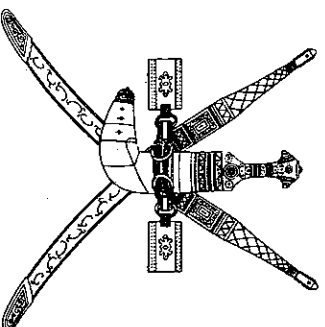


# SULTANATE OF OMAN

MINISTRY OF ELECTRICITY AND WATER



L.T. OVERHEAD LINES

**BRIEF SPECIFICATIONS  
AND  
STANDARD DRAWINGS**

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**1. TYPE OF CONSTRUCTION**

Low tension overhead lines shall comprise aluminium conductors bare or covered with XLPE insulation secured to brown glazed porcelain reel insulators on wood poles.

- a) Single "Medium" poles for phase and neutral conductors 100 sq.mm and above
- b) Single "Light" poles for phase and neutral conductors upto and including 70 sq.mm

**2. WOOD POLES**

Wood poles shall be Pinus Silvestris/Douglas Fir with minimum extreme fibre stress of 5.48 x 10<sup>6</sup> Kg/M<sup>2</sup> from regions north of 60°N complying with BS 1990 and creosoting to BS 913 except for retention of 140 Kgs per cubic metre.

Category	Length Metres	Top Dia Min. mm.	Dia 1.5 M from Butt End - Min. mm.
Medium	9.0	150	220
Light	9.0	125	180
Extra Long (for special locations)	11.0	150	225

**3. CONDUCTORS**

Conductors shall be aluminium conductors of the following sizes :

Nominal Area Sq. mm	Section Area Sq. mm	Stranding mm	Overall Dia. mm	Weight per/km Kg.	U.T.S. Kg	Bare	XLPE
200	204.3	19/3.78	21.70	690.00	3240	X	X
120	119.51	19/2.83	14.21	329.39	1991.8	X	X
70	73.65	7/3.66	10.97	202.77	1216.0	X	X
35	37.16	7/2.6	7.8	101.5	576	—	X

Bare conductors shall be the normal standard for Phase, Neutral and Earth and XLPE covered conductors for Phase and Neutral in special locations where horizontal clearances from buildings are less than two metres.

**4. INSULATORS**

Insulators shall be brown glazed porcelain reel type to Drg. No. MEW/OH/039.

**5. INSULATOR HARDWARE**

Insulators shall be fitted to wood poles:

- a) at tangent points with through bolts in vertical formation as per Drg. No. MEW/OH-GA/15;
- b) at cut points with 'D' clamp in vertical formation as per Drg. No. MEW/OH-GA/14.

6. **Stay Sets**  
Stay sets shall comply with Drg. No. MEW/OH/042.

7. **Stay Insulators**  
11KV stay insulators shall be of porcelain to Drg. No. MEW/OH/041.

8. **Stay Wire**  
Stay wire shall be galvanised comprising 7/3.25mm dia.  
Steel wire 7 strands with ultimate tensile strength of 66.8 KN to BSS 183 grade 1150.

9. **Accessories**  
The overhead line accessories shall include the following :  
— Drg. No. MEW/OH/019 - Cable Cleat  
— Drg. No. MEW/OH/045 - Stay Clamp  
— Galvanised mild steel bolts and nuts with threads to BSS 4190 each complete with one full nut, one half lock nut one flat circular washer and one spring washer.

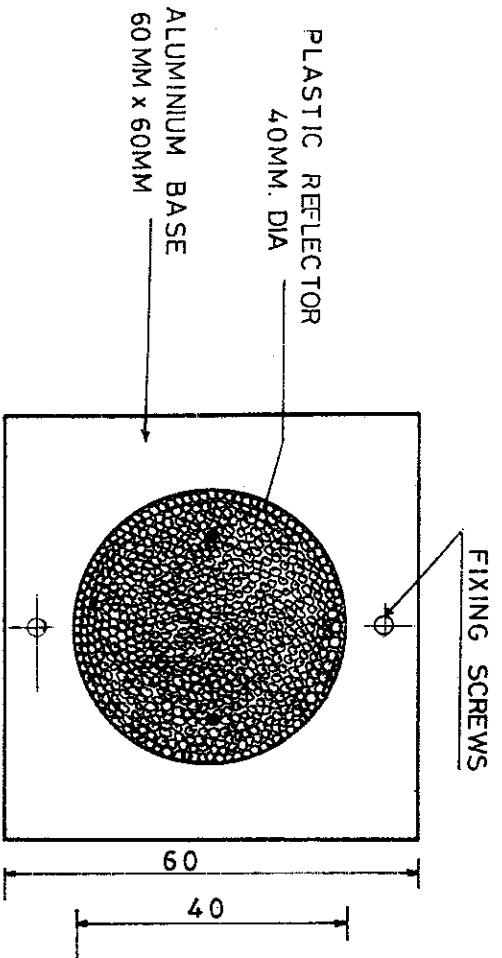
- Drg. No. MEW/OH/025 - Kicking block  
— Drg. No. MEW/OH/049 - Stay baulk

10. **UNDERGROUND CABLE TERMINATIONS**  
Under ground cable terminations on poles shall be heat shrink dry type.

11. **Normal Span :**  
— for Medium wood poles : 40 mtrs.  
— for Light wood poles : 35 mtrs.

12. **Conductor Ground clearance :**  
Normal ground not accessible to vehicles : 6 mtrs.  
Ground clearance in road crossings : 8 mtrs.

13. **GENERAL ARRANGEMENT DRAWINGS**  
— Drg. No. MEW/OH-GA/16 - L.T. service from Feeder Pillar  
— Drg. No. MEW/OH-GA/17 - 11KV/433 Typical S/S layout  
— Drg. No. MEW/OH-GA/18 - L.T. Feeder connection from P.M. transformer  
— Drg. No. MEW/OH-GA/19 - L.T. service from O/H line  
— Drg. No. MEW/OH-GA/20 - L.T. service with changeover standby supply typical arrangement  
— Drg. No. MEW/OH-GA/21 - L.T. Feeder from main Feeder Pillar  
— Drg. No. MEW/OH-GA/23 - 11KV Single circuit intermediate pole with L.T. O/H line  
— Drg. No. MEW/OH-GA/24 - Substation earthing details.



RED LIGHT REFLECTOR



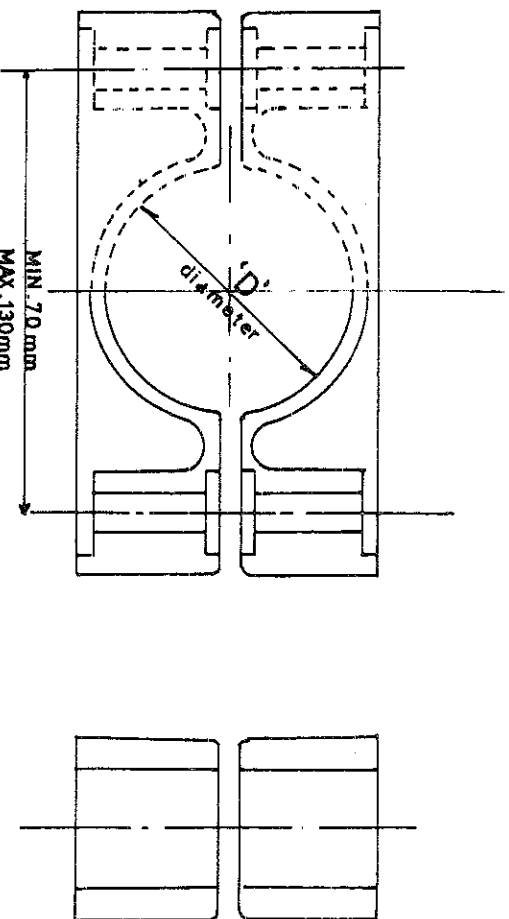
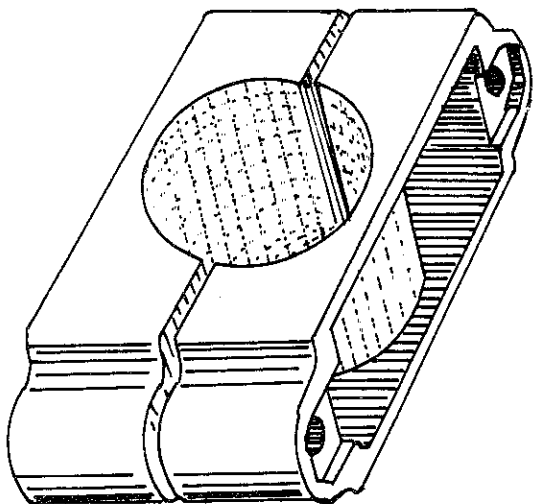
**SULTANATE OF OMAN**

MINISTRY OF ELECTRICITY & WATER

TITLE

RED LIGHT REFLECTOR

DRAWN BY	CHECKED BY	APPROVED BY
FRANCIS	<i>[Signature]</i>	<i>[Signature]</i>
DRG.NO. MEW/OH/016	DATE	19.09.1985



NOTE - INTERNAL DIAMETER 'D' TO SUIT INDIVIDUAL CABLE SIZES.  
 MATERIAL - ALUMINIUM ALLOY

VOLTAGE	SIZE OF CABLE	CABLE OVERALL DIAMETER
LV	120 Sq. mm	48 mm
LV	185 Sq. mm	57 mm
LV	240 Sq. mm	64 mm
11 KV	50 Sq. mm	63 mm
11 KV	185 Sq. mm	82 mm
11 KV	245 Sq. mm	86 mm
33KV	50 Sq. mm	86 mm
33 KV	300 Sq. mm	118 mm



**SULTANATE OF OMAN**

MINISTRY OF ELECTRICITY & WATER

TITLE  
**SINGLE WAY CABLE CLEAT**

TWO BOLT FIXING

DRAWN

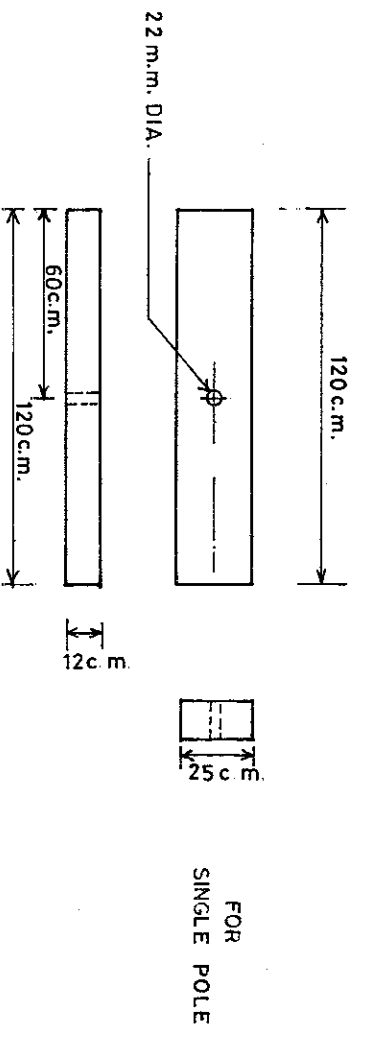
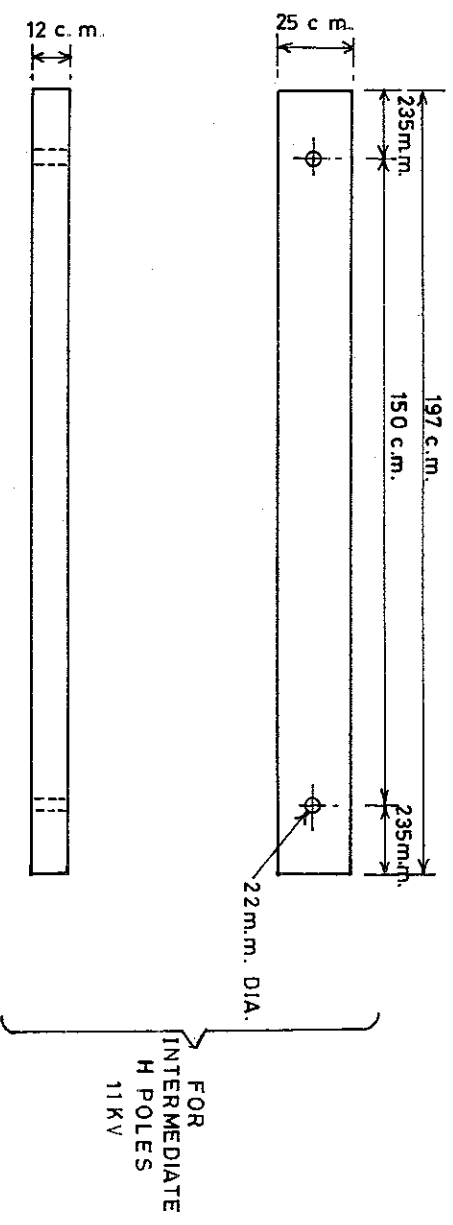
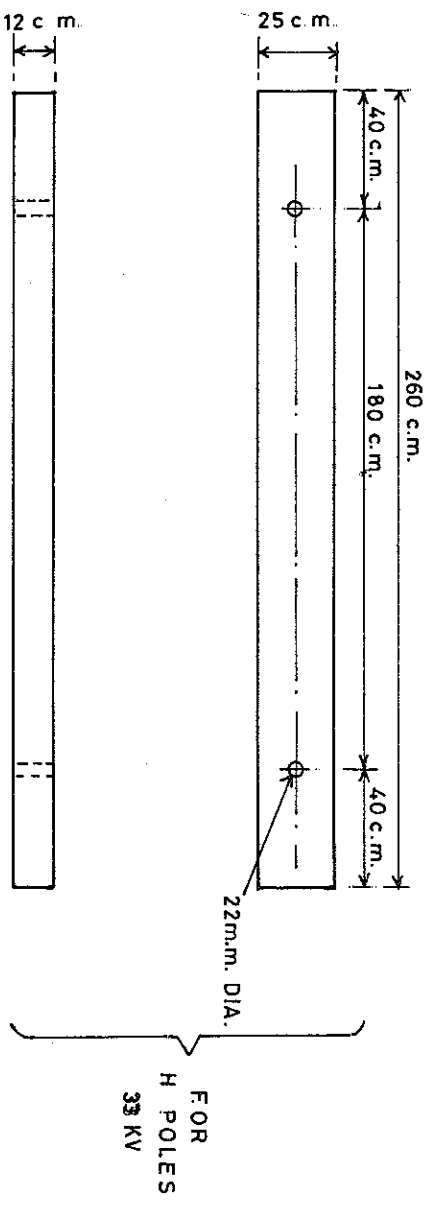
FRANCIS

CHECKED

APPROVED

DRG. NO. MEW/OH/019

DATE. 09-10-1985



MATERIAL WOOD. (SAME AS POLE MATERIAL)



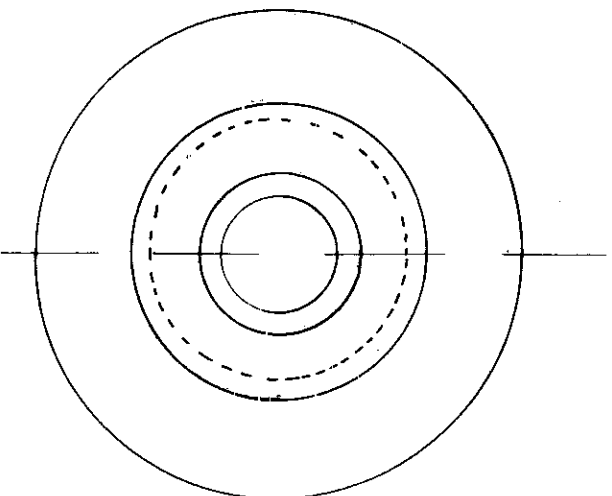
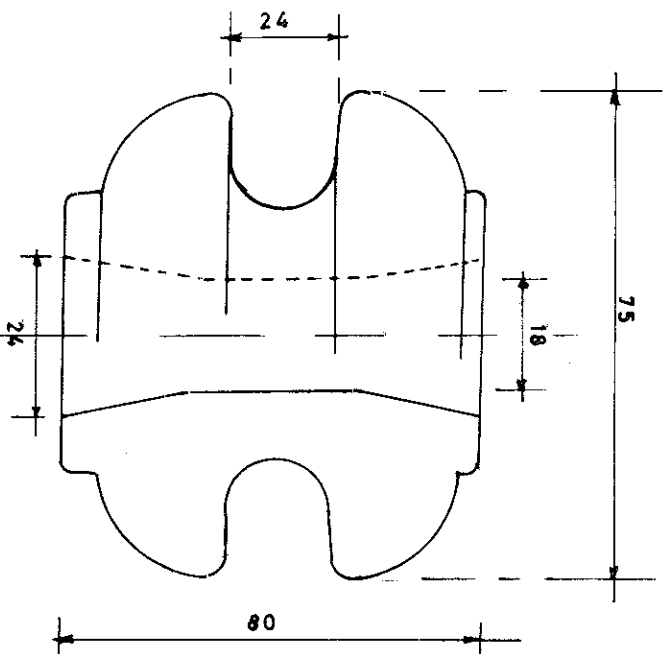
**SULTANATE OF OMAN**

MINISTRY OF ELECTRICITY WATER

TITLE  
**KICKING BLOCK**

DRAWN BY	CHECKED	APPROVED
JOSE		

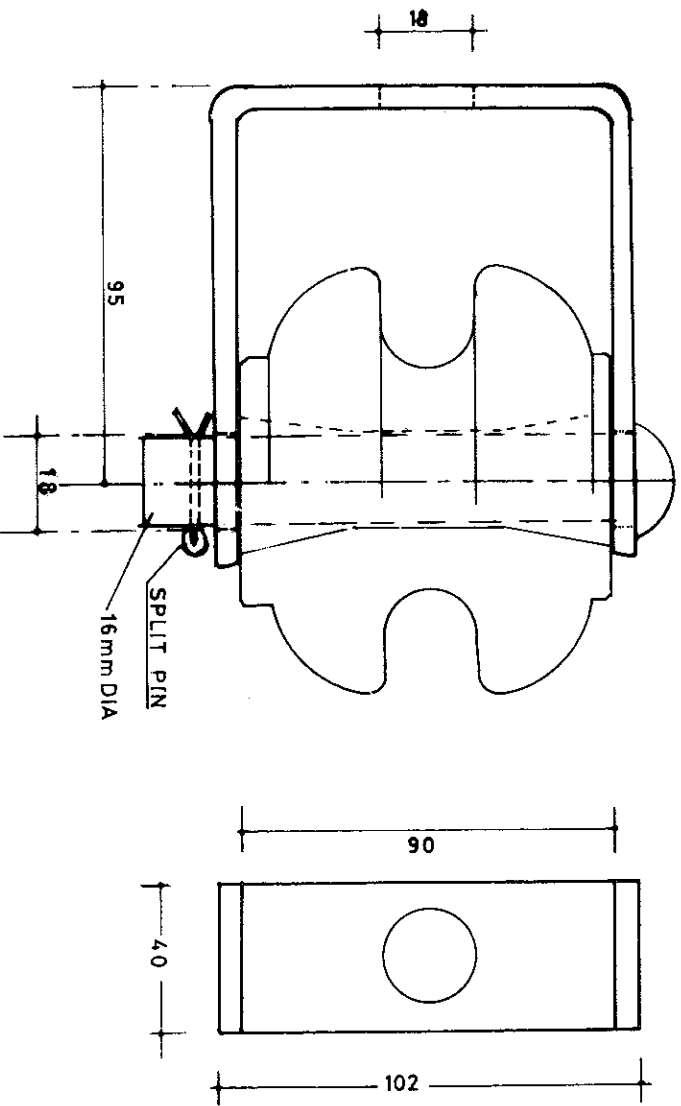
DRG NO. MEW/OH/025      DATE - 13 /12/1984  
SCALE



NOTE -  
 MATERIAL - PORCELAIN BROWN GLAZED  
 DRY FLASH OVER - 17 KV  
 WET FLASH OVER - 9 KV  
 TRANSVERSE STRENGTH - 13 KN

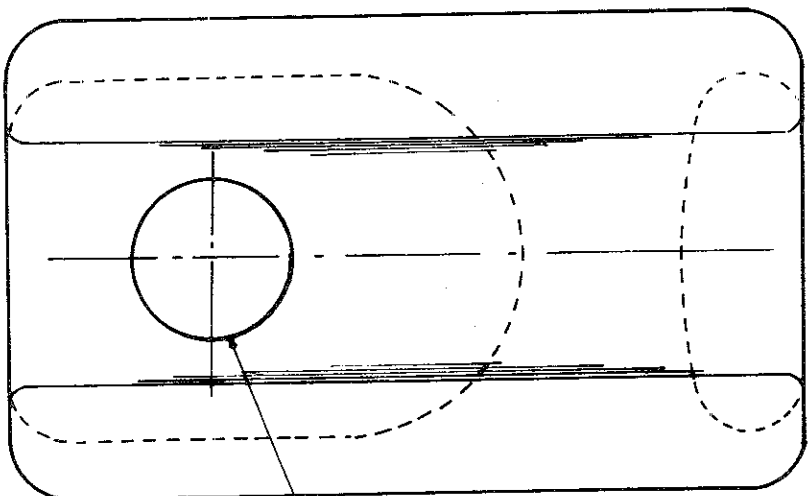
<b>MINISTRY OF ELECTRICITY &amp; WATER</b>			
<b>L.T. OVER HEAD LINE</b>			
<b>REEL INSULATOR</b>			
DRAN	CHECKED	APPROVED	
FRANCIS	<i>[Signature]</i>	<i>[Signature]</i>	
SCALE - N.T.S.	DATE - 05-03-1986		
DRAWING NO: MEW / O.H / 039			



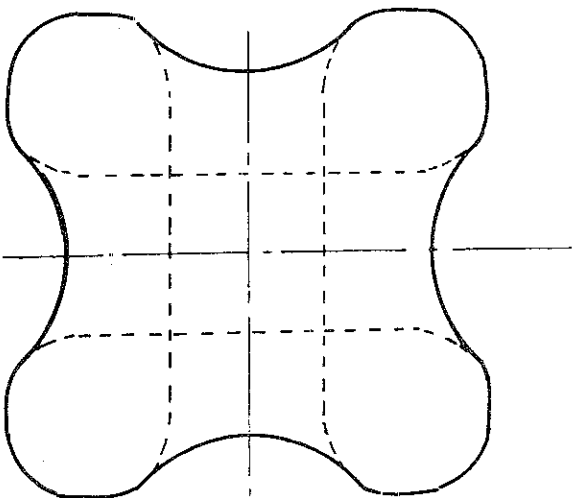


- MATERIAL-
1. PORCELAIN BROWN GLAZED
  2. MILD STEEL GALVANISED FOR 'D' CLAMP AND COMPLETE WITH BOLT AND SPLIT PIN
- ALL DIMENSIONS IN M.M.

<b>MINISTRY OF ELECTRICITY &amp; WATER</b>			
<b>L.T.OVER HEAD LINE</b>			
<b>'D' CLAMP WITH REEL INSULATOR</b>			
<b>AT CUT POINTS</b>			
DRAWN	CHECKED	APPROVED	
FRANCIS	<i>[Signature]</i>	<i>[Signature]</i>	
DRGNO: MEW/O.H/ 040	DATE -	04-03-1986	
SCALE - N.T.S.			



22 mm DIA HOLE



MATERIAL - PORCELAIN BROWN GLAZED.  
ALL DIMENSIONS IN M.M.  
TENSILE STRENGTH - 60 KN  
DRY FLASH OVER - 25 KV  
WET FLASH OVER - 12 KV

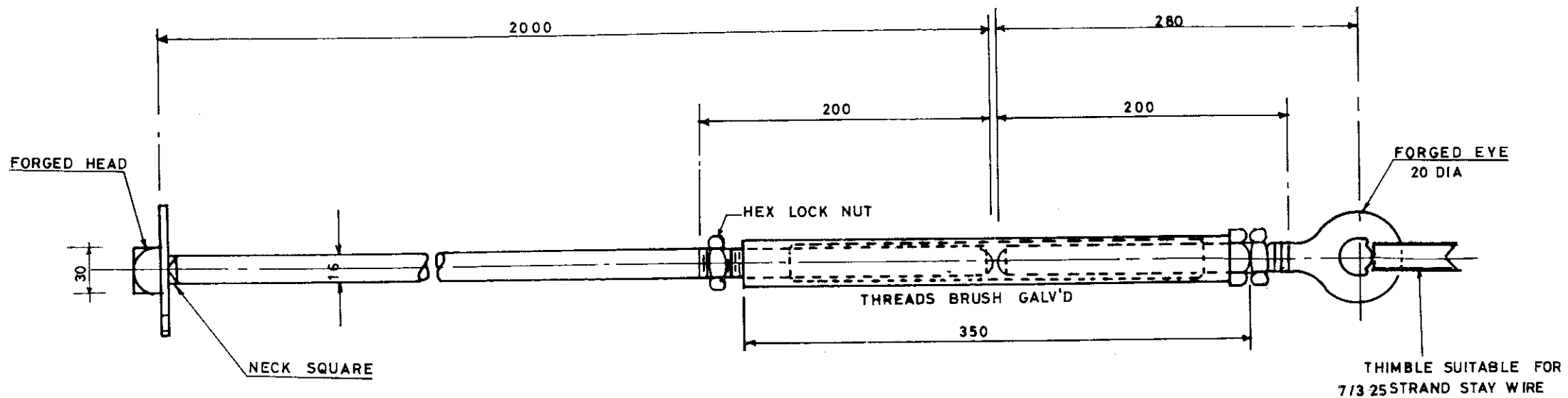
MINISTRY OF ELECTRICITY & WATER

L.T. OVER HEAD LINE  
STAY INSULATOR

DRAWN FRANCIS	CHECKED <i>[Signature]</i>	APPROVED <i>[Signature]</i>
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ORG.NO:MEW/O.H/041      DATE - 04-03-1986

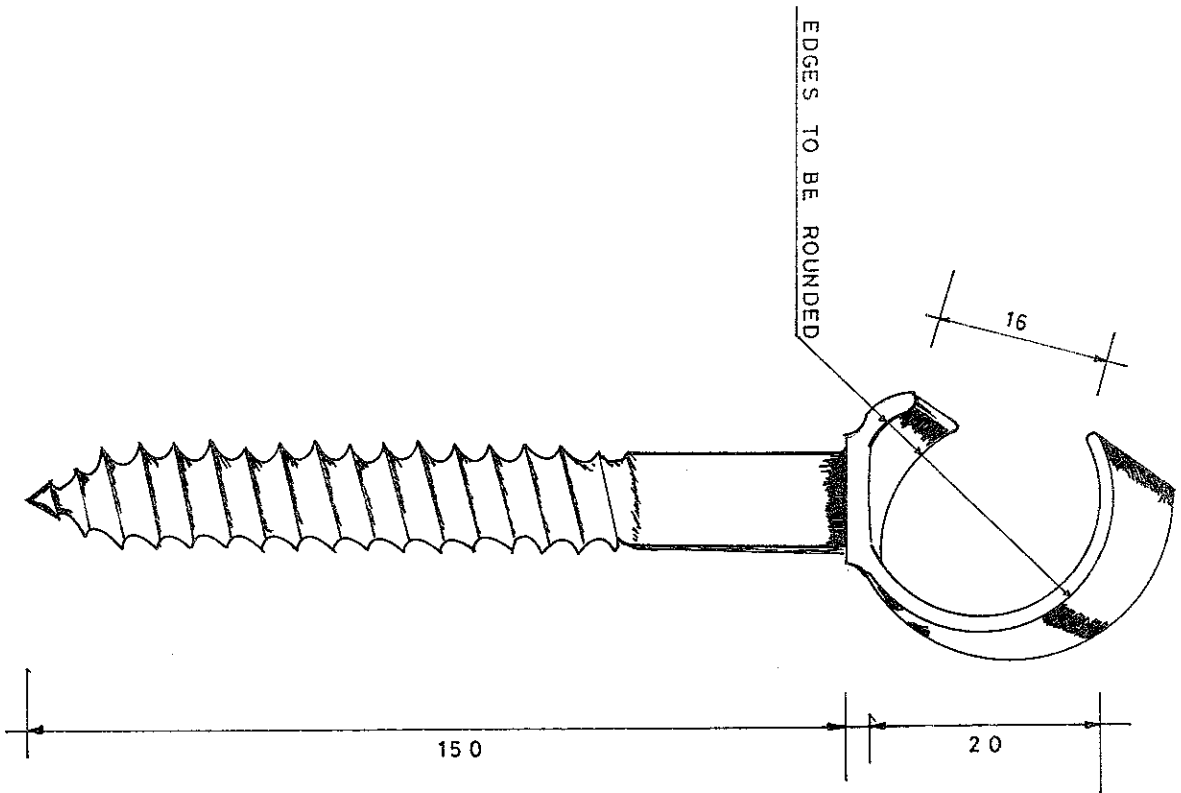
SCALE - N.T.S.



**NOTE :**

- 1 ALL DIMENSIONS IN MILLIMETRE
2. STEEL 30 TON QUALITY TO B.S. 4848
3. GALVANISED TO BS 729

<b>MINISTRY OF ELECTRICITY &amp; WATER</b>		
TITLE LT. O/H. LINE - STAY SET		
DRAWN FRANCIS	CHECKED <i>[Signature]</i>	APPROVED <i>[Signature]</i>
DRG. NO. - MEW/OH / 042		
SCALE - N.T.S.		DATE - 08-03-1986

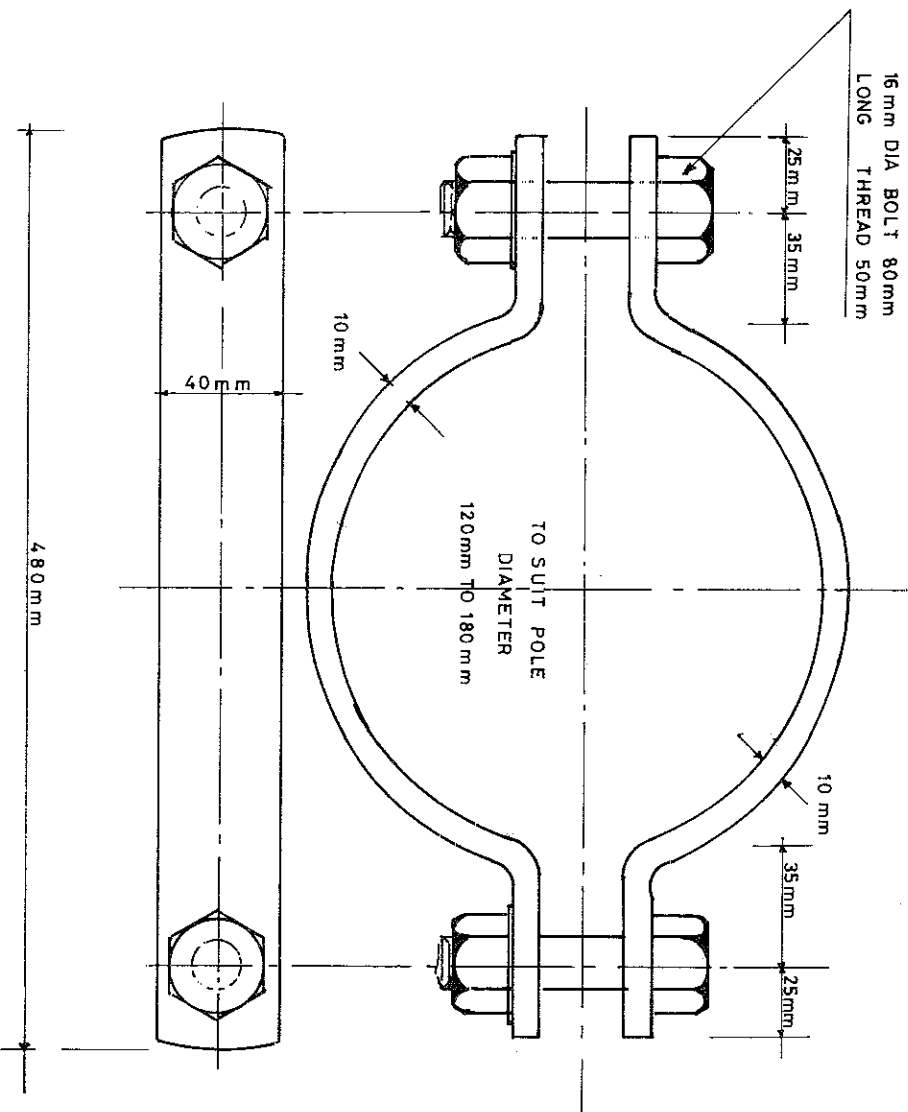


NOTE:

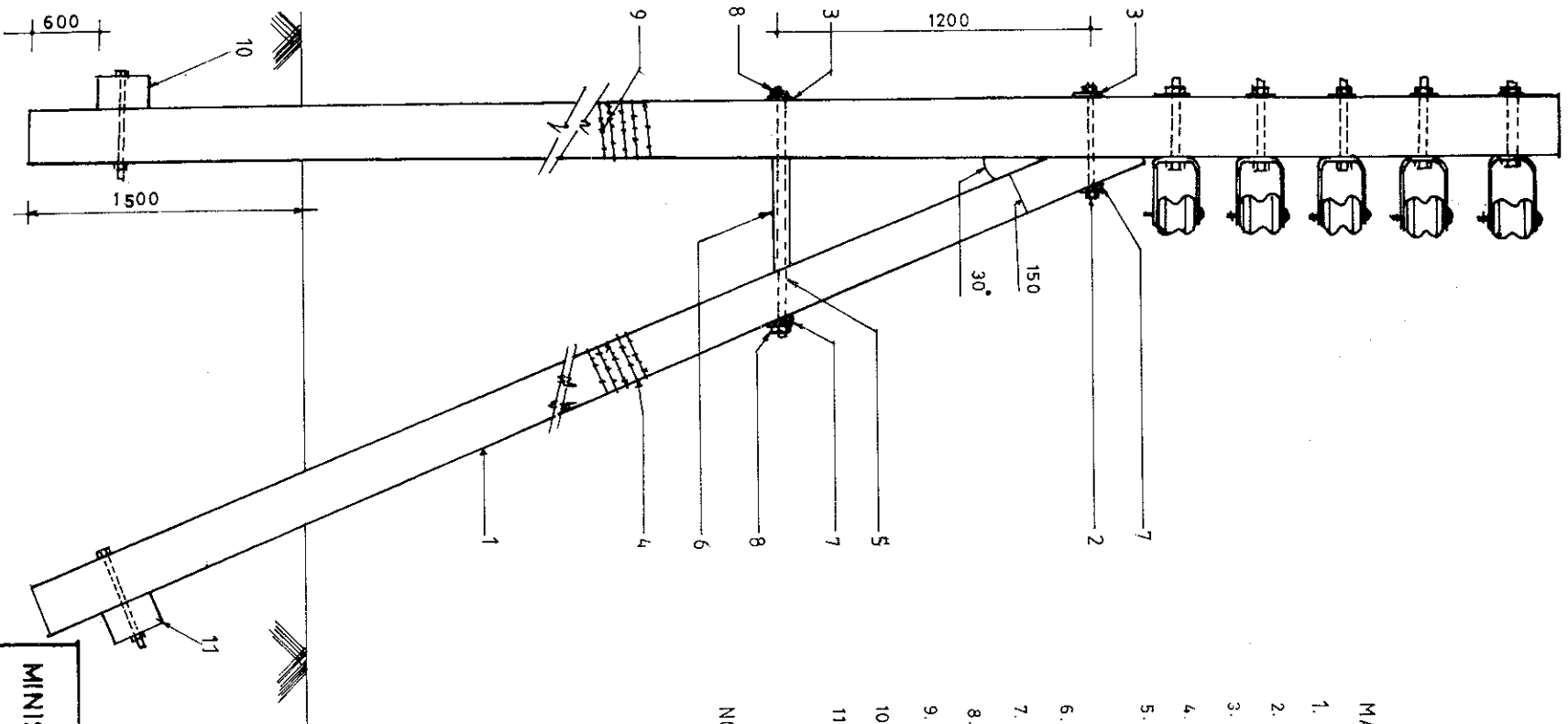
MATERIAL - MILD STEEL 30 TON QUALITY TO B.S. 4848 DROP FORGED  
HOT DIP GALVANISED

ALL DIMENSIONS IN MILLIMETRES

MINISTRY OF ELECTRICITY & WATER			
SCREW EYE FOR L.T. EARTH WIRE ON EXISTING WOOD POLE LINES			
DRAWN	CHECKED	APPROVED	
FRANCIS	<i>[Signature]</i>	<i>[Signature]</i>	
DRAWING NO: MEW/OH/043		DATE - 06-04-1986	
SCALE - N.T.S.			



MINISTRY OF ELECTRICITY & WATER		
TITLE L.T. STAY CLAMP		
DRAWN FRANCIS	CHECKED	APPROVED <i>Raymond</i>
DRAWING NO: MEW / OH / 045		
SCALE - N.T.S.	DATE - 05 - 05 - 1986.	



MATERIAL

1. 9M. POLE
2. M20 x 400mm BOLT & NUT
3. 3" CURVED WASHER
4. BARBED WIRE
5. TIE ROD 20mm DIA 1100mm LONG, THREADED 150mm ON BOTH ENDS
6. SPACER TUBE 25mm DIA
7. CURVED TAPERED WASHER
8. M 20 NUTS
9. STAPLES
10. KICKING BLOCK
11. STAY BAULK

NOTE

ALL DIMENSIONS IN M.M.  
ALL M.S. MATERIALS GALVANISED  
TO B.S. 729

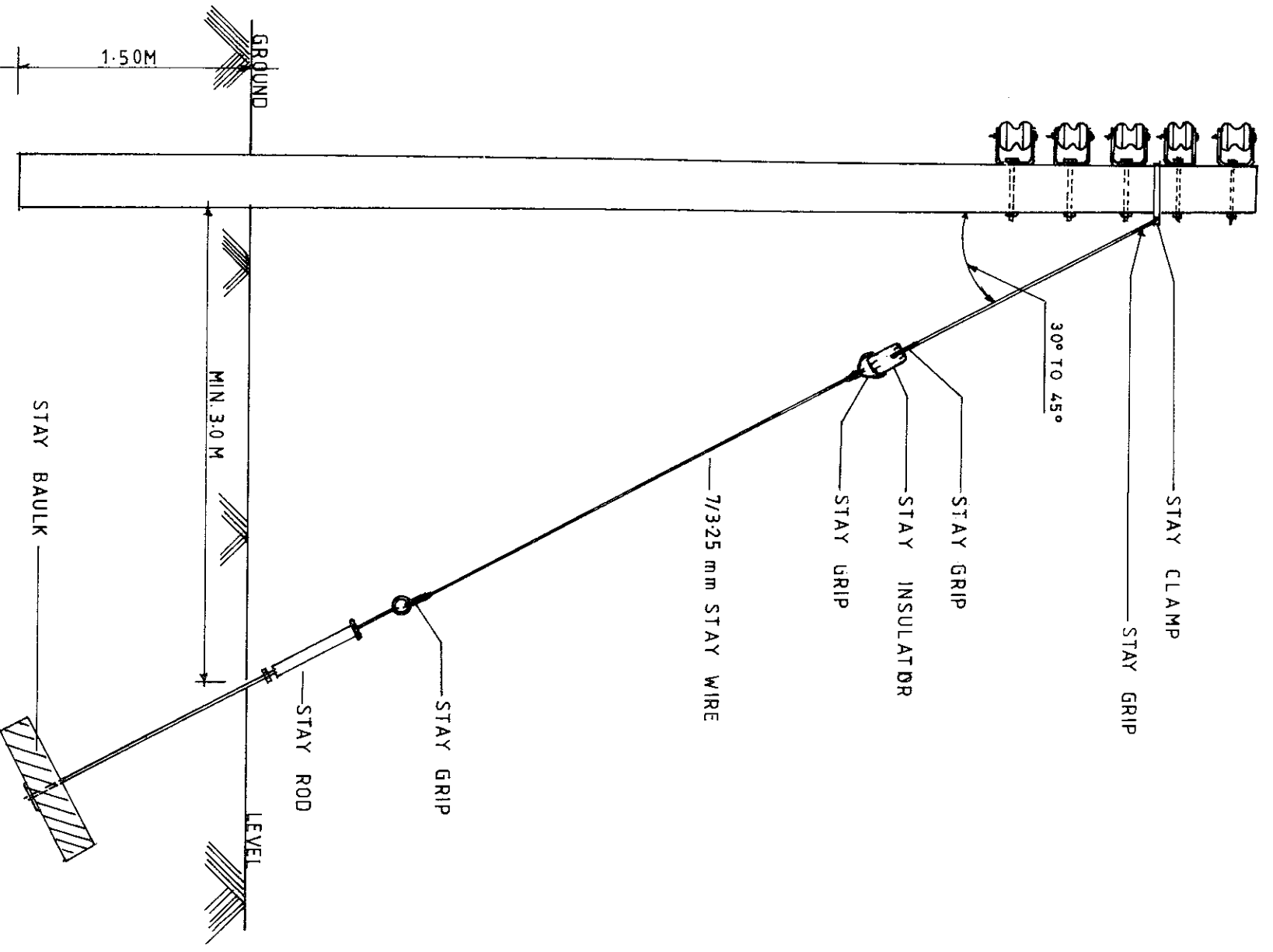
POLES TO BE PLANTED TO A  
DEPTH OF 1500mm BELOW THE  
GROUND LEVEL.

MINISTRY OF ELECTRICITY & WATER

LT STRUT STAY INSTALLATION

DRAWN	CHECKED	APPROVED
FRANCIS	<i>[Signature]</i>	<i>[Signature]</i>

DRAWING NO. MEW / OH / 046  
SCALE - N.T.S. DATE - 08 - 04 - 1986



NOTE -  
 1. STAY GRIP SHALL BE PERFORMED TYPE

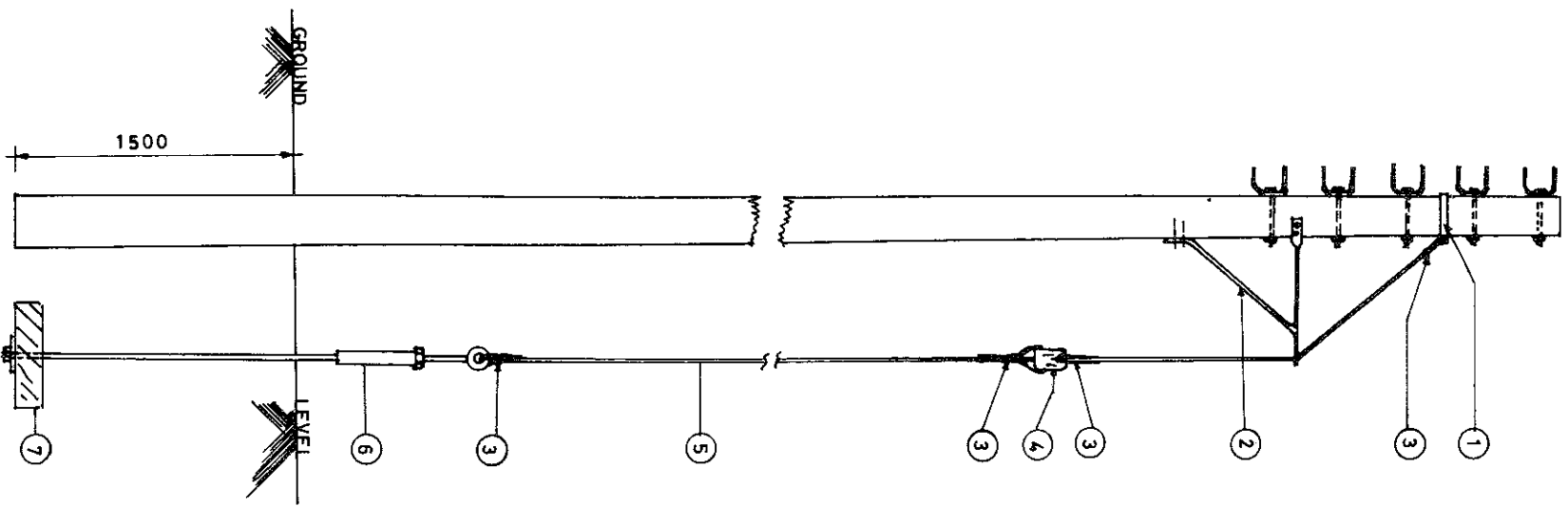
MINISTRY OF ELECTRICITY & WATER

L.T. STAY INSTALLATION

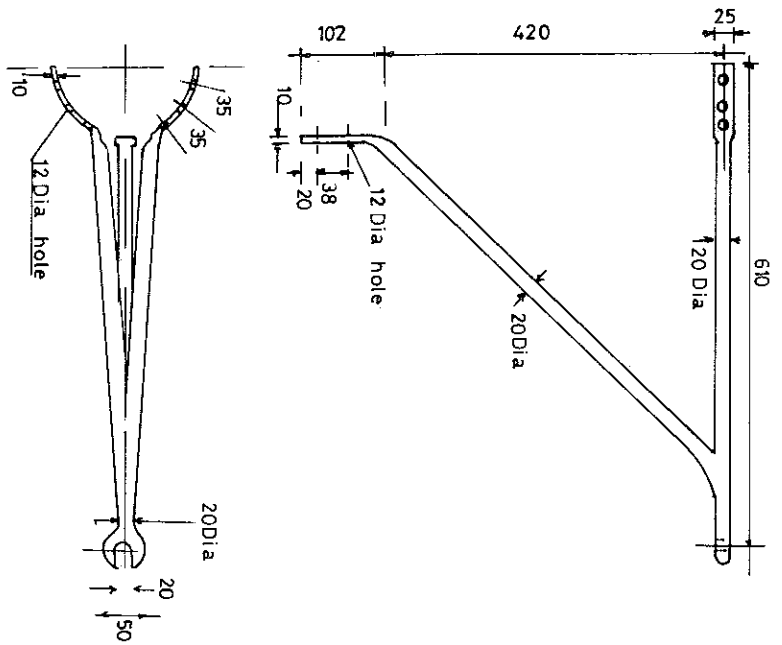
DRAWN	CHECKED	APPROVED
FRANCIS	<i>[Signature]</i>	<i>[Signature]</i>

DRAWING NO: MEW / OH / 047

SCALE - N.T.S. DATE - 12\_04\_1986



NOTE  
 ALL DIMENSIONS IN M.M.  
 TO BE USED IN SPECIAL LOCATIONS WHERE  
 SPACE LIMITATIONS DO NOT PERMIT THE  
 USE OF STAY AS PER DRGS. MEW/OH/046  
 AND. MEW/OH/047. SPECIFIC APPROVAL OF  
 MEW TO BE OBTAINED IN EACH CASE.



DETAILS OF OUTRIGGER BRACKET

MATERIAL - MILD STEEL 30TON QUALITY  
 GALVANISED TO B.S. 729

- ① STAY CLAMP
- ② OUTRIGGER BRACKET
- ③ GUY GRIP PERFORMED
- ④ STAY INSULATOR
- ⑤ STAY WIRE
- ⑥ STAY ROD
- ⑦ STAY BAULK

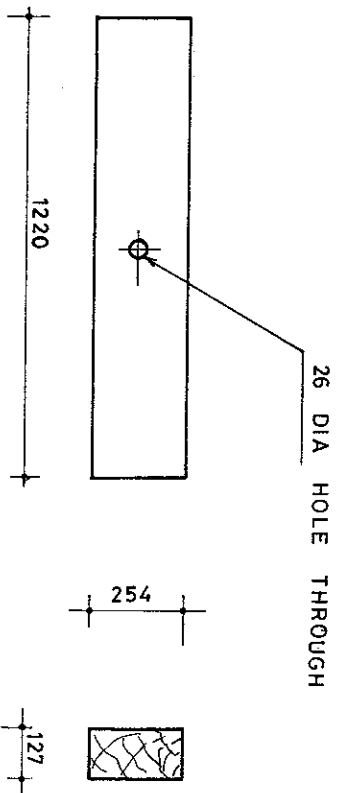
MINISTRY OF ELECTRICITY & WATER

L.T. OUTRIGGER STAY INSTALLATION

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FRANCIS	<i>[Signature]</i>	<i>[Signature]</i>

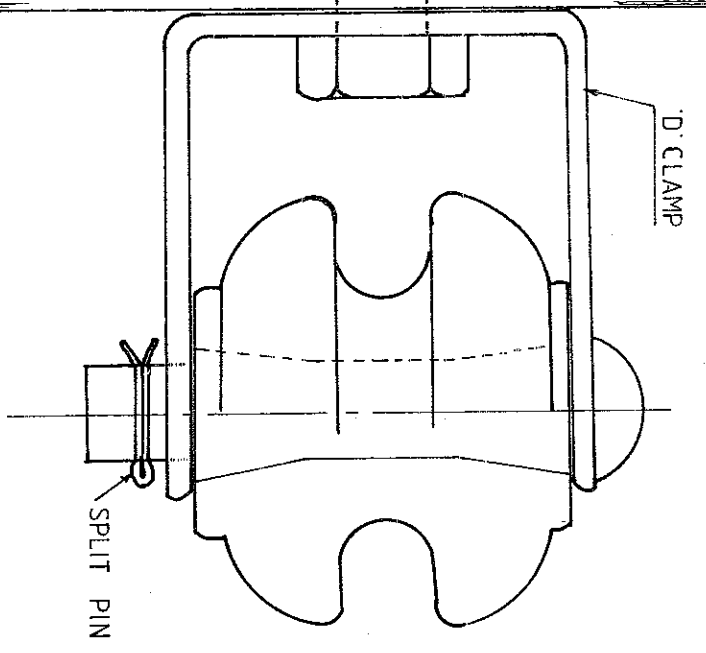
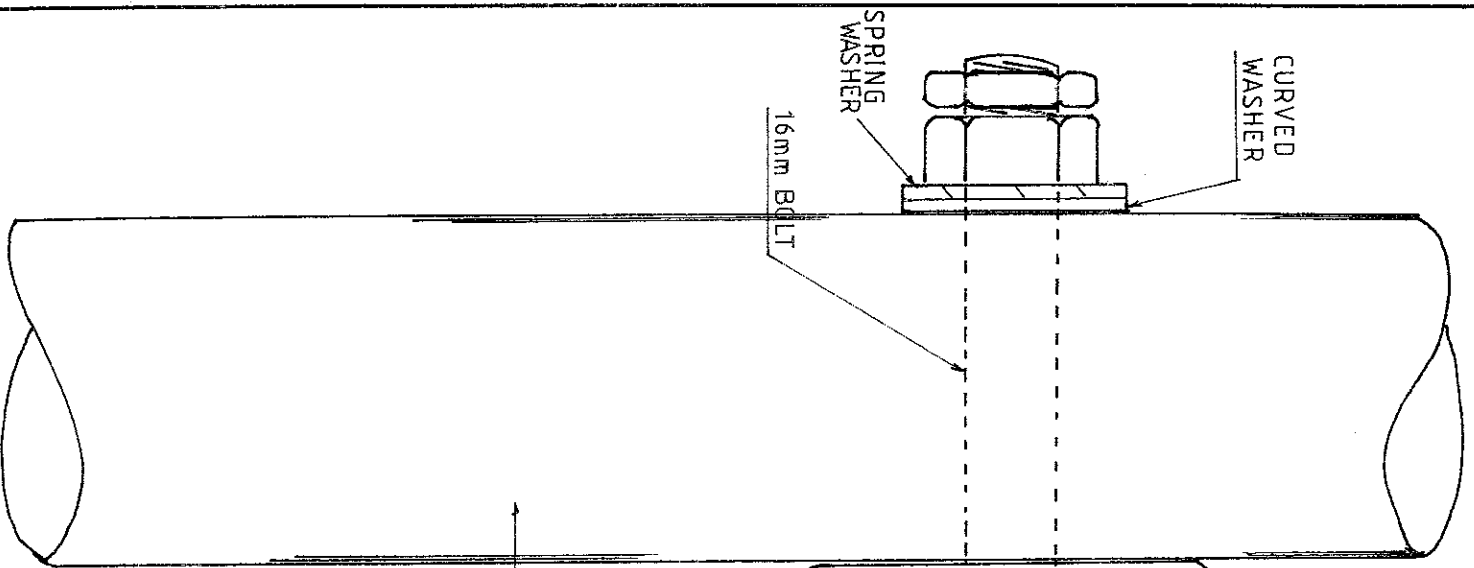
DRAWING NO. MEW / OH / 048  
 SCALE - N.T.S. DATE - 10-04-1986





MANUFACTURED FROM CREOSOTED WOOD  
 ALL DIMENSIONS IN MILLIMETERS.

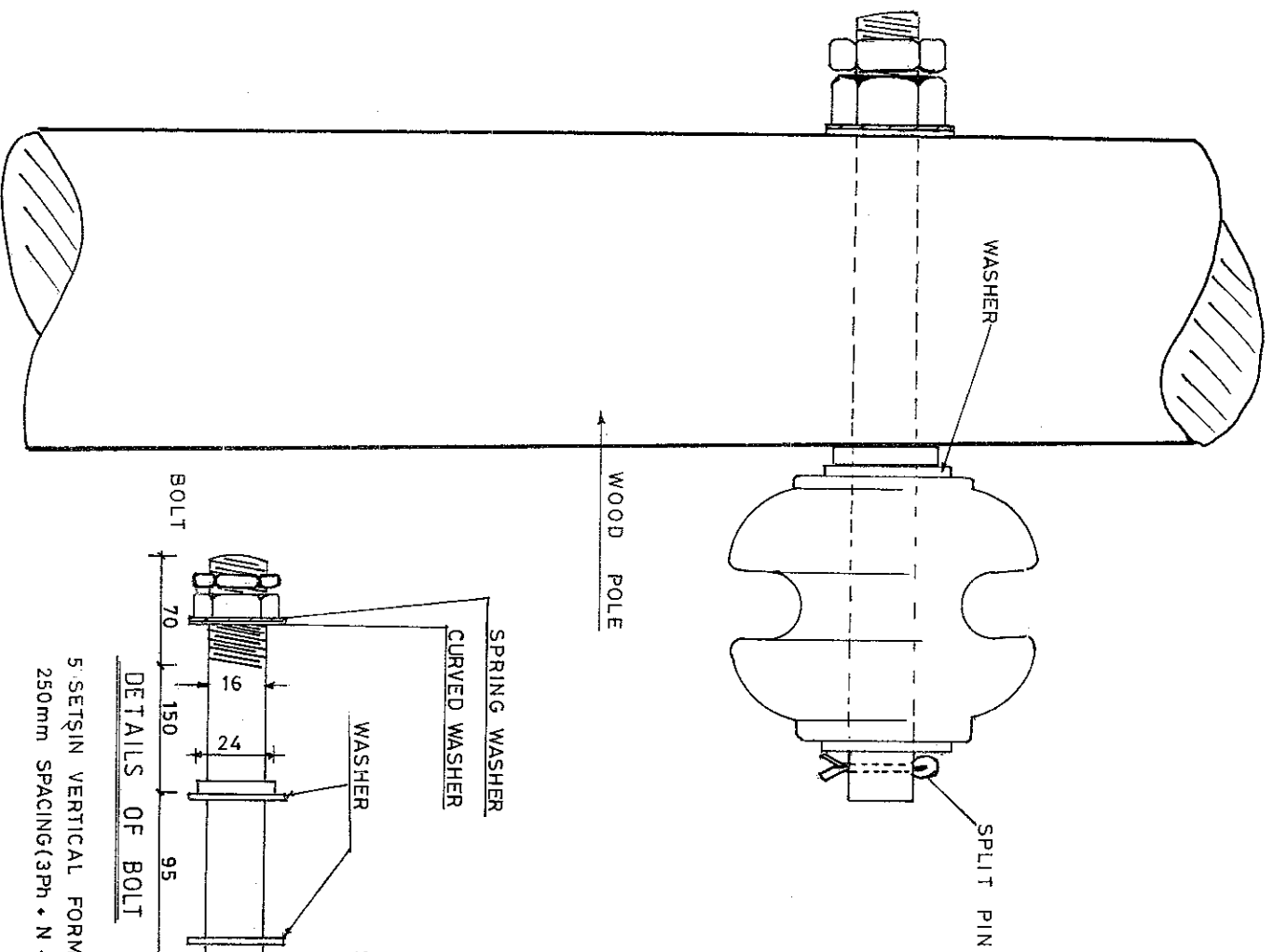
MINISTRY OF ELECTRICITY & WATER		
TITLE		
STAY BAULK		
DRAWN BY	CHECKED BY	APPROVED BY
FRANCIS		<i>Basu</i>
DRAWING NO: MEW / OH / 049		
SCALE - N. T. S.	DATE - 13 - 01 - 1987	



WOOD POLE

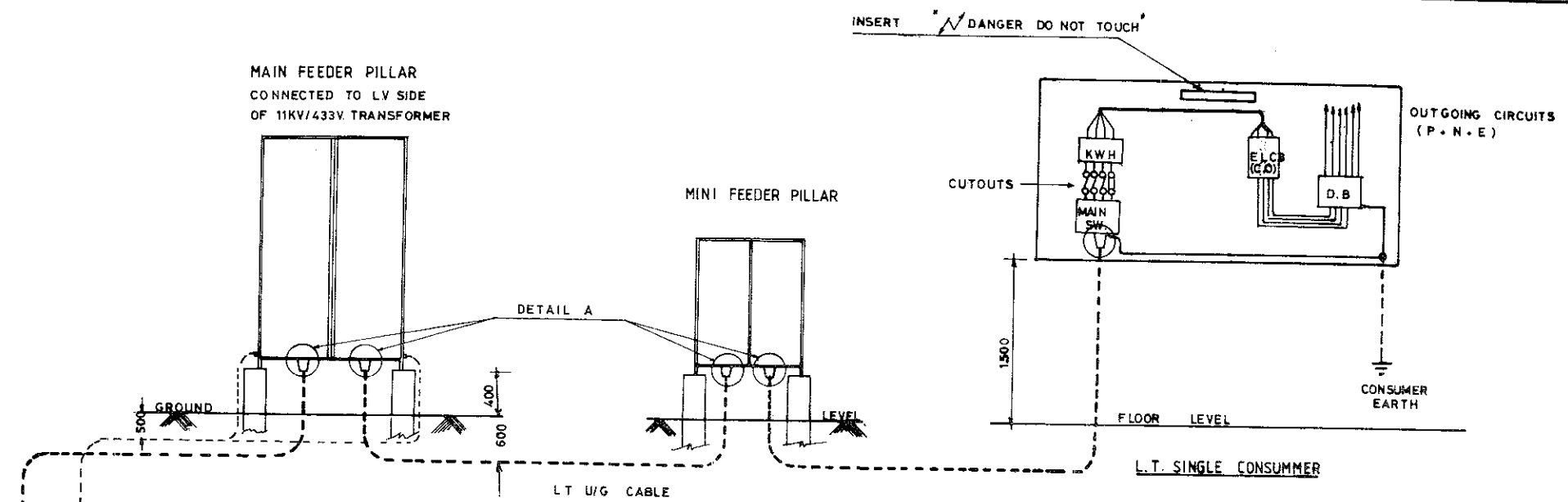
- NOTE -
1. REEL INSULATOR AS PER DRG. NO. MEW/O.H/039
  2. D. CLAMP AS PER DRG. NO. MEW/O.H/040
  3. FIVE SETS IN VERTICAL FORMATION 250mm SPACING (3Ph + N + E)

<b>MINISTRY OF ELECTRICITY &amp; WATER</b>	
<b>L.T. O/H LINE - GENERAL ARRANGEMENT FOR CUT POINT</b>	
DRAWN FRANCIS	CHECKED <i>[Signature]</i>
DRAWING. NO: MEW/OH-GA/14	APPROVED <i>[Signature]</i>
SCALE - N.T.S.	DATE - 11-03-1986

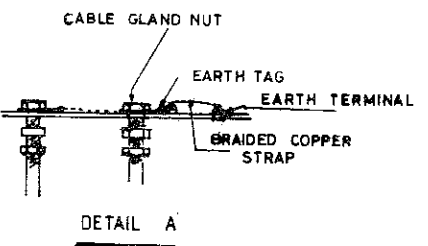


NOTE - FOR 3 PHASE & N + EARTH - 5SETS  
 EARTH WIRE TO BE 70mm<sup>2</sup> BARE ALUMINIUM  
 STEEL WORK GALVANISED  
 TO B.S. 729  
 REEL INSULATOR AS PER  
 DRG.NO: MEW/OH/039  
 GALVANISED BOLT & NUTS  
 TO B.S. 4190 COMPLETE  
 ONE FULL NUT, ONE HALF  
 LOCK NUT, THREE CIRCULAR  
 FLAT WASHER AND ONE  
 SPRING WASHER

<b>MINISTRY OF ELECTRICITY &amp; WATER</b>	
TITLE <b>L.T. O/H. LINE - GENERAL</b>	
<b>ARRANGEMENT FOR TANGENT POINT</b>	
DRAWN <b>FRANCIS</b>	CHECKED <i>[Signature]</i>
DRAWING NO: MEW/OH-GA/15	APPROVED <i>[Signature]</i>
SCALE N.T.S.	DATE 11.03.1986

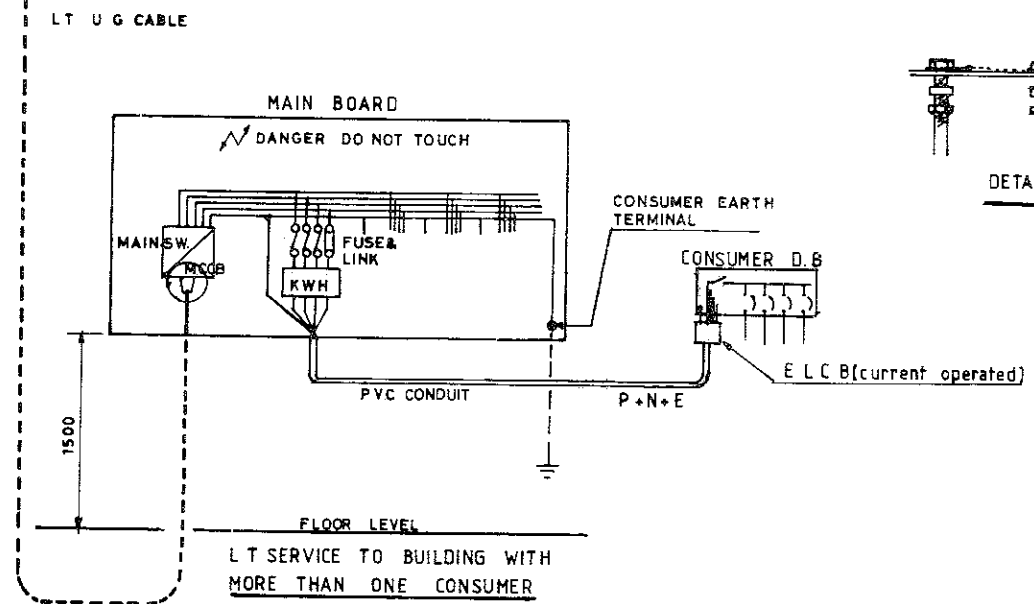


INSERT DANGER DO NOT TOUCH

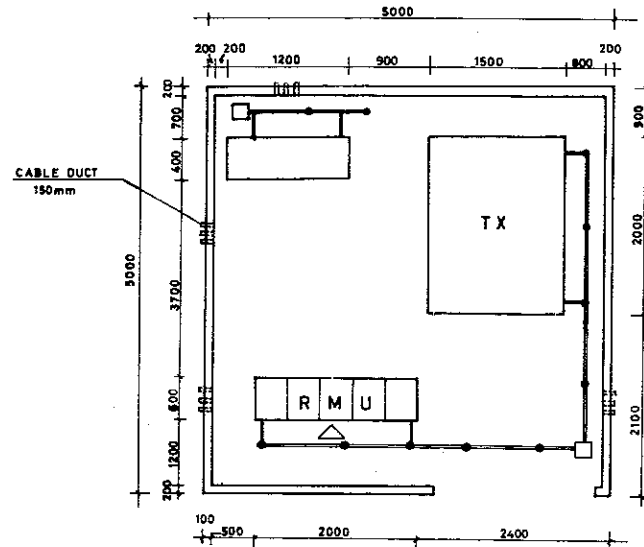


NOTE

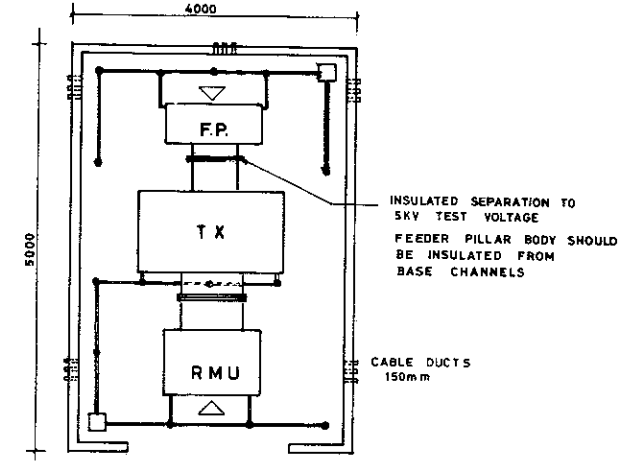
- 1 All cable armour to be connected by separate braided copper strap to earth bar inside feeder pillar
2. Neutral bar and earth bars inside to be connected solidly by bolted link in case of main feeder pillar and should remain separate in sub-distribution feeder pillar
- 3 Incoming and outgoing cable armour to be connected to earth bar inside the feeder pillar



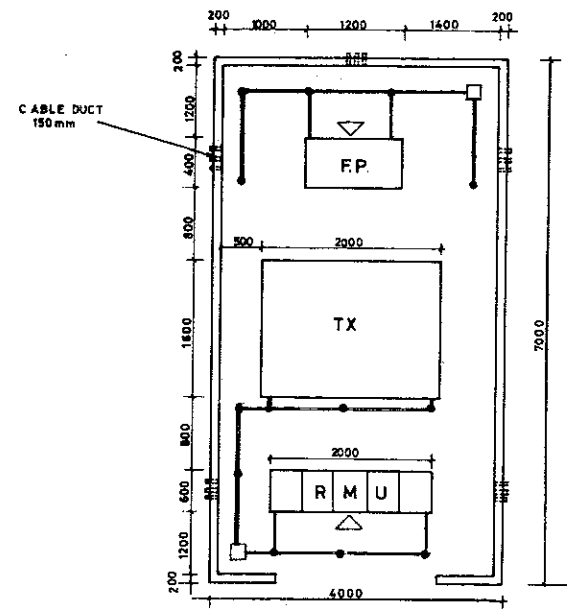
MINISTRY OF ELECTRICITY & WATER		
L.T. SERVICES FROM FEEDER PILLAR		
DRAWN FRANCIS	CHECKED 	A.PPROVED 
DRAWING NO: MEW / OH - GA / 16		
SCALE N.T.S.	DATE - 31 - 03 - 1986	



TYPE - A



UNIT SUBSTATION



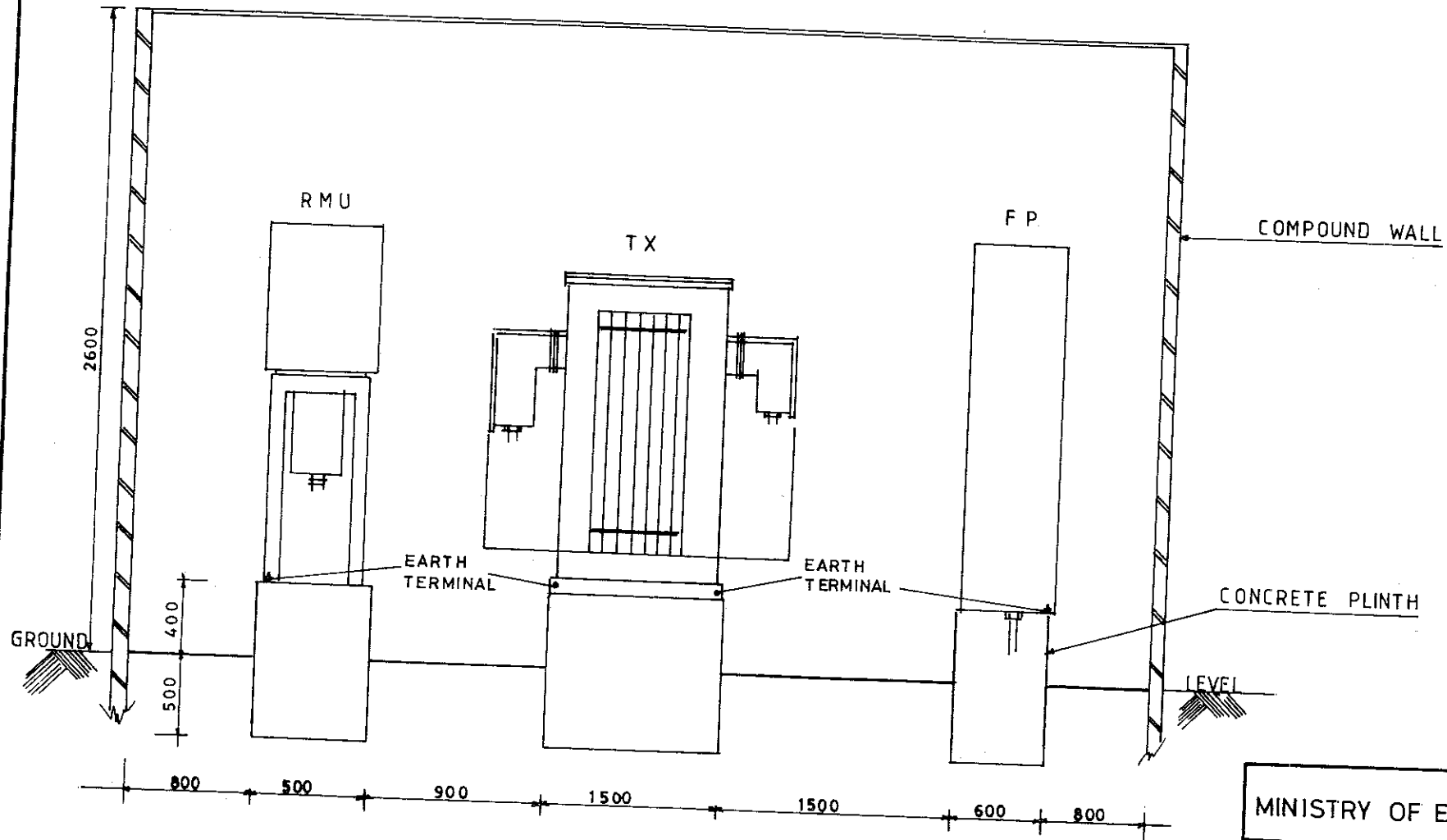
TYPE - B

LEGEND

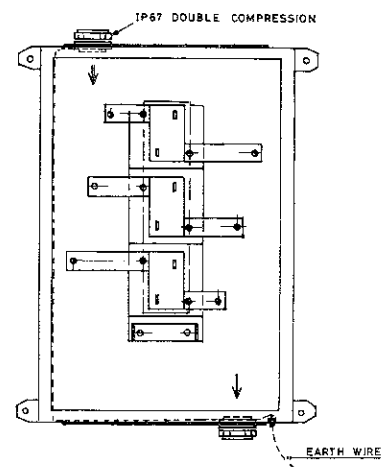
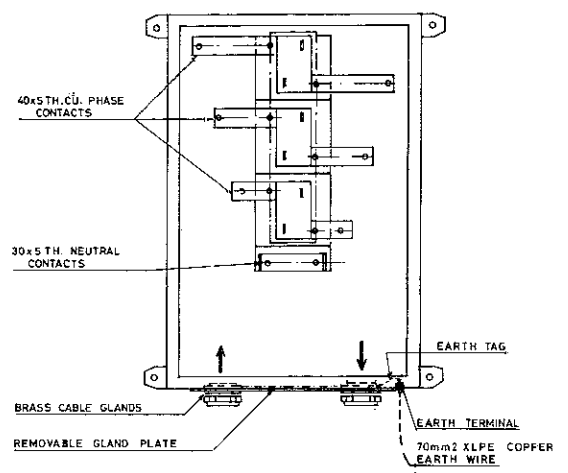
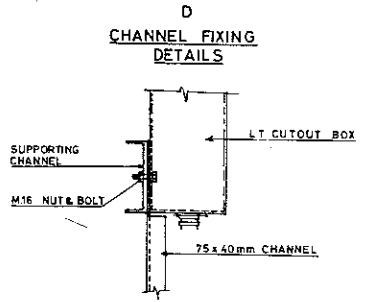
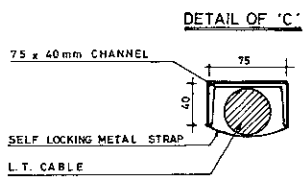
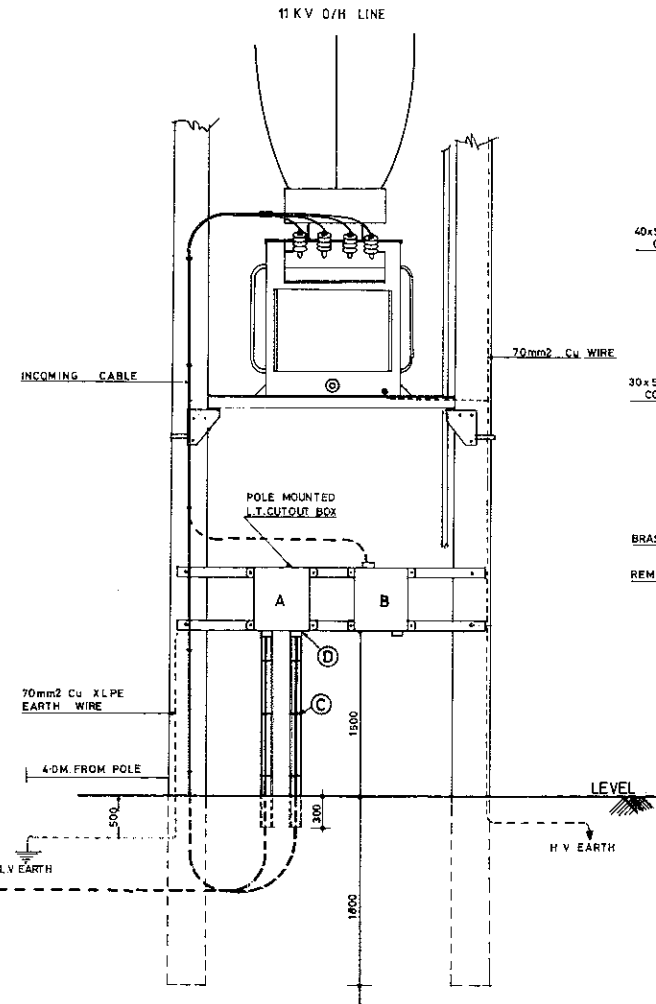
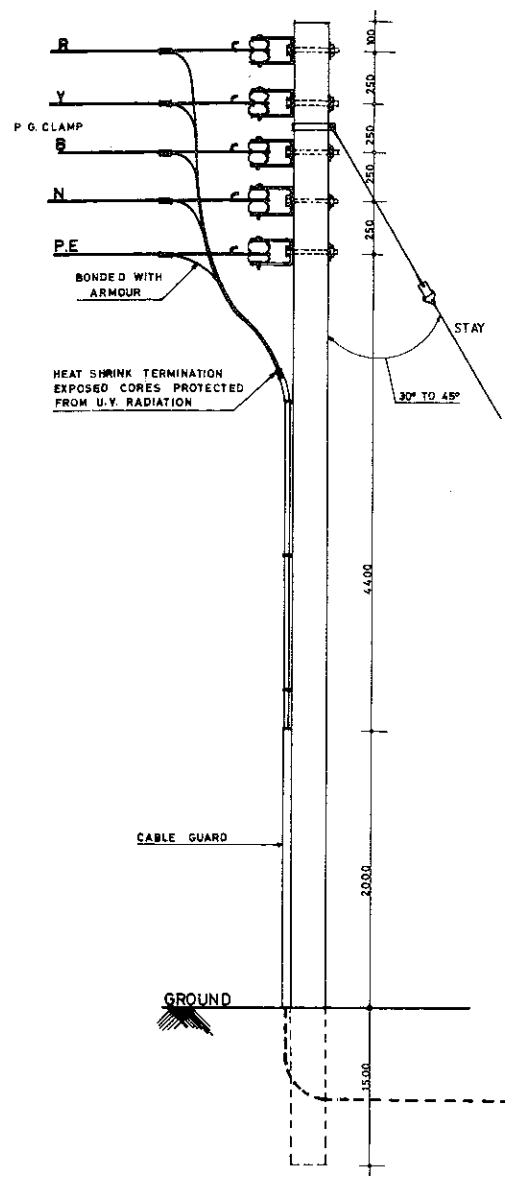
1. EARTH PIT WITH EARTH ROD DRIVEN TO REQUIRED DEPTH TO OBTAIN RESISTANCE NOT EXCEEDING 5 OHMS. EARTH ROD SHOULD BE IN COPPER
2. COPPER EARTH CONDUCTOR 70mm<sup>2</sup> XLPE INSULATED (LT)
3. COPPER EARTH CONDUCTOR 70mm<sup>2</sup> XLPE INSULATED (HT)
4. EARTH SPIKE COPPER 16mm DIA 1200mm LONG
5. MAIN EARTH CONDUCTOR AND SPIKE BURIED 500mm BELOW GROUND LEVEL

NOTE - LT SINGLE CORE CABLE ARMOUR TO BE BONDED ON FEEDER PILLAR SIDE ONLY  
EARTH PIT AS PER DRAWING NO. MEW/OH-GA/24

MINISTRY OF ELECTRICITY & WATER		
TITLE 11KV/433V. TYPICAL SUBSTATION LAYOUTS		
DRAWN FRANCIS	CHECKED <i>[Signature]</i>	APPROVED <i>[Signature]</i>
DRAWING NO: MEW / OH_GA / 17 (Sheet 1 of 2)		
SCALE - N. T. S.	DATE - 19. 03. 1986	



MINISTRY OF ELECTRICITY & WATER		
TITLE - 11KV/433V TYPICAL SUBSTATION LAYOUTS		
DRAWN FRANCIS	CHECKED <i>[Signature]</i>	APPROVED <i>[Signature]</i>
DRAWING NO: MEW/OH_GA/17 (Sheet 2 of 2)		
SCALE - N.T.S.	DATE - 09-04-1986	



- NOTE
- 1 75mm x 40mm H.S. CHANNEL BOLTED SUITABLY WITH HORIZONTAL CHANNEL SUPPORTING L.T. CUTOUT BOX AND BURIED IN GROUND TO 300mm DEPTH
  - 2 L.T. CABLE TO BE INSTALLED INSIDE WEB AND HELD IN POSITION WITH SELF LOCKING GALVANISED METAL STRAPS
  - 3 STEEL MATERIALS GALVANISED TO B S 729

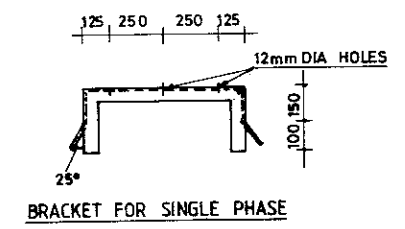
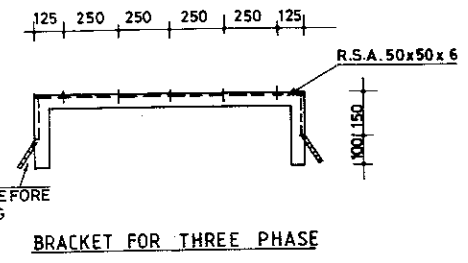
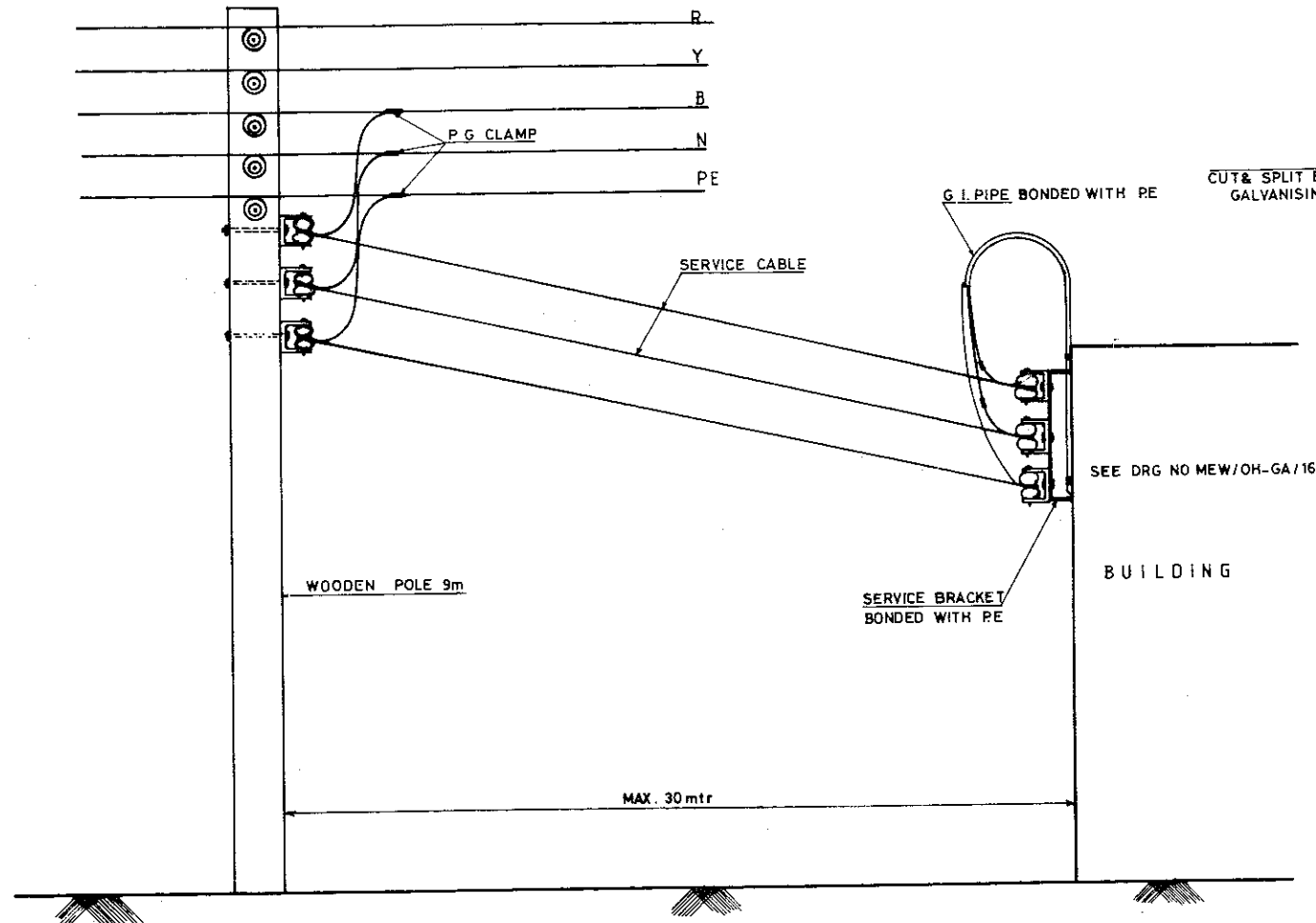
MINISTRY OF ELECTRICITY & WATER

TITLE LT. FEEDER CONNECTION FROM POLE MOUNTED TRANSFORMER

DRAWN FRANCIS	CHECKED	APPROVED <i>Francis</i>
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DRAWING. NO: MEW/OH-GA/18

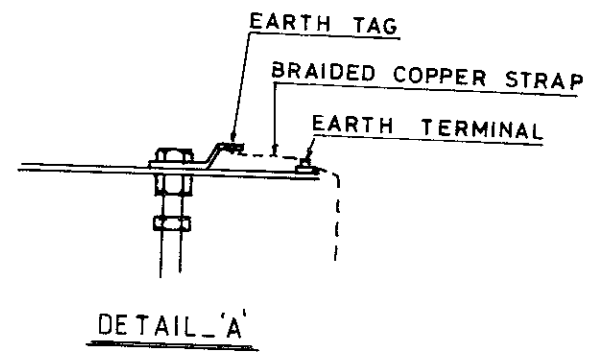
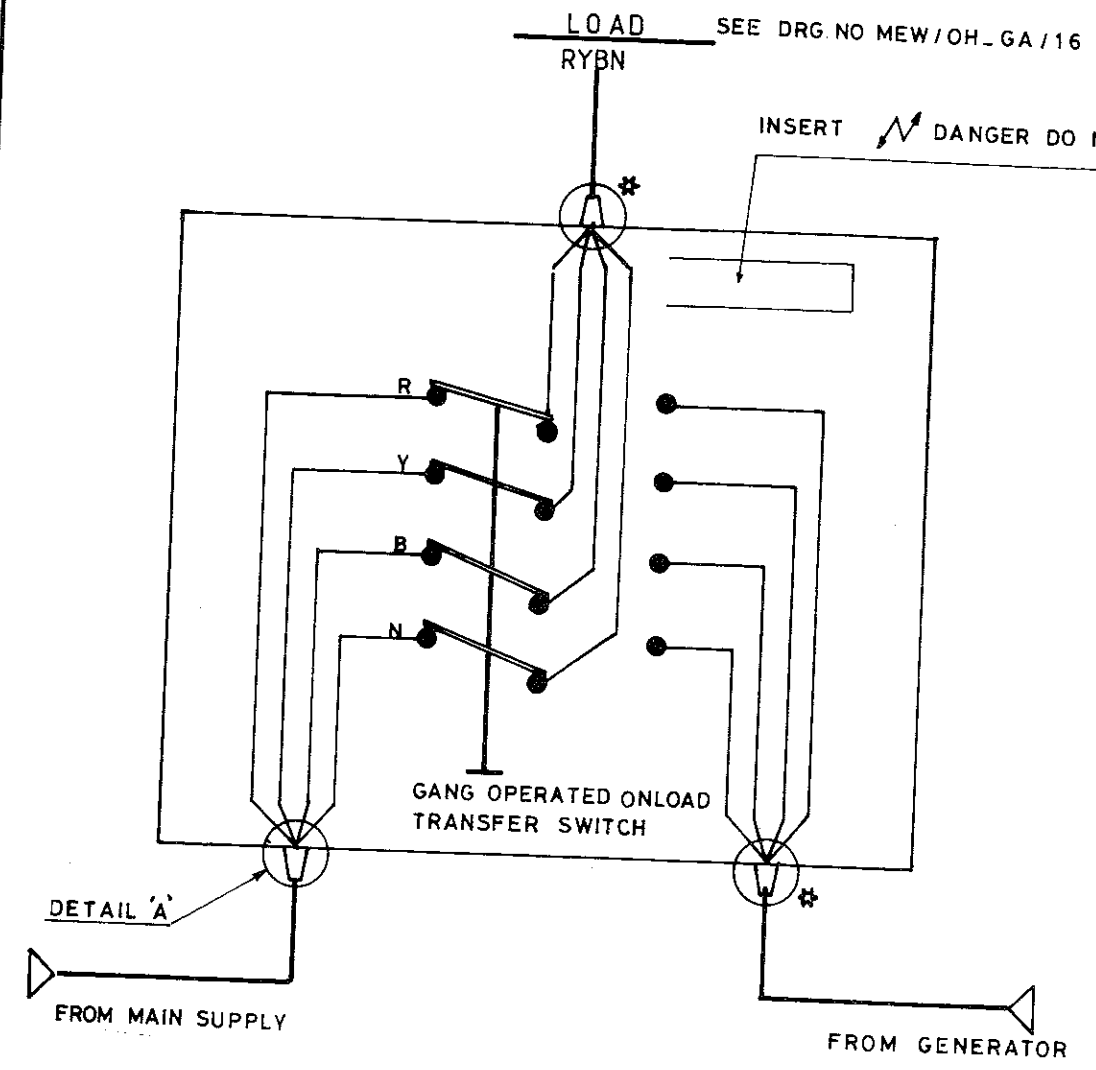
SCALE: N.T.S. DATE: 17-01-1987



NOTE\_ R S A 50x50x6mm BRACKETS GALVANISED TO BS 729  
ALL DIMENSIONS IN MILLIMETERS

MINISTRY OF ELECTRICITY & WATER		
TITLE LT. SERVICE FROM OVERHEAD LINE		
BRAWN FRANCIS	CHECKED	APPROVED <i>Francis</i>
DRAWING. NO: MEW / OH - GA / 19		
SCALE : N.T.S.	DATE : 18 - 01 - 1987	

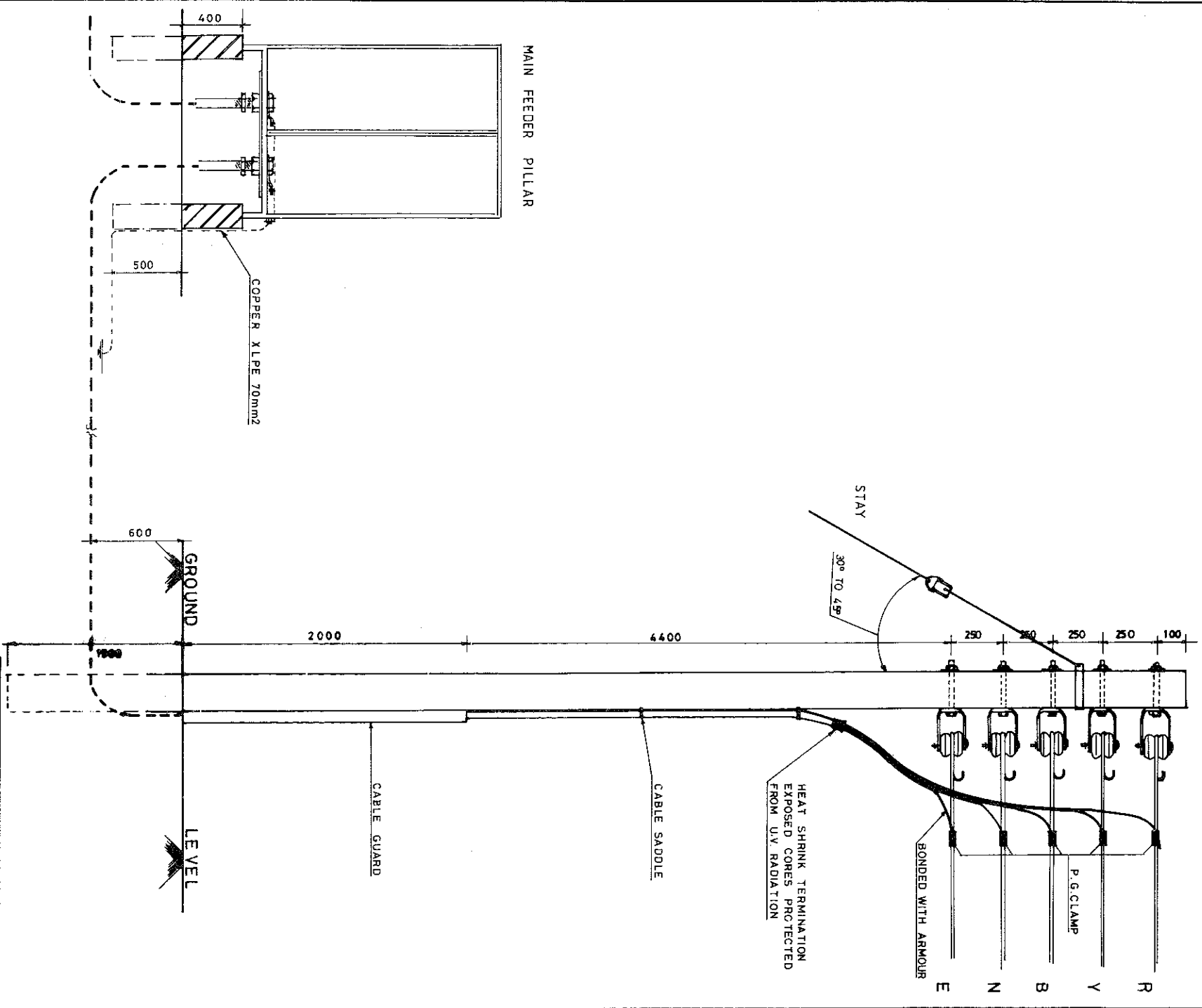




NOTE -  
 OPERATING HANDLE OF TRANSFER SWITCH TO BE INSULATED TO 2.5KV TEST VOLTAGE

\* ARMOUR NOT TO BE BONDED WITH METAL CASE

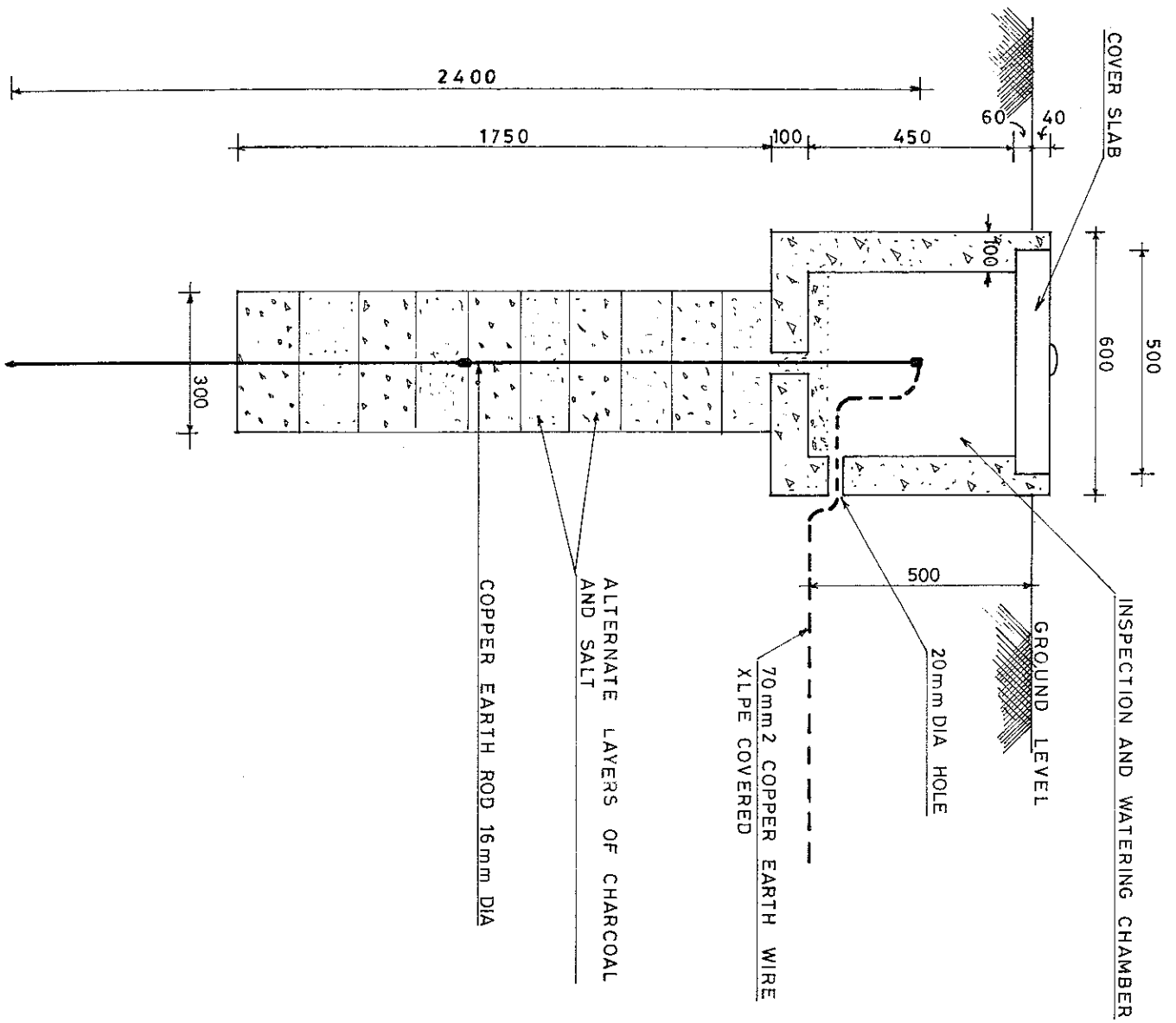
MINISTRY OF ELECTRICITY & WATER		
L.T. SERVICE WITH CHANGE OVER STANDBY SUPPLY		
DRAWN FRANCIS	CHECKED 	APPROVED 
DRAWING NO: MEW/OH_GA/20		
SCALE - N.T.S.	DATE - 06_04_1986	



- NOTE 1. POLE PLANTED TO A DEPTH OF 1500mm FROM GROUND LEVEL.
2. CABLE LOOP OF SUFFICIENT LENGTH TO BE PROVIDED FOR FUTURE RETERMINATION IN CASE OF DAMAGE.

MINISTRY OF ELECTRICITY & WATER	
L.T. FEEDER FROM MAIN FEEDER PILLAR	
DRAWN	CHECKED
FRANCIS	<i>[Signature]</i>
DRAWING NO. MEW / OH - GA / 21	APPROVED
SCALE - N.T.S.	<i>[Signature]</i>
DATE: 05_04_1986	





**NOTE**

- COPPER EARTH ROD COMPRISING:
2. 5/8" (16mm approx.) DIAMETER RODS EACH 4 FEET (120cm approx.) LONG EXTENSIBLE THREADED FOR COUPLING TOGETHER
  1. DRIVING TIP
  1. DRIVING HEAD
  1. BRASS OR COPPER CONNECTOR CLAMP FOR CONNECTING AND BONDING COPPER EARTH WIRE TO THE EARTH ROD

<b>MINISTRY OF ELECTRICITY &amp; WATER</b> DIRECTORATE GENERAL OF ELECTRICITY PLANNING DEPARTMENT		
<b>SUBSTATION EARTH PIT DETAILS</b>		
DRAWN	CHECKED	APPROVED
FRANCIS		<i>Kasim</i>
DRAWING NO: MEW / OH - GA / 24		
SCALE - N.T.S.	DATE. 15 - 02 - 1987	