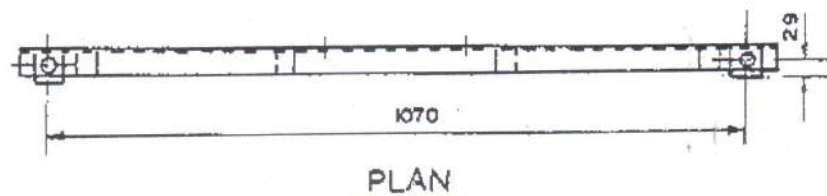
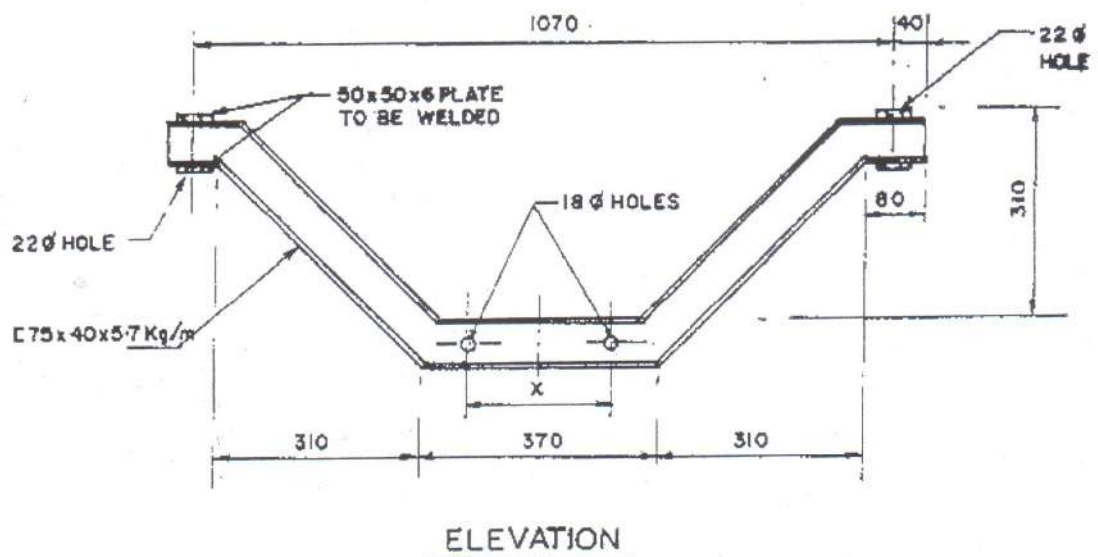


REC  
CONSTRUCTION STANDARD  
A-6



X :- -TO SUIT THE POLE  
NOTE:-AS AN ALTERNATIVE, M.S. ANGLE CROSS-ARM  
(A-13) MAY BE USED IF CHANNEL SECTION  
AS PER THIS STANDARD IS NOT AVAILABLE

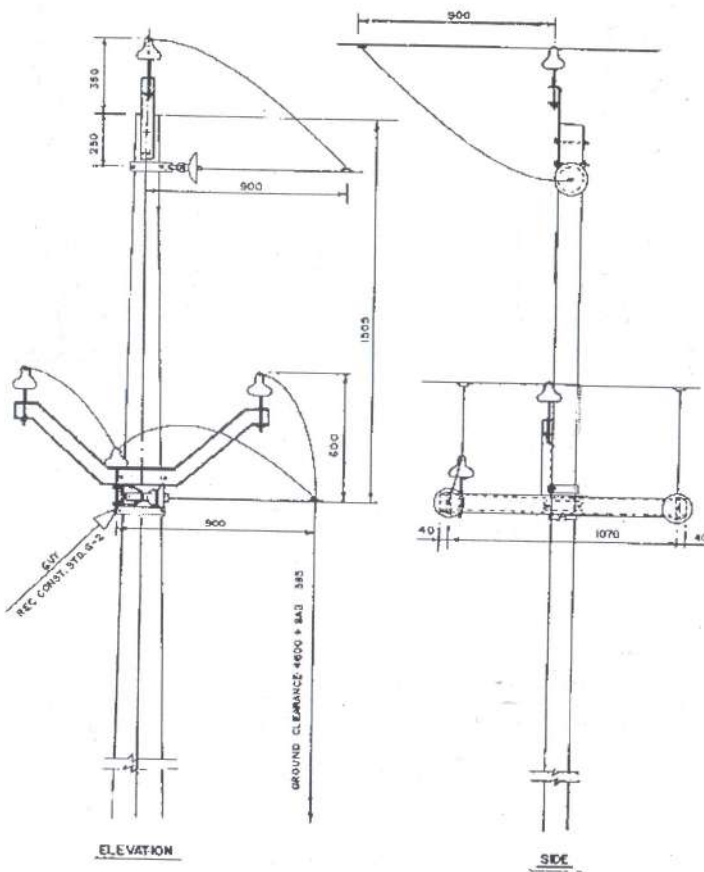
ALL DIMENSIONS ARE IN mm.

११ के.वी. लाईन  
V-क्रेसी भुजा  
11 KV LINES  
V - CROSS ARM

SCALE :- N.T.S

SEPT - 1972

REC  
CONSTRUCTION STANDARD  
A-II



BILL OF MATERIAL

P.C.C SUPPORT	8M LONG	1No.
CHANNEL (FOR V-CROSS ARM)	REFER REC CONST STD. A-6	1No.
CHANNEL (FOR HORIZONTAL CROSS ARM)	75x40-1150 (APPROX.)	1No.
11KV STRAIN INSULATORS WITH HARDWARE	—	3 Nos.
11KV PIN INSULATORS WITH PINS	—	4 Nos.
POLE TOP BRACKET	REFER REC. CONST. STD. A-7	1No.
GUY SET	REFER REC. CONST. STD. G-2	1No.
BASE PLATE	REFER REC. CONST. STD. K-1	1No.
PIPE / ROD EARTHING	REFER REC. CONST. STD. J-2	1No.
BACK CLAMP (FOR V-CROSS ARM)	REFER REC. CONST. STD. K-2	1No.
EARTHING MATERIAL, NUTS, BOLTS, CLAMPS ETC.	—	AS REQUIRED

NOTE: MAXIMUM SPAN BETWEEN THE TAPPING POLE AND ADJACENT POLE OF THE BRANCH LINE - 50 METRES

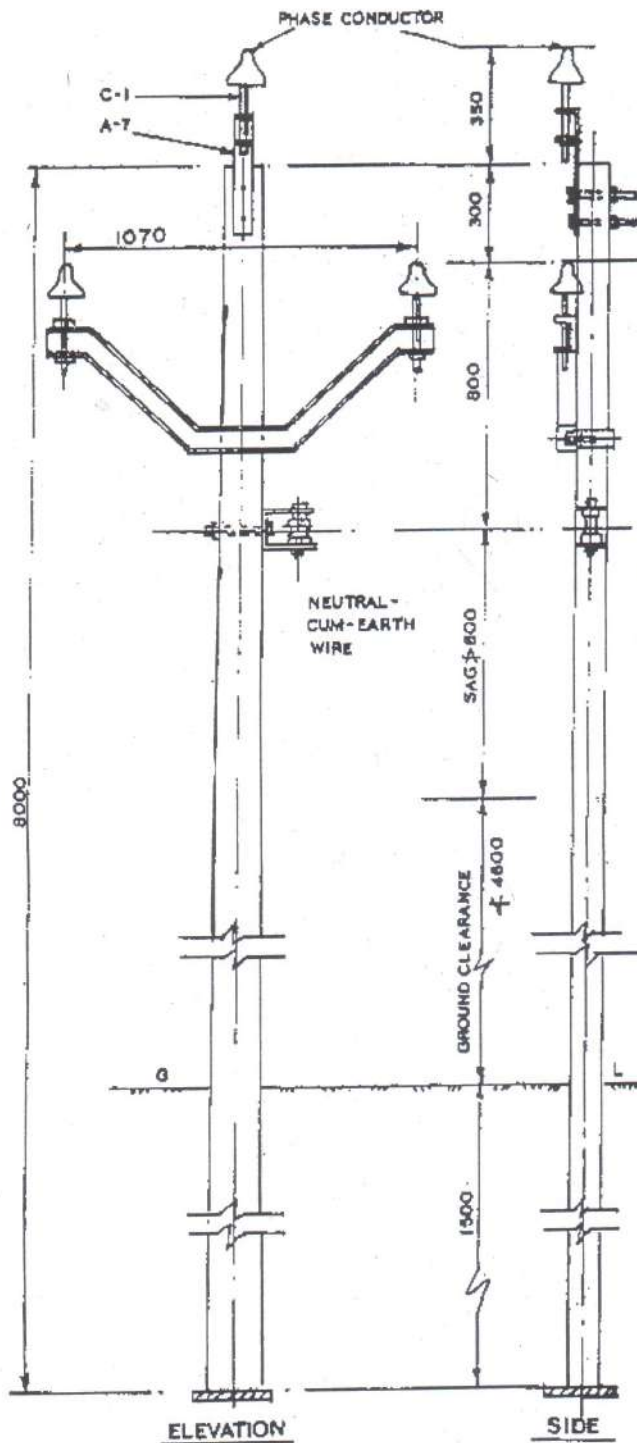
ALL DIMENSIONS ARE IN MM.

११ के. वी. लाईन  
निकाई व्यवस्था एक खम्भे से निकाई

11KV LINE  
TAPPING ARRANGEMENT  
SINGLE POLE TAPPING

SCALE: N.T.S. | FEB.-1979

**REC  
CONSTRUCTION STANDARD  
A-16**



**BILL OF MATERIAL**

P.C.C SUPPORT BM	1
POLE TOP BRACKET	1
V-CROSS ARM	1
11 KV PH INSULATOR WITH PINS	3
SHACKLE INSULATOR	1
U-CLAMP WITH BOLT	1
EARTHING MATERIAL	1
BOLTS, NUTS, CLAMPS ETC.	AS REQD.
BOLTS 16 #	4
BASE PLATE	1

**NOTES:-**

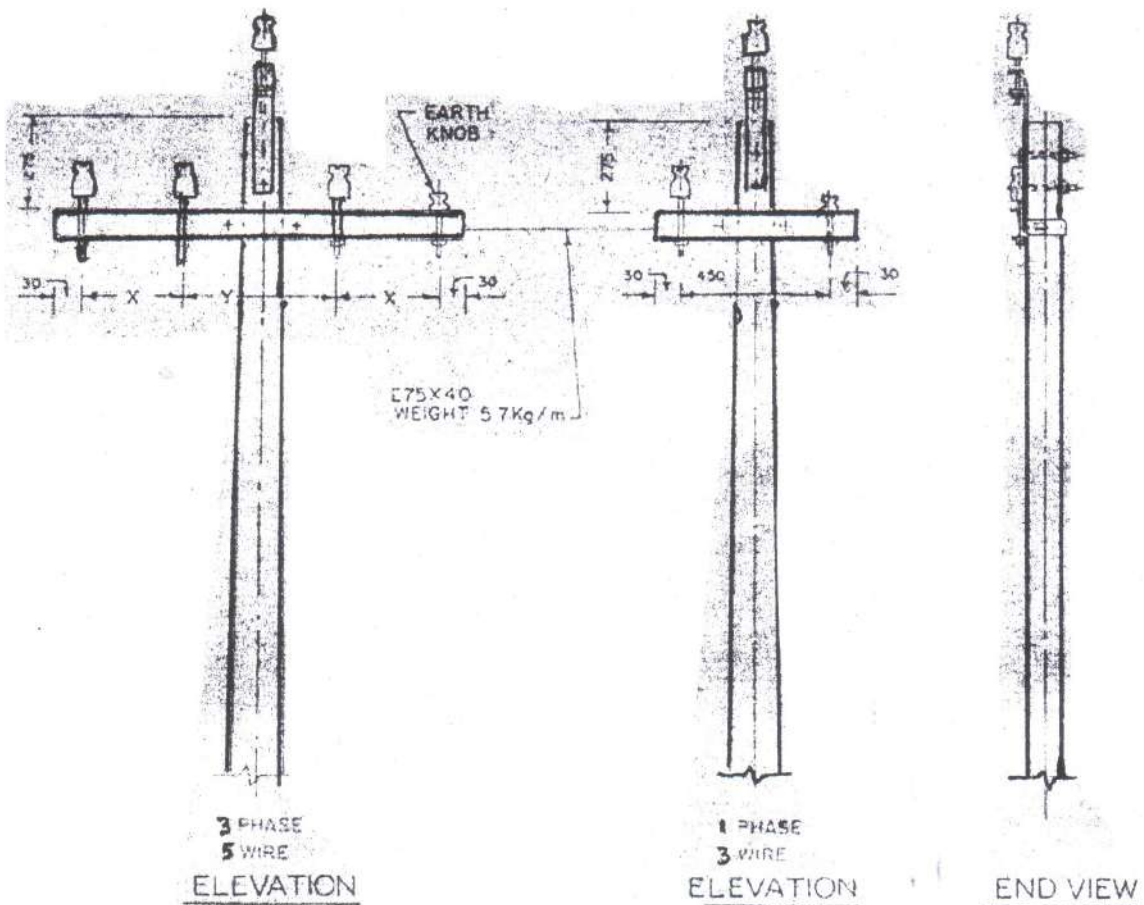
1. IF THROUGH BOLT ARRANGEMENT FOR FIXING THE SHACKLE INSULATOR TO THE POLE IS NOT POSSIBLE; SUITABLE POLE CLAMP MAY BE USED.
2. THE EARTH-CUM-NEUTRAL WIRE SHALL BE RUN ON LT SHACKLE INSULATORS

११ के.वी. ३-फेज लाइन व कन्डक्टर फार्मेशन  
और क्लोयर्स-३ फेज/सिंगल फेज कम्पोजिट सिस्टम  
फेज से-न्यूट्रल  
11 KV LINES

CONDUCTOR FORMATION AND CLEARANCES  
OF 11KV 3-PHASE LINE IN  
3-PHASE/SINGLE PHASE COMPOSITE SYSTEM  
(PHASE-TO-NEUTRAL)

SCALE:- N.T.S JULY, 1987

REC  
CONSTRUCTION STANDARD  
B-3



TANGENT LOCATION  
MAXIMUM SPAN - 67 METRES

SAGS	HORIZONTAL SPACING	
	X	Y
UP TO 750	300	450
750 TO 1200	450	450

ALL DIMENSIONS ARE IN mm

४१५/२४० वी. लाईन  
कन्डक्टर रचना व अंतराल  
गणना  
415/240V LINES  
CONDUCTOR FORMATION AND  
CLEARANCES  
HORIZONTAL FORMATION

SCALE - N.T.S

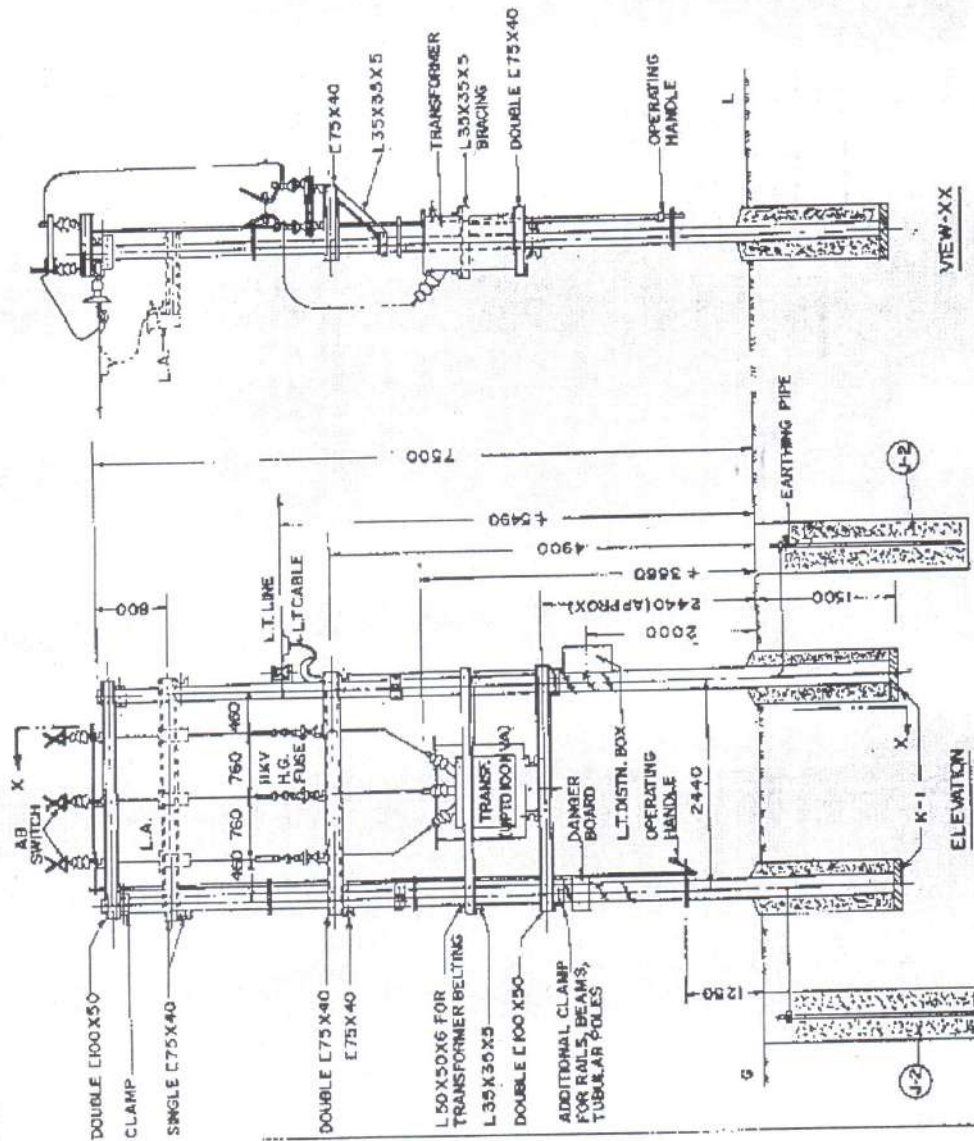
SEPT. - 1972



REC  
CONSTRUCTION STANDARD  
F-2

BILL OF MATERIAL

SUPPORTS	- 9 m.	2
CHANNELS	100X50 - 2600 (APPROX.)	4
CHANNELS	75X40 - 2600 (APPROX.)	2+1
CHANNELS	75X40 - X-ARM FOR SUPPORTING H.G. FUSE & L.A.	2+2
ANGLES	50X50X6 - 2600 (APPROX.)	2
ANGLES	35X35X5 - 460 (APPROX.)	2
ANGLES	35X35X5 - BRACING FOR SUPPORTING H.G. FUSE FOR SUPPORTING DISTRIBUTION BOX	2
DISTRIBUTION TRANSFORMER		1
AIR BREAK SWITCH (HORIZONTAL TYPE)		1
H.G. FUSE UNIT-3 PHASE		1 SET
11 KV. LIGHTNING ARRESTERS		3
DISTRIBUTION BOX		1
EARTHING SET		AS REQD.
DANGER BOARD		1
CLAMPS, NUTS, BOLTS, BARBED WIRE ETC. AS REQD.		AS REQD.
L.T. CABLE		AS REQD.

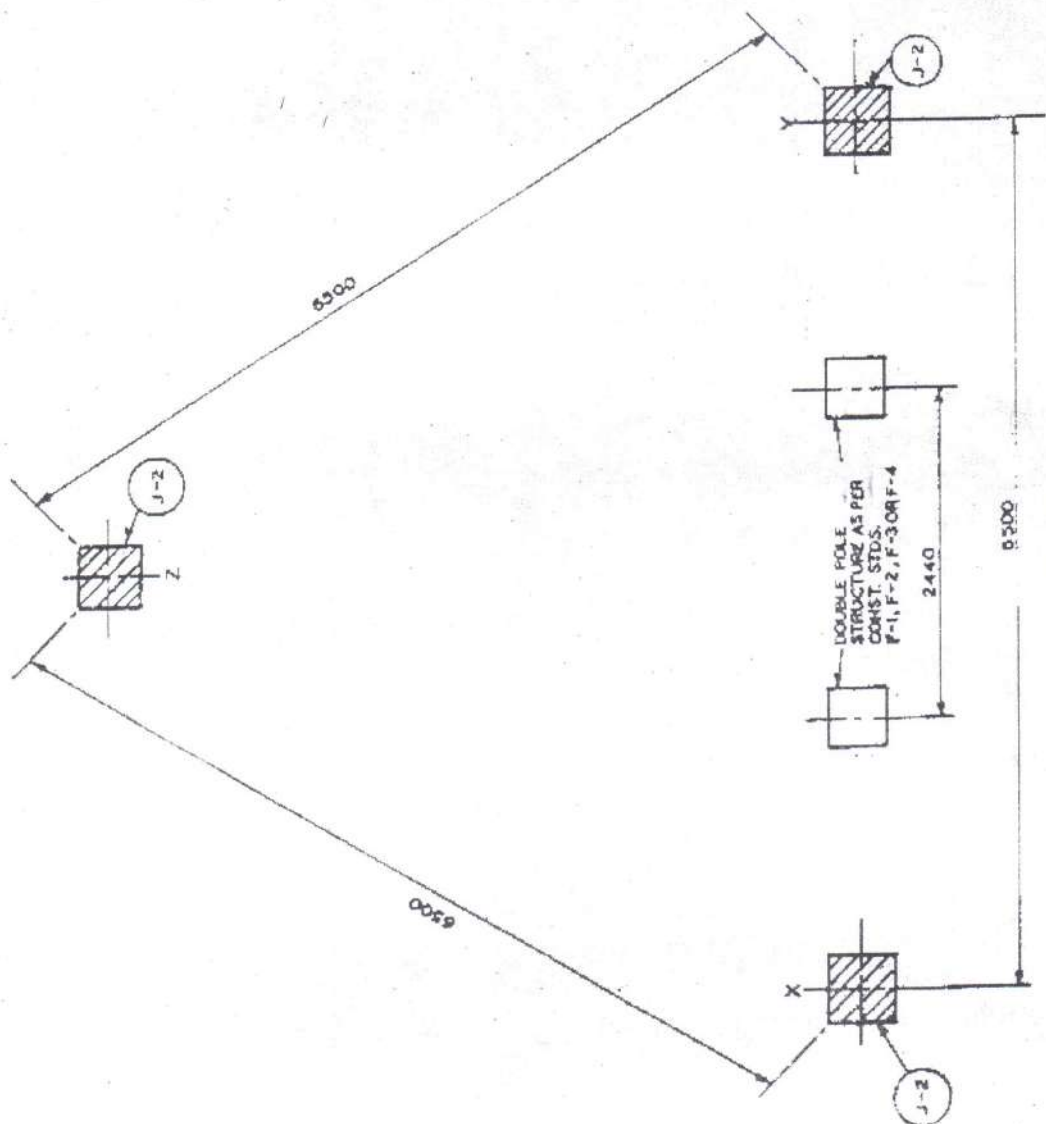


सं. ३०/४३३-२५० वॉल्ट  
११.००० वॉल्ट वॉल्ट वॉल्ट वॉल्ट  
वॉल्ट वॉल्ट वॉल्ट वॉल्ट  
11KV/433-250 V  
DISTRIBUTION SUB-STATION  
WITH A.B. SWITCH &  
HORN GAP FUSES  
SCALE: N.T.S. 1972 / JAN. - 195

# REC CONSTRUCTION STANDARD F-5

## NOTES

1. THE CONNECTIONS TO THE THREE - EARTH ELECTRODES SHOULD BE AS FOLLOWS:-
    - (a) TO ONE OF THE EARTH ELECTRODES ON EITHER SIDE OF DOUBLE POLE STRUCTURE (X OR Y).
    - (i) ONE DIRECT CONNECTION FROM THREE 11KV LIGHTNING ARRESTERS.
    - (ii) ANOTHER DIRECT CONNECTION FROM THE LT LIGHTNING ARRESTERS, IF PROVIDED.
  - (b) TO EACH OF THE REMAINING TWO EARTH - ELECTRODES.
  - iii) ONE SEPARATE CONNECTION FROM THE NEUTRAL (ON THE MEDIAN VOLTAGE SIDE) OF THE TRANSFORMER
  - iiii) ONE SEPARATE CONNECTION FROM THE TRANSFORMER BODY AND THE HANDLE OF THE 11KV AIR SWITCH.
  - iiiii) ONE SEPARATE CONNECTION FROM THE EARTHING TERMINAL OF THE POLES
2. 4mm (B.S.W.G) G.I.WIRE SHOULD BE USED FOR EARTH LEADS.



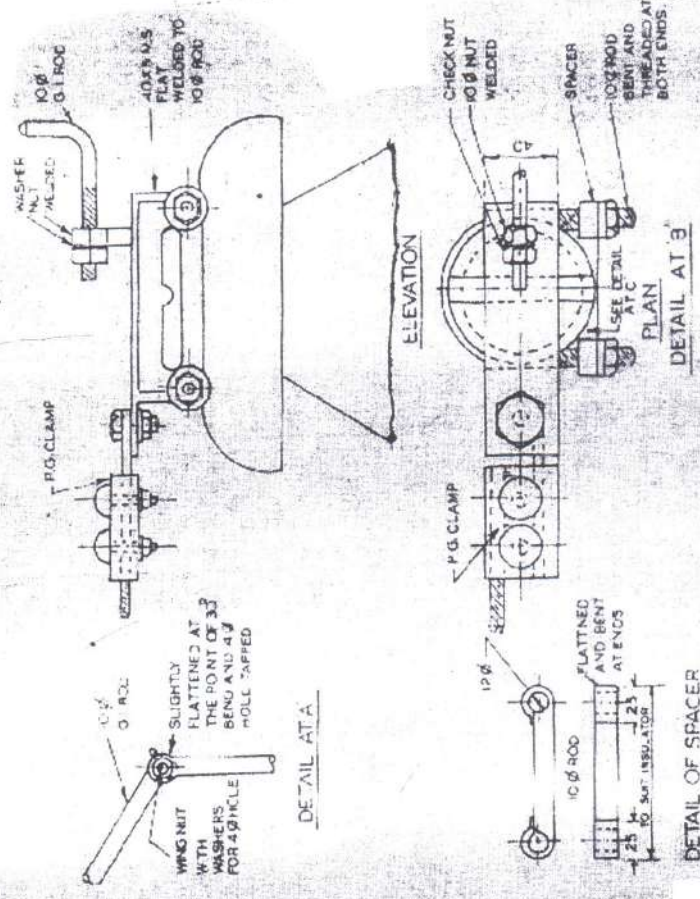
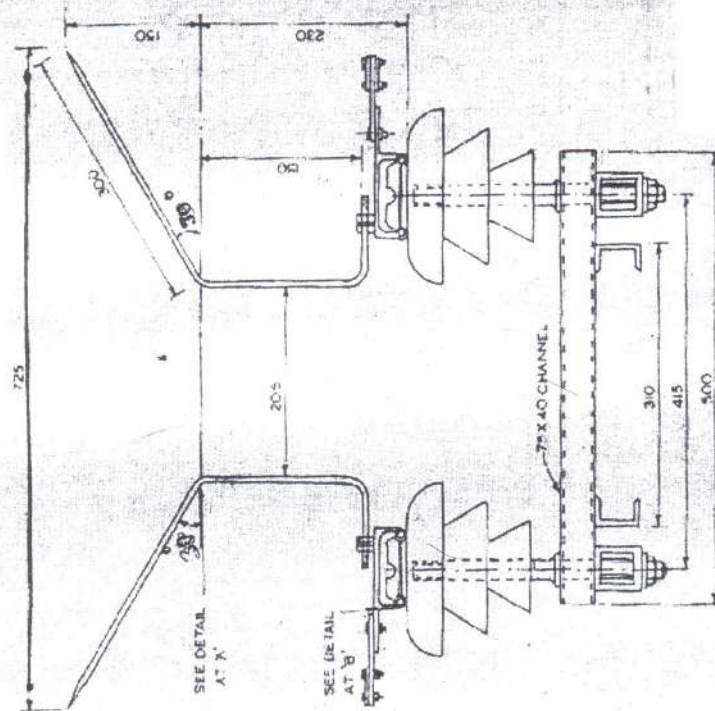
ALL DIMENSIONS ARE IN mm.

11 KV / 433-250V  
विद्युत सूचक-पैरा  
संयुक्त के बगैरे जो  
कमरे में है

11 KV/433-250V  
DISTRIBUTION SUB-STATION  
LOCATION OF EARTH PITS  
AND CONNECTIONS

R-2 SCALE : M.T.S. 1993 / JAN. - 1993

REC  
CONSTRUCTION STANDARD  
F-6



ALL DIMENSIONS ARE IN MM

११ के. वॉ. हॉर्न गैप फ्यूज

11KV HORN GAP FUSES

SCALE: 1:1



REC  
CONSTRUCTION STANDARD  
F-8  
(REVISED-1987)

RECOMMENDED TYPE AND SIZES OF MULTICORE CABLES

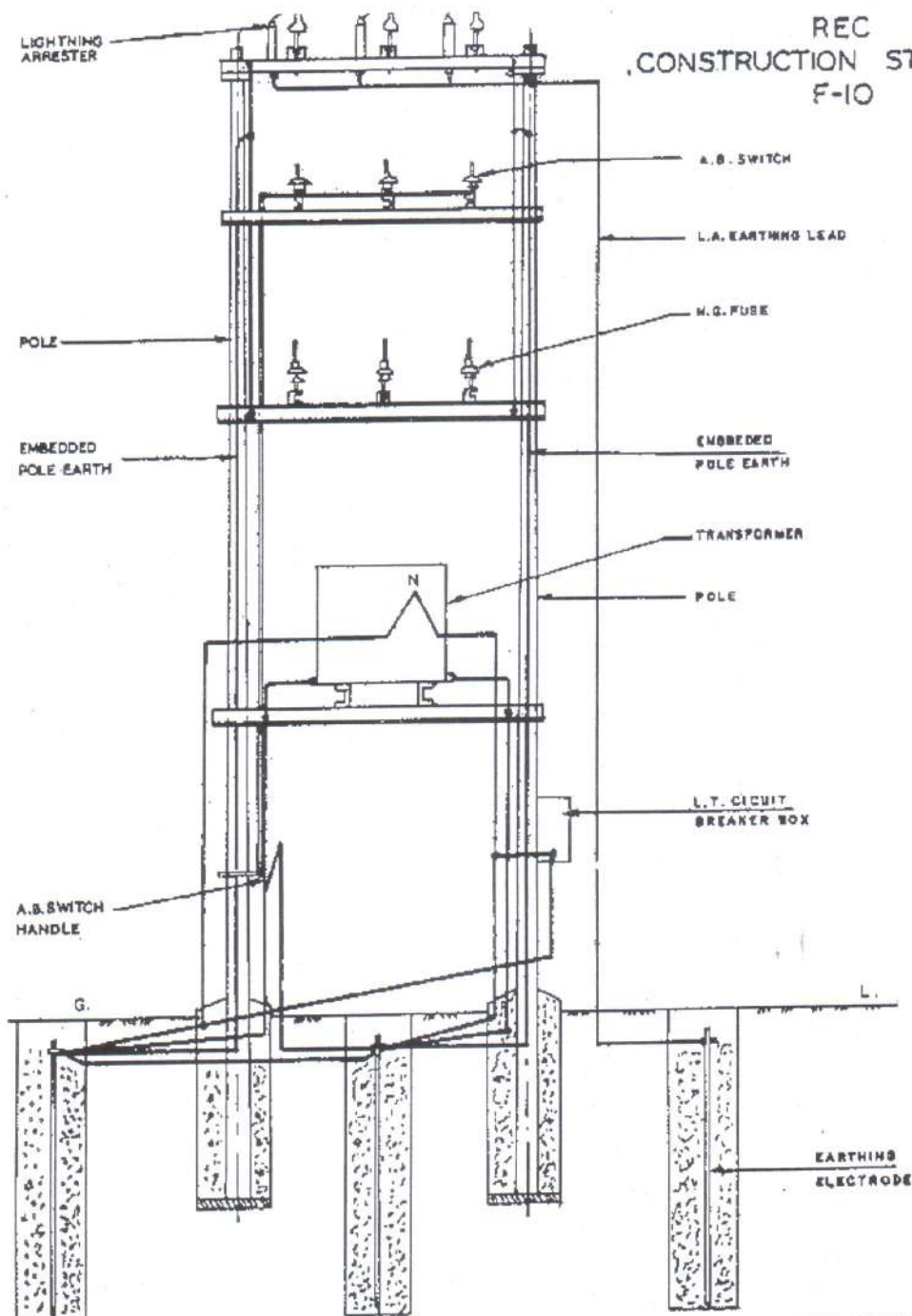
Distribution Transformer Centre Capacity in KVA	TYPE	Size (Nominal area of cross section)
25	PVC insulated and sheathed un-armoured four-core aluminium cable.	16 mm <sup>2</sup>
63	PVC insulated and sheathed un-armoured four-core aluminium cable with reduced neutral conductor.	70 mm <sup>2</sup>
	OR	
	PVC insulated and sheathed aluminium armoured three-core solid aluminium conductored cable.	70 mm <sup>2</sup>
100	PVC insulated and sheathed un-armoured four-core aluminium cable with reduced neutral conductor.	120 mm <sup>2</sup>
	OR	
	PVC insulated and sheathed aluminium armoured three-core solid aluminium conductored cable.	120 mm <sup>2</sup>

- NOTE: 1. The cables would be laid in air.  
2. In case of PVC armoured cables, aluminium armour shall serve as neutral for 63 and 100 KVA distribution transformer centres.  
3. Size of reduced neutral conductor shall comply with the main-neutral conductor combination as per IS:1554 (Part-I)-1976.  
4. Type and size of single core cables which can be used for the same purpose are given in REC Construction Standard F-18.

वितरण उप-केंद्र के लिए  
मल. टी. बहुकोर केबिल (एल्यूमीनियम)  
संस्तुत प्रकार एवं आकार  
L.T MULTICORE CABLES (ALUM.)  
FOR DISTRIBUTION SUB-STATIONS  
RECOMMENDED TYPE AND SIZES.

FEBRUARY - 1979





REC  
CONSTRUCTION STANDARD  
F-10

ALL DIMENSIONS ARE IN mm.

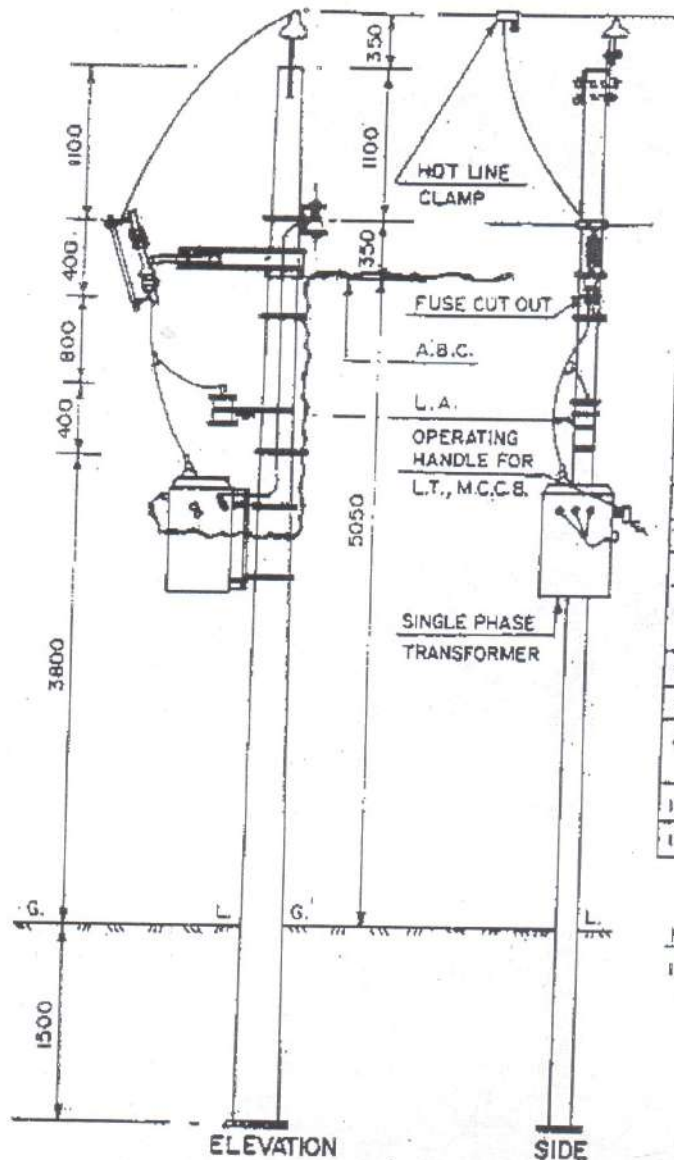
वितरण सब-स्टेशन के लिए  
अर्थन व्यवस्था

EARTHING ARRANGEMENT FOR  
DISTRIBUTION SUB-STATION

SCALE:- N.T.S

APRIL - 1983

**REC  
CONSTRUCTION STANDARD  
F-13**



BILL OF MATERIAL

1.	P.C.C. SUPPORT BM	1
2.	POLE TOP BRACKET	1
3.	11KV PIN INSULATOR WITH PIN	1
4.	SHACKLE INSULATOR	1
5.	U-CLAMP WITH BOLT	1
6.	L.A. WITH FIXTURES	1
7.	FUSE CUT-OUT WITH FIXTURES	1
8.	SINGLE PHASE TRANSFORMER WITH LT MCCB AND FIXTURES	1
9.	A.B.C	AS REQD.
10.	POLE CLAMPS	4
11.	EARTHING MATERIAL, NUTS, BOLTS, CLAMPS ETC.	AS REQD.
12.	HOTLINE CLAMP	1
13.	BASE PLATE	1

NOTE:-

1. THE TRANSFORMER MOUNTING DETAILS ARE GIVEN IN R.E.C CONSTRUCTION STANDARD 'F-14'

ALL DIMENSIONS ARE IN mm.

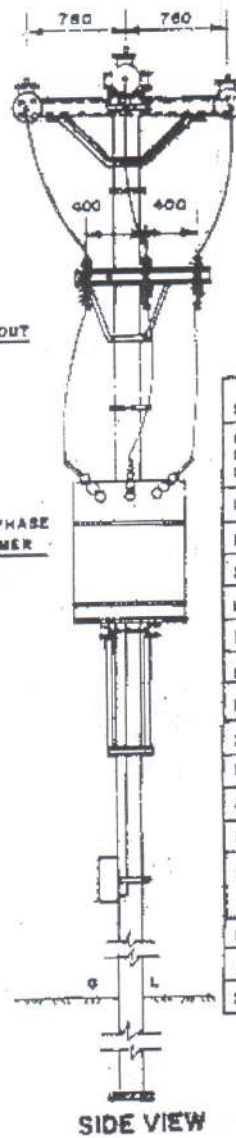
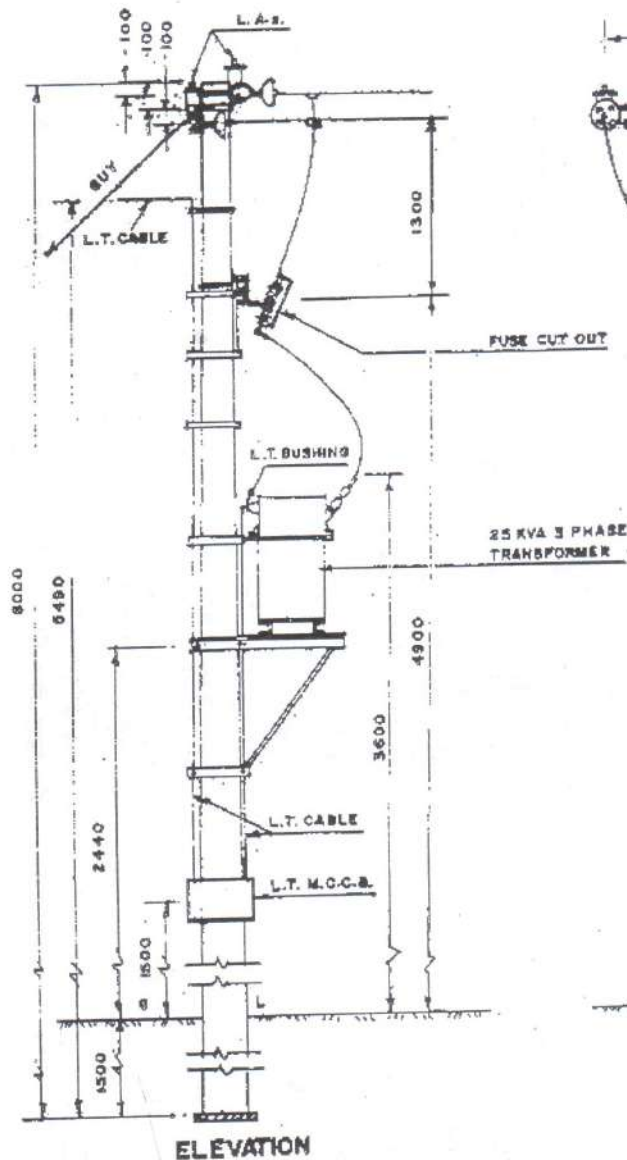
**सिंगल फेज (फेज-से-न्यूट्रल) वितरण  
सब-स्टेशन की व्यवस्था**

**SINGLE PHASE (PHASE - TO - NEUTRAL)  
DISTRIBUTION SUB-STATION  
ARRANGEMENT**

SCALE:- N.T.S

JULY, 1987

REC  
CONSTRUCTION STANDARD  
F-20



BILL OF MATERIALS

SUPPORT (8M/200Ks)	(No.
HORIZONTAL CROSS ARM C100X50X6-150	1No.
C100X60X6-1800	1No.
L.A. WITH FITTINGS	3Nos.
D.O. FUSE WITH FITTINGS	3Nos.
25 KVA TRANSFORMER	1No.
L.T. M.C.C.B.	1No.
DISC INSULATOR WITH FITTINGS	5Nos.
STRUCTURE FOR TRANS MOUNTING:-	
1. C100X50X6-1000	2Nos.
2. L 50X50X6-800	2Nos.
EARTHING MATERIAL	(No.
GUY SET	1SET
BASE PLATE	1No.
NUTS, BOLTS, POLE TOP CLAMPS AS Etc.	REQD.
STRUCTURE FOR D.O. FUSE MOUNTING:-	
1. C100X50X6-900	1No.
2. L 50X50X6-400	2Nos.

ALL DIMENSIONS ARE IN mm.

वितरण सब-स्टेशन  
माउंटिंग व्यवस्था  
सिंगल पोल पर 25 के.वी. ट्रांसफार्मर की  
DISTRIBUTION SUB-STATION  
MOUNTING ARRANGEMENT OF 25 KVA  
TRANSFORMER ON SINGLE POLE

SCALE: N.T.S.

OCT., 1987

REC  
CONSTRUCTION STANDARD  
G-1



③ STAY INSULATOR MAKE-OFF



④ END MAKING OF GUY WIRE

NOTES:-

1. ANCHOR ROD WITH WASHER & NUT SHOULD BE PREFERABLY GALVANIZED.
2. WHEN CONTINUOUS EARTH WIRE IS USED, GUY INSULATOR MAY NOT BE USED. (REFER - IE - RULE 901)

ALL DIMENSIONS ARE IN MM.

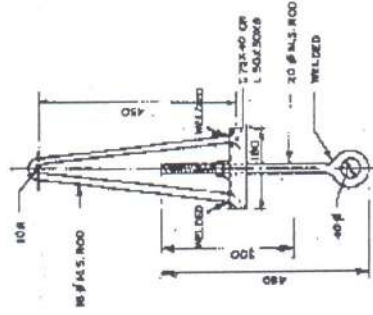
गोदर तटो प्रत्यक्षीकरण  
(सु. संयोजक)

GUY ASSEMBLY

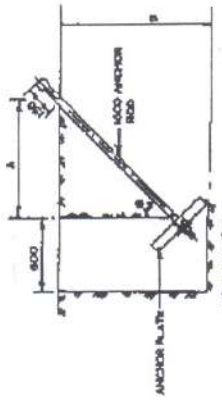
(CONVENTIONAL ARRANGEMENT)

SCALE:- N.T.S. SEPT. - 1972

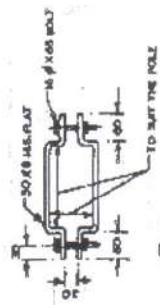
θ	30°	45°
A	750	1100
B	600	1300



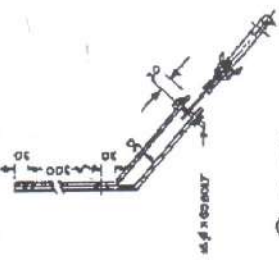
② TURN BUCKLE



⑥ STAY PIT - ANCHOR ASSEMBLY

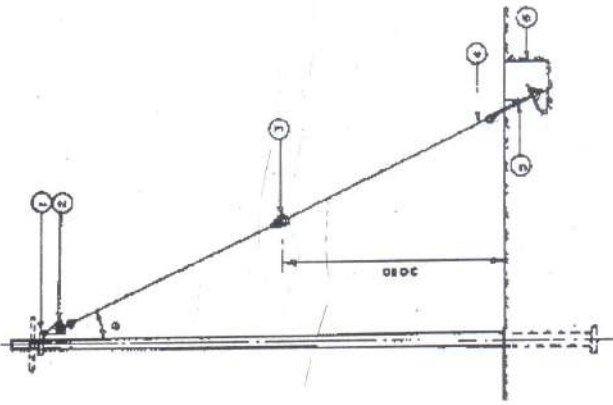


① CLAMP  
(H.V. LINES & L.T. LINES  
HORIZONTAL FORMATION)

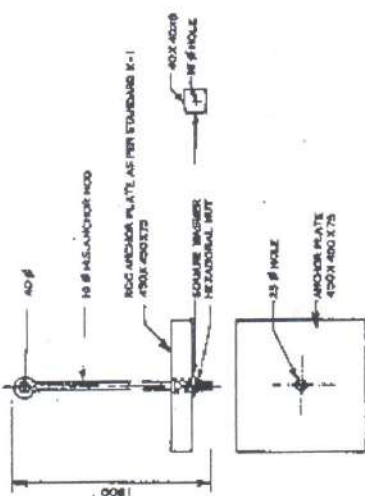


① CLAMP

(L.T. LINES VERTICAL FORMATION)



⑤ ANCHOR ROD & PLATE





REG  
CONSTRUCTION STANDARD  
G-3

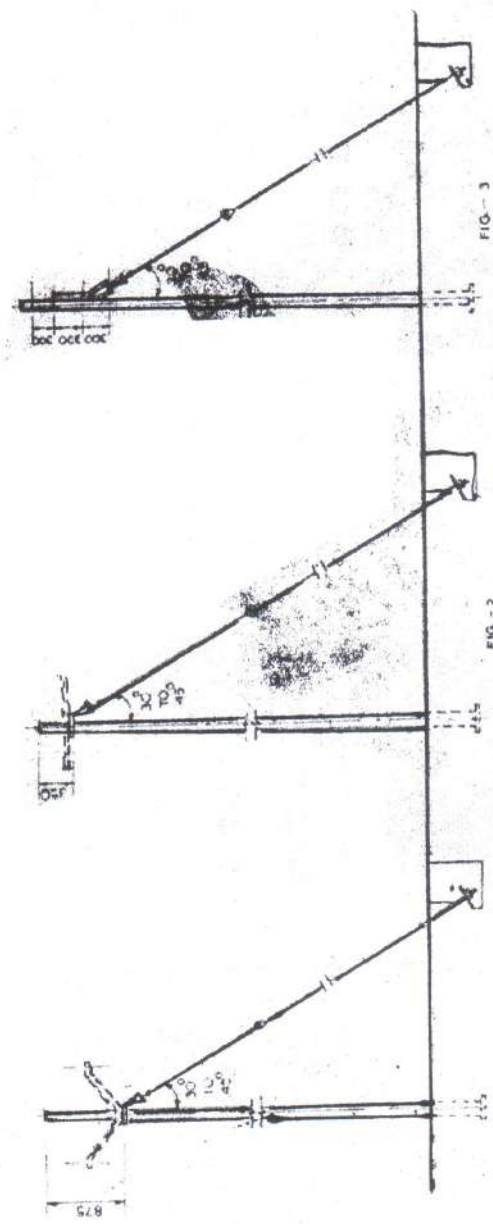


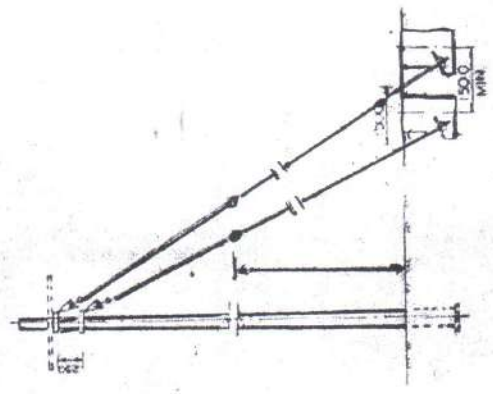
FIG-3

FIG-2

SINGLE GUY

- NOTES
1. SINGLE GUY ARRANGEMENT AS PER FIGURE 1, 2 & 3 CAN BE USED WHEN TOTAL TENSION TO BE TAKEN ON THE GUY DOES NOT EXCEED THE FOLLOWING LIMITS.
 

SIZES OF GUY WIRE	MAXIMUM TENSION TO BE TAKEN ON THE GUY
1/2" 50 MM	910 KG
1/3" 13 MM	1450 KG
  2. IN THE DOUBLE GUY ARRANGEMENT THE FOUNDATION OF THE GUYS SHOULD BE SO PLACED THAT ONE DOES NOT REDUCE THE STRENGTH OF THE OTHER IN OTHER WORDS, THE SOIL WHICH RESISTS THE UPLIFT SHOULD NOT BE DISTURBED WHILE DIGGING THE FOUNDATION FOR THE OTHER STAY.
  3. FOR DETAILS OF COMPONENTS OF GUY ASSEMBLY, REFER: G-1



DOUBLE GUY

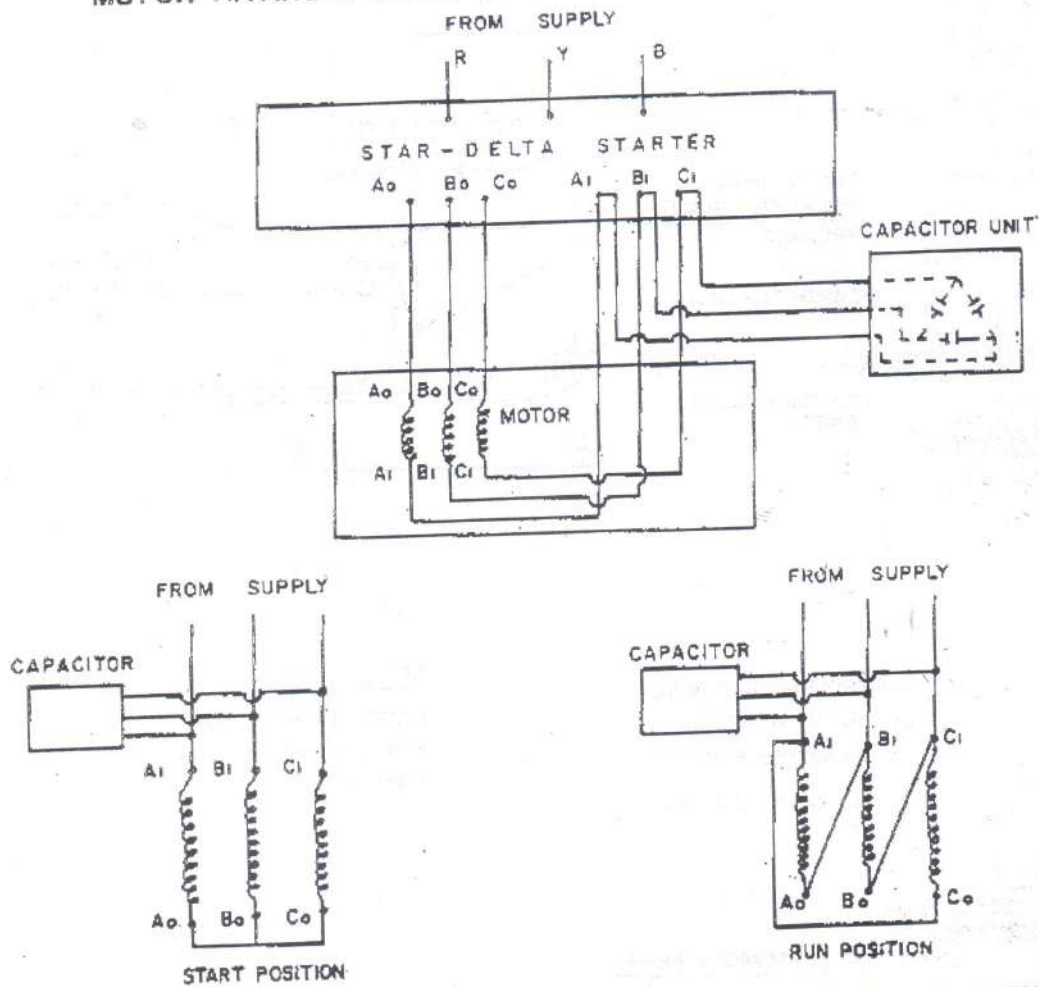
ALL DIMENSIONS ARE IN MM  
 नम रजि वरद्वि  
 रकत व वि नम रजि  
 GUYING ARRANGEMENTS  
 ALL DIMENSIONS ARE IN MM

REC  
CONSTRUCTION STANDARD  
H-9

RECOMMENDED CAPACITOR RATINGS

MOTOR RATING	22KW(3H.P.)	37KW (5H.P.)	55KW(7.5H.P.)	75KW(10H.P.)
CAPACITOR RATING IN KVAR	1	2	3	4

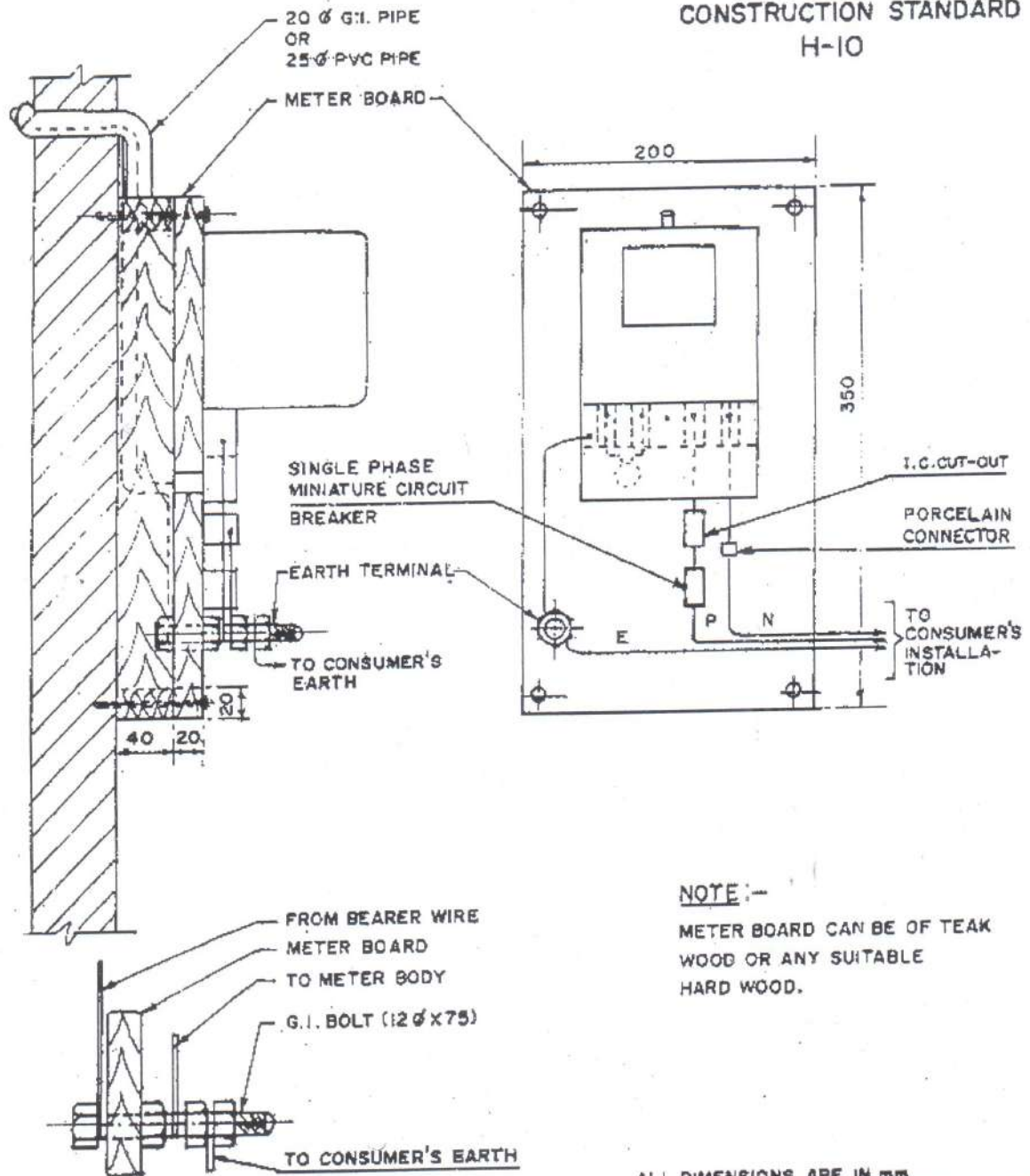
CONNECTIONS OF A 3-TERMINAL CAPACITOR UNIT TO A  
MOTOR HAVING A START DELTA STARTER



एल. टी. कैपेसिटर  
कनेक्शनों की संस्तुत रेटिंग एवं पद्धति  
L.T. CAPACITORS  
RECOMMENDED RATINGS  
AND MODE OF CONNECTIONS

MARCH - 1974.

# REC CONSTRUCTION STANDARD H-10



EARTH TERMINAL DETAILS

## NOTE :-

METER BOARD CAN BE OF TEAK  
WOOD OR ANY SUITABLE  
HARD WOOD.

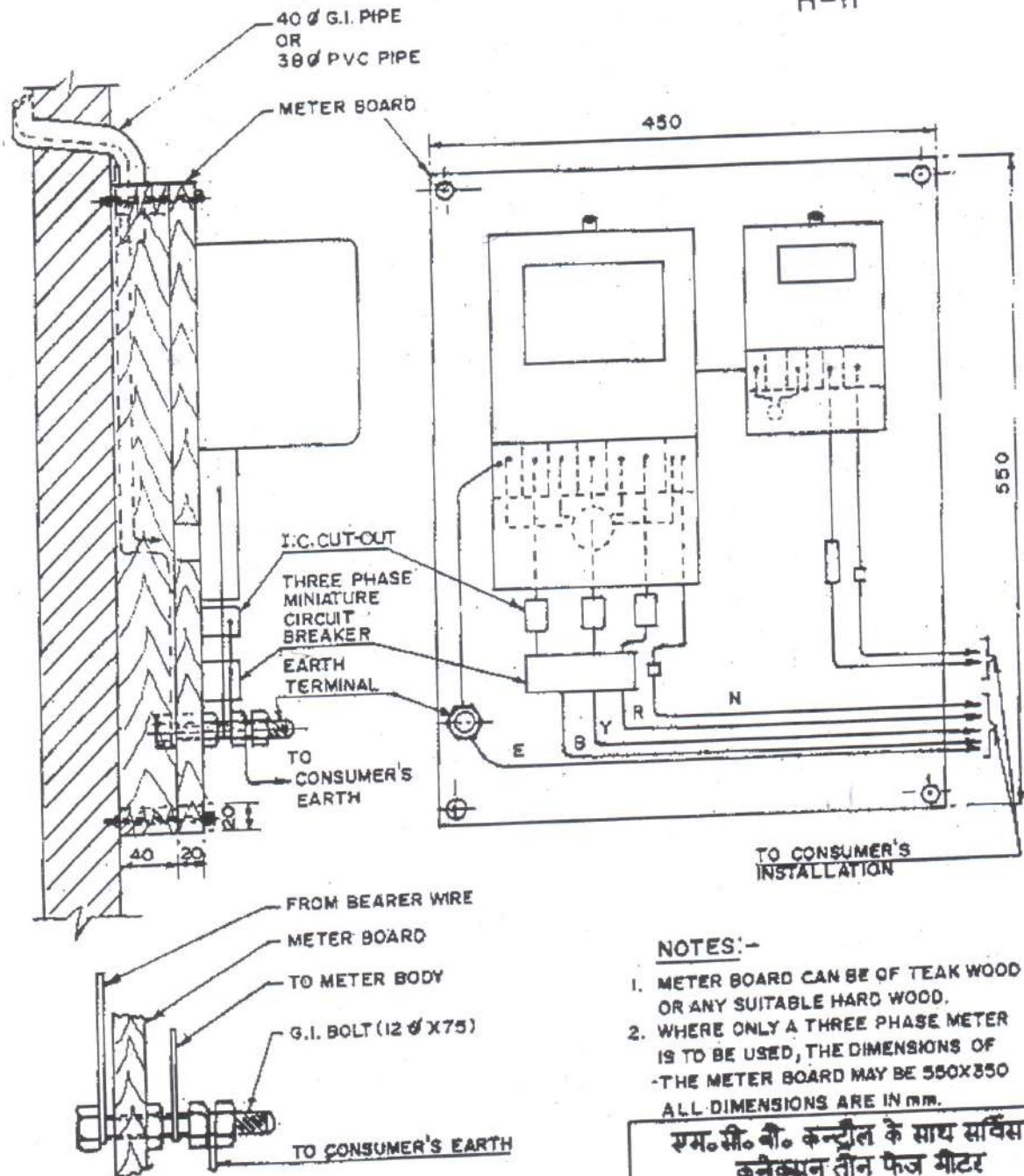
ALL DIMENSIONS ARE IN MM.

रम. सी. पी. कन्ट्रोल के साथ सर्विस  
कनेक्शन सिंगल फेज मीटर  
(अलग न्यूट्रल और अर्थ सहित)  
SERVICE CONNECTIONS  
SINGLE PHASE METER BOARD  
WITH MCB CONTROL  
(WITH SEPARATE NEUTRAL AND EARTH)

SCALE: N.T.S.

MAY, 1993

REC  
CONSTRUCTION STANDARD  
H-II



NOTES:-

1. METER BOARD CAN BE OF TEAK WOOD OR ANY SUITABLE HARD WOOD.
  2. WHERE ONLY A THREE PHASE METER IS TO BE USED, THE DIMENSIONS OF THE METER BOARD MAY BE 550X350
- ALL DIMENSIONS ARE IN MM.

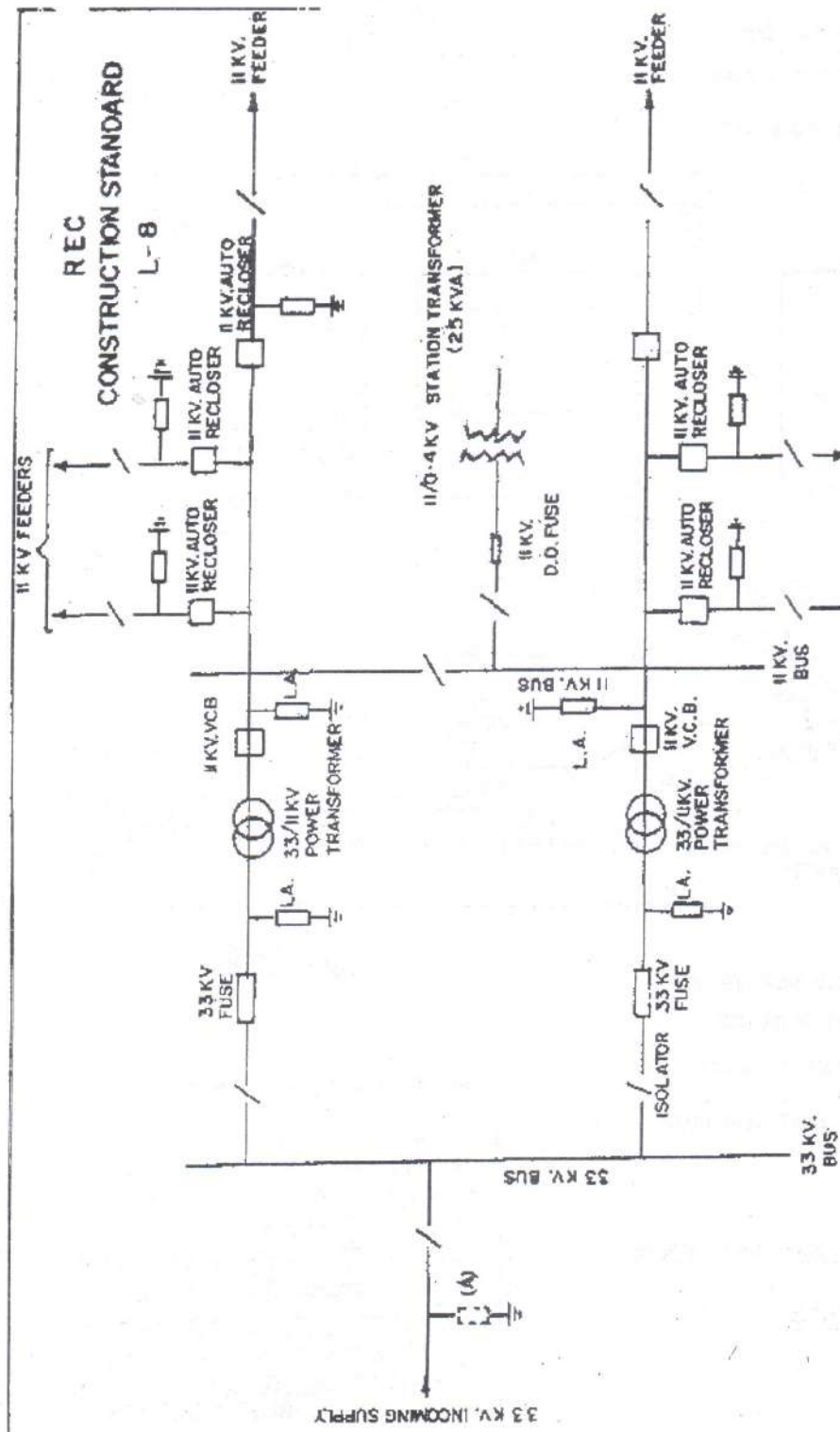
सम.सी.बी. कन्ट्रोल के साथ सर्विस  
कनेक्शन तीन फेज मीटर  
(अलग न्यूट्रल और अर्थ प्रदान)  
SERVICE CONNECTIONS  
THREE PHASE METER BOARD  
WITH MCB CONTROL

(WITH SEPARATE NEUTRAL AND EARTH)

SCALE: N.T.S.

MAY, 1993.





# LEGEND

- ISOLATOR
- 33 KV H.R.C. OR EXPULSION TYPE FUSE
- LIGHTNING ARRESTER
- 33 KV POWER TRANSFORMER
- 11 KV V.C.B.
- 11 KV AUTO RECLOSER
- 11 KV D.O. FUSE
- 11/0-4 K.V. STATION TRANSFORMER

NOTE

1. 11 KV L.A. AT (A) NOT REQUIRED IN CASE ONLY FUSES ARE USED TO PROTECT THE 33/11KV POWER TRANSFORMER. IN CASE CIRCUIT BREAKERS ARE USED INSTEAD OF FUSES, THE 11KV L.A. AT (A) MAY BE USED TO PROTECT THE C.B. FROM SURGE.

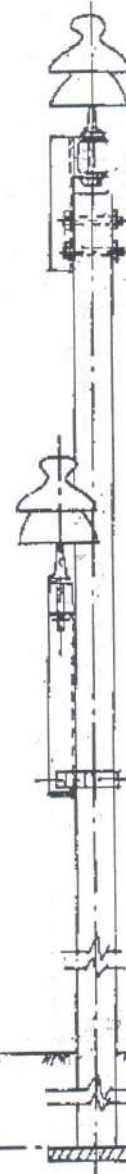
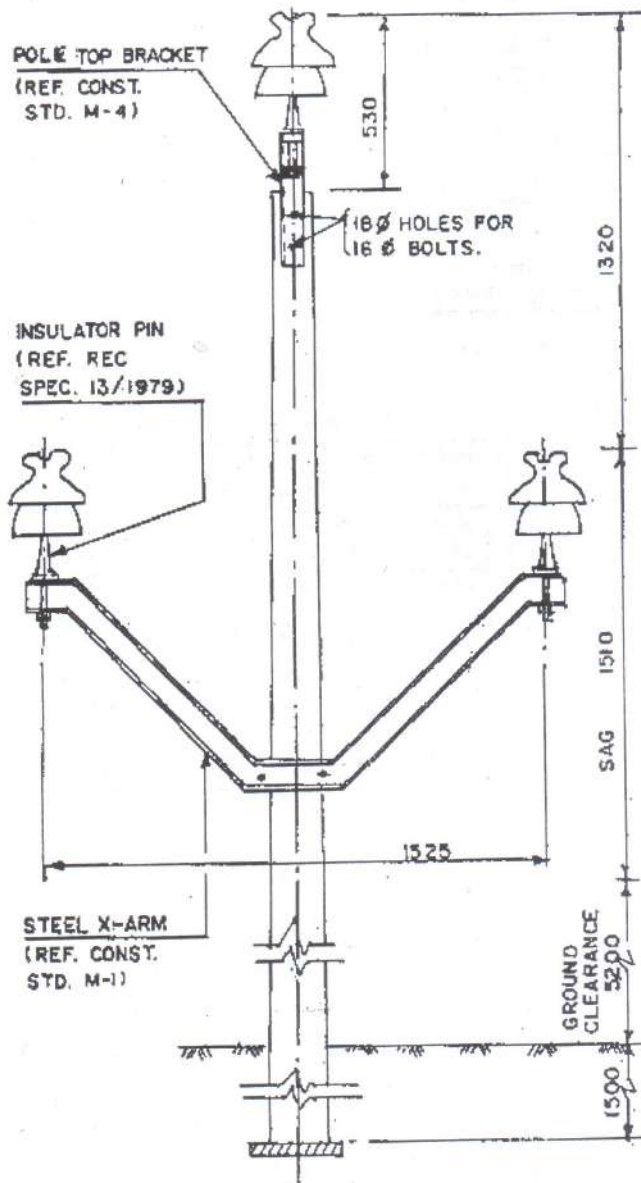
2. CIRCUIT BREAKERS HAVE TO BE USED INSTEAD OF 11KV FUSES IN CASE OF POWER TRANSFORMER CAPACITY OF 5 MVA AND ABOVE AS PER I.E. RULES.

बो 33 के.वी. ट्रांसफार्मर के साथ  
33/11 के.वी. कर्बोचरी रक्षित सिस्टम के सब-स्टेशन  
का एकल लाइन डायग्राम

SINGLE LINE DIAGRAM  
OF 33/11KV UNATTENDED TYPE  
SUB-STATION WITH TWO 33/11KV TRANSFORMERS

SCALE: N.T.S. | SEPT, 1997

**R E C**  
**CONSTRUCTION STANDARD**  
**M - 3**



**BILL OF MATERIAL**

9.0M SUPPORT	1
POLE TOP BRACKET	1
V- CROSS ARM (M.S.CHANNEL-100X50X6-4)	1
BACK CLAMP	1
BOLTS 16 Ø	4
33 KV PIN INSULATOR	3
33 KV PINS	3
EARTHING COMPLETE	1

**TANGENT LOCATION**  
**MAX. SPAN 125 M**  
**(CROSS COUNTRY)**

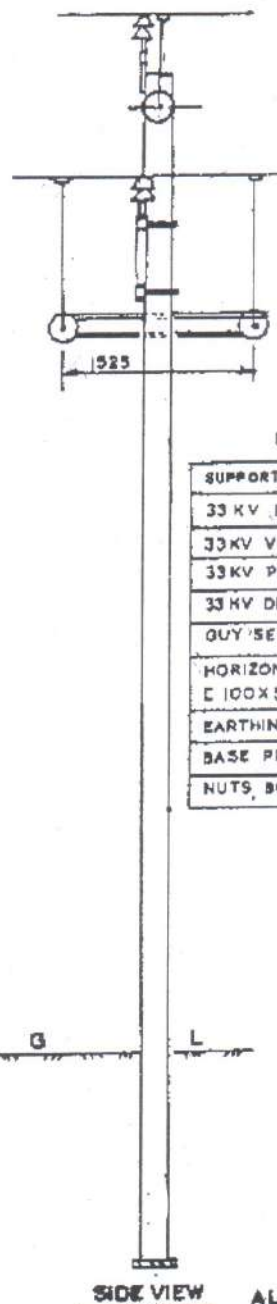
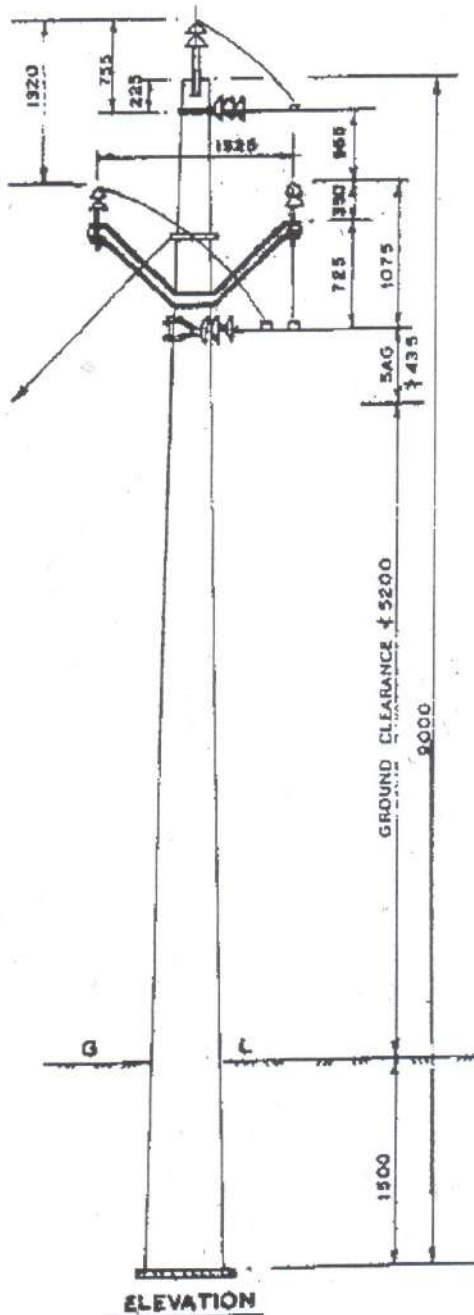
ALL DIMENSIONS ARE IN mm.

३३ कि० वी० लाईन  
कन्डक्टर रचना एवं अन्तराल  
33KV LINE  
CONDUCTOR FORMATION  
AND CLEARANCES

SCALE:-N.T.S

APRIL - 1981.

REC  
CONSTRUCTION STANDARD  
M-10



BILL OF MATERIAL

SUPPORT - 9.0M	1 NO.
33 KV POLE TOP BRACKET	1 NO.
33 KV V-CROSS ARM	1 NO.
33 KV PIN INSULATOR	3 NOS.
33 KV DISC INSULATORS	3 SETS
GUY SET	1 NO.
HORIZONTAL CROSS ARM C 100X50X6.4	1 NO.
EARTHING MATERIAL	AS REQD.
BASE PLATE	1 NO.
NUTS, BOLTS, POLE CLAMPS ETC AS REQD.	

NOTE :- MAXIMUM SPAN BETWEEN THE TAPPING  
POLE AND ADJACENT POLE OF THE  
BRANCH LINE - 50 MTS.

ALL DIMENSIONS ARE IN mm.

३३ के. वोल्ट टैपिंग  
व्यवस्था  
सिंगल पोल टैपिंग

33 KV LINES  
TAPPING ARRANGEMENT ON  
SINGLE POLE

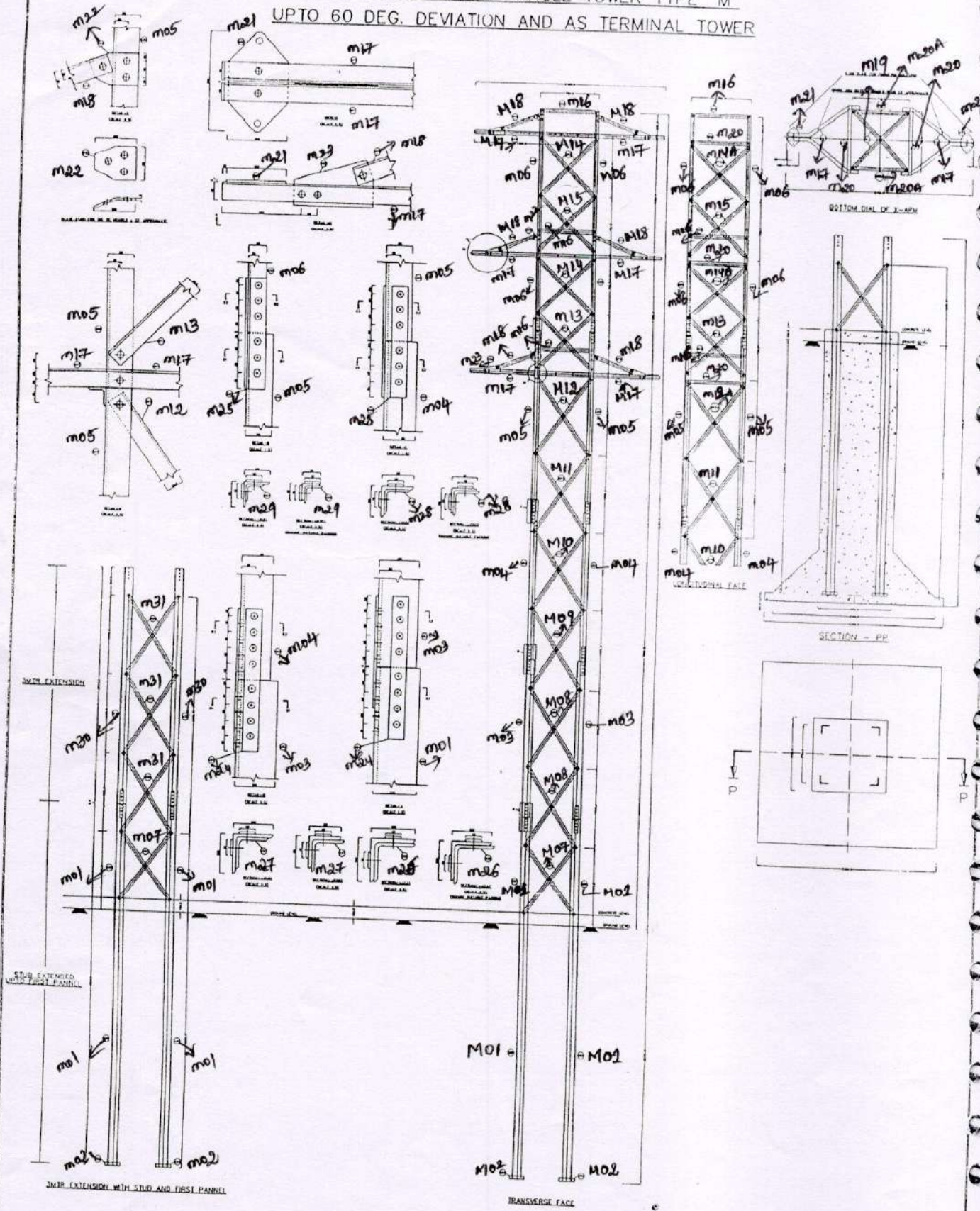
SCALE: N.T.S. OCT., 1967



# STRUCTURAL DRAWING

OF

33 KV DOUBLE CIRCUIT ANGLE TOWER TYPE "M"  
UPTO 60 DEG. DEVIATION AND AS TERMINAL TOWER



CENTRAL POWER DISTRIBUTION COMPANY OF  
ANDHRA PRADESH LTD, MINT COMPOUND, HYDERABAD  
33 K.V. DOUBLE CIRCUIT  
ANGLE TOWER TYPE "M"  
UPTO 60 DEG. DEVIATION AND AS  
TERMINAL TOWER

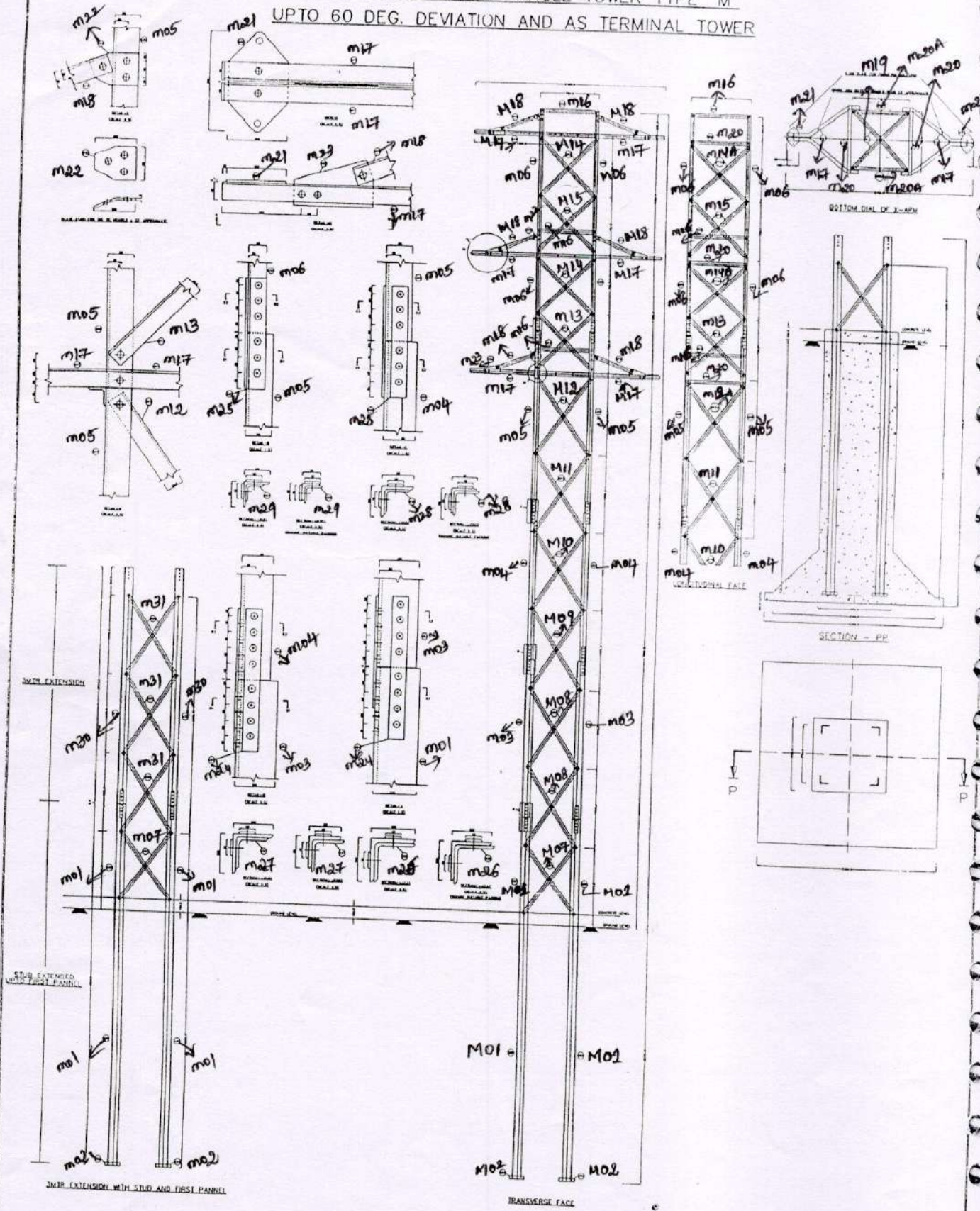
For clarity of drawing, may refer the Cost Data 18-19 pdf file placed on website



# STRUCTURAL DRAWING

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33 K.V. DOUBLE CIRCUIT  
ANGLE TOWER TYPE "M"  
UPTO 60 DEG. DEVIATION AND AS  
TERMINAL TOWER

For clarity of drawing, may refer the Cost Data 18-19 pdf file placed on website



# BILL OF MATERIAL FOR 33 KV DOUBLE CIRCUIT TOWER TYPE ' M '

Sl. No.	PART DESCRIPTION	PART NO.	DIMENSION S OF SECTION/P LATE B and	LENGTH/AREA (m/m)	QUANTITY (No's)	UNIT WEIGHT (kg)	TOTAL WEIGHT (kg)
<b>stub and cleats</b>							
1	stub	M01	110x110x8	4.560m	4	13.4	244.416
2	cleats for stub	M02	45x45x5	0.200m	8	3.4	5.44
						<b>sub total</b>	<b>249.856</b>
<b>super structure of L type tower</b>							
3	leg	M03	100x100x8	1.998m	4	12.1	96.703
4	leg	M04	80x80x8	1.898m	4	9.6	72.883
5	leg	M05	66x65x6	2.274m	4	5.8	52.575
6	leg	M06	45x45x5	2.761m	4	3.4	37.55
7	bracing	M07	45x45x5	1.098m	8	3.4	29.866
8	bracing	M08	45x30x5	1.222m	16	2.8	54.746
9	bracing	M09	45x30x5	1.230m	8	2.8	27.552
10	bracing	M10	45x30x5	1.238m	8	2.8	27.731
11	bracing	M11	45x30x5	1.224m	8	2.8	27.418
12	bracing	M12	45x30x5	1.200m	4	2.8	13.44
13	bracing	M12A	45x30x5	1.172m	4	2.8	13.126
14	bracing	M13	45x30x5	1.012m	8	2.8	22.669
15	bracing	M14	45x30x5	1.013m	8	2.8	22.691
16	bracing	M14A	45x30x5	0.999m	8	2.8	22.378
17	bracing	M15	45x30x5	1.019m	8	2.8	22.826
18	horizontal bracing	M16	45x30x5	0.750m	12	3.4	25.2
19	cross arms main member	M17	45x45x5	1.048m	12	2.8	42.758
20	cross arm tie member	M18	45x30x5	0.520m	12	2.8	17.472
21	cross arm plan member	M19	45x30x5	1.016m	6	2.8	17.069
22	belt member-longitudinal face	M20	45x30x5	0.750m	6	2.8	12.6
23	belt member-transverse face	M20A	45x30x5	0.740m	6	2.8	12.432
24	strain plate	M21	6 mm thick	0.038m <sup>2</sup>	6	47.1	10.598
25	plate(b/w tie member & leg)	M22	6 mm thick	0.013m <sup>2</sup>	12	47.1	7.235
26	plate(b/w tie member & main member)	M23	6 mm thick	0.020m <sup>2</sup>	6	47.1	5.652
27	cover plate for leg joint	M24	6 mm thick	0.01448m <sup>2</sup>	16	47.1	10.912
28	cover plate for leg joint	M25	6 mm thick	0.01128m <sup>2</sup>	16	47.1	8.501
29	cleat	M26	100x100x8	0.362m	4	12.1	17.521
30	cleat	M27	80x80x8	0.362m	4	9.6	13.901
31	cleat	M28	65x65x6	0.282m	4	5.8	6.542
32	cleat	M29	45x45x5	0.282m	4	3.4	3.835
33	bolts and nuts for leg joints	NA	16 mm DIA	65mm	128	0.288	36.8
34	bolts and nuts for leg joints	NA	16 mm DIA	50mm	96	0.2997	25.603
35	bolts and nuts for other joints	NA	16 mm DIA	40mm	243	0.2467	59.948
36	spring washers	NA	3.5 mm thick	suitable for 16mm bolts bolts and nuts	467	0.009	4.203
37	flat washers for packing	NA	2 mm thick	suitable for 16mm bolts bolts and nuts	48	0.01	0.48
38	flat washers for packing	NA	1 mm thick	suitable for 16mm bolts bolts and nuts	48	0.005	0.24
						<b>sub total</b>	<b>883.838</b>
						<b>grand total</b>	<b>1133.692</b>

weight of normal tower type "M" :1133.692kgs

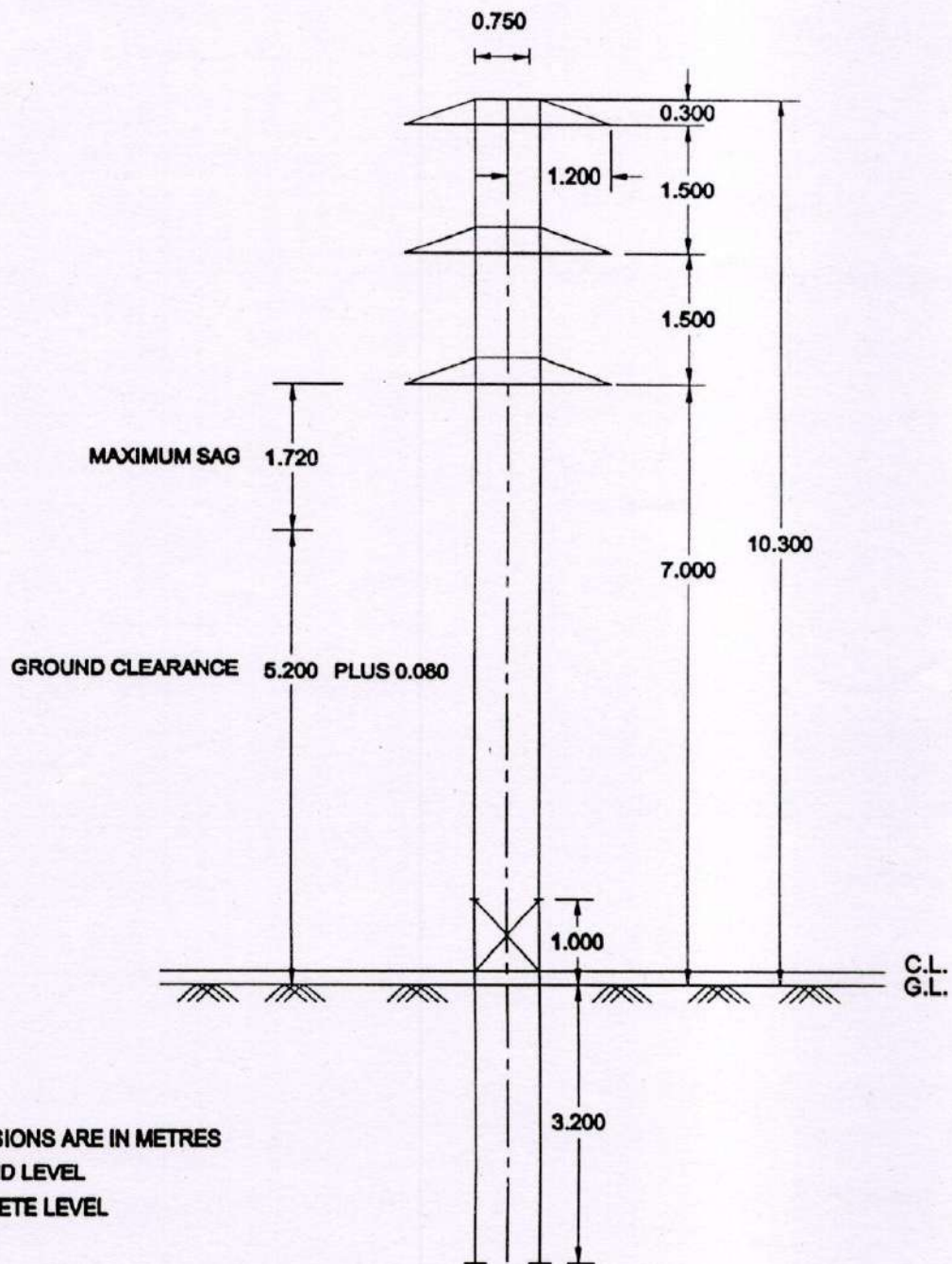


## BILL OF MATERIAL FOR 3 M EXTENSION OF M TYPE TOWER

Sl. No.	PART DESCRIPTION	PART NO.	DIMENSION S OF SECTION/PLATE B and N (mm)	LENGTH/AREA (m/m'2)	QUANTITY (No's)	UNIT WEIGHT (kg)	TOTAL WEIGHT (kg)
1	leg	M30	110x110x8	2.998m	4	13.4	160.693
2	bracing	M31	45x45x5	1.222m	24	3.4	99.715
3	cover plate	M24	6 mm thick	0.01448m	8	47.1	5.456
4	cleat	M26	100x100x8	0.362m	4	47.1	68.2
5	bolts and nuts	NA	16mm dia	65m	64	0.2875	18.4
6	bolts and nuts	NA	18 mm dia	40m	44	0.2467	10.855
7	spring washers	NA	3.5mm dia	suitable for 16 mm dia bolts and nuts	108	0.009	0.972
Total							384.292

weight of 3M extension of "M" type tower::364.292

## OUTLINE DIAGRAM OF 'M' TYPE TOWER

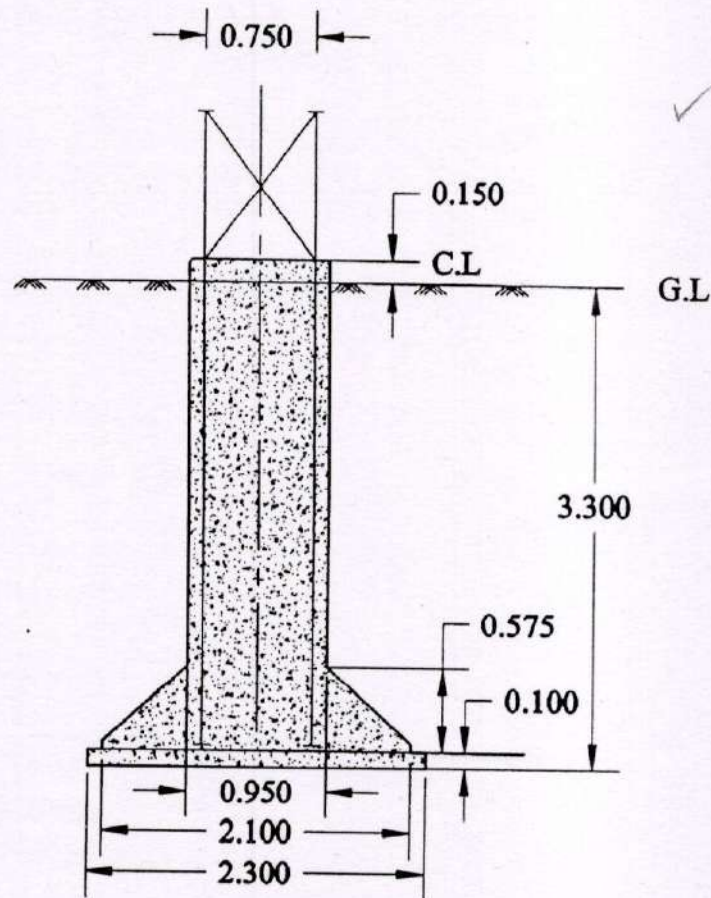


**FIG - 11**

Drawing No: APCPDCL-C.M-TOWERS-11



## FOUNDATION DRAWING OF 33Kv D.C. TOWER TYPE 'M'



ALL DIMENSIONS ARE IN METRES.

FOUNDATION IS DESIGNED FOR NORMAL TOWER, PLUS 3M AND 6M EXTENSIONS.

STUBS EXTENDED UPTO FIRST PANEL.

SECTION : 110 X 110 X 10 MM.

DIAGONAL BRACINGS OF FIRST PANEL : 45 X 45 X 5 MM.

CLEATS WELDED TO STUBS AT BOTTOM : 45 X 30 X 5 MM, 200MM LONG TWO FOR EACH STUB.  
ONE OF THE FOUR LEGS IS TO BE CONNECTED TO PIPE EARTHING PROVIDED SEPARATELY AT TOWER LOCATION.

VOLUME OF EXCAVATION = 22.308 CU.M (WORKING SPACE OF 150 MM ALL AROUND THE BOTTOM PAD)

VOLUME OF CONCRETE = 4.434 CU.M

THE FOUNDATION IS SUITABLE FOR NORMAL TOWER, PLUS 3M AND PLUS 6M EXTENSIONS.

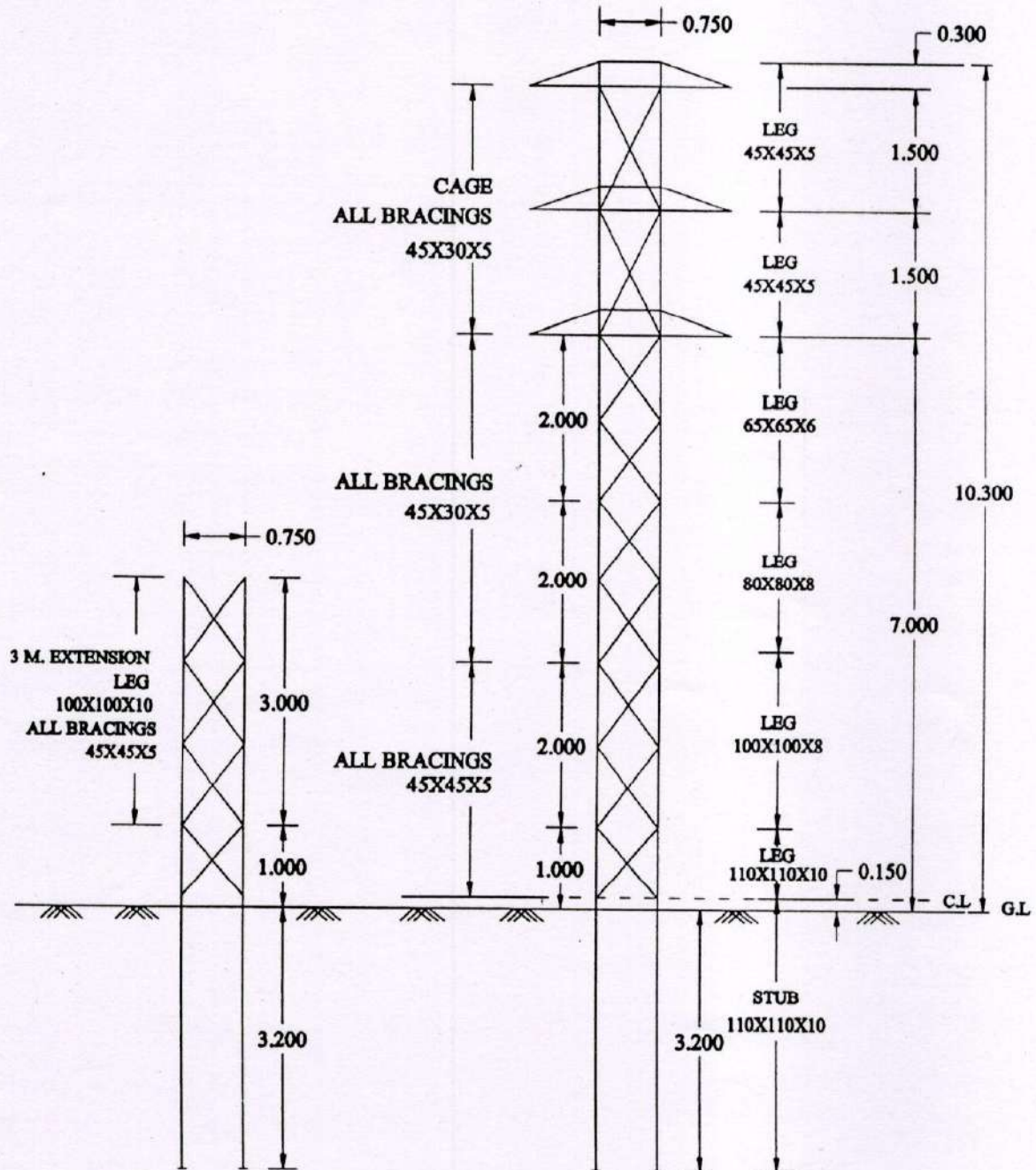
THE FOUNDATION CAN BE ADOPTED FOR PLUS 9M AND PLUS 12M EXTENSIONS ERECTING THE TOWER AS A STRAIGHT LINE CUT POINT AND LIMITING THE SPAN TO 80M.

**FIG - 14**

Drawing No: APCPDCL-C.M-TOWERS-09



**33KV DOUBLE CIRCUIT ANGLE TOWER TYPE 'M'  
UPTO 60 DEGREES DEVIATION AND AS TERMINAL TOWER**



ALL DIMENSIONS ARE IN METRES.

STEEL SECTIONS FOR LEG MEMBERS AND BRACINGS ARE INDICATED IN THE DRAWING.  
CROSS-ARM MAIN MEMBERS AND BELT MEMBERS ARE 45 X 45 X 5 MM. OTHER MEMBERS OF  
CROSS-ARMS ARE 45 X 30 X 5 MM.

ALL SECTIONS ARE IN MM.

8NO.S 16 MM Ø BOLTS AND NUTS DOUBLE SHEAR FOR FIRST PANEL, 3M AND 6M EXTENSIONS.

8NO.S 16 MM Ø BOLTS AND NUTS DOUBLE SHEAR FOR SECOND AND THIRD PANELS.

6NO.S 16 MM Ø BOLTS AND NUTS DOUBLE SHEAR FOR FOURTH TO SEVENTH PANELS.

4NO.S 16 MM Ø BOLTS AND NUTS DOUBLE SHEAR FOR CAGE.

ALL DIAGONALS SHALL HAVE SINGLE BOLT CONNECTIONS.

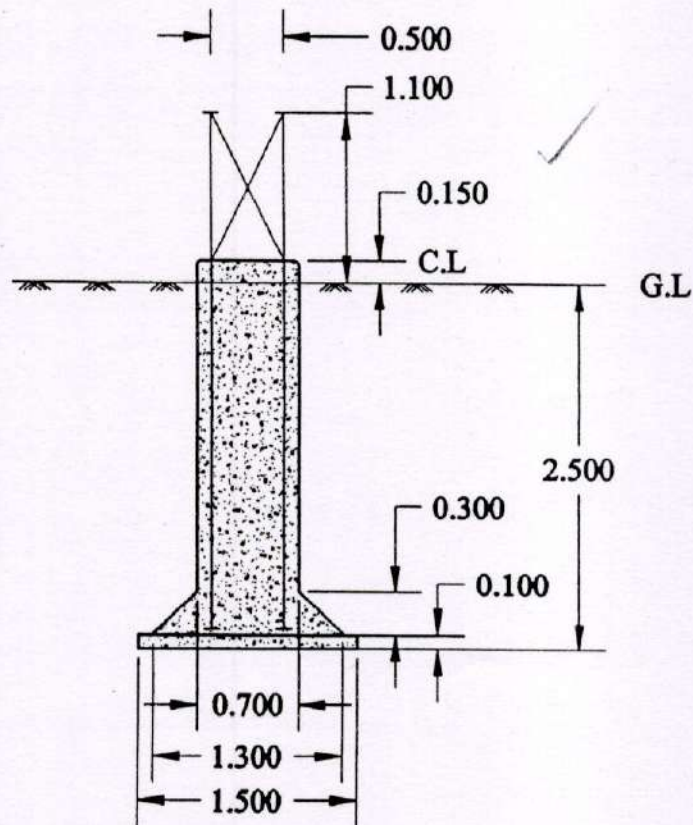
ALL LEG MEMBERS ARE BUTT-JOINTED.

**FIG - 13**

Drawing No: APCPDCL-C.M-TOWERS-13



## FOUNDATION DRAWING OF 33 Kv D.C. TOWER TYPE 'K'



ALL DIMENSIONS ARE IN METRES

FOUNDATION IS DESIGNED FOR NORMAL TOWER WITH 3M AND 6M EXTENSIONS

VOLUME OF EXCAVATION : 8.100 CU M (WORKING SPACE OF 150 MM ALL AROUND THE BOTTOM PAD)

VOLUME OF CONCRETE : 1.636 CU M

STUBS EXTENDED UPTO FIRST PANEL

SECTION : 75 X 75 X 6 MM

CLEATS : 45 X 30 X 5, 200MM LONG

TWO FOR EACH STUB

ONE OF THE FOUR LEGS IS TO BE CONNECTED TO PIPE EARTHING PROVIDED SEPARATELY.

THE FOUNDATION IS SUITABLE FOR NORMAL TOWER, PLUS 3M AND PLUS 6M EXTENSIONS.

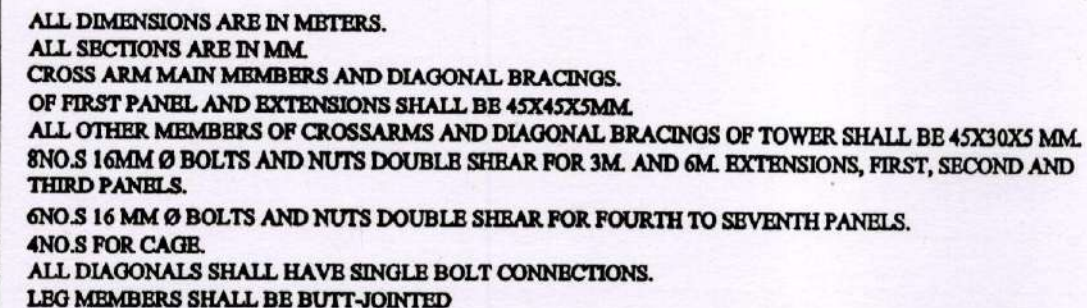
THE FOUNDATION CAN BE ADOPTED FOR PLUS 9M AND PLUS 12M EXTENSIONS LIMITING THE SPAN TO 80M.

**FIG - 04**

Drawing No: APCPDCL-C.M-TOWERS-04



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Drawing No: APCPDCL-C.M-TOWERS-08