FINAL ELECTRICAL INSTALLATION DESIGN PROJECT PAPER

(G+3 MULTI_ FAMILY RESIDENTIAL BUILDING)

Power Demand Calculation

1- For one single family dwelling

- ✓ Bed room 1= 3.5m*3.0m = 10.5m^2
- ✓ Bed room 2 = 3.5m*3.0m= 10.5 m^2
- ✓ Master bed room = 3.5m*4.0m = 14.0 m^2
- ✓ Living room =6.5m*7.0m= 45.5 m^2
- ✓ Kitchen = 3.25m*3.0m= 9.75 m^2
- ✓ Bath room = 3.25m*3.0m = 9.75 m^2
- ✓ Corridor total = (52m*2.5m)/10 =13.0 m^2
- ✓ Stair case =(2m*10m*2)/10 = 4.0 m^2

A_T =117 m^2

Total Area for single family dwelling

A_T = 117 m^2

N.B There are ten (10) families dwelling for one floor. Therefore, forty (40) single families dwelling for G+3 .

2)The minimum ampacityof service or feeder conductors from a main service supplying loads in dwelling units

- The first 45. 0m^2 of living area = 2500w
- The second 45. 0m^2 of portion = 1500w
- The third 90.0m^2 of excess = 1000w
- For " injeramittad" = 3500w
- For cooking stove 10kw = 6000w
- For water heater = 1000w

= 15500w

Total power demand is P_T = 15500W = 15.5kw

3) POWER DEMAND FOR EACH FLOOR (10 FAMILY DWELLING)

- Heaviest load 100 % 1unit = 1* 15500 w = 15,500 w
- 65% Loads in next 2 units = 0.65*15500w *2 = 20,150 w
- 40 % Loads in next 2 units = 0.40*15500w*2= 12,400 w
- 25% Loads in next 5 units = 0.25 * 15500 w*5= 19,375 w

= 67,425W

Total power demand is P_T = 67,425W = 67,425KW

i)Determine the design current (I_b)

For 3 – Phase (3 -ϕ)

P.f = 0.9

$I_b=P_T/ (\sqrt{3}* V_L *P.f)$ =67,425w/ (√ 3 *380V* 0.9)= **113. 824 A** ii) Determine NominalCurrent (I_n)

$I_n \geq I_b$

I_n= 125 A

[From EBCS- 10, Table 9-1, Page – 243]

iii) Cable Size Selection

$I_t \geq I_n / (C_g C_a C_i)$

- For three Circuits = C_g = 0.7
- For temp.> 25^0 c = C_a = 0.94
- For PVC insulation = C_i= 1

I_t=125A/(0.7*0.94*1) = **189.97**A

[From EBCS – 10, Table B – 3 , page -92]

I_t= 206 A

A =120m m^2

Iv)Required Breaker Selection

[From EBCS – 10 , Table 9-1, Page – 243]

I_n = 125 A

4) Power Demand for 1^{st} ; 2^{nd} ; 3^{rd} Floor

(For30 – Single families dwelling)

- Heaviest load 100 %1 units = 1 *15, 500 w = 15,500 w
- 65 % loads in next 2 units =0.65 *15,500w *2= 20,150 w
- 40 % Loads in next 2 units= 0.40*15,500w*2 = 12,400 w

- 25 % Loads in next 15 units = 0.25*15,500w*15= 58,125 w
- 10 % Loads in next 10 unit = 0.10*15,500w*10= 15,500 w

=121,675w

P_{t0tal} = **121,675w =121,**675kw

i)Determine the design current (I_b)

For 3 – Phase (3 -ϕ)

P.f = 0.9

$I_b = P_T / (\sqrt{3} * V_L * P.f)$ = 121,675w /(√3*380v*0.9) = 205.4A

I_b= 205.4A

ii) Determine the Nominal Current (I_n)

$I_n \geq I_b$

I_n=225 A [FromEBCS – 10, Table 9-1 , page -243]

iii)To Determine Cable Size Selection

$I_t \geq I_n / (C_g C_a C_i)$

- For three Circuits = C_g = 0.7
- For temp.> 25^0 c = C_a= 0.94
- For PVC insulation = C_i= 1

I_t = 225 / (0.7*1*.94) = 341.94A

[From EBCS – 10, Table B – 3 , page -92]

I_t = 402A

A = 400 mm^2

iV) Required Breaker Selection

[From EBCS – 10, Table 9 – 1 , Page – 243]

I_n= 225 A

5) **Power Demand for 2nd and 3rd floor**

(For 20 – Single Family dwelling)

- Heaviest load 100 % 1units = 1* 15, 500 w = 15,500w
- 65 % loads in next 2 units = 0.65* 2* 15,500w = 20,150 w
- 40 % Loads in next 2 units=0.40*2x*15,500w =12,400w
- 25 % Loads in next 15 units= 0.25*15*15,500 w =58,125 w

=106,175w

P_{total}=**106,175 w**

i)Determine the design current (I_b)

For 3 – Phase (3 - ϕ)

P.f = 0.9

$I_b = P_T/ (\sqrt{3}* V_L *P.f)$ =106,175w / (√3*380v*0.9) = 179.24A

I_b = 179.24A

ii) Determine the Nominal Current (I_n)

$I_n \geq I_b$

I_n= 200 A

[From EBCS – 10, Table 9-1 , page -243]

iii) To Determine Cable Size Selection

$I_t \geq I_n / (C_g C_a C_i)$

- For three Circuits = $C_g = 0.7$
- For temp.> 25^0 c = $C_a = 0.94$
- For PVC insulation = $C_i = 1$

[From EBCS – 10, Table B – 3 , page -92]

I_t = 200A / (0.7*1*0.94) = 303.95A

I_t = 339A

A = 300 mm^2

iV) Required Breaker Selection

[From EBCS – 10, Table 9 – 1 , Page – 243]

I_n= 200 A

6) Power Demand for G+3 main feeder

(For 40 – Single family dwelling)

- Heaviest load 100% 1 units = 1*15,500w= 15,500w
- 65% Loads in next 2 units=0.65*15,500w*2 =20,150w
- 40% Loads in next 2 units= 0.40*15,500w*2 =12,400w
- 25% Loads in next 15 units = 0.25*15,500w*15 =58,125w
- 10% Loads in remaining 20 units = 0.10*15,500w*20 = 31,000w

=**137,175 w**

P_{total} = **137,175 w**

i)Determine the design current (I_b)

For 3 – Phase (3 -ϕ)

P.f = 0.9

$I_b = P_T / (\sqrt{3} * V_L * P.f) = 137175w / (\sqrt{3} * 380v * 0.9) =$ 231.57A

ii) Determine the Nominal Current (I_n)

$I_n \geq I_b$

$I_n \geq$ 231. 57A

[From EBCS – 10, table 9-1, page – 243]

I_n = 250 A

iii) To Determine Cable Size Selection

$I_t \geq I_n / (C_g C_a C_i)$

- For three Circuits = C_g = 0.7
- For temp.> 25^0 c = C_a= 0.94

For PVC insulation = C_i= 1

$I_t = 250A / (0.7*1*0.94) =$ 379.94A

I_t = 402 A

[From EBCS – 10, table B -3, page – 92]

A =400 mm^2

iv) Required Circuit Breaker Selection

[From EBCS – 10, Table 9.1, Page – 243]

I_n= 250 A

7) Power Demand for each 40 – Single Family dwelling

(For – one Single family dwelling)

- Heaviest load 100 % = 15,500w

  P_{total} =15,500w

i)Determine the design current (I_b)

For single – Phase (1- ϕ)

P.f = 0.9

$I_b = P_T / (V_{ph} * P.f) = 15500W / (220V*0.9) =$ 78.28A

$I_b =$ 78.28 A

ii) Determine the Nominal Current (I_n)

$I_n \geq I_b$

[From EBCS – 10, table 9-1, page – 243]

$I_n =$ 100A

iii) To Determine Cable Size Selection

$I_t \geq I_n / (C_g C_a C_i)$

- For twoCircuits = $C_g = 0.8$
- For temp.> 25^0 c = $C_a = 0.94$

For PVC insulation = $C_i = 1$

$I_t \geq 100A / (0.8*0.94*1) = 133A$

$I_t = 133A$

[From EBCS – 10, table B -3, page – 92]

$I_t =$ 133A

$A = 50mm^2$

iv) Required Circuit Breaker Selection

[From EBCS – 10, Table 9.1, Page – 243]

I_n= 100A

8) Lighting Calculations by using LUMEN`S Method

No Ofluminairs (lamps) =N = (E * A) / (F*n*UF*MF)

Where ÷

N = Number of luminairs (lamps) in a given cross – sectional Area

E = Illumination in flux

n = No of lamps for one group

UF = utilization factor

MF = Maintenance factor.

i) For Direct lighting

- UF = 0.6 to 0.45 = 0.5
- MF = 0.5 to 0.8 = 0.8

Ii) Type of luminaires Used for each Rooms

1- For Kitchen -----Fluorescent lamps , 65 w

2- For corridors and staircases ----- Fluorescent lamps ,36 w

3- For living Room---- Incandescent lamps,60 w

4- For Bed Rooms ---- Incandescent lamps,100 w

5- For Bath Room ----- Incandescent lamps,100w

6- ForMaster Bed Room ---- Incandescent lamps,75 w

iii) **Number of luminaries (lamps) for each Rooms**

A) For Living Room

N = (E * A) / (F*n*UF*MF)

E = 100 lux ,p =60 w,F = 730 lumen, A=45.5m^2

N = (100lux*45.5m^2) / (730lum*3*0.5*0.8) = 5.2 lamps

N = 6 lamps

- Corner lamps = 25 w
- Total Corner lamps = 3 lamps

  P = 25 w, F = 235 Lumens

B)For Master Bed Room

E =50lux,P = 75 w , F = 1190 lumens , A =14.0 m^2

N = (E * A) / (F*n*UF*MF)

N =(50 lux *14.0m^2) / (1190 lum*1*0.5*0.8) = 1.47 lamps**N = 2 lamps**

C) Bed Room 1

E = 50lux, P = 100w, F = 1380 lumens, A = 10.5m^2

N = (E * A) / (F*n*UF*MF)

N = (50 lux * 10.5m^2) / (1380 lumens *1*0.5*0.8) = 0.951

N = 1 Lamps

D)Bed Room 2

E = 50lux, P = 100w, F = 1380 lumens , A = 10.5m^2

N = (E * A) / (F*n*UF*MF)

N = (50 lux * 10.5m^2) / (1380 lumens *1*0.5*0.8) = 0.951

N = 1 Lamps

E)Kitchen

E = 300 lux, F = 5200 lumen, P = 65 w , A = 9.75m^2

N = (E * A) / (F*n*UF*MF)

N = (300 lux * 9.75m^2) / (5200lum*1*0.5*0.8) =1.4

N = 2 lamps

F) **Bath Room**

E = 100 lux , P = 100 w , F = 1380lumen, A = 9.75m^2

N = (E * A) / (F*n*UF*MF)

N = (100 lux *9.75m^2) / (1380lum *1*0.5*0.8) = 1.77 lamps

N = 2 lamps

G) **No of luminaire for one floor corridor**

E = 100 lux, P = 36 w, F = 3450 lumen, A = 130 m^2

N = (E * A) / (F*n*UF*MF)

N = (100 lux *130m^2) / (3450lum*1*0.5*0.8) = 9.42 lamps

N = 10 lamps

H) **No of luminaire for one floor staircase**

E = 100lux , p = 36 w , F = 3200 lum, A = 40 m^2

N = (E * A) / (F*n*UF*MF)

N = (100 lux * 40m^2) / (3200 lum *1*0.5*0.8) =3.13 lamps

N = 4 Lamps

iv) **Data on commonly used light sources**

Item No	Room description	Type of fittings	E (lux)	F (lumen)	P (w)	UF	MF	
01	Living room	Incandescent Lamp,p =60w	100	730	60	0.5	0.8	
02	Master Bed room	Incandescent Lamp, p =75w	50	1190	75	0.5	0.8	
03	Bed Room 1	Incandescent Lamp,p =100w	50	1380	100	0.5	0.8	
04	Bed Room 2	Incandescent Lamp,p =100w	50	1380	100	0.5	0.8	

05	kitchen	Fluorescent lamp ,p =65w	300	5200	65	0.5	0.8	
06	Bath room	Incandescent Lamp,p =100w	100	1380	100	0.5	0.8	
07	corridor	Fluorescent lamp ,p =36w	100	3450	36	0.5	0.8	
08	staircase	Fluorescent lamp ,p =36w	100	3200	36	0.5	0.8	

Practically Power Consumed For each Room

A) **For living room**

- Lighting = 6 lamps * 60 w = 360w
- Corner Light = 3lamps * 25 w = 75 w
- 1-TV = 1*110 w = 110w
- 1-Computer = 1*500 w = 500w
- 1- CD /Tape/ player = 1*60 w = 60 w
- 1- Charger = 1 *2 w = 2 w
- 1- receiver = 1 * 25 w = 25 w
- 1- Refrigerator = 1 * 300 w=300w
- 1- Tele – Box = 1* 10 w = 10 w

P_T = 1442 w

B) **Master bed Room**

- Lighting = 2 lamps * 75 w = 150 w
- 1 – TV = 1* 110 w = 110 w
- 1- CD / Tape / player = 1* 60 w = 60 w
- 1- Computer = 1 * 500 w = 500 w
- 1 – Charger = 1 *2 w = 2 w
- 1 – Receiver = 1* 25 w = 25 w
- 3 – Corner light = 3 * 25 w=75 w

P_T= 922 w

C) **Bed Room – 1**

- Lighting = 1 lamp * 100 w = 100 w
- 1- TV = 1* 110 w = 110 w
- 1- CD / Tape / Player = 1 *60 w = 60 w
- 1- Charger = 1 * 25 w = 25 w

P_t = 295 w

D) **Bed Room -2**

- Lighting= 1lamp * 100w =100 w
- 1 - TV = 1 * 110 w = 110 w
- 1- CD / Tape/ Player = 1 * 60 w = 60 w
- 1 – Charger = 1 * 25 w = 25 w

P_t = 295 w

e)**Kitchen**

- Lighting = 2 lamps * 65 w = 130 w
- 1- cooker (stove) = 1 *3,500 w =3,500w
- 1- “Injeramittad” = 1 * 3,500 w = 3,500w
- 1- Refrigerator= 1 * 350 w = 350 w
- 1 – onion grinder = 1 * 500 w = 500 w

P_t = 7,980 w

F) **Bath Room**

- Lighting = 2 lamps * 100 w = 200w
- 1 – heater = 1 * 1000 w = 1000 w
- 1 – Shaver = 1 * 300 w =300w

P_t = 1,500 w

G)**Corridor lamps for one- family**

Lighting ------- 10 lamps * 36 w = 360w / 10 = 36 w

H) **Staircase lampsfor one–family**

Lighting --------- 2 lamps * 36 w =72w / 10 = 7.2w

SUMMARY

TOTAL POWER DEMAND FOR EACH DWELLING

Item No	Room description	Wattage lighting	Wattage Socket outlet	Total wattage
01	Living room	435w	1007w	1442w
02	Master bedroom	225w	697w	922w
03	Bed Room-1	100w	195w	295w
04	Bed Room-2	100w	195w	295w

05	kitchen	130w	7850w	7980w
06	Bath room	200w	1300w	1500w
07	corridor	36w	–	36w
08	staircase	7.2w	–	7.2w
	Total wattage			12477.2w

10) **From Practically Power Consumed for each Room**

P_{total}= 1

Diversty Factor = 0.7

P_{total}= 12477.2w+ 10% (12477.2w)

=13732.84w

P_{total} = 13732.84*0.7 =9613 VA

i) Power Demand for one-family

[For each – 40 – Single family dwelling]

- Heaviest load 100% = 9613 w

P_{total} = 9613 w

A) To Determine the design current (I_b)

For single – Phase (1- ϕ) ,P.f = 0.9

$I_b = P_T / (V_{ph} * P.f) = 9613w / (220v*0.9) = 48.55A$

I_b = 48.55A

B) Determine the Nominal Current (I_n)

$I_n \geq I_b$

[From EBCS – 10, table 9-1, page –243]

I_n = 50A

C) To Determine Cable Size Selection

$I_t \geq I_n / (C_g C_a C_i)$

- For twoCircuits = C_g = 1
- For temp.> 25^0 c = C_a= 0.94

For PVC insulation = C_i = 1

$I_t \geq 69A / (1*0.94*1) = 53.2A$

I_t = 69A

[From EBCS – 10, table B -3, page – 92]

I_t = 69A

A = 16mm²

D) Required Circuit Breaker Selection

[From EBCS – 10, Table 9.1, Page – 243]

I_n = 50A

ii)Power Demand for one floor (10 – families)

- Heaviest load 100% = 1 * 13,732 .84 w = 13,732.84 w
- 65% loads in next 2 units = 0.65*2*13,732.84w = 17,852.69 w
- 40% loads in next 2 units = 0.40*2* 13,732.84 w = 10,986.272 w
- 25% loads in next 5 units = 0.25*5* 13,732.84 w = 17,166.05 w

P_T = 63,171.064 w

Diversity Factor =0.7

P_T = 63,171.064 w* 0.7 =44219.45A

i) Determine the design current (I_b)

For 3 – Phase (3 -ϕ)

P.f = 0.9

Diversity Factor =0.7

$I_b = P_T / (\sqrt{3} * V_L * P.f) = 44219.45W / (\sqrt{3} * 380v * 0.9)$ = 74.65A

ii) Determine the Nominal Current (I_n)

$I_n \geq I_b$

$I_n \geq$ 118 A

[From EBCS – 10, table 9-1, page –243]

I_n = 100 A

iii) To Determine Cable Size Selection

$I_t \geq I_n / (C_g C_a C_i)$

- For three Circuits = $C_g = 1$
- For temp.> 25^0 c = $C_a = 0.94$

  For PVC insulation = $C_i = 1$

$I_t = 100A / (1*1*0.94) = 125.53$

I_t = 118 A

[From EBCS – 10, table B -3, page – 92]

A =50 mm^2

iv) Required Circuit Breaker Selection

[From EBCS – 10, Table 9.1, Page – 243]

I_n=100 A

iii) Power Demand for 2^{nd} and 3^{rd} floor

(For 20 – Single family dwelling)

- Heaviest load 100% 1units = 1*13,732.84 w = 13,732.84 w
- 65% loads in next 2 units = 0.65* 2 *13,732.84 = 17,852.692 w
- 40% loads in next 2 units = 0.40 * 2* 13,732.84 = 10,986.272 w
- 25% loads in next 15 units = 0.25*15*13,732.84 = 51,498.15 w

P_T = 94,069.952 w

P_T =94,069.954 w

Diversity Factor =0.7

P_T = 94069.954A*0.7=65849VA

i) Determine the design current (I_b)

For 3 – Phase (3 -ϕ) , P.f = 0.9

$I_b = P_T / (\sqrt{3} * V_L * P.f) = 65849W / (\sqrt{3} * 380v * 0.9) = 111.2A$

I_b = 111.2A

ii) Determine the Nominal Current (I_n)

$I_n \geq I_b$

$I_n \geq$ 158.8 A

[From EBCS – 10, table 9-1, page -243]

I_n = 125 A

iii) To Determine Cable Size Selection

$I_t \geq I_n / (C_g C_a C_i)$

- For three Circuits = C_g = 1
- For temp.> 25^0 c = C_a= 0.94

  For PVC insulation = C_i = 1

$I_t = 125A / (1*1*0.94) = 133A$

I_t = 149 A

[From EBCS – 10, table B -3, page – 92]

A =70 mm^2

iv) Required Circuit Breaker Selection

[From EBCS – 10, Table 9.1, Page – 243]

I_n=125A

iV) Power Demand for 1st, 2nd , 3rd floors

(For 30 – single family dwelling)

- Heaviest load 100 % 1 units = 1*13,732 .84w =13,732.84 w
- 65 % loads in next 2 units = 0.65 *2*13,732.84w =17,852.692 w
- 40% loads in next 2 units = 0.40*2*13,732.84w =10,986.272 w
- 25 % loads in next 15 units= 0.25*15*13,732.84w =51,498.15 w
- 10 % loads in next 10 units = 0.10*10*13,732.84w =13,732.84 w

P_T =107,802.8w

P_T= 107,802.8 w

Diversity Factor =0.7

P_T = 107802.8W*0.7 = 75461.96VA

i) Determine the design current (I_b)

For 3 – Phase (3 -ϕ)

P.f = 0.9

I_b= P_T/ (√3* V_L *P.f) =75461.96VA/ (√3*380v*0.9) = 127.4A

I_b = 182A

ii) Determine the Nominal Current (I_n)

$I_n \geq I_b$

$I_n \geq$ 182A

[From EBCS – 10, table 9-1, page –243]

I_n = 150 A

iii) To Determine Cable Size Selection

$I_t \geq I_n / (C_g C_a C_i)$

- For three Circuits = C_g = 1
- For temp.> 25^0 c = C_a= 0.94

  For PVC insulation = C_i = 1

I_t = 150A / (1*1*0.94) = 159.57A

I_t = 179A

[From EBCS – 10, table B -3, page – 92]

A =95 mm^2

iv) Required Circuit Breaker Selection

[From EBCS – 10, Table 9.1, Page – 243]

I_n=150A

v) Power Demand for G + 3 Main Feeder

[For 40 – Single family dwelling]

- Heaviest load 100% 1units = 1*13,732.84 = 13,732.84 w
- 65% loads in next 2 units = 0.65*2*13,732.84 = 17,852.69 w
- 40% loads in next 2 units = 0.40*2*13,732.84 = 10,986.272 w
- 25% loads in next 15 units = 0.25*15*13,732.84 = 51,498.15 w

- 10% loads in remaining 20 units = 0.10*20*13,732.84 = 27,465.68w

P_T = 121,535.634w

P_T =121,535.634 w

Diversity Factor =0.7

P_T=121,535.634 w*0.7 =85074.95VA

i) Determine the design current (I_b)

For 3 – Phase (3 -ϕ)

P.f = 0.9

$I_b = P_T / (\sqrt{3} * V_L * P.f)$ =85074.95VA/ (√3*380v*0.9) = 153.62A

I_b = 153.62A

ii) Determine the Nominal Current (I_n)

$I_n \geq I_b$

I_n>206A

[From EBCS – 10, table 9-1, page-243]

I_n = 175 A

iii) To Determine Cable Size Selection

$I_t \geq I_n / (C_g C_a C_i)$

- For three Circuits = C_g = 1
- For temp.> 25^0 c = C_a= 0.94

For PVC insulation = C_i = 1

I_t = 175A / (1*1*0.94) = 186.17A

I_t = 206A

[From EBCS – 10, table B -3, page – 92]

A = 120 mm^2

iv) Required Circuit Breaker Selection

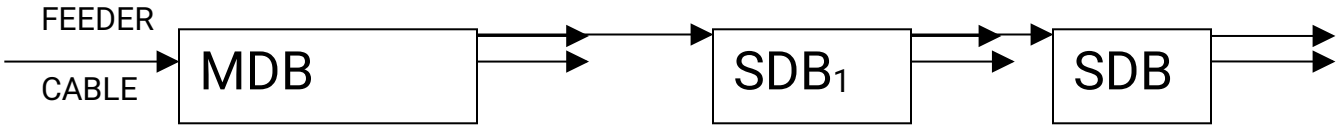
[From EBCS – 10, Table 9.1, Page – 243]

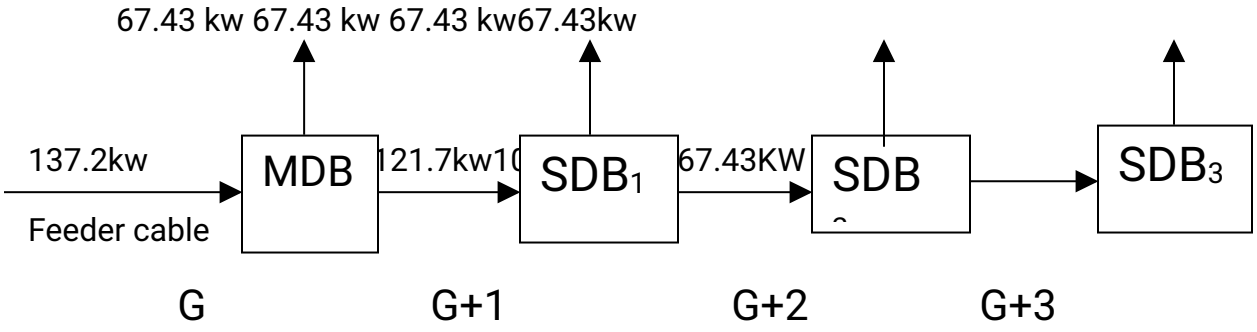
I_n=175A

Arrangement of Electrical installation BoardsBy using

FromMDB toSDB and

From SDBtoSDBConnection





- FOR ONE SINGLE FAMILY DWELLING CIRCUIT BREAKERS

- 1 & 2 Indicates breakers for each 10A

i) Wire Dimension for single family (1x2.5mm^2)

1) 4.25mx2+3x4.25m+3x4.25m+3x4.5m+3x4.5m+2x5m+3x4.55m+3x6.5m+7x2m+ for connection (10m) =115.15meter

2) 2x3.1m+2x3.3m+2x2.7m+2x3.3m+2x2.9m+2x2.8m+3x3.7m+3x2m+3x3.7m+2x1.75m+2x4m+2x3.5m+3x3.6m+2x2.5m+3x3.2m+3x3.2m+2x1.5m+3x3.1m+3x3.3m+for connection(15m)=154.4meter

ii) Wire dimension forone family dwelling (1x2.5mm^2)

- 3 & 4 indicates breaker 3 and 4for each 16A

3) 3x1.5m+3x2.2m+3x2.3m+3x7m+3x3.4m+3x3.4m+3x8m+for connection(16m) = 99.1meter

4) 3x2.9m+3x2m+3x2.9m+3x0.5m+3x3m+3x3m+7m(for connection) +3x7m =70.3meter

iii) Cross sectional area of wire (1x4mm^2)

- 5indicates Breaker 5 for 20A (heater)
- 3x12m = 36 meter

IV) ⟶

6& 7 Indicates Breaker 6&7 for each 25 A

❖ Wire Dimension for each 1x 4 mm^2

6 ⟶ 3 x10 m = 30 meter

7 ⟶ 3 x 11 m = 33 meter

V) For corridor (1x2.5 mm^2) ⟶

10A Breaker (3x8m +3x8m + (4x3.25)x10m+10x(3x6))

=358 meter≈360 meter

Vi)For Staircase total (2.5 mm^2) [2x2.70x3]X8m + (3x4x2)x4m +(4x4x3x)x4m

+(3x2x8x3)m + 2x4m+20m (for connection)

= **589.6 meter**

vii) For bell, Cross selection Area (1x1.5 mm^2)

⟶ 5.5mx2 + 5.5 x2m+9x2m+2x8.5 +2x9.5m

= 11m+ 11m + 18m +17m + 19 m= **76meter**≈80 meter

i) 1x2.5mm^2 for Single family dwelling

- 115.15m + 154.4 meter + 99.1m +70.3m

= 439 meter ≈450m

ii) 1x4mm^2 for Single family dwelling

- 36m+ 30m +33 meter = 99 meter =100m

iii) 1x1.5mm^2 for Single family dwelling

- 76 meter = 80 meter

iv) Ckt Breaker for single family

- 6A ---------- 1 → for bell
- 10A --------- 2 → for lighting
- 16 A -------- 2 → for socket outlet
- 20 A ------- 1 → for heater
- 25 A ------- 2 → for Injeramittad& Stove
- 50 A ------- 1 → for main Breaker
-

v) Conduit for single family

- Conduit ϕ-16 → 70 PCs → 1pcs → indicates 3 meter
- Conduit ϕ – 19 → 15 PC s
- PVC ϕ - 32

Vi) Distribution Board

- Board (12 ACB) ------- 40 PCS

Vii) junction box

- Junction box – ϕ 65 → 50 → for switches, sockets, bells, etc ….
- Junction box – ϕ 85 → 20 for lightings
  - Cϕonduitϕ – 19 → for Sockets

N.B Conduit – ϕ16 for lighting, Switches, switches (for 2.5 mm^2 wires)

- Conduit ϕ – 21 → for power Sockets (for 4mm^2 wires)
- PVC – 32 → for power Cables (from SDB to each Single family Dwelling or to 40 Single family)
- Conduit – ϕ – 13 (for bell – 1.5mm^2)

TOTAL ELECTRICAL BILL OF QUANTITY

ITEM NO	Type Of Materials	Quantity	Measurement	Unit price (Birr)	Total Price (Birr)	Remark
01	Incandescentlamp,p=60w	240	PCS	14	3360	
02	Incandescent lamp, p=75w	80	PCS	15	1200	

03	Incandescent lamp, p=100w	160	PCS	23	3680	
04	Fluorescent lamp ,p=36w	56	PCS	35	1960	
05	Fluorescent lamp ,p=65w	80	PCS	60	4800	
06	Socket outlet ,16A / 220V	560	PCS	46	25760	
07	Power socket ,20A / 220V	40	PCS	230	9200	
08	Power socket ,25A / 220V	80	PCS	260	20800	
09	TV socket	200	PCS	30	6000	
10	Tele socket RJ-11	200	PCS	30	6000	
11	Bell push button	200	PCS	48	9600	
12	Bell siren	40	PCS	680	27200	
13	single way switch	80	PCS	18	1440	
14	Two way switch	332	PCS	23	7636	
15	Double pole switch	80	PCS	28	2240	
16	Intermediate switch	44	PCS	48	2112	
17	Circuit breaker 1- ϕ10A	86	PCS	90	7740	
18	Circuit breaker 1 - ϕ 16A	80	PCS	115	9200	
19	Circuit breaker 1 - ϕ 20A	40	PCS	115	4600	
20	Circuit breaker 1 - ϕ 25A	80	PCS	115	9200	
21	Circuit breaker 1 - ϕ 50A	40	PCS	195	7800	
22	Circuit breaker 3 - ϕ 100A	4	PCS	1400	5600	
23	Circuit breaker 3 - ϕ 125A	1	PCS	2000	2000	
24	Circuit breaker 3 - ϕ 150A	1	PCS	2500	2500	

25	Circuit breaker 3 - ϕ 175A	1	PCS	2700	2700	
26	Electric wire 1x1.5mm^2	4	Roll	460	1840	
27	Electric wire 1x2.5mm^2	201	Roll	635	127635	
28	Electric wire 1x4mm^2	40	Roll	1140	45600	
29	Electric wire 1x6mm^2	5	Roll	2200	11000	
30	Power cable (2x16+6)mm^2	520	meter	265	137800	
31	Power cable (4x50+25)mm^2	30	meter	460	13800	
32	Power cable (4x70+35)mm^2	18	meter	520	9360	
33	Power cable (4x95+50)mm^2	12	meter	610	7320	
34	Power cable(4x120+70)mm^2	15	meter	720	10800	
35	Conduit Dia -13	100	pcs	13	1300	
36	Conduit Dia -16	300	pcs	15	4500	
37	Conduit Dia -19	450	pcs	18	8100	
38	Conduit Dia -21	260	pcs	22	5720	
39	PVC Dia-32	520	meter	42	21840	
40	PVC Dia-50	30	meter	90	2700	
41	PVC Dia-75	40	meter	120	4800	
42	PVC Dia-110	15	meter	195	2925	
43	SubDistributionboard12ACB	1	pcs	2600	2600	
44	Sub Distribution board 40cmx40cmx30cm	1	pcs	4000	4000	

45	Sub Distribution board 50cmx60cmx30cm	1	pcs	6400	6400	
46	Sub Distribution board 60cmx70cmx40cm	1	pcs	8500	8500	
47	Main distribution board 70cmx80cmx50cm	1	pcs	12000	8500	
48	Junction box Dia - 65	320	pcs	18	5760	
49	Junction box Dia - 85	90	pcs	20	1800	
50	Grounding copper rod	1	pcs	600	600	
51	Grounding wire 1x16mm^2	22	meter	150	3300	
52	Plastic fisher Dia-6	30	packet	15	450	
53	Vitae 3.5	9	packet	287	2583	
54	Metal fisher Dia-10	58	pcs	69	4002	
55	Nastero (Insulating tape) Japan	75	pcs	12	900	
	TOTAL				650,763.00	