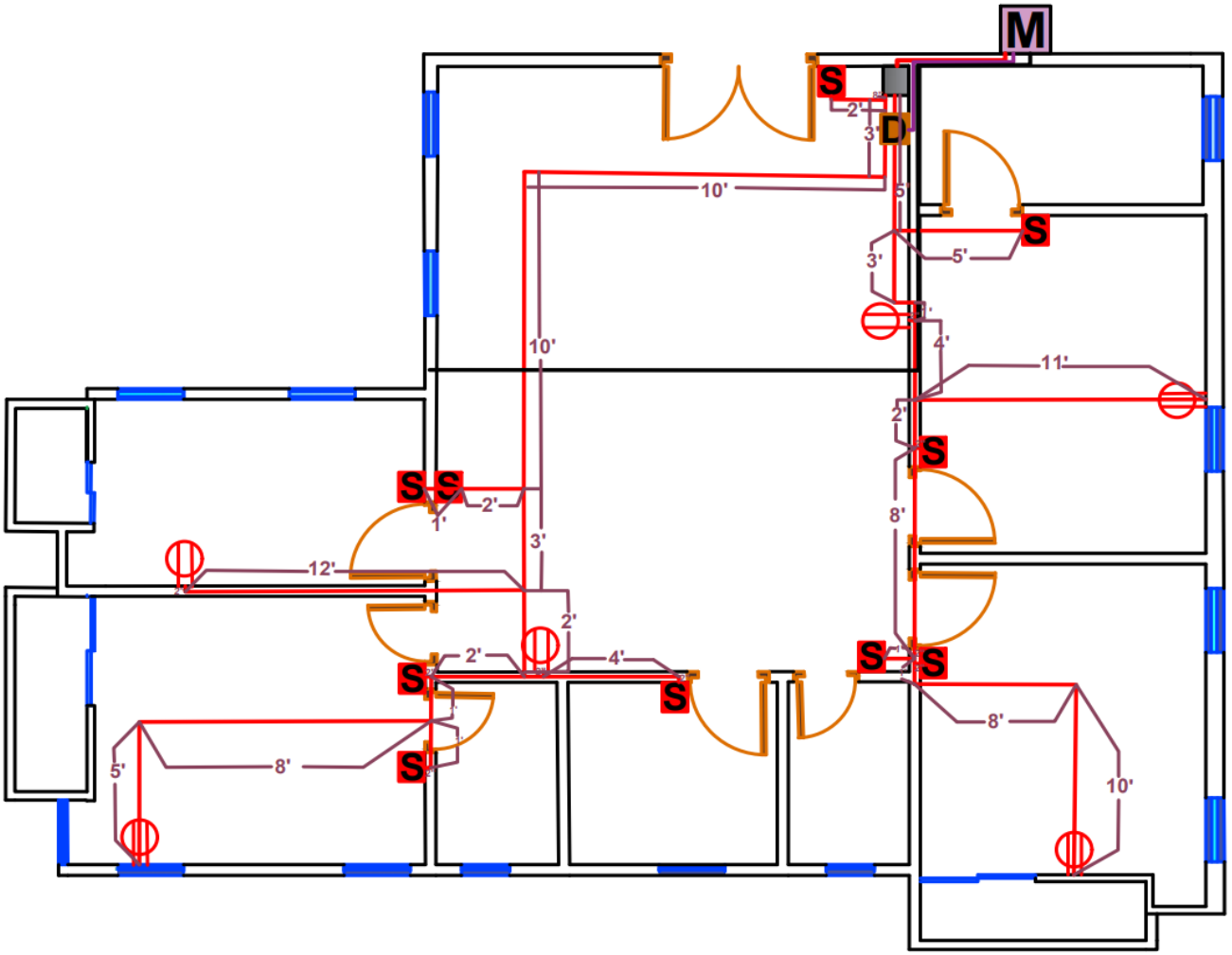


Figure 09: Detailed Plan with Main Conduit Measurement

Detailed Plan With Sub Conduit Measurement

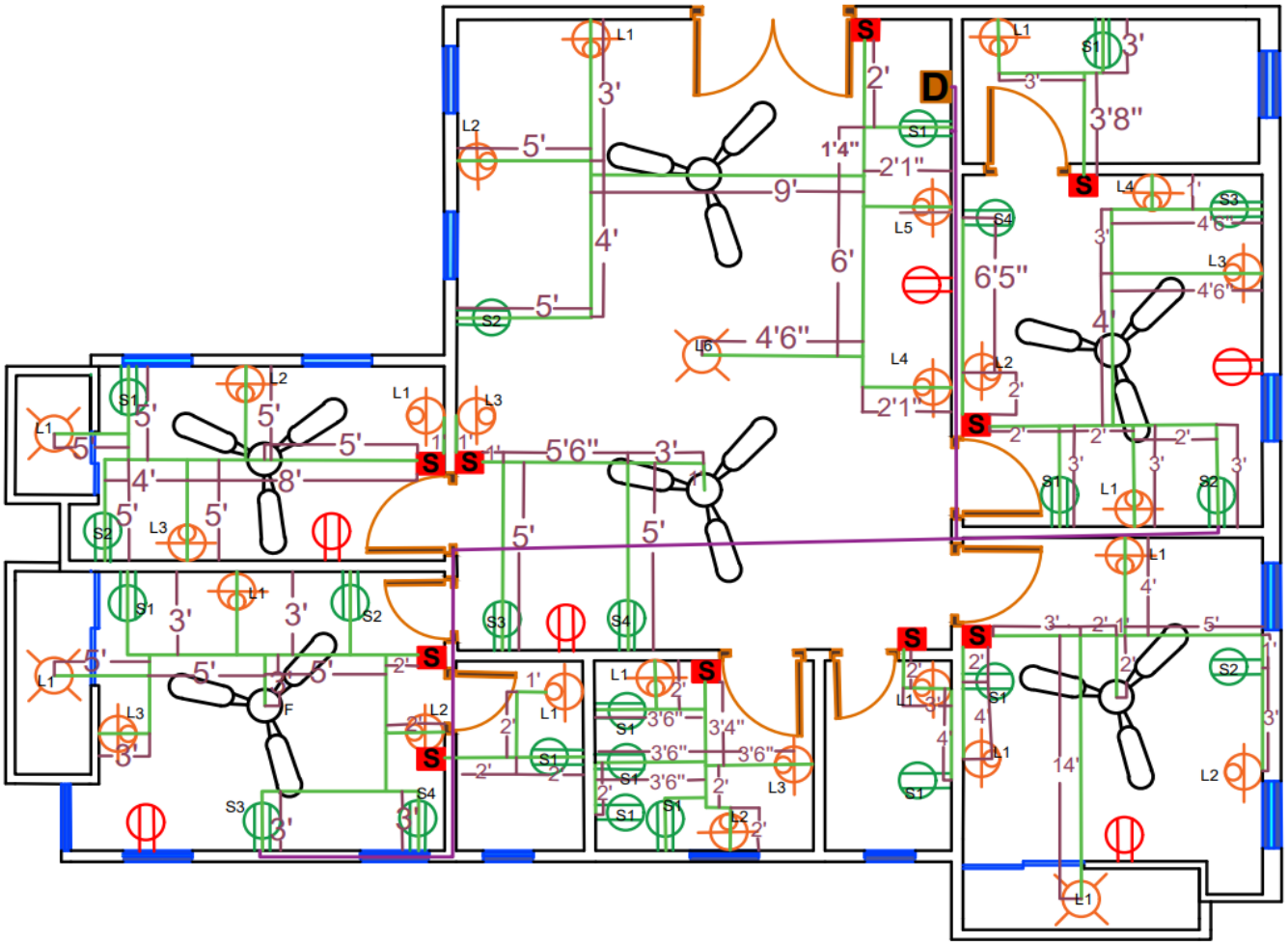


Figure 10: Detailed Plan with Sub Conduit Measurement

Conduit Length Calculation

❖ (From main meter to distribution box)

From	Meter	to	Distribution Box / Sub-Circuit Box / Circuit Breaker Box	25 ft

❖ (From Distribution Box to Every Switchboard and AC)

From	Distribution box	to	Master room-1	14 ft
			Master room-2	15.2 ft
			Bedroom-1	13.2 ft
			Bedroom-2	19.2 ft
			Drawing/Dining Room	60 ft
			Kitchen	4.2 ft
			Toilet-1	2.2 ft
			Toilet-2	1 ft
			Toilet-3	5 ft
Total				134 ft

❖ (From Switchboard to Every Light/Fan/Plug)

From	Switchboard	to	Master room-1	44 ft
			Porch-1	5 ft
			Master room-2	39.5 ft
			Bedroom-1	34 ft
			Porch-2	5 ft
			Bedroom-2	37 ft
			Porch-3	3 ft
			Drawing/Dining Room	56.9 ft
			Kitchen	23.8 ft
			Toilet-1	7 ft
			Toilet-2	9 ft
			Toilet-3	9.8 ft
Total				274 ft

Wire length Calculation

❖ (From main meter to distribution box)

From	Meter	to	Distribution Box / Sub-Circuit Box / Circuit Breaker Box	25 ft

❖ (From Distribution Box to Every Switchboard and AC

From	Distribution box	to	Master room-1	37 ft
			Master room-2	22.2 ft
			Bedroom-1	37.8 ft
			Bedroom-2	30.4 ft
			Drawing/Dining Room	45.6 ft
			Kitchen	44 ft
			AC-1	16.2 ft
			AC-2	36 ft
			AC-3	50 ft
			AC-4	46.2 ft
			AC-5	31 ft
			AC-6	47.8 ft
			Toilet-1	44 ft
			Toilet-2	35 ft
			Toilet-3	21 ft
Total				544.2 ft

❖ Master Bedroom-1
(From Switchboard to Every Light/Fan/Plug)

Master Bedroom-1	Form	Switchboard	To	Light-1	19 ft
				Light-2	10 ft
				Light-3	26 ft
				Fan	16 ft
				Iron	20 ft
				TV	24 ft
				PC	27 ft
				Home Theater	20 ft
Total					162 ft

❖ Master Bedroom-2
(From Switchboard to Every Light/Fan/Plug)

Master Bedroom-2	Form	Switchboard	To	Light-1	15 ft
				Light-2	10 ft
				Light-3	20 ft
				light-4	20 ft
				Fan	12 ft
				Iron	19 ft
				TV	23 ft
				PC	22.5 ft
				Sound system	23 ft
Total					164.5 ft

❖ Bedroom -1

(From Switchboard to Every Light/Fan/Plug)

Bedroom-1	Form	SwitchBoard	To	Light-1	9 ft
				Light-2	19 ft
				Light-3	21 ft
				Fan	11 ft
				Iron	31 ft
				PC	31 ft
Total					122 ft

❖ Bedroom -2

(From Switchboard toEvery Light/Fan/Plug)

Bedroom-2	Form	SwitchBoard	T0	Light-1	18 ft
				Light-2	14 ft
				Light-3	22 ft
				Fan	14 ft
				Iron	16 ft
				PC	26 ft
Total					110 ft

❖ Toilet -1

(From Switchboard to Every Light/Fan/Plug)

Toilet -1	Form	SwitchBoard	To	Light-1	14 ft
				Geyser	12 ft
Total					26ft

❖ **Toilet -2**

(From Switchboard to Every Light/Fan/Plug)

Toilet -2	Form	SwitchBoard	To	Light-1	14 ft
				Geyser	17 ft
Total					31 ft

❖ **Toilet -3**

(From Switchboard to Every Light/Fan/Plug)

Toilet -3	Form	SwitchBoard	To	Light-1	18.8 ft
				Geyser	15.8 ft
Total					34.6 ft

❖ **Kitchen**

(From Switchboard to Every Light/Fan/Plug)

Kitchen	Form	SwitchBoard	To	Light1	7.6 ft
				Light-2	17.4 ft
				Light-3	15 ft
				Exhaust fan	17.4 ft
				Kitchen hood	18 ft
				Microwave Oven	17.6 ft
				Rice cooker/ Blender	23 ft
Total					116 ft

❖ Drawing/Dining Room
(From Switchboard toEvery Light/Fan/Plug)

Drawing/ Dining room	Form	SwitchBoard	To	Light-1	23.4 ft
				Light-2	23 ft
				Light-3	7 ft
				Light-4	17 ft
				Light-5	25 ft
				Light-6	19.6 ft
				Fan-1	14 ft
				Fan-2	16.6 ft
				Router	27 ft
				Refrigerator	19.2 ft
				Aquarium	12 ft
Total					203.8 ft

❖ Porch-1
(From Switchboard to Every Light/Fan/Plug)

Porch-1	Form	SwitchBoard	To	Light-1	22 ft
Total					22 ft

❖ Porch-2
(From Switchboard to Every Light/Fan/Plug)

Porch-2	Form	SwitchBoard	To	Light-1	23 ft
Total					23 ft

❖ **Porch-3**

(From Switchboard to Every Light/Fan/Plug)

Porch-3	Form	SwitchBoard	To	Light-1	23 ft
Total					23 ft

Total Conduit Calculation

From	To	Wire Length (Feet)	Add 5% Wire Length (Feet)
Main Meter	Distribution Meter	25	26.25
Distribution Meter	Every Switchboard and AC	134	140.7
Distribution Meter	Every Light/Fan/ Plug	274	287.7
		Total	454.65

Total Load of different sector as well as circuit breaker load

❖ **Total Load of Master Bed Room-1 (Without AC-01):**

Light+Fan+Iron+TV+PC+Home theater
=160 W+75 W+1000 W+80 W+150 W+100 W
=1565W

❖ **Total Load of Master Bed Room-2 (Without AC-02):**

Light+Fan+Iron+TV+PC+Sound system
=125 W+75 W+1000 W+80 W+150 W+50 W
=1480W

❖ **Total Load of Bed Room-1 (Without AC3):**

Light+Fan+Iron+PC
=160 W+75 W+1000 W+150 W
=1385W

❖ **Total Load of Bed Room-2(Without AC4):**

Light+Fan+Iron+PC
=160 W+75 W+1000 W+150 W
=1385W

❖ **Total Load of Dining / Sitting Room (Without AC5 and AC6):**

Lights+fan+TV+Router+Refrigerator +Aquarium
=340W+75W+80W+10W+200W+100W
=805W

❖ **Total Load of Kitchen:**

Lights+Kitchen hood+microwave oven+Rice Cooker+Blender Machine +Exhaust fan
=95W+150W+2000W+700W+500W+60W
=3505W

❖ **Total Load of 3 toilets:**

Toilet-1 Light +Toilet-2 Light+Toilet-3 Light+(3×Geyser)
=15W+15W+40W+(3×1500)W
=4570W

Total Load of different sector as well as circuit breaker load

- Total load of Porch: 40 W (Lights)
- Total load of AC-1: 1200 W
- Total load of AC-2: 1200 W
- Total load of AC-3: 1200 W
- Total load of AC-4: 1200 W
- Total load of AC-5: 1200 W
- Total load of AC-6: 1200W

❖ Meter to Distribution box(25 ft)

Total Load=14695 W

With 25% extra load=18368.75W

$I=\frac{P}{V}$

$=\frac{18368.75}{220}$

=83.49 A

Form table 1 for load current 83.49 best is the cable model is 19/0.064 (105A).

For 50◦C and (122K)

So the temperature factor is 0.88 in the table .

So current ratio for 50◦C and (122K) =105×0.88

=92.4 A

Which is Greater than 83.49 A so it is suitable for it.

Now voltage drop for 19/0.064 (105A) cable is 3.4 V in 100 ft

Actual voltage drop in 25 ft is=$(\frac{3.4\times25}{100}\times\frac{83.49}{105})$ =0.67 v

Allowable voltage drop is =$(\frac{2.5\times220}{100})$ = 5.5 V

Note: So meter to distribution box total 19/0.064 (105A) cable will need for 25 ft with 5%(Assume) extra wire =27 ft

❖ Distribution box to Master room -1 Switchboard(37 ft);

Total Load= 1565W

With 25% extra load=1956.25 W

I=$\frac{P}{V}$

=$\frac{1956.25}{220}$

=8.89 A

Form table 1 for load current 8.89 best is the cable model is 1/0.044 (11A).

For 50◦C and (122K)

So the temperature factor is 1 in the table .

So current ratio for 30◦C and (303.15K) =(11×1)

=11 A

Which is Greater than 8.89 A so it is suitable for it.

Now voltage drops for 1/0.044 (11A) cable is 14 V in 100 ft

Actual voltage drop in 37 ft is=($\frac{14\times37}{100}$ × $\frac{8.89}{11}$)=4.18 v

Allowable voltage drop is =($\frac{2.5\times220}{100}$)= 5.5 V

Note: From the switchboard to master bedroom-1 (Light-1, Light-2, Light-3, Fan, Iron, TV, PC, Home theater) all 162 ft will use 1/0.044 (11A) cable size .

So total 1/0.44 (11A) cable size in master bedroom-1 will be=(37+162)

=199 ft

With 5 % (assume) extra cable will be=209 ft

❖ Distribution box to Master room -2 Switchboard(22.2ft):

Total Load= 1480W

With 25% extra load=1850 W

I=$\frac{P}{V}$

=$\frac{1850}{220}$

=8.40 A

Form table 1 for load current 8.40 A best is the cable model is 1/0.044 (11A).

For 30◦C and (303.15 K)

So the temperature factor is 1 in the table .

So current ratio for 30◦C and (303.15K) =(11×1)

=11 A

Which is Greater than 8.40 A so it is suitable for it.

Now voltage drops for 1/0.044 (11A) cable is 14 V in 100 ft

Actual voltage drop in 22.2 ft is=$(\frac{14\times22.2}{100} \times \frac{8.40}{11})$ =2.37 v

Allowable voltage drop is =$(\frac{2.5\times220}{100})$ = 5.5 V

Note: From the switchboard to master bedroom-2 (Light-1, Light-2, Light-3, Light-4, Fan, Iron, TV, PC, Sound system) all 164.5 ft will use 1/0.044 (11A) cable size.

So total 1/0.044 (11A) cable size in master bedroom-1 will be=(22.2 +164.5, =186.7 ft

With 5 % (assume) extra cable will be=196 ft

❖ Distribution box to Bedroom -1 Switchboard(37.8ft):

Total Load= 1385W

With 25% extra load=1731.25 W

I=$\frac{P}{V}$

=$\frac{1731.25}{220} = 7.86\,A$

Form table 1 for load current 7.86 A best is the cable model is 1/0.044 (11A).

For 30◦C and (303.15 K)

So the temperature factor is 1 in the table .

So current ratio for 30◦C and (303.15K) =(11×1)=11 A

which is greater than 7.86 A so it is suitable for it.

Now voltage drops for 1/0.044 (11A) cable is 14 V in 100 ft

Actual voltage drop in 37.8 ft is=$(\frac{14\times37.8}{100} \times \frac{7.86}{11})$,=3.74 v

Allowable voltage drop is =$(\frac{2.5\times220}{100})$,= 5.5 V

Note: From the switchboard to bedroom-1 (Light-1, Light-2, Light-3, Fan, Iron, PC) all 122 ft will use 1/0.044 (11A) cable size .

So total 1/0.044 (11A) cable size in master bedroom-1 will be=(37.8 +122) =159.8 ft

With 5 % (assume) extra cable will be=168 ft

❖ Distribution box to Bedroom -2 Switchboard(30.4ft):

Total Load= 1385W

With 25% extra load=1731.25 W

I=$\frac{P}{V}$

=$\frac{1731.25}{220}$

=7.86 A

Form table 1 for load current 7.86 A best is the cable model is 1/0.044 (11A).

For 30◦C and (303.15 K)

So the temperature factor is 1 in the table .

So current ratio for 30◦C and (303.15K) =(11×1)

=11 A

Which is Greater than 7.86 A so it is suitable for it.

- Now voltage drops for 1/0.044 (11A) cable is 14 V in 100 ft

Actual voltage drop in 30.4 ft is=($\frac{14\times30.4}{100}$ × $\frac{7.86}{11}$) =3.04 v

Allowable voltage drop is =($\frac{2.5\times220}{100}$)= 5.5 V

Note: From the switchboard to bedroom-2 (Light-1, Light-2, Light-3 , Fan, Iron, PC) all 122 ft will use 1/0.044 (11A) cable size.

So total 1/0.044 (11A) cable size in master bedroom-1 will be=(30.4+110) =140.4 ft

With 5 % (assume) extra cable will be=148 ft

❖ Distribution box to Drawing/Dining Room Switchboard(45.6 ft):

Total Load= 805 W

With 25% extra load=1006.25 W

I=$\frac{P}{V}$

=$\frac{1006.25}{220}$

=4.57 A

Form table 1 for load current 4.57 A best is the cable model is 1/0.044 (11A).

For 30◦C and (303.15 K)

So the temperature factor is 1 in the table .

So current ratio for 30◦C and (303.15K) =(11×1)

=11 A

Which is Greater than 4.57 A so it is suitable for it.

Now voltage drops for 1/0.044 (11A) cable is 14 V in 100 ft

Actual voltage drop in 45.6 ft is=$(\frac{14\times45.6}{100} \times \frac{4.57}{11})$=2.65 V

Allowable voltage drop is =$(\frac{2.5\times220}{100})$= 5.5 V

Note: From the switchboard to drawing/Dining room (Light-1, Light-2, Light-3, Light-4, Light-5, Light-6, Fan-1, Fan-2, Router, Refrigerator, Aquarium) all 203.8 ft will use 1/0.044 (11A) cable size .

So total 1/0.044 (11A) cable size in Drawing /Dining room will be=(45.6+203.8) =249.4 ft

With 5 % (assume) extra cable will be=262 ft

❖ Distribution box to Kitchen Switchboard(44 ft):

Total Load= 3505W

With 25% extra load=4381.25 W

I=$\frac{P}{V}$

=$\frac{4381.25}{220}$

=19.91 A

Form table 1 for load current 19.91 A best is the cable model is 7/0.029 (21A).

For 35◦C and (308.15 K)

So the temperature factor is 0.97 in the table .

So current ratio for 35◦C and (308.15K) =(21×0.97)

=20.37 A

Which is Greater than 19.91 A so it is suitable for it.

Now voltage drops for 7/0.029 (21A) cable is 8.4 V in 100 ft

Actual voltage drop in 44 ft is=$(\frac{8.4\times44}{100} \times \frac{20.37}{21})$ =3.58 V

Allowable voltage drop is =($\frac{2.5\times220}{100}$) = 5.5 V

Note: From the switchboard to kitchen (Kitchen hood,microwave oven, rice cooker, blender machine) all 116 ft will use 1/0.044 (11A) cable size .
So total 1/0.044 (11A) cable size in Kitchen will be =116 ft
Because switch board to Kitchen we use different types of cable
With 5 % (assume) extra cable will be=122ft
And Other type of cable 7/0.029 (21A) size in kitchen will be =44 and with 5% extra 46.5 ft

❖ Distribution box to AC-1 and all AC Switchboard (16.2 ft):

Total Load= 1200W
With 25% extra load=1500W
I=$\frac{P}{V}$
=$\frac{1500}{220}$
=6.81 A
Form table 1 for load current 6.81 A best is the cable model is 1/0.044 (11A).
For 30◦C and (303.15 K)
So the temperature factor is 1 in the table .

So current ratio for 30◦C and (303.15K) =(11×1)
=11 A
Which is Greater than 6.81 A so it is suitable for it.
Now voltage drops for 1/0.044 (11A) cable is 14 V in 100 ft

Actual voltage drop in 16.2 ft is=($\frac{14\times16.2}{100}$ × $\frac{6.81}{11}$) ,=1.40 V
Allowable voltage drop is =($\frac{2.5\times220}{100}$) = 5.5 V

Note: Samely for AC-2,AC-3,AC-4,AC-5,AC-6 all will be suitable in this same type cable .
So total 1/0.044 (11A) cable will be use for all ACs is
=(16.2+36+50+46.2+31+47.8)ft
=227.2 ft
With 5% extra wire = 239 ft

❖ Distribution box to Toilets Switchboard(44 ft):

Total Load=1515W

With 25% extra load=1893.75 W

$I=\frac{P}{V}$

$=\frac{1893.75}{220}$

=8.60 A

Form table 1 for load current 8.60 A best is the cable model is 1/0.044 (11A).

For 35◦C and (308.15 K)

So the temperature factor is 0.97 in the table .

So current ratio for 35◦C and (308.15K) =(11×0.97)

=10.67 A

which is greater than 8.60 A so it is suitable for it.

Now voltage drops for 1/0.044 (11A) cable is 14 V in 100 ft

Actual voltage drop in 44 ft is=$(\frac{14\times44}{100}\times\frac{8.60}{11})$,=4.81 V

Allowable voltage drop is =$(\frac{2.5\times220}{100})$ = 5.5 V

Note: Samely for Toilet-2,Toilet-3 all will be suitable in this same type cable.

So total 1/0.044 (11A) cable will be use for all Loilets is

=(44+35+21)ft

=100 ft

Again Note: From every toilet to (Light, geyser) will be used 1/0.044 (11A) so cable will be.

=91.6 ft

So total 1/0.044 (11A) cable will be need for all toilets is

=191.6 ft

With 5% extra cable =201 ft

❖ **Switchboard to Porches**:

1/0.044 (11A) cable will be use for switch board to porches
Total cable will need for porches is (22+23+23),=68 ft

With 5% extra cable =71.4 ft

Step 03 (Wire Size Calculation)

From	To	Current(A)	Wire Size
Main Meter	Distribution Meter	83.49	19/0.064
Distribution Meter	Master Bedroom-01 (Switchboard)	8.89	1/0.044
Distribution Meter	Master Bedroom-02 (Switchboard)	8.40	1/0.044
Distribution Meter	Bedroom-01 (Switchboard)	7.86	1/0.044
Distribution Meter	Bedroom-02 (Switchboard)	7.86	1/0.044
Distribution Meter	Sitting/Dining Room (Switchboard)	4.57	1/0.044
Distribution Meter	Kitchen	19.91	7/0.029
Distribution Meter	All ACs	6.81	1/0.044
Distribution Meter	All Toilets	8.60	1/0.044

Total Wire Calculation:

SL No	Name	Wire Length (Feet)	Add 5% Wire Length (Feet)	Wire Length (Live+Neutral) (Feet)
01	Distribution Meter	25	26.25≃27	54
02	Master room 1 (Switchboard)	199	208.95≃209	418
03	Master room 2 (Switchboard)	186.7	196.035≃197	384
04	Bedroom 1 (Switchboard)	159.8	167.79≃168	336
05	Bedroom 2 (Switchboard)	140.4	147.42≃148	296
06	Drawing/ Dining room	249.4	261.87≃262	524
07	Kitchen	160	168	336
08	AC-1	16.2	17.01≃18	36
09	AC-2	36	37.8≃38	76
10	AC-3	50	52.5≃53	106
11	AC-4	46.2	48.51≃49	98
12	AC-5	31	32.55≃33	66
13	AC-6	47.8	50.19≃51	102
14	Toilet-1	70	73.5≃74	148
15	Toilet-2	66	69.3≃70	140
16	Toilet-3	55.6	58.38≃59	118
17	Porch-1	22	23.1≃24	48
18	Porch-2	23	24.15≃25	50
19	Porch-3	23	24.15≃25	50

Cost Estimation
Conduit Cost Estimation

From	To	Wire Length (Feet)	Add 5% Wire Length (Feet)	Conduit Name & Size	Cost (per ft) (BDT)	Total Cost (BDT)
Main Meter	Distribution Meter	25	26.25≃27	VIGO Wire Guard Popular Pipe 3/4"×10’ Black	8	216
Distribution Meter	Every Switchboard and AC	134	140.7≃141	VIGO Wire Guard Pipe 1/2"×10’ White	10	1,410
Distribution Meter	Every Light/Fan/ Plug	274	287.7≃288	VIGO Wire Guard Pipe 1/2"×10’ White	10	2,280
					Total	3,906

Wire Cost Estimation

SL No	Name	Wire Length (Feet)	Add 5% Wire Length (Feet)	Wire Length (Live+Neutral) (Feet)	Wire size	Cost (per ft) (BDT)	Total Cost (BDT)
01	Distribution Meter	25	26.25≃27	54	19/0.064	148.86	8,038.44
02	Master room 1 (Switchboard)	199	208.95≃209	418	1/0.044	2.301	961..818
03	Master room 2 (Switchboard)	186.7	196.035≃197	384	1/0.044	2.301	883.584
04	Bedroom 1 (Switchboard)	159.8	167.79≃168	336	1/0.044	2.301	773.136
05	Bedroom 2 (Switchboard)	140.4	147.42≃148	296	1/0.044	2.301	681.096
06	Drawing/ Dining room	249.4	261.87≃262	524	1/0.044	2.301	1,205.724
07	Kitchen	160	168	336	7/0.029	3.671	1,233.456
08	AC-1	16.2	17.01≃18	36	1/0.044	2.301	82.836
09	AC-2	36	37.8≃38	76	1/0.044	2.301	174.876
10	AC-3	50	52.5≃53	106	1/0.044	2.301	243.906
11	AC-4	46.2	48.51≃49	98	1/0.044	2.301	225.498
12	AC-5	31	32.55≃33	66	1/0.044	2.301	151.866
13	AC-6	47.8	50.19≃51	102	1/0.044	2.301	234.702
14	Toilet-1	70	73.5≃74	148	1/0.044	2.301	340.548
15	Toilet-2	66	69.3≃70	140	1/0.044	2.301	322.14
16	Toilet-3	55.6	58.38≃59	118	1/0.044	2.301	271.518
17	Porch-1	22	23.1≃24	48	1/0.044	2.301	110.448
18	Porch-2	23	24.15≃25	50	1/0.044	2.301	115.05
19	Porch-3	23	24.15≃25	50	1/0.044	2.301	115.05
						Total	15,203.87 ≃ 15, 204

- Total Cost of this floor is $= (3,906 + 15,204)$ BDT
$= 19,110$ BDT

———————*END*———————

Total lumens required $= \frac{Area * Foot\ Candle}{Utilization\ factor * Depreciation\ factor} \cong$ Total lumens

Power required $= \frac{Total\ lumens}{Lumens\ per\ watt}$ = total power required for lighting

- Number of light