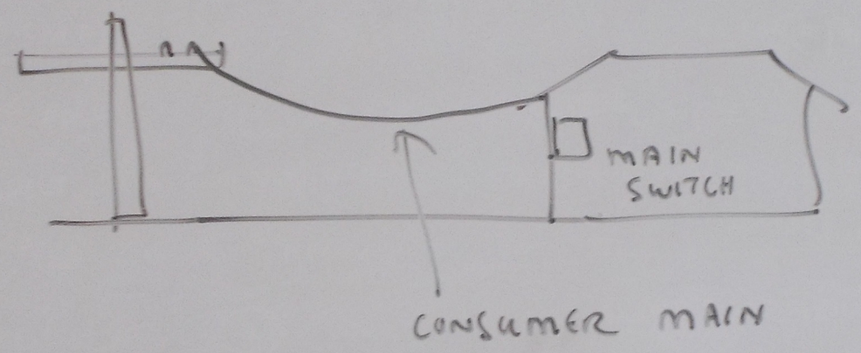
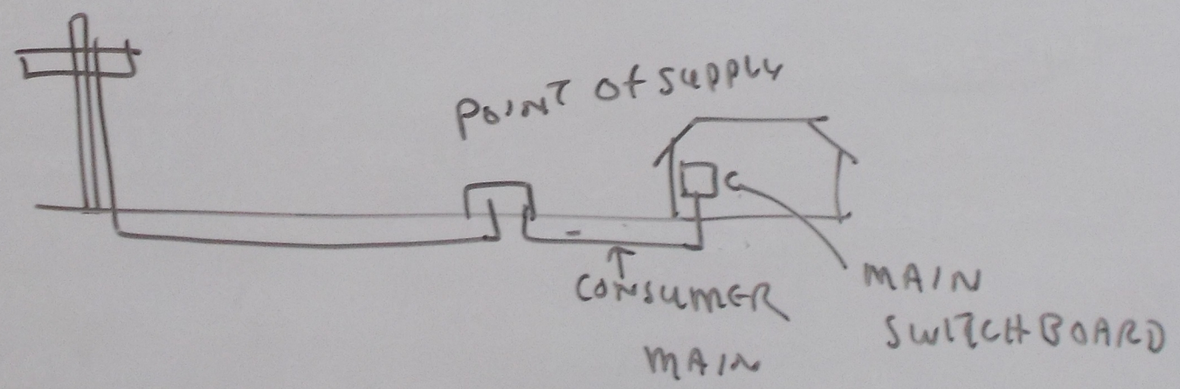
ELECTRICAL WIRING SYSTEM

CONSUMER MAIN, MAXIMUM DEMAND

CONSUMER MAINS ARE THE CONDUCTORS BETWEEN THE POINT OF SUPPLY AND THE MAIN SWITCH BOARD AND FORM PART OF AN ELECTRICAL INSTALLATION.





CABLE SI
SUFFICIENT
INSTALLATI
TYPES OF
TIMBER / S
CAUTY, D
INSTALLAT
CATEGOR
CATEGOR
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AND

TORS BETWEEN THE POINT OF

ARD AND FORM PART OF AN

MAIN SWITCHBOARD

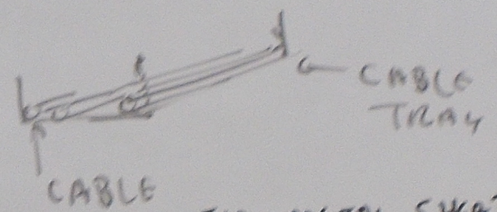
CABLE SIZE OF CONSUMER MAIN MUST BE SUFFICIENT TO SUPPLY ALL LOADS IN THE INSTALLATION.

Types of Buildings

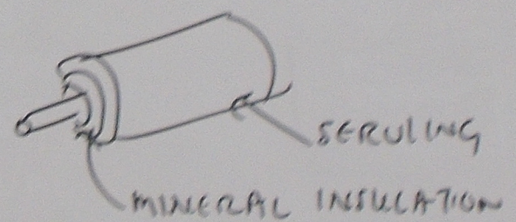
TIMBER / STEEL FRAME / BRICK VENEER / PVC CAVITY, DOUBLE BRICK, STEEL, REINFORCED CONCRETE

INSTALLATION CONDITIONS

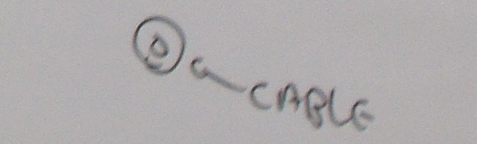
CATEGORY (A) - INSULATED, SHEATHED CABLE ON CABLE TRAY



CATEGORY (B) - MIMS - MINERAL INSULATED METAL SHEATHED CABLE FIXED DIRECTLY TO CONCRETE WALL



CATEGORY (C) - INSULATED AND SHEATHED CABLE BURIED DIRECT IN GROUND



CONSUMER
Point of supply

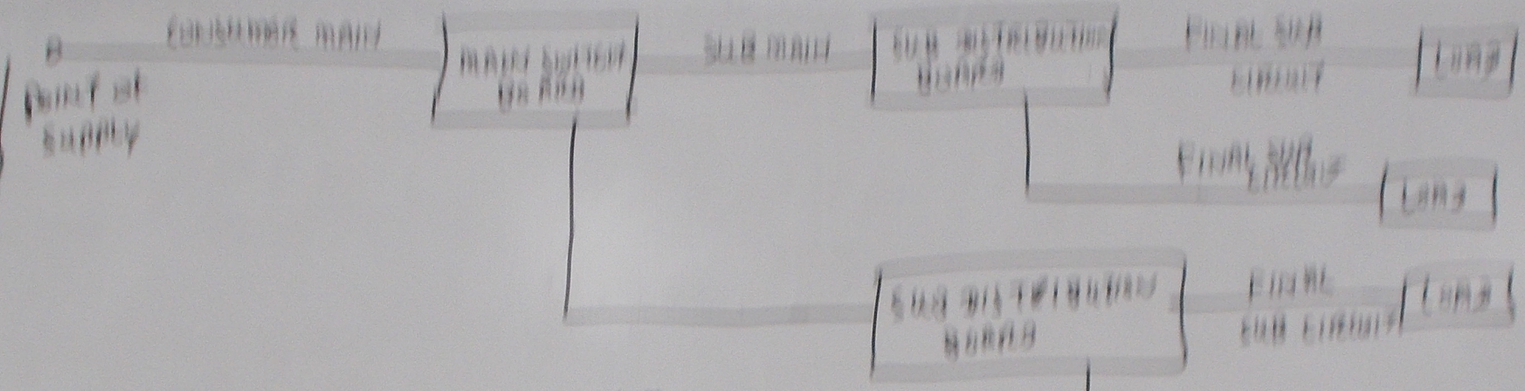
LOAD - LIGHT
ELECTR

NOT ALL GO
THERE IS
THE DIVERS

LOAD -

AS3000 TA

TABLE C1 -
C2
C3



Load = Lighting, socket outlet, Hot water
Electric range etc

Not all electrical loads are being used at the same time
There is diversity among the loads, it needs to consider
the diversity factor to determine the total (maximum demand)
load.

AS3000 Table $E1, E2, E3$ outline the ways to select the maximum
demand depending on different kinds of loads.

Table E_1 = Single and multiple domestic electrical installations
— E_2 = Non domestic electrical installations → Residentials
— E_3 = Energy estimation = VA/m² → Factories/Office

pb ①

DETERMINE THE MAXIMUM DEMAND OF A SINGLE DOMESTIC ELECTRICAL INSTALLATION SUPPLIED AT SINGLE PHASE WITH THE FOLLOWING LOADS

24 LIGHTING POINTS ✓ a(i)
10m LIGHTING TRACK ✓ a(i)
9 – 10A SINGLE SOCKET OUTLET b(i)
8 – 10A DOUBLE SOCKET OUTLET b(i)
1 – 50W EXHAUST FAN ✓ a(ii)
1 – 1000W STRIP HEATER (e)
1 – 15A SOCKET OUTLET b(ii)
1 – 10KW RANGE c
1 – 4.8KW WATER HEATER f
1 – 3KW TENNIS COURT LIGHTING a(ii)

LOAD GROUP

(a) LIGHTING
- LIGHT – POINTS
- LIGHTING TRACK 2pt/m x LENGTH OF TRACK – PAGE 467 FOOT NOTE (4)
- ELECTRICAL EQUIPMENTS UP TO 50W

(b) SOCKET OUTLET (i) 10A (ii) 15A (iii) 20A

(c) RANGE + LAUNDRY

(d) SPACE HEATING / AIR CON

(e) INSTANTANEOUS WATER HEATER

(f) STORAGE WATER HEATER

TABLE (C1)
COLUMN 2 – SINGLE
3 – 2–5 UNIT
4 → 6–20 UNITS
5 → 21 OR MORE

SINGLE DOMESTIC , TABLE (C1) COLUMN (2)

(a) (i) LIGHTING

24 POINTS , 10m LIGHTING TRACK + 50W EXHAUST FAN

24 + 2 pt/m x 10 + 1 = 24 + 20 + 1 = 45 { FIRST 2 SECOND THIRD

b(i)
10A SOCKET OUTLET

9 – 10A SOCKET OUTLET =) 9
8 – 10A DOUBLE SOCKET OUTLET = 8x2 = 16

10A SOCKET OUTLET: 25 → 1st 20 pt → 10A
2nd 5 pt → 5A
15A

1 – 1000W STRIP HEATER – INSTANTANEOUS WATER HEATER – LOAD GROUP (

$\frac{1000\ W \times 0.333}{240V} = 1.387A$

1 – 15A SOCKET OUTLET LOAD GROUP b(ii) → 10A

1 – 10KW RANGE LOAD GROUP (c) – 50% CONNECTED L

1 – 4.8KW WATER HEATER – STORAGE HEATER –

$\frac{4.8 \times 1000}{240} = 20A$

1 – 3KW TENNIS COURT LIGHTING – OUT DOO

$\frac{3 \times 1000 \times 0.75}{240} = 9.4A$

MAXIMUM DEMAND: 7 + 15 + 1.387 + 10 + 20.8 +

MAND OF A SINGLE
TION SUPPLIED AT SINGLE PHASE

)
i)
ET b(i)
ET b(i)
ii)
)

ING a(ii)
6 (C1)
N 2- SINGLE
— 3- 2-5 UNIT
— 4 → 6-20 UNITS
— 5 → 21 OR MORE

LENGTH OF TRACK - PAGE 467 FOOT NOTE (4)
UP TO 50W
(ii) 15A (iii) 20A
(e) INSTANTANEOUS WATER HEATER
(f) STORAGE WATER HEATER

SINGLE DOMESTIC , TABLE (C1) COLUMN (2)

(a) (i) LIGHTING

24 POINTS , 10m LIGHTING TRACK + 50W EXHAUST FAN

24 + 2 pt/m × 10 + 1 = 24 + 20 + 1 = 45 — FIRST 20 pt → 3A; SECOND 20 pt → 2A; THIRD 5 pt → 2A

7A

b(i)

10A SOCKET OUTLET

9 - 10A SOCKET OUTLET => 9

8 - 10A DOUBLE SOCKET OUTLET = 8×2 = 16

10A SOCKET OUTLET: 25 → 1st 20 pt → 10A; 2nd 5 pt → 5A

15A

1 - 1000W STRIP HEATER — INSTANEOUS WATER HEATER - LOAD GROUP(e) 33.3 % CONNECTED LOAD

$\frac{1000\text{ W} \times 0.333}{240\text{V}} = 1.387\text{A}$

1 - 15A SOCKET OUTLET LOAD GROUP b(ii) → 10A

1 - 10KW RANGE LOAD GROUP(c) - 50% CONNECTED LOAD - $\frac{10\times1000\times 0.5}{240} = 20.8\text{A}$

1 - 4.8KW WATER HEATER - STORAGE HEATER - LOAD GROUP(F) - FULL LOAD

$\frac{4.8\times1000}{240} = 20\text{A}$

1 - 3KW TENNIS COURT LIGHTING - OUT DOOR LIGHTING LOAD GROUP a(ii) 75%

$\frac{3\times1000\times 0.75}{240} = 9.4\text{A}$

MAXIMUM DEMAND: 7 + 15 + 1.387 + 10 + 20.8 + 20 + 9.4 = 83.58 A

Pb ①

DETERMINE THE MAXIMUM DEMAND OF A SINGLE DOMESTIC ELECTRICAL INSTALLATION SUPPLIED AT SINGLE PHASE WITH THE FOLLOWING LOADS

24 LIGHTING POINTS ✓ a(i)
10m LIGHTING TRACK ✓ a(i)
9 – 10A SINGLE SOCKET OUTLET b(i)
3 – 10A DOUBLE SOCKET OUTLET b(i)
1 – 50W EXHAUST FAN ✓ a(i)
1 – 1000W STRIP HEATER (e)
1 – 15A SOCKET OUTLET b(ii)
1 – 10KW RANGE c
1 – 4.8KW WATER HEATER f
1 – 3KW TENNIS COURT LIGHTING a(ii)

LOAD GROUP
(a) LIGHTING
- LIGHT – POINTS
- LIGHTING TRACK 2pt/m × LENGTH OF TRACK – PAGE 467 FOOT NOTE (4)
- ELECTRICAL EQUIPMENTS UP TO 50W

(b) SOCKET OUTLET (i) 10A (ii) 15A (iii) 20A
(c) RANGE + LAUNDRY
(d) SPACE HEATING / AIRCON
(e) INSTANTANEOUS WATER HEATER
(f) STORAGE WATER HEATER

TABLE (C1)
column 2 – SINGLE
3 – 2–5 UNIT
4 → 6–20 UNITS
5 → 21 OR MORE

SINGLE DOMESTIC , TABLE (C1) Column (2)

(a) (i) LIGHTING
24 POINTS , 10m LIGHTING TRACK + 50W EXHAUST FAN
24 + 2 pt/m × 10 + 1 = 24 + 20 + 1 = 45
- FIRST 20 pt → 3A
- SECOND 20 pt → 2A
- THIRD 5 pt → 2A

7A

b(i)
10A SOCKET OUTLET
9 – 10A SOCKET OUTLET ⇒ 9
3 – 10A DOUBLE SOCKET OUTLET = 3×2 = 16
10A SOCKET OUTLET: 25
- 1st 20 pt → 10A
- 2nd 5 pt → 5A

15A

1 – 1000W STRIP HEATER – INSTANTANEOUS WATER HEATER – LOAD GROUP(e) 33.3% CONNECTED LOAD

$\frac{1000\text{ W} \times 0.333}{240\text{V}} = 1.387\text{A}$

1 – 15A SOCKET OUTLET LOAD GROUP b(ii) → 10A

1 – 10KW RANGE LOAD GROUP(c) – 50% CONNECTED LOAD – $\frac{10 \times 1000 \times 0.5}{240} = 20.8\text{A}$

1 – 4.8KW WATER HEATER – STORAGE HEATER – LOAD GROUP(F) – FULL LOAD

$\frac{4.8 \times 1000}{240} = 20\text{A}$

1 – 3KW TENNIS COURT LIGHTING – OUT DOOR LIGHTING LOAD GROUP a(ii) 75%

$\frac{3 \times 1000 \times 0.75}{240} = 9.4\text{A}$

MAXIMUM DEMAND: 7 + 15 + 1.387 + 10 + 20.8 + 20 + 9.4 = 83.58 A

Load group	Single domestic electrical installation or individual living unit per phase[1]	2 to 5 living units per phase	6 to 20 living units per phase	21 or more living units per phase
		Loading associated with individual units		
(a) Lighting				
(i) Lighting except (ii) and load group (h) below[4, 5]	3 A for 1 to 20 points + 2 A for each additional 20 points or part thereof	6 A	5 A + 0.25 A per living unit	0.5 A per living unit
(ii) Outdoor lighting exceeding a total of 1000 W[4, 7]	75% connected load	No assessment for the purpose of maximum demand		
(b) (i) Socket-outlets not exceeding 10 A[4, 5]. Permanently connected electrical equipment not exceeding 10 A and not included in other load groups[4]	10 A for 1 to 20 points + 5 A for each additional 20 points or part thereof	10 A + 5 A per living unit	15 A + 3.75 A per living unit	50 A + 1.9 A per living unit
(ii) Where the electrical installation includes one or more 15 A socket-outlets, other than socket-outlets provided to supply electrical equipment set out in load groups (c), (d), (e), (f), (g) and (i)[4, 15]	10 A			
(iii) Where the electrical installation includes one or more 20 A socket-outlets other than socket-outlets provided to supply electrical equipment set out in load groups (c), (d), (e), (f), (g) and (i)[4, 15]	15 A			

(continued)

TABLE C1 (*continued*)

1	2	3	4	5
Load group	Single domestic electrical installation or individual living unit per phase[1]	Blocks of living units[1, 2, 5]		
		2 to 5 living units per phase	6 to 20 living units per phase	21 or more living units per phase
		Loading associated with individual units		
(c) Ranges, cooking appliances, laundry equipment or socket-outlets rated at more than 10 A for the connection thereof[3]	50% connected load	15 A	2.8 A per living unit	
(d) Fixed space heating or airconditioning equipment, saunas or socket-outlets rated at more than 10 A for the connection thereof[3, 11]	75% connected load	75% connected load	75% connected load	
(e) Instantaneous water heaters[3, 9]	33.3% connected load	6 A per living unit		100 A + 0.8 A per living unit
(f) Storage water heaters[10]	Full-load current	6 A per living unit		100 A + 0.8 A per living unit
(g) Spa and swimming pool heaters	75% of the largest spa, plus 75% of the largest swimming pool, plus 25% of the remainder			
(h) Communal lighting[6, 7]	Not applicable	Full connected load		
(i) Socket-outlets not included in load groups (j) and (m) below[4, 8, 14]	Not applicable	2 A per point, up to a maximum of 15 A		
Permanently connected electrical equipment not exceeding 10 A				

CLASS EXERCISE

DETERMINE THE MAXIMUM DEMAND OF SINGLE DOMESTIC ELECTRICAL INSTALLATION CONSISTING OF

40 LIGHTING POINTS
20 m LIGHTING TRACK
2 - 50W EXHAUST FANS

15 - 10A SINGLE SOCKET OUTLET
9 - 10A DOUBLE SOCKET OUTLET
1 - 2000 W STRIP WATER HEATER
3 - 15A SOCKET OUTLET
2 - 20 KW RANGE
1 - 5 KW WATER HEATER
1 - 5 KW TENNIS COURT LIGHTING

IF IT IS GIVEN AS HEATER THEN, IT CAN BE REGARDED AS LOAD GROUP b(i)

CABLE SIZE OF CONSUMER MAIN
SUFFICIENT TO SUPPLY ALL LOA
INSTALLATION.

TYPES OF BUILDINGS

TIMBER / STEEL FRAME / BRI
CAVITY, DOUBLE BRICK, STE

INSTALLATION CONDITIONS

CATEGORY (A) - INSULATED
CABLE TRA

CATEGORY (B) - MIMS - MIN
CA
W

CATEGORY (C) - INSULATED
CABLE BUR

Home work

ENPRALOIA WEEK 6, 8, 9 CH 6 STUDENT WORK BOOK
EXAMPLE X 6-2-1

P7) DETERMINE THE MAXIMUM DEMAND OF CONSUMER MAIN FOR A BLOCK OF 24 HOMES UNITS CONNECTED ACROSS THREE PHASES WHERE EACH UNIT IS SUPPLIED WITH SINGLE PHASE SUPPLY ONLY.
EACH UNITS HAS THE FOLLOWING LOADS

11 – LIGHTING POINTS
7 – DOUBLE SOCKET OUTLETS ✓
3 – SINGLE SOCKET OUTLETS ✓
1 – 15 A SOCKET OUTLET ✗
1 – 9.2 KW RANGE ✗
1 – 4.4 KW STORAGE HEATER
1 – 1000 W STRIP HEATER ✓

1322
1322
1322
3Φ

TOTAL UNITS

HOME → HOMES

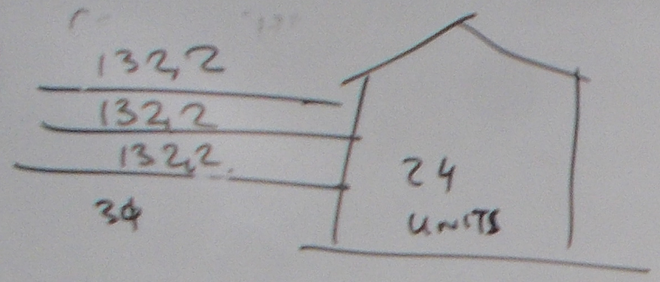
11 LIGHT

7 - DOUBLE SOCKET
3 SINGLE SOCKET
1 - 1000W STR

1 X 15A SOC

1 X 9.2 K

1 X 4.4 K



TOTAL UNITS / EACH PHASE: $\frac{24}{3} = 8$ UNITS/PHASE

Home → DOMESTIC INSTALLATION — TABLE (C1) COLUMN (4)

11 LIGHTING POINTS

LOAD GROUP a (i) - col 4

5A + 0.25 A × UNITS

5 + 0.25 × 8 = 7 A

10A

7 - DOUBLE SOCKET OUTLET = 7 × 2 = 14

3 SINGLE SOCKET OUTLET = 3

1 - 1000W STRIP HEATER = 1

18 × 10A SOCKET — TABLE (C1) COL 4

OUTLET - 15A + 3.75 × UNITS

= 15 + 3.75 × 8 = 45A

1 × 15A SOCKET

10A

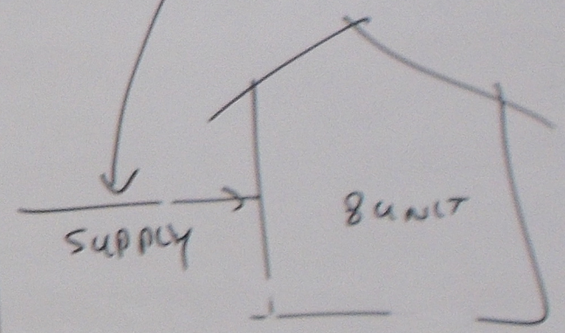
1 × 9.2 KW RANGE LOAD GROUP (C) COL 4 2.8 × 8 = 22.2A

1 × 4.4 KW STORAGE WATER HEATER COL 4 6 × 8 = 48A

TOTAL CURRENT

7 + 45 + 10 + 22.2 + 48

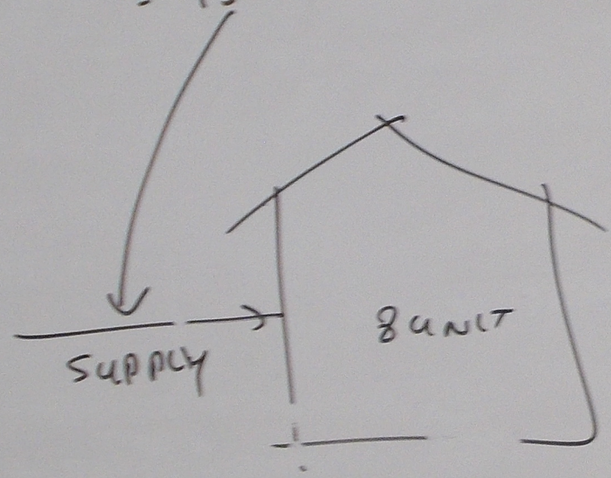
= 132.2A



TOTAL CURRENT

7+45+10+22.2+48

= 132.2A



UITS

= 45A

10A

22.2A

8A

CALCULATE THE MAXIMUM DEMAND OF THE SINGLE PHASE CONSUMER'S MAIN FOR 63 UNITS SUPPLIED BY EACH UNIT HAS THE FOLLOWING LOADS

15 LIGHTING POINTS

9 DOUBLE SOCKET OUTLET

5 SINGLE SOCKET OUTLET

1 x 10KW RANGE

1 x 5KW STORAGE WATER HEATER

3 - 15A SOCKET

P17 DETERMINE THE MAXIMUM DEMAND OF THE HEAVIEST LOADED PHASE IN A DOMESTIC ELECTRICAL INSTALLATION COMPRISING

- 26 LIGHTING POINTS
- 24 X 10A SINGLE SOCKET OUTLET (15+9)
- 1 X 15A SOCKET OUTLET
- 1 X 6.6KW RANGE
- 1 X 12.96 KW INSTANTANEOUS WATER HEATER — 12.96/3 = 4.8
- 1 X 3.6KW CLOTH DRYER
- 2 X 5 KW HOT PLATES, 1 X 4KW AIR CON

AND THE ARRANGEMENT FOR 3φ CONNECTION IS AS FOLLOWS

RED	WHITE	BLUE
5 KW HOT PLATE	15 X 10A SOCKET OUTLET	26 LIGHTS
4KW AIRCON	5KW HOT PLATE	9 X 10A SOCKET OUTLET
4.8 KW INSTANTANEOUS WATER HEATER	4.8KW INSTANTANEOUS WATER HEATER	6.6 KW RANGE
	3.6 KW CLOTH DRYER	4.8 KW INSTANTANEOUS WATER HEATER

DOMESTIC INSTALLATION — TABLE

EQUIPMENT	
26 LIGHTS	
1st 20 pt =	3A
2nd 6 pt =	2A
	5A
10A SOCKET OUTLET	
15 NO	10A FOR 1→20 pt
9 NO	10A FOR 1→20 pt

RANGE (HOT PLATE)

5KW = $\frac{5 \times 10^3 \times 0.5}{240}$ = 10.4A

5KW = 10.4A

6.6KW = $\frac{6.6 \times 10^3 \times 0.5}{240}$ = 17.7A

INSTANTANEOUS WATER HEATER

$\frac{4.8 \times 10^3 \times 0.33}{240}$ = 7.5A

4KW AIRCON = $\frac{4 \times 10^3 \times 0.75}{240}$ = 12.5A

3.6KW CLOTH DRYER = $\frac{3.6 \times 10^3 \times 0.5}{240}$ = 7

DEMAND OF THE HEAVIEST LOADED PHASE

TALLATION COMPRISING

OUTLET (15+9)

12.96/3 = 4.3

OUS WATER HEATER

1 X 4KW AIR CON

FOR 3Φ CONNECTION IS AS FOLLOWS

	BLUE
SOCKET OUTLET	26 LIGHTS
PLATE	6 NO 10A SOCKET OUTLET
	6 NO 6KW RANGE
NTANEOUS HEATER	4.8KW INSTANTANEOUS WATER HEATER
CLOTH	
HEATER	

DOMESTIC INSTALLATION — TABLE C1

EQUIPMENT	LOAD GROUP	COLUMN	RED	WHITE	BLUE
26 LIGHTS 1st 20 pt = 3A 2nd 6 pt = 2A 5A	A(i)	2			→ 5A
10A SOCKET OUTLET 15 NO 10A FOR 1→20 pt 9 NO 10A FOR 1→20 pt	B(i)	2		→ 10 → 10	
RANGE (HOT PLATE) 5KW = $\frac{5\times10^3\times0.5}{240}$ = 10.4A 5KW = 10.4A 6.6KW = $\frac{6.6\times10^3\times0.5}{240}$ = 12.7A	C	2		→ 10.4 → 10.4 → 12.7	
INSTANTANEOUS WATER HEATER $\frac{4.8\times10^3\times0.33}{240}$ = 7.5A	E	2		→ 7.5 → 7.5 → 7.5	
4KW AIRCON = $\frac{4\times10^3\times0.75}{240}$ = 12.5A	D	2		→ 12.5	
3.6KW CLOTH DRYER = $\frac{3.6\times10^3\times0.5}{240}$ = 7.5	C	2		7.5	

RED	WHITE	BLUE
30.9A	35.9A	35L

WHITE 35.9A

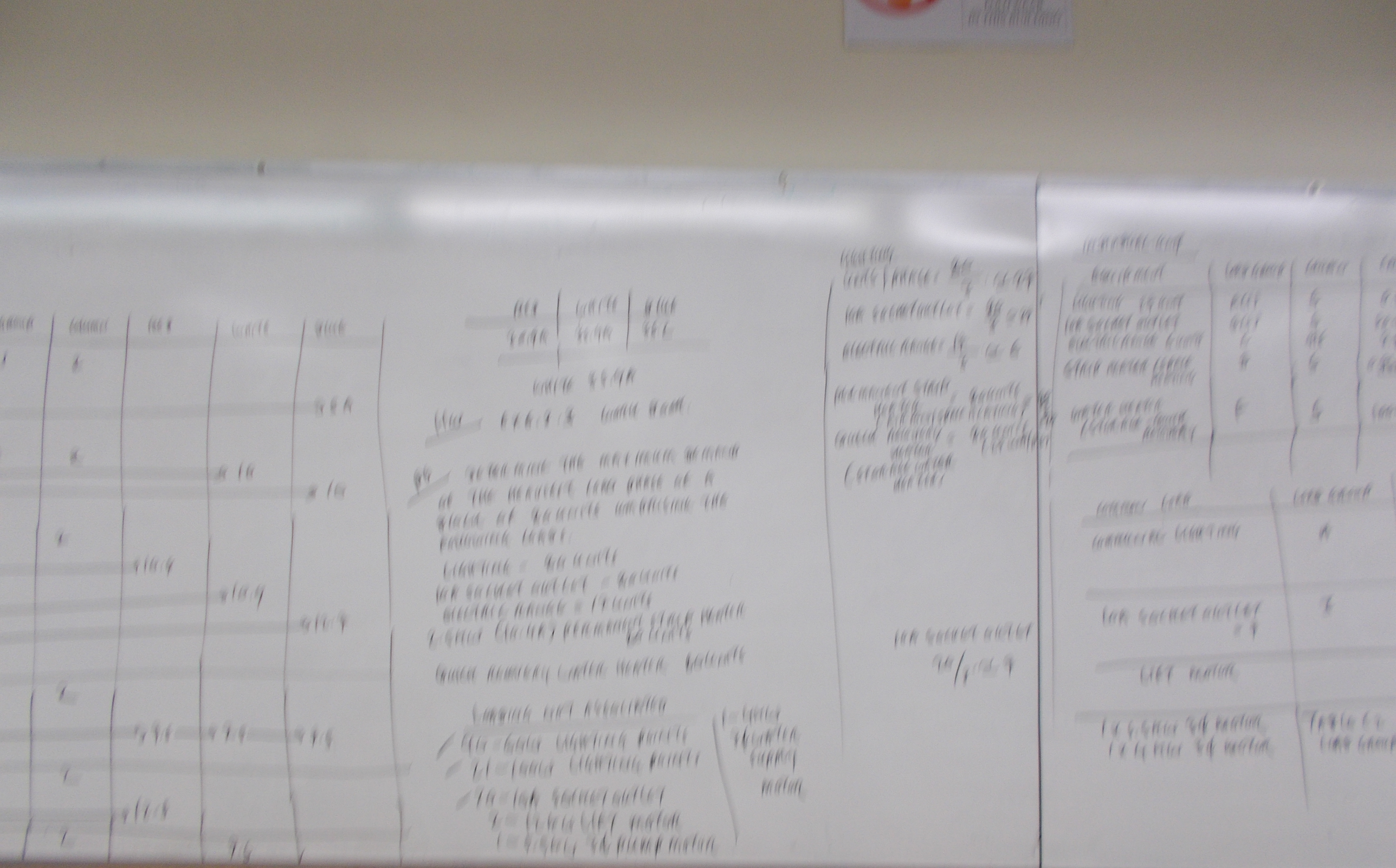
HW EX 6.2.3 WORK BOOK

Pb/ DETERMINE THE MAXIMUM DEMAND OF THE HEAVIEST LOAD PHASE OF A BLOCK OF 80 UNITS COMPRISING THE FOLLOWING LOADS.

LIGHTING - 80 UNITS
10A SOCKET OUTLET - 80 UNITS
ELECTRIC RANGE = 17 UNITS
2-5KW (10.4A) PERMANENT STRIP H
80 UNITS

QUICK RECOVERY WATER HEATER 80

LOADING NOT ASSOCIATED
90-60W LIGHTING POINTS
21-100W LIGHTING POINTS
70-10A SOCKET OUTLET
2-12KW LIFT MOTOR
1-5.5KW 3Φ PUMP MOT



RED	WHITE	BLUE
30.9A	35.9A	35.2

WHITE 35.9A

1-1W EX6.2.3 WORK BOOK.

pb DETERMINE THE MAXIMUM DEMAND OF THE HEAVIEST LOAD PHASE OF A BLOCK OF 80 UNITS COMPRISING THE FOLLOWING LOADS.

LIGHTING - 80 UNITS
10A SOCKET OUTLET - 80 UNITS
ELECTRIC RANGE = 17 UNITS
2.5KW (10.4A) PERMANENT STRIP HEATER
80 UNITS

QUICK RECOVERY WATER HEATER 80 UNITS

LOADING NOT ASSOCIATED	
90-60W LIGHTING POINTS	1-4KW 3ϕ WATER SUPPLY MOTOR
21-100W LIGHTING POINTS	
20-10A SOCKET OUTLET	
2-12KW LIFT MOTOR	
1-5.5KW 3ϕ PUMP MOTOR	

LIGHTING

UNITS / PHASE = $\frac{80}{3} \simeq 27$

10A SOCKET OUTLET = $\frac{80}{3} \simeq 27$

ELECTRIC RANGE = $\frac{17}{3} \simeq 6$

PERMANENT STRIP HEATER (AIR CON/SPACE HEATING) = 80 UNITS = $\frac{80}{3} = 27$

QUICK RECOVERY HEATER (STORAGE WATER HEATER) = 80 UNITS (27 UNIT/PH)

10A SOCKET OUTLET

$20/3 \simeq 7$

INDIVIDUAL UNIT

EQUIPMENT	LOAD GROUP	COLUMN	CALCULATION	RESULT
LIGHTING 27 UNIT	A(i)	S	0.5 x 27 = 13.5A	13.5 A
10A SOCKET OUTLET	B(i)	S	50 + 1.9 x 27 = 101.3	101.3A
ELECTRIC RANGE 6 UNITS	C	415	2.8 x 6 = 16.8	16.8A
STRIP HEATER (SPACE HEATING	D	S	$\frac{0.75 \times 2.5 \times 10^3}{240} \times 27 = 210.6$	210.6A
WATER HEATER (STORAGE - QUICK RECOVERY	F	S	100 + 0.8 x 27 = 121.6	121.6
				463.8 A

COMMON LOAD	LOAD GROUP	COLUMN		RESULT
			FULL CONNECTED LOAD.	
COMMUNAL LIGHTING	H	3+4+5	$\frac{40 \times 60 + 21 \times 100}{240 \times 3}$	10.4
10A SOCKET OUTLET = 7	I	3+4+5	2 x 7 = 14 A (MAX 15)	14
LIFT MOTOR			NOT APPLICABLE	
1 x 5.5KW 3ϕ MOTOR 1 x 4 KW 3ϕ MOTOR	TABLE C2 LOAD GROUP D	2	FULL LOAD OR HIGHER + 50%, REMAINDER $\frac{5.5 \times 10^3 + 0.5 \times 4 \times 10^3}{\sqrt{3} \times 415}$	15.3
				39.7A

TOTAL LOAD = 463.8 + 39.7
= 503.5 A

1ϕ POWER = EI (cosθ ≈ 1)

3ϕ POWER = $\sqrt{3}$EI (cosθ ≈ 1)

$$I = \frac{3\phi \text{ POWER}}{\sqrt{3}E}$$

RED	WHITE	BLUE
30.9A	35.9A	35.2

WHITE 35.9A

1-1W EX6.2.3 WORK BOOK.

pb DETERMINE THE MAXIMUM DEMAND OF THE HEAVIEST LOAD PHASE OF A BLOCK OF 80 UNITS COMPRISING THE FOLLOWING LOADS.

LIGHTING - 80 UNITS
10A SOCKET OUTLET - 80 UNITS
ELECTRIC RANGE = 17 UNITS
2-5KW (10.4A) PERMANENT STRIP HEATER 80 UNITS

QUICK RECOVERY WATER HEATER 80 UNITS

LOADING NOT ASSOCIATED

- 90-60W LIGHTING POINTS
- 21-100W LIGHTING POINTS
- 20-10A SOCKET OUTLET
  - 2-12KW LIFT MOTOR
  - 1-5.5KW 3ϕ PUMP MOTOR

1-4KW 3ϕ WATER SUPPLY MOTOR

LIGHTING

UNITS / PHASE = $\frac{80}{3} \simeq 27$

10A SOCKET OUTLET = $\frac{80}{3} \simeq 27$

ELECTRIC RANGE = $\frac{17}{3} \simeq 6$

PERMANENT STRIP HEATER = 80 UNITS (AIR CON/SPACE HEATING) = $\frac{80}{3} = 27$

QUICK RECOVERY HEATER = 80 UNITS (27 UNIT/PH)
(STORAGE WATER HEATER)

10A SOCKET OUTLET

$20/3 \simeq 7$

INDIVIDUAL

EQUIP ME

LIGHTING 27

10A SOCKET OU

ELECTRIC RANG

STRIP HEATER

WATER HEATE
(STORAGE -
RE

COMMON

COMMON AL

10A SO

LIF

1 x 5.5K
1 x 4 K

$\frac{80}{3} \simeq 27$

LOT = $\frac{80}{3} \simeq 27$

$\frac{17}{3} \simeq 6$

= 80 UNITS

PACE HEATING) = $\frac{80}{3}$ = 27

= 80 UNITS (27 UNIT/PH)

ET OUTLET

$\frac{7}{3} \simeq 7$

INDIVIDUAL UNIT

EQUIPMENT	LOAD GROUP	COLUMN	CALCULATION	RESULT
LIGHTING 27 UNIT	A(i)	5	$0.5 \times 27 = 13.5A$	13.5 A
10A SOCKET OUTLET	B(i)	5	$50 + 1.9 \times 27 = 101.3$	101.3A
ELECTRIC RANGE 6 UNITS	C	4|5	$2.8 \times 6 = 16.8$	16.8A
STRIP HEATER (SPACE HEATING	D	5	$\frac{0.75 \times 2.5 \times 10^3}{240} \times 27 = 210.6$	210.6A
WATER HEATER (STORAGE - QUICK RECOVERY	F	5	$100 + 0.8 \times 27 = 121.6$	121.6
				463.8 A

TOTAL LO

1φ POW

3φ POW

COMMON LOAD	LOAD GROUP	COLUMN		RESULT
COMMUNAL LIGHTING	H	3+4+5	FULL CONNECTED LOAD: $\frac{40 \times 60 + 21 \times 100}{240 \times 3}$	10.4
10A SOCKET OUTLET = 7	I	3+4+5	$2 \times 7 = 14A$ (MAX 15)	14
LIFT MOTOR			LOT APPLICABLE	
1 X 5.5KW 3φ MOTOR 1 X 4 KW 3φ MOTOR	TABLE C2 LOAD GROUP D	2	FULL LOAD OF HIGHEST + 50% REMAINDER $\frac{5.5 \times 10^3 + 0.5 \times 4 \times 10^3}{\sqrt{3} \times 415}$	10.4
				34.8

INDIVIDUAL UNIT

EQUIPMENT	LOAD GROUP	COLUMN	CALCULATION	RESULT
LIGHTING 27 UNIT	A(i)	S	$0.5 \times 27 = 13.5A$	13.5 A
10A SOCKET OUTLET	B(i)	S	$50 + 1.9 \times 27 = 101.3$	101.3A
ELECTRIC RANGE 6 UNITS	C	4IS	$2.8 \times 6 = 16.8$	16.8 A
STRIP HEATER (SPACE HEATING	D	S	$\frac{0.75 \times 2.5 \times 10^3}{240} \times 27 = 210.6$	210.6A
WATER HEATER (STORAGE - QUICK RECOVERY	F	S	$100 + 0.8 \times 27 = 121.6$	121.6
				463.8 A

COMMON LOAD	LOAD GROUP	COLUMN		RESULT
COMMUNAL LIGHTING	H	3+4+5	FULL CONNECTED LOAD: $\frac{40 \times 60 + 21 \times 100}{240 \times 3}$	10.4
10A SOCKET OUTLET = 7	I	3+4+5	$2 \times 7 = 14A$ (MAX IS)	14
LIFT MOTOR			NOT APPLICABLE	
1 x 5.5KW 3φ MOTOR 1 x 4 KW 3φ MOTOR	TABLE C2 LOAD GROUP D	2	FULL LOAD OF HIGHEST + 50% REMAINDER $\frac{5.5 \times 10^3 + 0.5 \times 4 \times 10^3}{\sqrt{3} \times 415}$	10.4
				34.8

TOTAL LOAD = 463.8 + 34.8
= 498.6 A

1φ POWER = $EI(\cos\theta \simeq 1)$

3φ POWER = $\sqrt{3}EI(\cos\theta = 1)$

$$I = \frac{3\phi \text{ POWER}}{\sqrt{3}E} \quad \text{(i)}$$

1			2	3
Load group			Residential institutions, hotels, boarding houses, hospitals, accommodation houses, motels[1]	Factories, shops, stores, offices, business premises, schools and churches[1]
(A)	Lighting other than in load group (F)		75% connected load	Full connected load
(B)	(i)	Socket-outlets not exceeding 10 A other than those in (B)(ii)	1000 W for first outlet plus 400 W for each additional outlet	1000 W for first outlet plus 750 W for each additional outlet
	(ii)	Socket-outlets not exceeding 10 A in buildings or portions of buildings provided with permanently installed heating or cooling equipment or both	1000 W for first socket-outlet, plus 100 W for each additional outlet	
	(iii)	Socket-outlets exceeding 10 A	Full current rating of highest rated socket-outlet, plus 50% of full current rating of remainder	Full current rating of highest rated socket-outlet plus 75% of full current rating of remainder
(C)	(i)	Appliances for cooking, heating and cooling, including instantaneous water heaters, but not appliances included in load groups (D) and (J) below	Full connected load of highest rated appliance, plus 50% of full load of remainder	Full connected load of highest rated appliance, plus 75% of full load of remainder
	(ii)	Charging equipment associated with electric vehicles	Full connected load of highest rated appliance plus 75% of full load of remainder	Full connected load of highest rated appliance, plus 75% of full load of remainder
(D)	Motors other than in (E) and (F) below		Full load of highest rated motor, plus 50% of full load of remainder	Full load of highest rated motor, plus 75% of full load of second highest rated motor, plus 50% of full load of remainder
(E)	Lifts		(i) Largest lift motor—125% full load (ii) Next largest lift motor—75% full load	

NON DOMESTIC ENERGY DEMAND METHOD

P19 A SMALL RETAIL COMPLEX CONSISTING of 3 SHOPS AT STREET LEVEL 280m² EACH AND 3 OFFICES 250m² EACH ON FIRST FLOOR ALL SHOPS AND OFFICE HAVE REVERSE CYCLE AIR CONDITIONING DETERMINE THE MAXIMUM DEMAND SUPPLYING INDIVIDUAL SHOP AND OFFICE.

TABLE (C3)

LIGHTS + POWER, AIR CON → OFFICE, RETAIL SHOP

TYPE OF OCCUPANCY	LOAD	AREA	VA/m²	VA
SHOP	LIGHT + POWER	280m²	70	19600
	AIR CON	280m²	30	8400
			TOTAL	28000
OFFICE	LIGHT + POWER	250m²	50	12500
	AIR CON	250m²	25	6250
			TOTAL	18750

SHOP MAXIMUM DEMAND = 28000 / √3 × 400

OFFICE MAXIMUM DEMAND = 187 / √3 ×

32

FIL

ELECTRICAL ENG

	AREA	VA/m²	VA
power	230 m²	70	19600
	230 m²	30	6900
		TOTAL	28000
power	250 m²	50	12500
con	250 m²	25	6250
		TOTAL	18750 VA

SHOP MAXIMUM DEMAND = $\frac{28000}{\sqrt{3}\times 400}$ = 41A /ph — 50A HRC fuse (OR) C43
CABLE SIZE MINIMUM 50A

OFFICE MAXIMUM DEMAND = $\frac{18750}{\sqrt{3}\times 400}$ = 28A /ph

32A HRC fuse (OR) CIRCUIT BREAKER
FOR PROTECTION.

CABLE SIZE = MINIMUM 32A

HW X6.2.4

LIGHTING
UNITS / PHASE = $\frac{80}{3} \simeq 27$
10A SOCKET OUTLET = $\frac{80}{3} \simeq 27$
ELECTRIC RANGE = $\frac{17}{3} \simeq 6$
PERMANENT STRIP HEATER (AIR CON/SPACE HEATING) = 80 UNITS
QUICK RECOVERY HEATER (STORAGE WATER HEATER) = 80 UNITS (27 UNIT/PH)

10A SOCKET OUTLET
$20/3 \simeq 7$