GALVANISED STEEL CROSS ARM ASSEMBLY

CEB Standard - 040 - 1 : 2000

CEYLON ELECTRICITY BOARD

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CONTENTS

SPECIFICATION FOR GALVANISED STEEL CROSS ARM ASSEMBLY

1.0 SCOPE

This specification covers the general requirements of the manufacture and testing of Galvanised Steel Cross Arm Assemblies of the following types for use in the construction of medium voltage (33kV and 11kV) overhead distribution power lines.

i) **Galvanised steel cross arm assemblies for Inland application**

ii) **Galvanised steel cross arm assemblies for Coastal Application**

2.0 APPLICABLE STANDARDS

The cross arm assemblies supplied shall be in accordance with the latest editions of the standards specified below.

a)	BSEN 10113-2 (1999#0	-	Weldable fine grain structural steel.
b)	B.S. 4360 (1990)	-	Weldable structural steel
c)	B.S. 4848 Parts IV & V	-	Hot rolled structural steel sections
d)	B.S. 464 (1998)	-	Thimbles for wire ropes.
e)	BSENISO 1461 (1999)	-	Hot dip galvanised coating on iron and steel articles.

3.0 BASIC FEATURES

The cross arm assembly shall consists of three parts such as channel iron cross arm, flat iron bracing and angle iron earth wire tension assembly.

3.1 Grade and Quality of Steel

The grade of steel used for the fabrication of cross arm assembly shall be 43DD as per BS 4360 or 355N as per BSEN10113. The dimensional tolerance on flat iron and angle iron shall be as stipulated in BS4360 / BSEN 10113 and BS 4848 Part 4 respectively. The minimum thickness of the channel iron shall be 6mm. The chemical composition of the steel used shall be as stipulated in BS 4360 / BSEN10113 (Table 14 and Table 1 respectively)

The steel used for the fabrication of cross arm assembly shall be sound and free from any internal and external defects or surface flaws, which might preclude its use for the purpose for which it is intended.

3.2 Mechanical Properties

The mechanical properties of steel including the minimum Tensile Strength Yield Strength and Elongation shall be as stipulated in BS 4360 /BSEN 10113 (Table 15 and Table 3 respectively).

3.3 Fabrication

Cross arm assembly shall be fabricated out of following types of steel sections manufactured in accordance with BS 4360 : 1990 / BSEN 10113 structural steel.

a) Channel Iron section of 100mmX50mmX 6mm (for cross arm)
b) Flat Iron section of 40mmX10mm (for bracing)
c) Angle iron section of 60mmx60mmX6mm(for earth wire tension assembly),

The manufacturer shall have all equipment necessary to carry out shot / grit blasting, punching, shearing/cutting, forging, welding and bending operations in the place of manufacture and shall have facilities and capability to supply the quantity as indicated in the schedule of prices.

The channel iron, flat iron and angle iron sections shall be first cleaned and made rust free by shot / grit blasting, then necessary holes punched, cut in to required sizes, then welding, bending, forging and identification marking (as per Clause 5.1) shall be carried out. All components of the cross arm assemblies shall be hot dip galvanised conforming to BSENISO 1461 (1999) and as per Clause 3.6-Galvanising.

Position and size of holes on the cross arms, bracings and earth wire tension assembly shall be precisely in accordance with the drawing annexed.

The supporting piece for the centre pin insulator in the pin cross arms shall be welded securely as indicated in the drawing.

The bracing with the earth wire attachment shall be precisely bent / forged as per the drawing annexed.

The thimbles for earth wire tension assembly shall be fabricated in accordance with the BS 464 (1998)

3.4 Drawings

Cross Arms Assembly shall be in strict accordance with the Specifications and as per drawings indicated below.

a) 11kV Pin cross arm assembly as per Dr. No. DS&S/2000/40-1A
b) 11kV Tension cross arm assembly as per Dr. No. DS&S/2000740-1B
c) 33kV Pin cross arm assembly as per Dr. No. DS&S/2000/40-1C
d) 33kV Tension cross arm assembly as per Dr. No. DS&S/2000/40-1D

3.5 Components

a) The components that make up a Pin Cross Arm (11kV and 33kV) are as follows :-

i.	Channel Iron Cross Arm 100mmx50mmx6mm	-	1 No.
ii.	Flat Iron Bracing (40mm x 10mm)	-	2 Nos.
iii.	Earth Wire attachment (Pin Point)	-	1 No. (As per drawing)

b) The Components that make up a Tension Cross Arm (11kV and 33kV) are as follows :

i.	Channel Iron Cross Arm 100mmx50mmx6mm	-	2 Nos.
ii.	Flat Iron Bracing (40mm x 10mm)	-	4 Nos.
iii.	Earth Wire tension assembly (Angle iron piece & thimble)	-	2Nos. (As per drawing)

c) Bolts, Nuts and Washers necessary for the Pin and Tension Cross Arm assemblies are not required to be supplied.

3.6 Galvanising

All burrs shall be removed after punching, shearing, forging, welding and bending operations. All components shall be free from sharp edges and rust, .All items shall be clean, smooth and uniform throughout and shall be free from, oil, paint, and shall be hot dip galvanised as per BSEN ISO 1461 (1999).

The thickness of zinc coating shall be as indicated below;

i) The mean thickness of zinc coating on the cross arm assemblies for **Inland Applicationshall not be less than 85 microns in plain surface.**

ii) The mean thickness of zinc coating on the cross arm assemblies for **Coastal Application shall not be less than 110 microns in plain surface**

To prevent the formation of white rust, all items shall be treated with sodium dichromate after galvanizing and stored under well ventilated conditions.

3.7 Finish

Galvanized coating on all components of the cross arm assembly shall be smooth, continuous, uniform and free from flux stains and nodules of spelter.

4.0 QUALITY ASSURANCE

The manufacturer shall poses ISO 9002 Quality Assurance Certification for the plant where the galvanising work is done. The bidder shall furnish a copy of the ISO Certificate certified as true copy of the original by the manufacturer, along with the offer.

5.0 ADDITIONAL REQUIREMENTS

5.1 Marking

Manufacturer's identification marks and the letter "CEB" shall be impressed clearly on all components such as cross arms, bracings and earth wire tension assembly before galvanising.

5.2 Routine Test

The following routine tests shall be carried out on all the cross arms assembly manufactured.

a) Visual inspection
b) Dimensional check
c) Galvanizsing

5.3 Packing

The cross arms assemblies shall be supplied in the following form;

i) Ten numbers of 11kV/33kV tension / pin cross arms shall be firmly bundled together using GS wire.

ii) Twenty numbers of 11kV/33kV bracings for pin cross arms shall be firmly bundled together using GS wire.

iii) Forty numbers of 11kV/33kV bracings for tension cross arms shall be firmly bundled together using GS wire.

iv) Twenty numbers of earth wire tension assembles shall be firmly bundled together using GS wire

Each bundle shall carry a label that indicates the name, quantity and weight of the item.

5.4 Plant facilities

The manufacturer shall have all the equipment such as Shot / Grit blasting, Punching, Cutting, Welding, Bending, Forging and hot dip galvanising plant necessary for the fabrication of the galvanised steel cross arm assemblies at the place of manufacture.

5.5 Manufacturing Experience

The manufacturer shall have at least a minimum of five years experience in fabrication of steel structures and shall furnish documentary evidence with the offer in proof of this.

6.0 INFORMATION TO BE SUPPLIED WITH THE OFFER

6.1 Following shall be furnished with the offer.

a) Completed schedule of guaranteed technical particulars ANNEX - E.

b) Full details of manufacturing and plant facilities available at the place of manufacture.

c) Manufacturing experience and list of supplies in the past five years

d) Quality Assurance Certification conforming ISO 9002 for the galvanizing plant.

e) Complete dimensional drawings of .

i) 11kV Pin cross arm assembly
ii) 11kV Tension cross arm assembly
iii) 33kV Pin cross arm assembly
iv) 33kV Tension cross arm assembly

6.2 Test Certificates

The following test certificates shall be furnished with the offer

a) Mill certificates for the following for Channel iron, Flat iron and Angle iron,

- i) Chemical composition
- ii) Ultimate Tensile strength
- iii) Yield Strength
- iv) Percentage elongation

b) Test on galvanising as per BSEN ISO 1461

c) In case of foreign suppliers the full particulars of the pre-shipment inspection institution as specified in Clause 8.3.

Failure to furnish the above particulars and the sample as per clause 7.0 will result in the offer being rejected.

7.0 SAMPLE

One sample (non returnable) of each type of cross arm assembly shall be furnished with the offer.

8.0 INSPECTION AND TESTING

8.1 Inspection

The selected tenderer shall make necessary arrangements for inspection by an Engineer appointed by the CEB and also to carry out acceptance tests in his presence. Routine test report shall be made available for the observation of the inspector.

8.2 Acceptance / Sample Tests

The manufacturer shall make necessary arrangements to carry out the following acceptance tests as per BS4360/BSEN 10113-2, on all type of steel sections used in the fabrication of cross arm assemblies for the Inspector to wittiness the same.

a) Tensile Strength

b) Elongation

c) Yield Strength

d) To check the;

- i) Dimensions
- ii) Tolerance,
- iii) Finish – rust / paint / oil free surface

e) Galvanizing thickness

8.3 Pre-shipment Inspection

The foreign manufacturers shall furnish pre-shipment Inspection certificate from an independent world-wide recognised institution, certifying that the consignment ready for shipment to the Ceylon Electricity board is fully conforming to the CEB Standard 040-1 2000, to the Deputy General Manager (Procurement) along with the shipping document.

The Manufacturer shall furnish the full particulars of the Inspecting institution to be nominated by them for the pre-shipment inspection, with the offer.

9.0 ANNEX

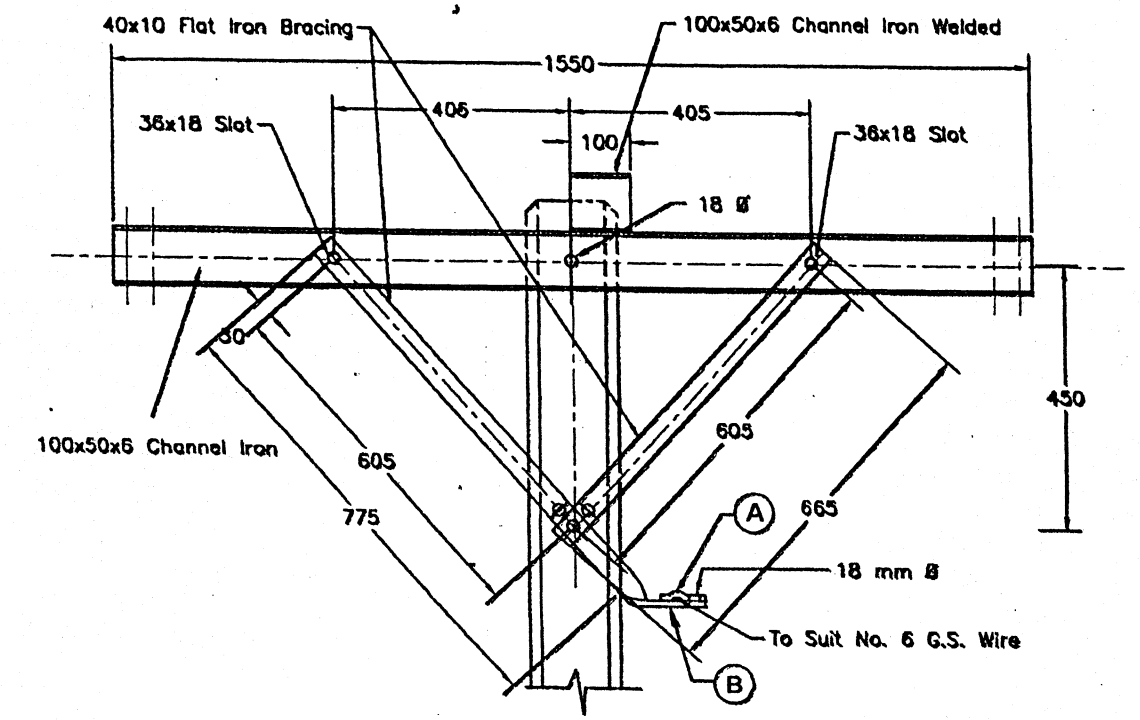
A. - 11kV Pin cross arm assembly Dr. No. DS&S/2000/40-1A

B - 11kV Tension cross arm assembly Dr. No. DS&S/2000/40-1B

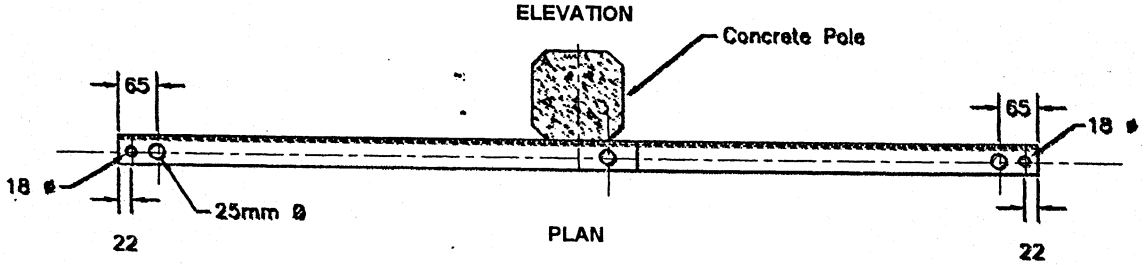
C - 33kV Pin cross arm assembly Dr. No. DS&S/2000/40-1C

D - 33kV Tension cross arm assembly Dr. No. DS&S/2000/40-1D

E - Schedule of Guaranteed Technical Particulars –
To be filled by the Bidder.

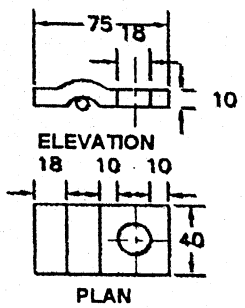


ELEVATION

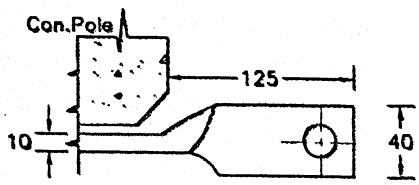


PLAN

CROSS ARM FOR 11kV PIN POINTS

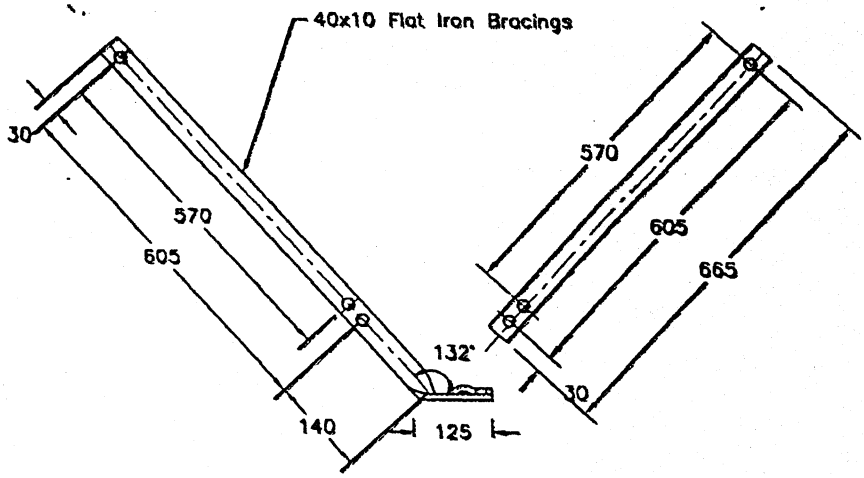


DETAIL A



DETAIL B

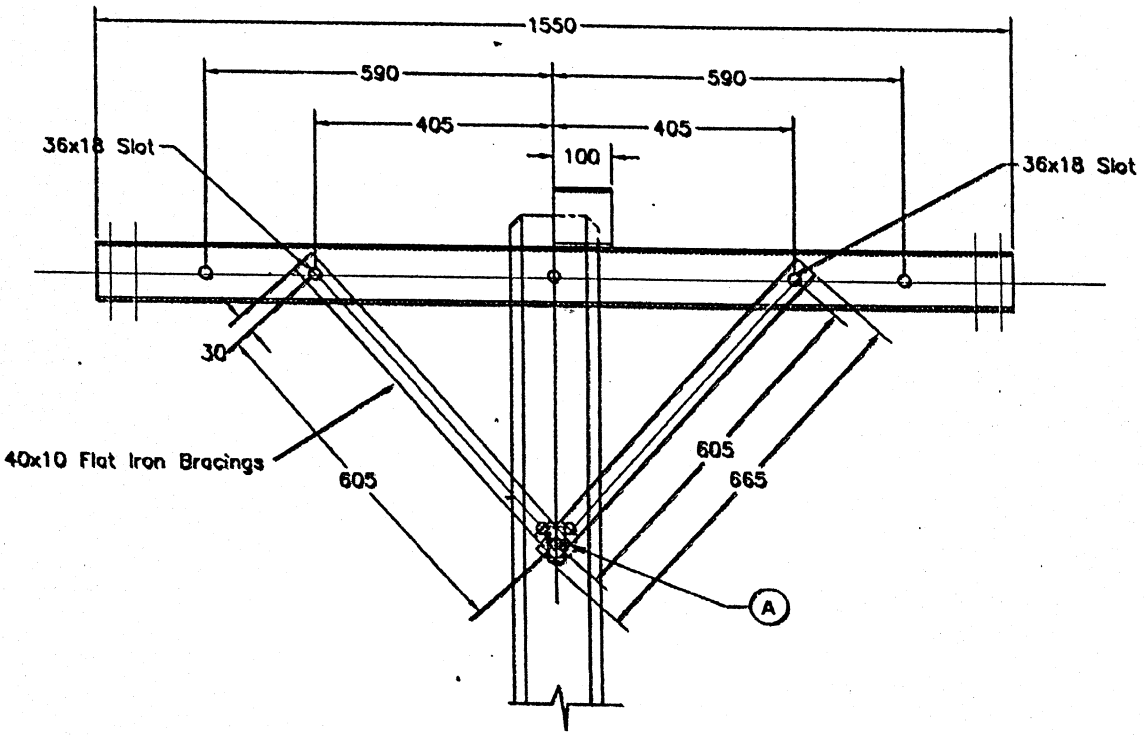
DETAIL OF EARTH WIRE ATTACHMENT FOR PIN POINTS



11 kV PIN CROSS ARM BRACINGS

ALL DIMENSIONS ARE IN mm.

CEYLON ELECTRICITY BOARD	DISTRIBUTION STANDARDS & SPECIFICATION	SCALE : NOT TO SCALE
	11 kV GALVANISED STEEL, PIN CROSS ARM	DRAWN : LALANI
	DESIGN BY: E.E. (DS&S) / APPROVED BY: CHAIRMAN, SPECIFICATION COMMITTEE	DATE : Nov. 2000
		DRG. NO : DS&S/2000/40-1A
DIST. PLANNING BRANCH		CAD NO :



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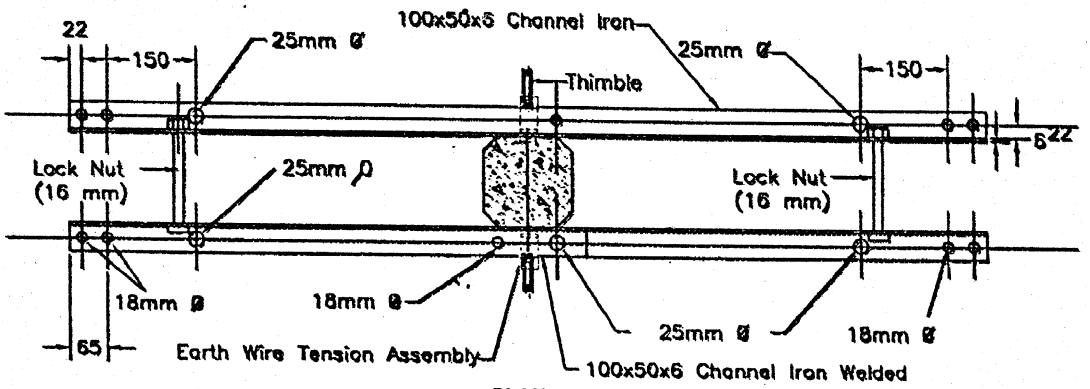
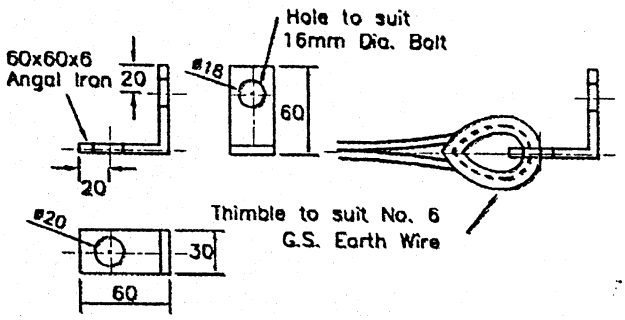


PLAN

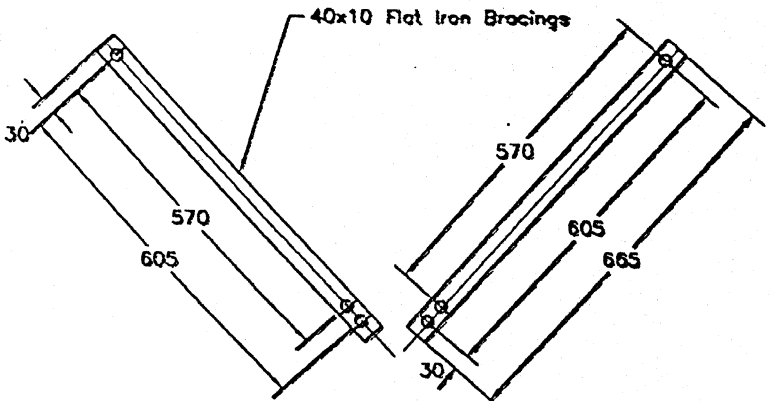
CROSS ARM FOR 11kV TENSION POINTS



DETAIL A

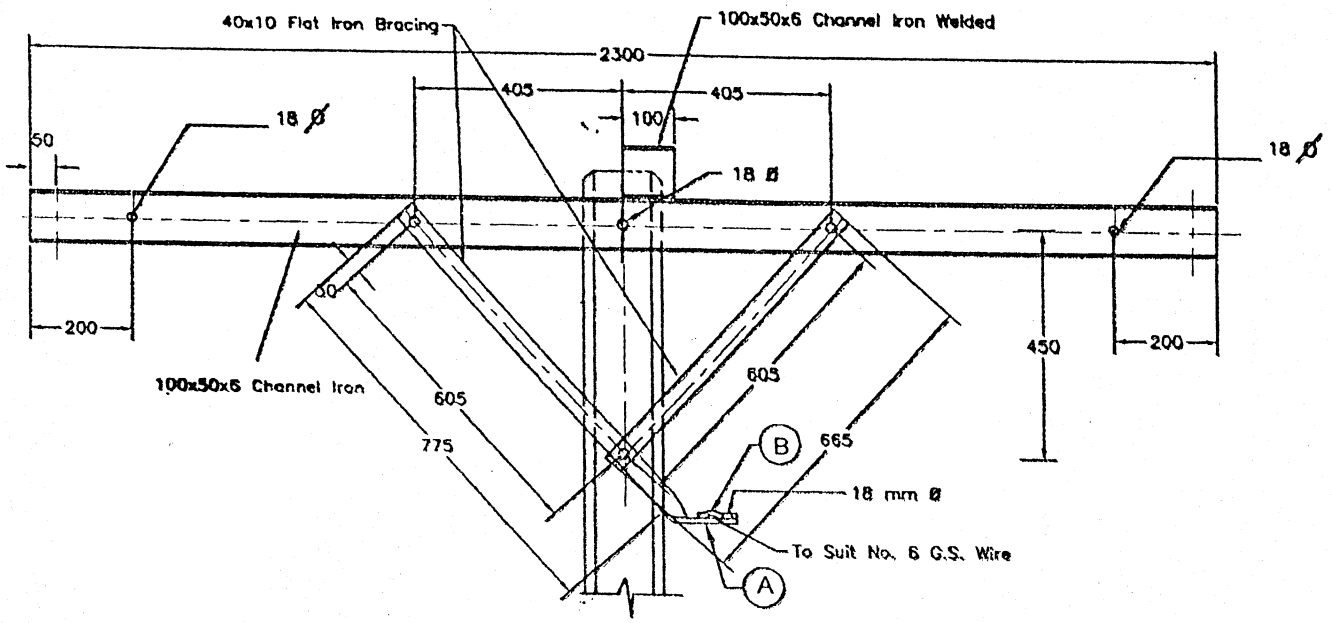
DETAILS OF EARTH WIRE TENSION ASSEMBLY FOR TENSION POINT

ALL DIMENSIONS AEA IN mm.

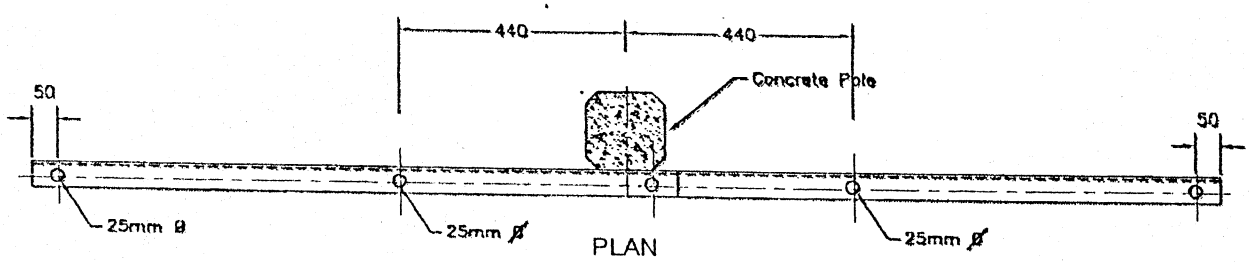


11 kV TENSION CROSS ARM BRACINGS

CEYLON ELECTRICITY BOARD	DISTRIBUTION STANDARDS & SPECIFICATION	SCALE : NOT TO SCALE
	11 kV GALVANISED STEEL, TENSION CROSS ARM	DRAWN : LALANI
	DESIGN BY / E.E. (DS&S) — APPROVED BY / CHAIRMAN, SPECIFICATION COMMITTEE	DATE : Nov. 2000
DIST. PLANNING BRANCH		DRG NO : DS&S/2000/40-1B
		CAD NO :

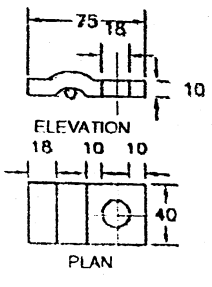


ELEVATION

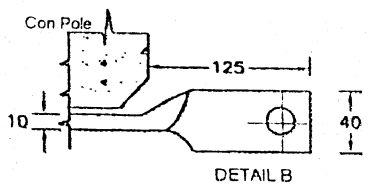


PLAN

CROSS ARM FOR 33kV PIN POINTS

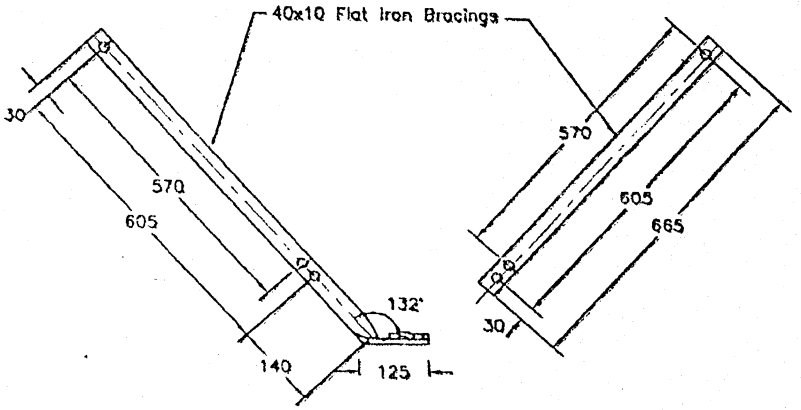


DETAIL A



DETAIL B

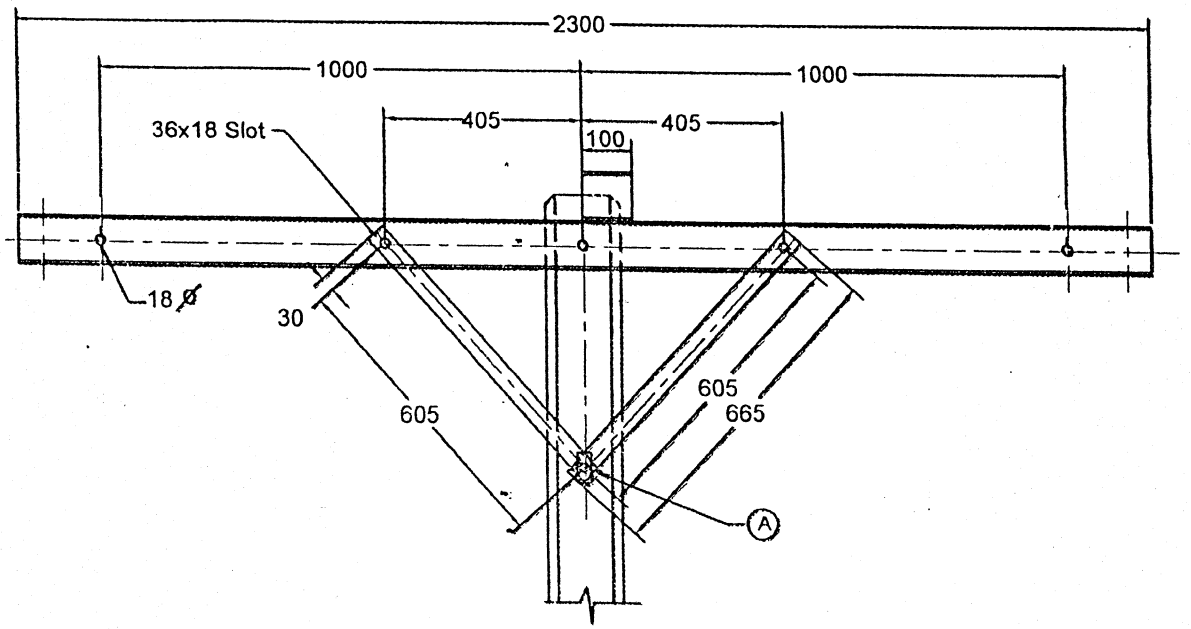
DETAIL OF EARTH WIRE
ATTACHMENT FOR PIN POINTS



33 kV PIN CROSS ARM
BRACINGS

ALL DIMENSIONS ARE IN mm.

CEYLON ELECTRICITY BOARD	DISTRIBUTION STANDARDS & SPECIFICATION	SCALE : NOT TO SCALE
	33 kV GALVANISED STEEL, PIN CROSS ARM	DRAWN : LALANI
	DESIGN BY: E.E. (DS&S) / APPROVED BY: CHAIRMAN SPECIFICATION COMMITTEE	DATE : Nov. 2000
		DRG. NO : DS&S/2000/40-1C
DIST. PLANNING BRANCH		CAD NO



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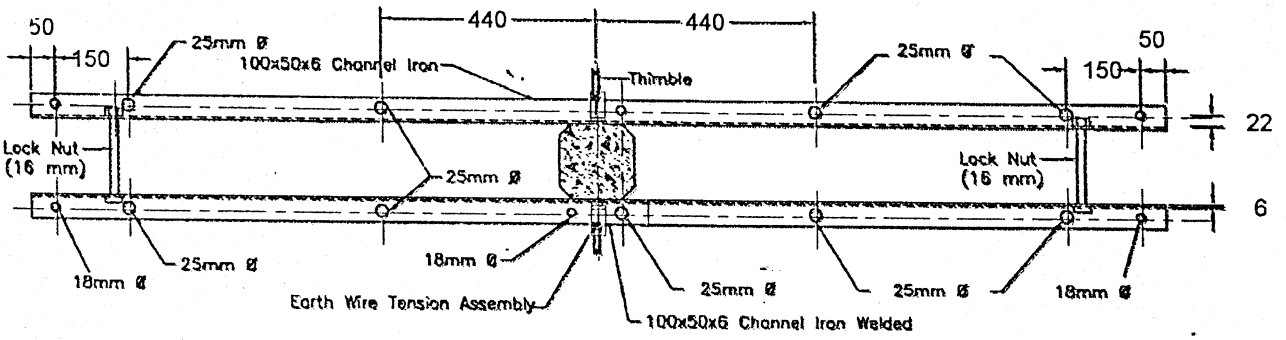
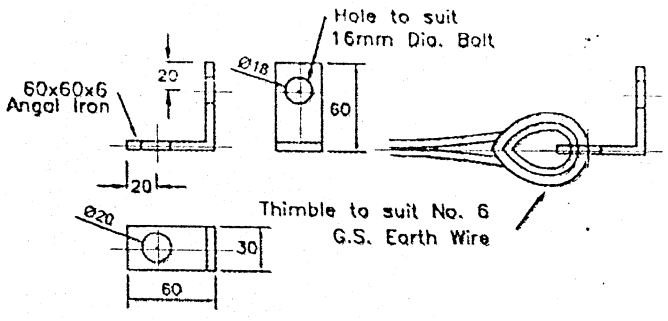


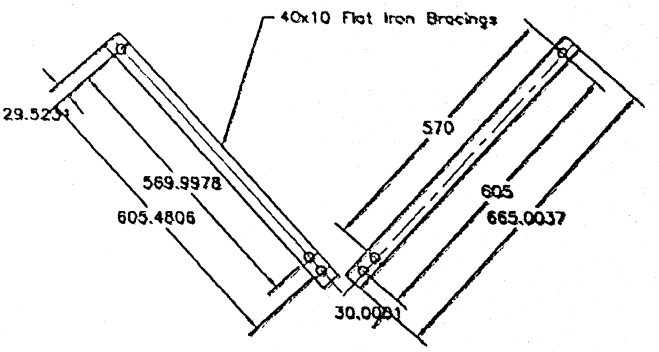
PLAN

CROSS ARM FOR 33kV TENSION POINTS



DETAIL A

DETAILS OF EARTH WIRE TENSION ASSEMBLY
FOR TENSION POINT



33 kV TENSION CROSS ARM
BRACINGS

ALL DIMENSIONS AEA IN mm.

CEYLON ELECTRICITY BOARD	DISTRIBUTION STANDARDS & SPECIFICATION	SCALE : NOT TO SCALE
	33 kV GALVANISED STEEL, TENSION CROSS ARM	DRAWN : LALANI
		DATE : Nov. 2000
	DESIGN BY: E.E. (DS&S) / APPROVED BY: CHAIRMAN, SPECIFICATION COMMITTEE	DRG. NO : DS&S/2000/40-1D
DIST. PLANNING BRANCH		CAD NO :

ANNEX - E

SCHEDULE OF GUARANTEED TECHNICAL PARTICULARS

(This schedule shall be duly filled by the Manufacturer)

1. Name of manufacturer & Country of origin of Steel used -

2. Name manufacturer & Country of Manufacture -

3. Grade of Steel

   a) Channel iron -
   b) Flat Iron -
   c) Angle iron -

4. Mechanical Properties of Channel iron

   a) Tensile strength -
   b) Upper Yield strength -
   c) Elongation at fracture -

5. Mechanical Properties of Flat iron

   a) Tensile strength -
   b) Upper yield strength -
   b) Elongation at fracture -

6. Mechanical Properties of Angle iron

   a) Tensile strength -
   b) Upper Yield strength -
   c) Elongation at fracture -

7. Whether the following equipment are available at the place of manufacture

   a) Grit blast facilities for rust Freeing the steel sections Yes/No -
   b) Punching machine Yes/No -
   c) Cutting Yes/No -
   d) Welding Yes/No -
   e) Forging Yes/No -
   f) Bending Yes/No -
   g) Hot dip galvanising plant Yes/No -

8. Dimensions / tolerance of the steel sections used in the manufacturer Cross arm assemblies

   a) Channel iron (cross arm) -
      Tolerance -

   b) Flat iron (bracings) -
      Tolerance -

   c) Angle iron (earth wire tension assembly) -
      Tolerance -

9. Tolerance on hole diameters before galvanising -

10. Dimension of thimbles -

11. Weight of

a) Complete set of 11kV Pin Corss Arm -
b) Complete set of 11kV Tension Cross Arm -
c) Complete set of 33kV Pin Cross Arm -
d) Complete set of 33kV Tension Cross Arm -

12. Galvanising

a) Method -
b) Coating thickness -

13. Whether the Quality Assurance Certificate Conforming to ISO 9002 for galvanising plant Furnished Yes/No -

14. Whether the dimensional drawing of the Following furnished

a) 11kV Pin Cross arm Yes/No -
b) 11kV Tension Cross arm Yes/No -
c) 33kV Pin Cross arm Yes/No -
d) 33V Tension Cross arm Yes/No -
e) Earth wire tension assembly Yes/No -

15. Whether the full particulars of the Inspecting Authority to be nominated as per Clause 8.3 is furnished (in the case of foreign manufacturers) Yes/No -

16. Any Deviations -

I/We certify that the above data are true and correct.

SEAL AND SIGNATURE OF THE MANUFACTUER / DATE