

Necessary light calculation:

$$N = \frac{E \times A}{F \times UF \times MF}$$

Here,

E = Required luminance level(lux)

A = Area at working plane height(m²)

F = Average luminous flux from each lamp(lm)

UF = Utilization factor, an allowance for the light distribution of the luminaries and the room surfaces.

MF = Maintenance factor, an allowance for reduced light output because of deterioration and dirt.

As per floor plan , Some of the rooms are symmetric and they are basically used for official and study purpose .

So, the required luminance level for these rooms are **400** lux.

Utilization factors and Maintenance factor are 0.45 and 0.75 respectively.

Rooms which have the length of 3.65 meter (12 feets) and width of 4.90 meter (16.08 feet) :

So, Number of LED = $\frac{3.65 \times 4.90 \times 400}{6000 \times 0.40 \times 0.75} = 3.97 = 4$ LED light (45 watts)

Rooms which have the length of 3.91 meter (12.83 feet) and width of 4.90 meter (16.08 feet) :

$$\text{So, Number of LED} = \frac{3.91 \times 4.90 \times 400}{6000 \times 0.40 \times 0.75} = 4.2 = 4 \text{ LED light (45 watts)}$$

Rooms which have 7.30 meter (24 feet) of length and width of 4.90 meters (16.08 feet) :

Assuming this rooms are class room. So, installing tube lights in stead of LED bulbs.

$$\text{So, Number of Tubelights} = \frac{7.30 \times 4.90 \times 400}{4000 \times 0.40 \times 0.75} = 11.92 = 12 \text{ tubelights (36 watts) .}$$

Necessary Ceiling Fan calculation:

To calculate necessary ceiling fan two things have to keep in mind.

1. Area of the room
2. To keep the fan 18 inch away from any wall.

Again,

As the rooms are symmetric we will calculate for the similar case.

Rooms which have the length of 3.65 meter (12 feet) and width of 4.90 meter (16.08 feet) :

$$\begin{aligned} \text{Area of the room} &= 12 \times 16.08 \text{ feet} \\ &= 192 \text{ feet.} \end{aligned}$$

Assuming this is for office purpose.

If we match the datasheet we will have a fan for 56 inch.

Rooms which have the length of 3.91 meter (12.83 feet) and width of 4.90 meter (16.08 feet) :

Area of the room = 12.83 X 16.08 feet
= 206 feet.

Assuming this is for office purpose.

If we match the datasheet, we will have a fan for 56 inches.

Rooms which have 7.30 meter (24 feet) of length and width of 4.90 meters (16.08 feet) :

Using this room for classroom purpose.

Then calculation will be different.

To calculate then total area of the room will be divided by total area of fan.

$$\begin{aligned}\text{Number of Fan} &= \frac{\text{Total area of the room}}{\text{total area of the fan}} \\ &= \frac{24 \times 16}{3 \times 3} \\ &= 4\end{aligned}$$

Necessary Air conditioner Calculation:

_To get the require air conditioner, we need to get the BTU first. Then match the data sheet of BTU vs tonnes.

BTU = (Area of the room X (If the floor is the 2nd floor , we have to multiple it by 40) + (each foot above 8 feet ceiling X 1000) X (Each person over first 2 persons * 600)

Rooms which have the length of 3.65 meter (12 feets) and width of 4.90 meter (16.08 feet) :

$$\text{BTU} = (12 \times 16.08 \times 40) + (2 \times 1000) + (600 \times 5)$$

= 12718 BTU (This calculation is done by taking approximating 7 to 10 person maximum)

Matching this with datasheet, it will match with 1 ton AC.

Rooms which have the length of 3.91 meter (12.83 feet) and width of 4.90 meter (16.08 feet) :

$$\text{BTU} = (12.83 \times 16.08 \times 40) + (2 \times 1000) + (600 \times 5)$$

= 13252 BTU. (This calculation is done by taking approximating 7 to 10 person maximum) Matching this with datasheet , it will match with 1 ton AC.

Rooms which have 7.30 meter (24 feet) of length and width of 4.90 meters (16.08 feet) :

$$\text{BTU} = (24 \times 16.08 \times 40) + (2 \times 1000) + (600 \times 35)$$

= 38436 (This calculation is done by taking approximating 37 to 40 person maximum)

Matching this with datasheet , it will match with 2.5 ton AC.

It can be installed as 1.5 ton with 1 ton AC. That would be efficient.

Revised Load after calculation:

A	B	C	D	E	F	G	H	I	J	K
Room number	LED Bulb(45 w)	Table Fan(52.7 w)	Tube light(36 W)	Ceiling fan(65 w)	Printer(50W)	PC(200W)	Electric kettle(1500W)	AC(1000 W)	Saucer Light(18 w)	Total Load
311	0	0	12	4	2	2	0	0	0	1192
312	4	0	0	1	0	1	0	1	0	1445
313	4	0	0	1	1	1	0	0	0	495
314	4	0	0	1	1	1	0	0	0	495
315	0	0	12	4	1	2	0	0	0	1142
316	0	0	12	4	1	3	0	2.5	0	3842
317	4	0	0	1	2	2	1	0	0	2245
319	4	1	0	1	1	1	0	0	0	547.7
320	4	0	0	1	2	2	0	0	0	745
321	4	0	0	1	1	1	0	1	0	1495
322	4	0	0	1	1	2	0	0	0	695
323	4	0	0	2	1	1	0	0	0	560
Washroom(male)	1	0	2	0	0	0	0	0	4	189
Washroom(female)	1	0	2	0	0	0	0	0	5	207
Corridor	0	0	0	0	0	0	0	0	13	234
Total	2	2	78	30	14	19	1	2	22	15528.7

Wire Calculation:

To calculate current , V = 230 V and Power factor =0.80

$$I = \frac{\text{Power}}{\text{Voltage} \times \text{Power factor}}$$

	A	B	C	D	E	F	G	H
	Room number	Total Load	Rated current	Multiply by safety factor 1.5	Wire specification(mm*mm)	Wire price per meter	Wire length up to switch board from busbar	Taka
1	311	1192	6.48	9.72	1 re (1.13mm)	17.2	3.048	52.43
2	312	1445	7.85	11.78	1 re (1.13mm)	17.2	3.048	52.43
3	313	495	2.69	4.04	1 re (1.13mm)	17.2	3.048	52.43
4	314	495	2.69	4.04	1 re (1.13mm)	17.2	3.048	52.43
5	315	1142	6.21	9.31	1 re (1.13mm)	17.2	3.048	52.43
6	316	3842	20.88	31.32	7 X 6 rm (1.05 mm)	119.35	3.048	363.78
7	317	2245	12.20	18.30	2.5 re (1.78 mm)	41.22	3.048	125.64
8	319	547.7	2.98	4.46	1 re (1.13mm)	17.2	3.048	52.43
9	320	745	4.05	6.07	1 re (1.13mm)	17.2	3.048	52.43
0	321	1495	8.13	12.19	1 re (1.13mm)	17.2	3.048	52.43
1	322	695	3.78	5.67	1 re (1.13mm)	17.2	3.048	52.43
2	323	560	3.04	4.57	1 re (1.13mm)	17.2	3.048	52.43
3	Washroom(male)	189	1.03	1.54	1 re (1.13mm)	17.2	3.048	52.43
4	Washroom(female)	207	1.13	1.69	1 re (1.13mm)	17.2	3.048	52.43
5	Corridor	234	1.27	1.91	1 re (1.13mm)	17.2	3.048	52.43
6	Total							1170.95

*all the price of wire taken from bizli cables website.

For Busbar:

Per meter busbar price for 140A current rating = 220 taka.

For 36.576 meter length busbar price = taka

Total wiring cost:

Wiring + busbar price = (13716 + 375) taka
= 8046 taka.

For MCB :

	A	B	C	D	E
	Room number	Total Load	Rated current	MCB(A)	MCB Price
	311	1192	6.48	8	240
	312	1445	7.85	8	240
	313	495	2.69	4	240
	314	495	2.69	4	240
	315	1142	6.21	8	240
	316	3842	20.88	22	450
	317	2245	12.20	16	365
	319	547.7	2.98	4	240
0	320	745	4.05	4	240
1	321	1495	8.13	10	240
2	322	695	3.78	4	240
3	323	560	3.04	4	240
4	Washroom(male)	189	1.03	2	200
5	Washroom(female)	207	1.13	2	200
6	Corridor	234	1.27	2	200
7	Total	15528.7	84.40		3815
8					

Total costing = Total wire cost(from bus bar to switch board) + Busbar cost + MCB cost

$$= 1175 + 8046 + 3815$$

$$= 13036 \text{ taka.}$$

Revised drawing based on calculated load:

