

राजकीय पॉलिटेक्निक महाविद्यालय कर्ली
विद्युत विभाग

II - Mid term test

Subject - Electrical INSTALLATION
ESTIMATING & COSTING

Code - EE 303

Max Mark - 15

DATE \Rightarrow 10/1/2018

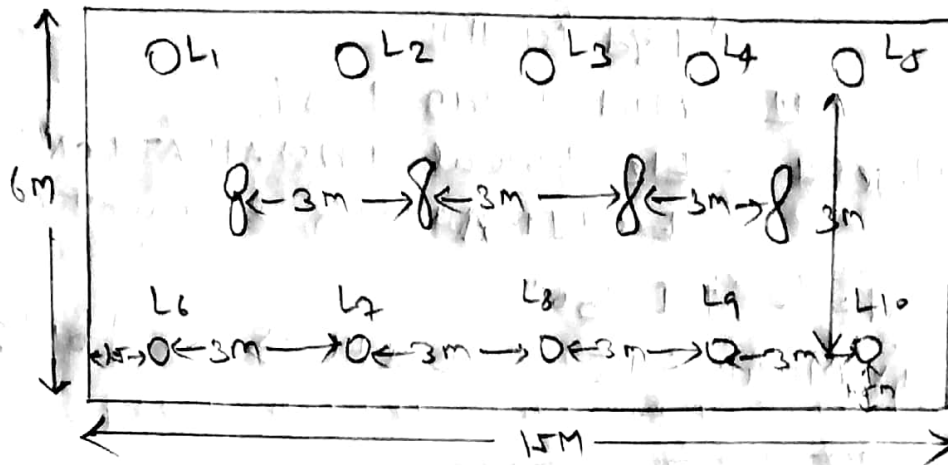
Q. Attempt any two questions. Question No 3 is compulsory

Q=1. Draw the electric ckt and estimate the quantity of material and total cost for PVC wiring system used in a hall of $15\text{m} \times 6\text{m} \times 4\text{m}$ height. The hall is to be fitted with 04 fan point and 10 light ~~point~~ ^{point} (10)

OR
Q=2. A 7 HP, 415V, 3- ϕ , 50HZ Induction motor is to be installed in a workshop of which is shown in fig. Show the layout of the wiring and estimate the quantity of material required and give its (10) approximate cost.

Q=3. A single store building at 240V, 1- ϕ , 50HZ, having a light and fan load of 5KW. Find the conductor size and draw GI service connection diagram for building. (05)

Solution = 1.



Connected load = $10 \times 100 + 4 \times 60 = 1240$ Watts
 Assuming supply voltage of 240V

$$\text{Line current} = \frac{1240}{240} = 5.2 \text{ A}$$

So 1/1.80mm, single core aluminium conductor PVC cable having current carrying capacity of 15 amperes, maximum load ~~switch~~ which can be connected in one ckt is 800 Watts. We will have two ckt, each of them having 7 points and a load of 620 Watts.

5 Lamp + 2 fan
 $5 \times 100 + 2 \times 60$
 620W each ckt.

since full load current in each ckt = $\frac{620}{240} = 2.6 \text{ A}$

1/1.40mm Aluminium conductor, single core, PVC cable having current carrying capacity of 10 amperes with

other data assumed are \Rightarrow

- (i) The height at which meter board / main switch board are to be fitted = 1.5 meter from ground level.
- (ii) The height at which conduit will be run = 3.5 meter from ground level.
- (iii) The meter board is to be fixed on entrance wall at a distance of 2 meter from the left hand side wall.

Length of PVC Conduit

CKT No 1 \Rightarrow from meter board to main board = 0.2m
Vertical run above main board = 2.0m

Horizontal run along the wall above the main entrance = 2.2m
Horizontal run along the left hand wall up to $L_5 = 15 - 7.5 = 13.5m$

Vertical drop along the left hand side wall up to switch boards
 SB_1 and $SB_2 = 2 + 2 = 4.0m$

Vertical run up to ceiling and run along the ceiling up to
Point L_1, L_2, L_3, L_4 and L_5
 $= 5 \times (1 + 1.5) = 12.5m$

Vertical run up to ceiling and run along the ceiling up to
Points F_1 and $F_2 = 2 \times (1 + 3) = 8.0m$

CKT No 2 \Rightarrow The horizontal run along the entrance wall = 3.8m

Horizontal run along the right hand side wall up to $L_6 = 15 - 1.5 = 13.5m$

Vertical drop along the right hand side wall up to switch boards
 SB_3 and $SB_4 = 2 + 2 = 4m$

Vertical run up to ceiling and run along the ceiling up to points
 L_6, L_7, L_8, L_9 and $L_{10} =$
 $5 \times (1 + 1.5) = 12.5m$

Vertical run up to ceiling and run along ceiling up to points
 F_3 and $F_4 = 2 \times (1 + 3) = 8.0m$

total Length of PVC conduit run = $0.2 + 2.0 + 2.2 + 13.5 +$
 $4 + 12.5 + 8.0 + 3.8 + 13.5$
 $+ 4.0 + 12.5 + 8.0 = 84.2$ meters

Wastage and Length used in Joints $15\% = 12.63$ meter

total length of PVC conduit required = $84.2 + 12.63$
 $= 96.83$ meter ≈ 100 meter

Length of 1/1.80mm, single core, ~~6~~ aluminum conductor
PVC cable from meter board = 0.50 meter (including wastage)

Length of 1/1.40mm, aluminum conductor, single core PVC cable.

ESTIMATE ON THE BASIS OF ITEM WIRE RATES

S No.	Description of Material with full specifications	Quantity Required		RATE			Amount		Remarks
		Quantity	Unit	₹	P	Per	₹	P	
1.	240 V grade, 16A, DPIC switch fuse	1	no	300	00	each	300	00	
2.	2 way, 240 V, 16 A / way MCB type double pole distribution board. Board MCB	1	do	300	00	do	300	00	DB with MCBs
		2	do	300	00	do	200	00	
3.	Teak wood boards double								
	(i) 30cm x 25cm	1	do	90	00	do	90	00	for main board
	(ii) 25cm x 20cm	4	do	65	00	do	260	00	for switch board
4.	PVC conduit pipe, 25mm diameter	100	m	22	50	m	2250	00	
5.	1/1.60mm single core 650 V grade aluminium conductor PVC cable	0.5	do	10	00	m	5	00	
6.	1/1.40mm single core 650 V grade aluminium conductor PVC cable	300	do	3	00	m	900	00	
7.	Piano switches; one way SA surface type	14	nos	12	00	each	168	00	
8.	Round wooden blocks 10cm x 4cm	14	do	16	50	do	231	00	
9.	ceiling rose two plate PVC type	14	do	12	00	do	168	00	
10.	pendant holders (PVC) type	10	do	18	00	do	180	00	
11.	flexible wire 23/0.193mm	25	m	8	00	m	200	00	
12.	Earth wire 14 SWG GI wire	0.25	m	10	00	m	2	50	1 meter weight 30 gms app
13.	Earthing thimbles with bolts and nuts	4	nos	15	00	each	60	00	
14.	wooden screws								
	5mm for wiring boards	50	do	48	00	100	22	50	
	19mm for fixing switches	100	do	30	00	100	30	00	
15.	PVC sheets for mounting switches ceiling rose, associated sizes	38	do	22	50	each	855	00	
16.	Cement, sand, Paint, Varnish etc.						300	00	ump sum provision

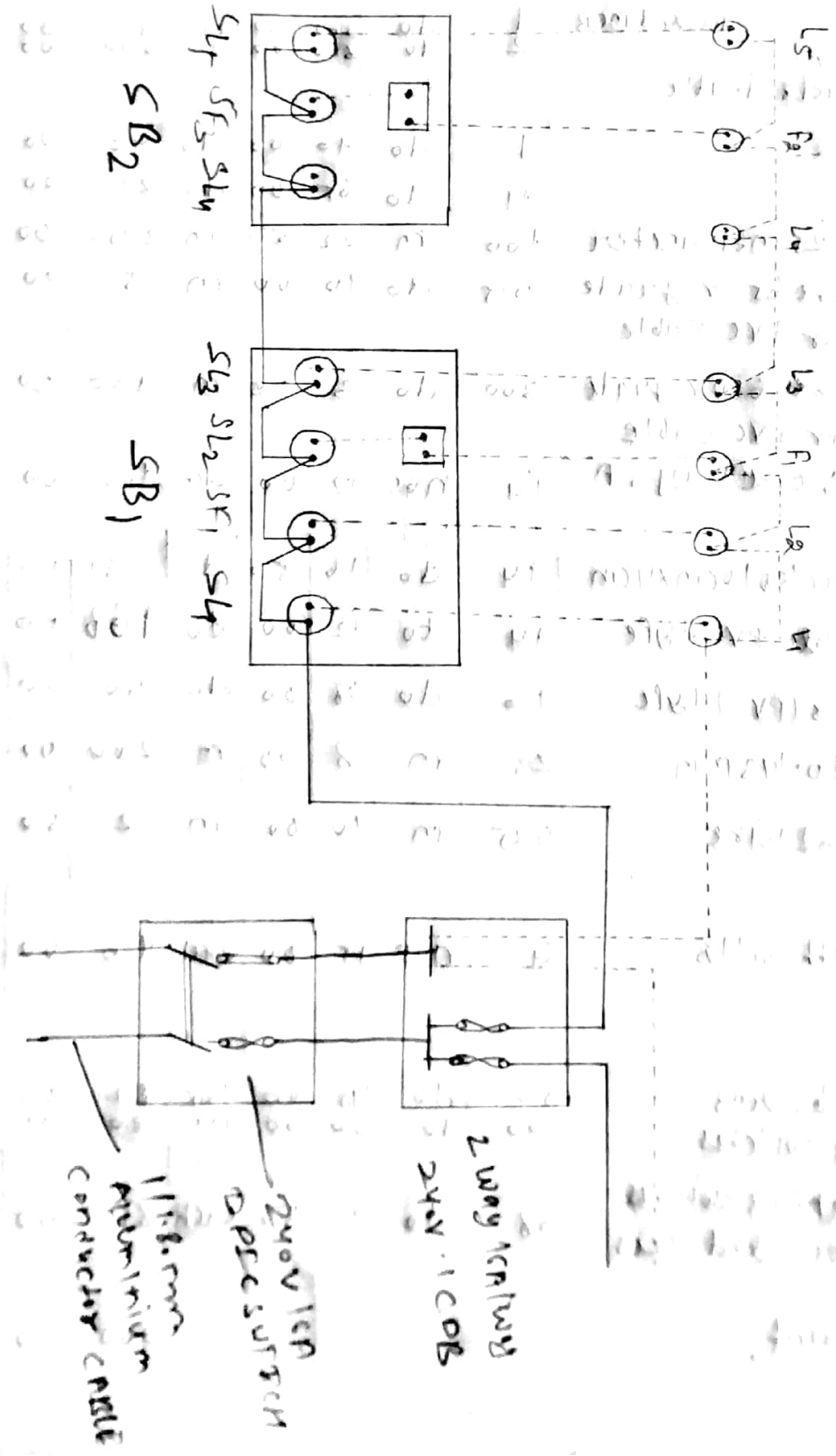
total = 69231
 Labour cost 6009 per point = 1083

total = 8003

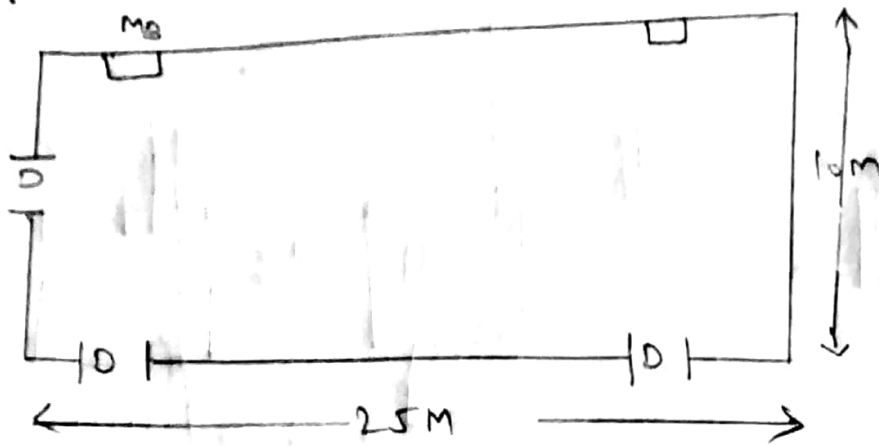
Contingencies 5% = 400

Grand total = 8403 DB

2 Point for
 MAD and
 2 points for



Solution = 2.



Assumptions made \Rightarrow

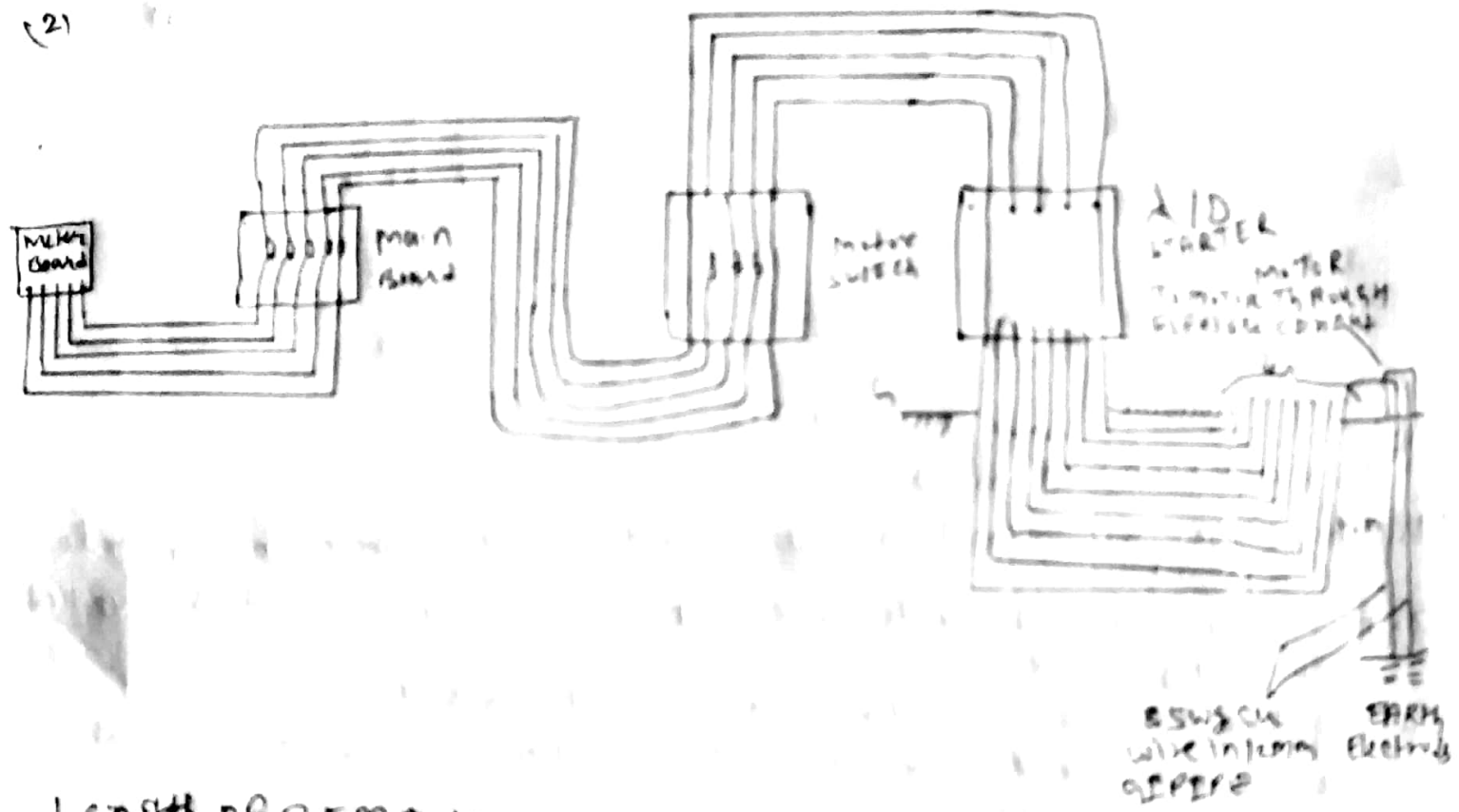
1. The motor and starter are to be procured through separate contract.
2. motor disconnect switches and main switches are to be supplied by wiring contractor.
3. All the conduits are to be run exposed on walls.
4. The main switch, motor switch and starter shall be mounted at a height of 1.5 meters from ground level.
5. Two earth wires will be run side by side for earthing the motor, starter and switches.
6. The motor shall be installed on suitable foundation 0.2m above the floor.
7. motor efficiency 85% and power factor 0.8 (lagging)

$$\text{full load current} = \frac{7 \times 735.5}{\sqrt{3} \times 415 \times 0.8 \times 0.85}$$
$$= 10.54 \text{ A}$$

$$\text{starting current} = 1.5 \text{ times full load current} = 1.5 \times 10.54$$
$$= 15.81$$

Hence three core PVC 6mm² aluminium conductor cable of current carrying capacity 32 A. may be used. The main switch and motor switch to be used will be 32 A 415 V TPCC switches.

(2)



Length of 25mm Hg Rigid Conduit =
 from meter board to main board = 0.5m
 from main board to motor switch (mounted on control board) = 2.2m
 total = 2.7m
 wastage 10% = 2.3m
 total = 25.1 meter

Length of 31mm Hg Conduit =
 from motor starter to ground = 1.5m
 Below ground level = 0.2m
 Along ground up to foundation = 1.0m
 up to top of motor foundation = 0.2 to 0.2 = 0.4m
 total = 1.5 + 0.2 + 0.4 + 1.0 = 3.1 meter
 wastage 10% = 0.31 meter
 total = 3.1 + 0.31 = 3.41 = 3.8 meter

Length of 25mm flexible conduit required for connecting motor switch to motor starter = 0.2m
 Length of 31mm flexible conduit required for connecting heavy gauge conduit to motor = 1 meter

Length of 3 core, 1100V grade, $1/2 \times 0.8 \text{ mm}^2$ aluminium conductor PVC
 (1) Length from meter board to main board = 0.25 M
 (2) 1/2 from main board to motor switch = 22.5 M
 (3) Length from motor switch to motor starter = 0.25 M
 (4) 2 Length from motor starter to motor terminal box = $2(3.2+1) = 8.2 \text{ M}$
 total Length = 31.25 M
 wastage = 3.13 M
 total = 34.38 = 35 meter

Length of Earth wire $\Rightarrow 2 \times$ Length of conduit including Length of flexible
 $= 2 \times (25 + 3.5 + 0.25 + 1)$
 $= 59 \text{ meter} = 60 \text{ meter.}$

ON THE BASIS OF ITEM WISE RATES \Rightarrow

S. NO	DESCRIPTION of material with full specifications	Quantity Required		RATE		Per	Amount		Remarks
		Quantity	UNIT	Q	P		Q	P	
1.	32 A, 415V TPIC rewirable type switches	2	Nos	500	0	each	3000	00	
2.	IC boards complete with locking arrangement etc.								
	(1) 25 cm x 30 cm	1	no	375	00	do	375	00	
	(2) 45 cm x 60 cm	1	do	900	00	do	900	00	
3.	heavy gauge TG SWH conduit								
	(1) 31 mm	2.5	m	38	00	m	133	00	
	(2) 25 mm	25	do	27	00	do	175	00	
4.	flexible conduit								
	(1) 31 mm	1	do	38	00	do	38	00	
	(2) 25 mm	0.25	do	22	00	do	5	75	
5.	3 core 1100V grade 6mm ²	35	do	60	00	do	2100	00	
6.	Conduit bends								
	(1) 31 mm	2	Nos	10	50	each	21	00	
	(2) 25 mm	6	do	9	00	do	54	00	
7.	Conduit saddles								
	(1) 31 mm	4	do	4	00	do	16	00	
	(2) 25 mm	25	do	3	00	do	75	00	
8.	Lock nuts								
	(1) 31 mm	6	do	7	50	do	45	00	
	(2) 25 mm	2	do	6	00	do	12	00	
9.	flexible pipe coupling complete with lock								
	(1) 31 mm	2	do	15	00	do	30	00	
	(2) 25 mm	2	do	12	00	do	24	00	
10.	Wooden lagging								
	(1) 31 mm	2	do	3	00	do	6	00	
	(2) 25 mm	6	do	3	00	do	18	00	Lump sum provision

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Solution = 3. Connected load $P = 5\text{KW}$ or 5000W
taking diversity factor of 1.66,

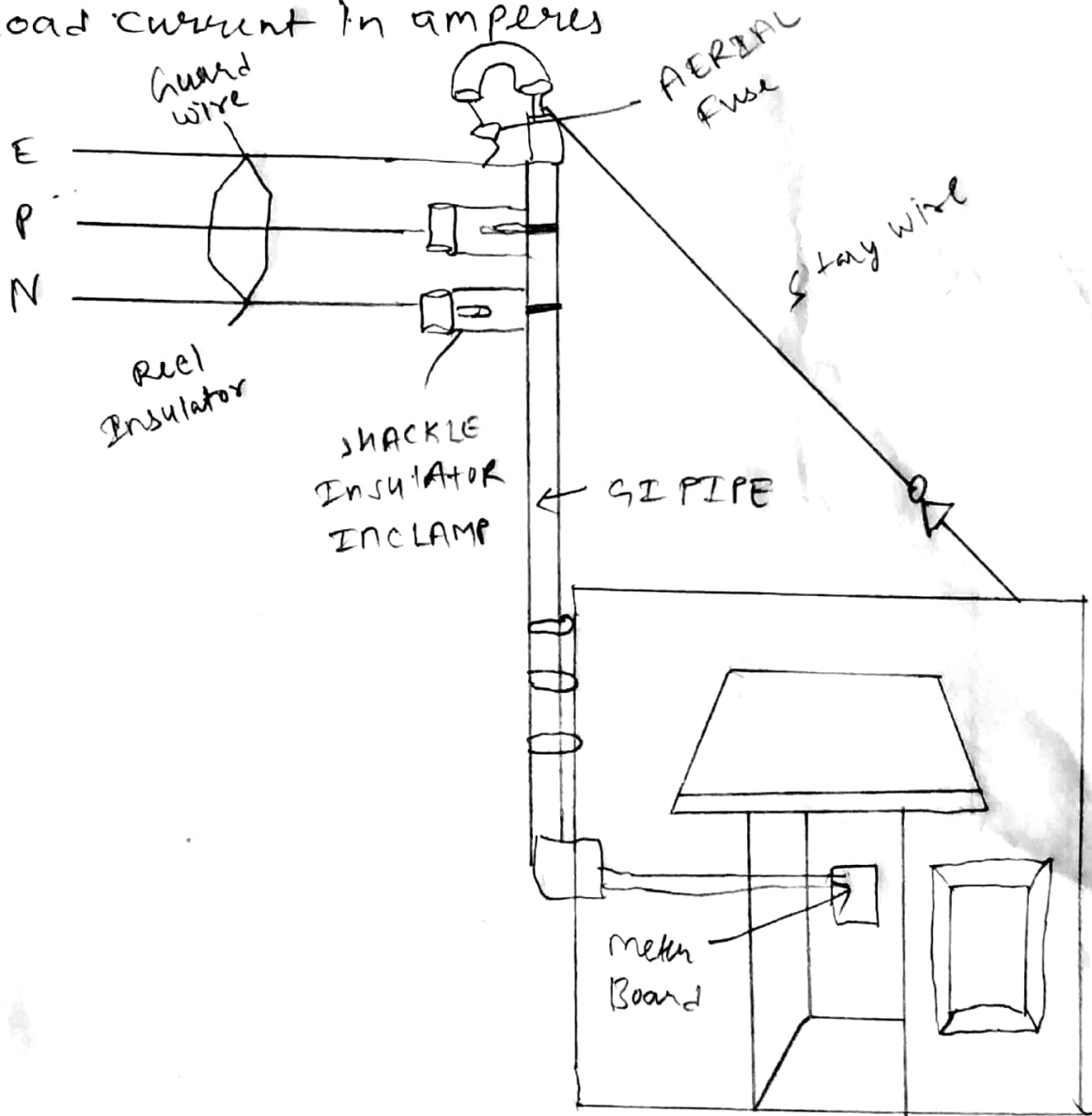
$$\text{total load requirement} = \frac{5000}{1.66} = 3000\text{W}$$

Keeping in view the future additional demand let the future load be twice of present load i.e. $2 \times 3000\text{W} = 6000\text{W}$

$$\text{total load requirement} = \frac{6000}{1.66} = 3600\text{W}$$

Keeping in view the future additional demand

Load current in amperes



G.I. PIPE Service Connection