



The Kenya Power & Lighting  
Co. Ltd.

TITLE:

SPECIFICATION FOR STEEL  
STRUCTURES FOR OVERHEAD  
LINES

Doc. No.	KPLC1/3CB/TSP/03/003
Issue No.	1
Revision No.	1
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### 0.1 Circulation List

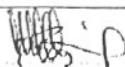
COPY NO.	COPY HOLDER
1	Supplies Manager
2	Stores & Stock Control Manager
3	Distribution Manager
4	Research & Development Manager
5	Assistant Manager, Technical Audit


### 0.2 Amendment Record

Rev No.	Date (YYYY-MM-DD)	Description of Change	Prepared by (Name & Signature)	Approved by (Name & Signature)
1	2007-04-12	Added Fig. 15 CODE 181228 - Bracket Top Pole 33kV Delta Cons.		

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## FOREWORD

This specification has been prepared by the Research and Development Department and the Drawing Office both of The Kenya Power & Lighting Company Limited (KPLC) and it lays down requirements for steel structures for overhead lines. It is intended for use by KPLC in purchasing the items.

It shall be the responsibility of the manufacturer to ensure adequacy of the design and good engineering practice in the manufacture of the steel structures for KPLC. The manufacturer shall submit information which confirms satisfactory service experience with products which fall within the scope of this specification.

## 1. SCOPE

- 1.1. This specification is for galvanized mild steelworks for overhead lines and pole-mounted transformers.
- 1.2. This specification covers the following steelworks:
  - a) Steel cross arms of different configurations for use on wood poles.
  - b) Supporting steelworks for distribution transformers, fuses, isolating links and other line equipment.
  - c) Steelworks for supporting and terminating HV and MV/LV overhead lines and services.

## 2. REFERENCES

The following documents were referred to during the preparation of this specification. In case of conflict, the provision of this specification shall take precedence.

ISO 1461: Metallic Coatings – Hot dip galvanized coatings on fabricated ferrous products – Requirements.

BS 4360: Specification for weldable structural steel

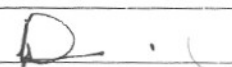
BS 5135: Specification for arc welding of carbon and carbon manganese steels

KS 02-572: Specification for hot-rolled structural steel sections

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ESI 43-95: Steelworks for overhead lines

### 3. TERMS AND DEFINITIONS

For the purpose of this specification, the definitions in the reference standards shall apply.

### 4. REQUIREMENTS

#### 4.1. SERVICE CONDITIONS

The steel structures shall be suitable for continuous use outdoors in tropical areas at altitudes of up to 2200m above sea level, humidity of up to 90%, average ambient temperature of +30°C with a minimum of -1°C and a maximum of +40°C and saline conditions along the coast.

#### 4.2. MATERIALS

4.2.1. Structural steel used shall be grade 43A as specified in the BS 4360.

The tensile strength and yield stress of the steel shall be not less than 430/510 N/mm<sup>2</sup> and 255 N/mm<sup>2</sup> respectively.

Angle sections, channel sections and flats shall be as per KS 02-572.

#### 4.2.2. Welding

Welding where specified shall be by metal-arc welding and shall be as per BS 5135.

After welding and before galvanizing, welds shall be thoroughly cleared to remove slag and spatter, preferably by sand blasting.

#### 4.3. CONSTRUCTION/FABRICATION

4.3.1. All materials before and after fabrication shall be straight and free from twists. The material shall be free from blisters, scale and other defects.

4.3.2. All dimensions specified shall be subject to the following tolerances, unless otherwise stated.

(i) Dimensions up to and including 50 mm: ±1 mm

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(ii) Dimensions greater than 50 mm:  $\pm 2$  mm

4.3.3. Erection clearance for cleated ends of members connecting steel to steel shall not be greater than 2mm at each end.

4.3.4. Boltholes shall not be more than 2mm greater than the diameter of the bolt for bolts up to 24mm diameter.

4.3.5. Cutting may be by shearing, cropping, sawing or machine flare cutting. Sheared or cropped edge shall be dressed to a neat finish and be free from distortion where parts are to be in metal contact.

4.3.6. All holes shall be drilled in one operation and burrs shall be removed. Holes shall not be formed by a gas cutting process. All matching holes for bolts shall register with each other so that a gauge 2mm less in diameter than the diameter of the bolt shall pass freely through the assembled members in a direction at right angle to such members.

**4.3.7. Galvanizing**

a) All materials to be galvanized shall be of the full dimensions shown or specified and all punching, cutting, and the removal of burrs shall be completed before the galvanizing process commences.

b) All galvanizing shall be done by the hot dip process with spelter, not less than 98% of which must be pure Zinc and in accordance with ISO 1461.

c) The Zinc coating shall be uniform, clean, smooth and as free from spangle as possible.

d) Where specifically requested by KPLC, galvanized steel structures shall be treated after galvanizing with Sodium Dichromate Solution.

Table 1: Galvanizing

	<b>Steel Structures for Inland installations</b>	<b>Steel Structures for installation along the coast</b>
Minimum Average Coating Weight	610 g/m <sup>2</sup>	800 g/m <sup>2</sup>
Post-treatment (chromating)	See Tender Requirements	See Tender Requirements

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4.3.8. Bending of flat straps shall be carried out cold.

**5. TESTS AND INSPECTION**

- 5.1 The manufacturer shall be responsible for performing or for having performed all the required tests in this specification. Tenderers shall confirm the manufacturer's capabilities in this regard when submitting tenders. Any limitations shall be clearly specified.
- 5.2 The tensile strength, yield strength, elongation and bending tests shall be done in accordance with the requirement of BS 4360 and KS 02-572.
- 5.3 Tests on galvanizing shall be carried on the finished steel in accordance with the requirement of ISO 1461 and this specification.
- 5.4 Copies of previous test reports (for similar items) issued by the relevant National Testing Authority (or ISO/IEC 17025 accredited laboratory) confirming compliance of the steel structures on offer with the specifications shall be submitted with the tender for the purpose of technical evaluation.
- 5.5 KPLC authorized Engineers shall have access at all reasonable time to all places of work and when work is being carried out and shall be provided (by the manufacturer) with all necessary facilities for inspection and testing during and after fabrication.

Test reports shall be completed (by the manufacturer) and submitted to KPLC for approval before shipment/delivery of the materials.

- 5.6 On receipt of the goods KPLC may perform any of the tests specified in order to verify compliance with this specification. The supplier shall replace without charge to KPLC steel structures which upon examination, test or use fail to meet any of the requirements in the specification.

**6. MARKING, LABELLING AND PACKING**

- 6.1 Each assembly and package of items associated with this specification shall be suitably marked with reference to KPLC Stores Code.
- 6.2 Where an item includes a number of components to form a complete assembly, all component parts shall be included in one composite package which shall be firmly strapped or bound together.

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6.3 Each item shall be engraved legibly with the following information:

- Manufacturer's Name
- Order Number
- The words "PROPERTY OF KPLC"
- Size/dimensions

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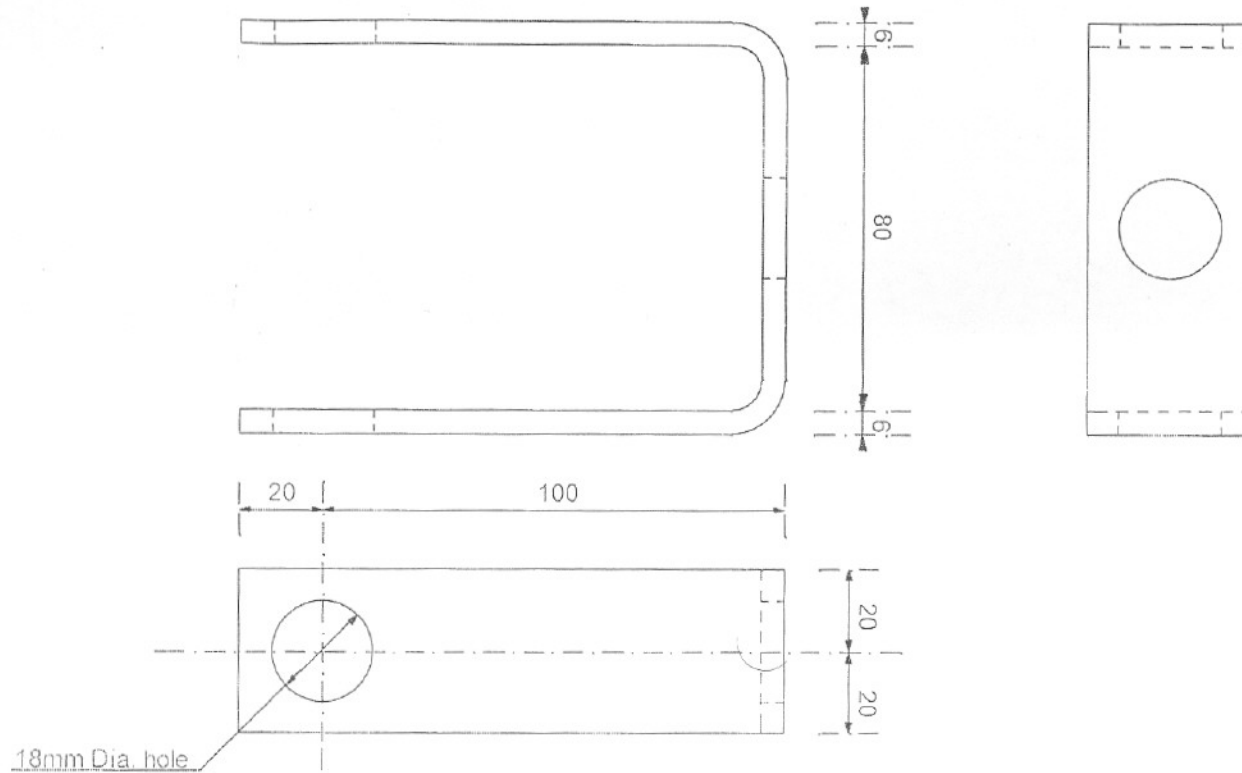
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**FIG. 1: D – IRON (LV Insulator Bracket): KPLC CODE 181201** (332mm x 40mm x 6mm mild steel, galvanized)

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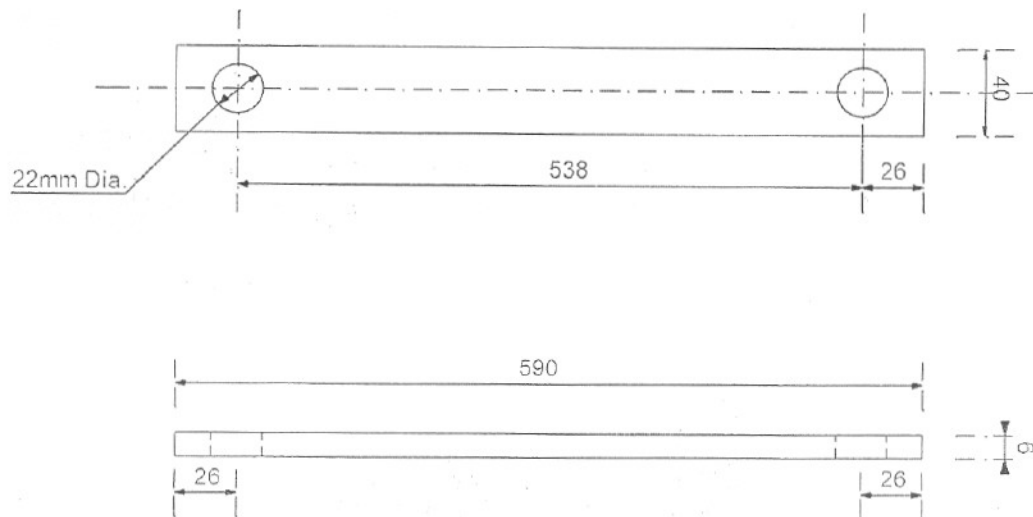



FIG. 3A: 11KV FLAT TIE STRAP: KPLC CODE 188115 (590mm x 40mm x 6mm mild steel, galvanized)

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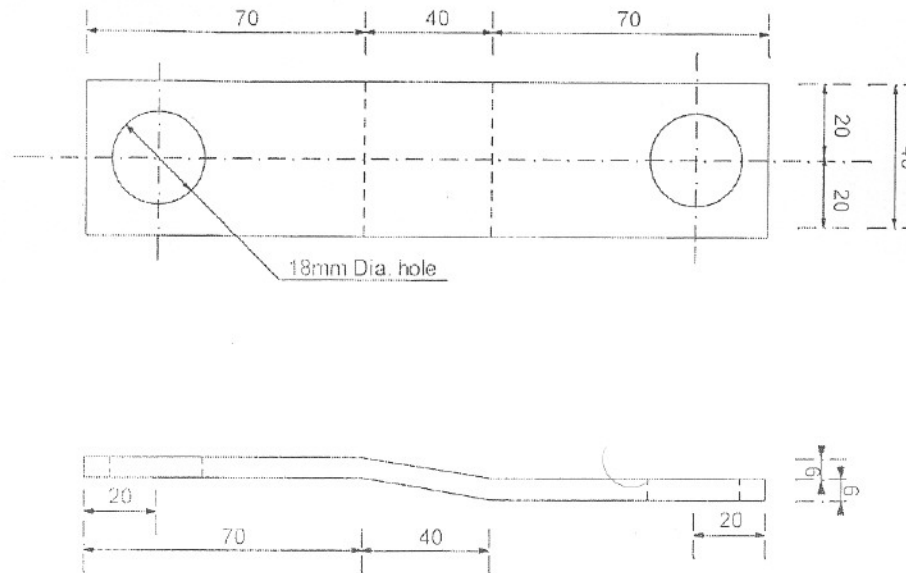


FIG. 2: SHACKLE STRAP (LV Extension Strap): KPLC CODE 188104 (180mm x 40mm x 6mm mild steel, galvanized)

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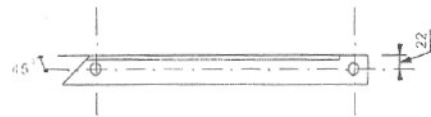
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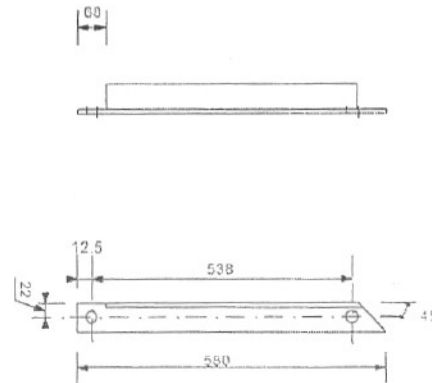
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1 - OFF L - HAND



1 - OFF R - HAND

68 x 68 x 6.25mm MS ANGLE

**FIG. 3B: 11KV ANGLE TIE STRAP: KPLC CODE 188111** (580mm x 68mm x 68mm x 6.25mm mild steel angle, galvanized)

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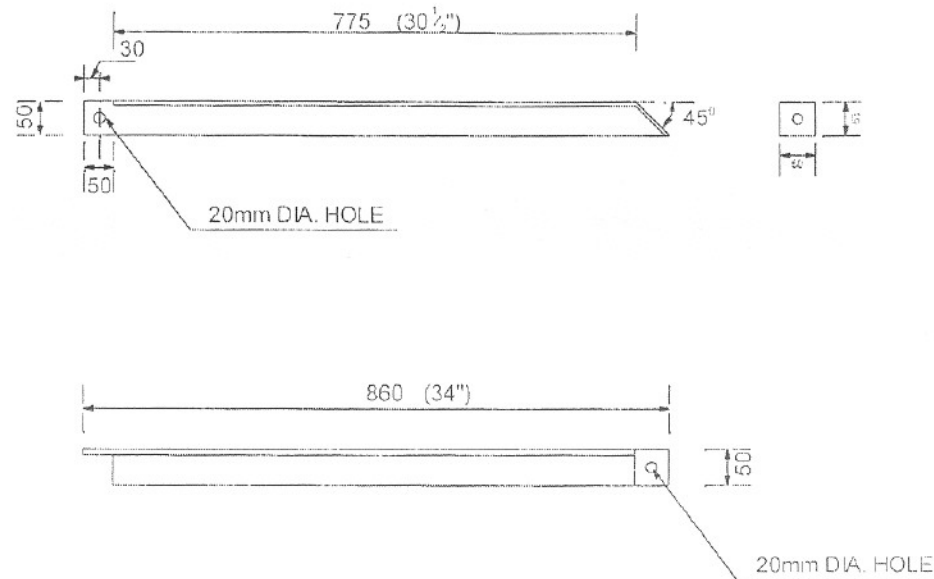
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**FIG. 4: 33KV TIE STRAP: KPLC CODE 188108** (860mm x 50mm x 50mm x 6mm mild steel angle, galvanized)

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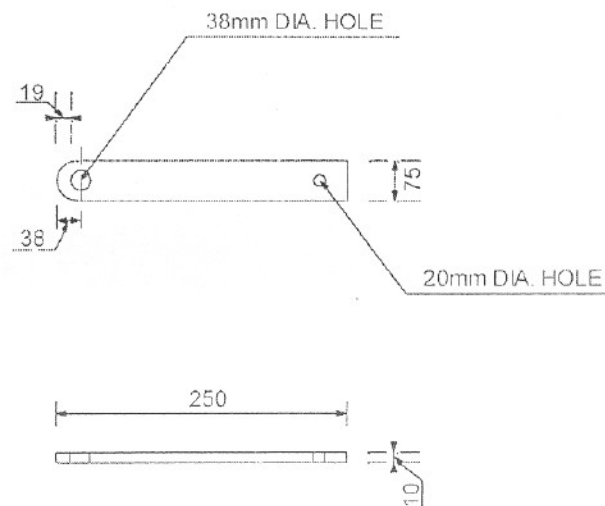




FIG. 5: 11KV TERMINAL STRAP: KPLC CODE 188107 (250mm x 75mm x 10mm mild steel flat, galvanized)

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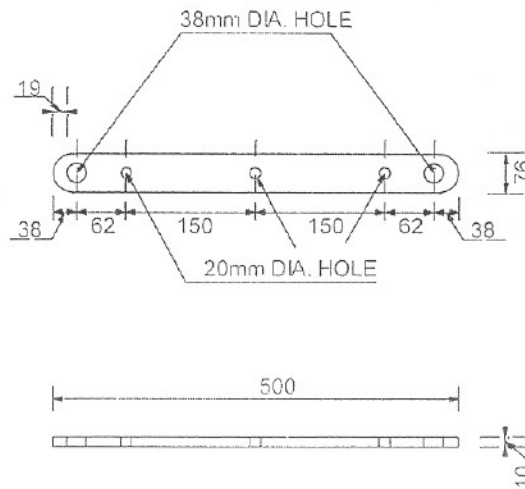


FIG. 6: 33kV TERMINAL STRAP: KPLC CODE 188109 (500mm x 76mm x 10mm mild steel flat, galvanized)

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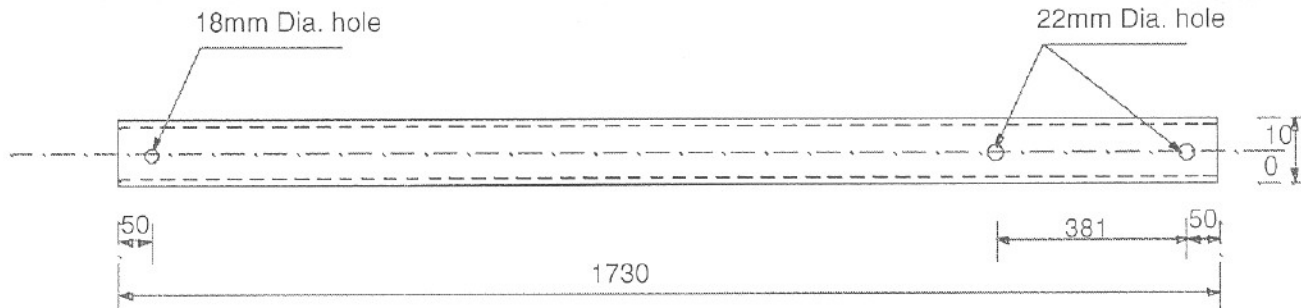


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**FIG. 7: EARTH STOCK: KPLC CODE 186928** ('U' Channel 1730mm x 100mm x 50mm x 6mm mild steel, galvanized)



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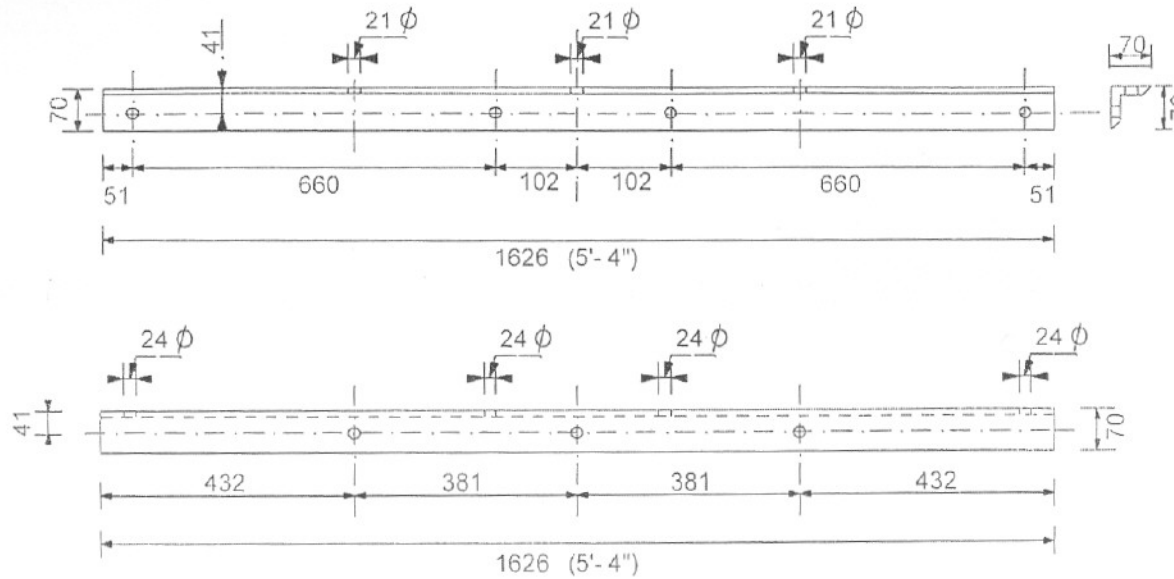


FIG. 8A: 11KV CROSS ARM: KPLC CODE 182911 (1625mm x 70mm x 70mm x 9.5mm mild steel angle, galvanized)

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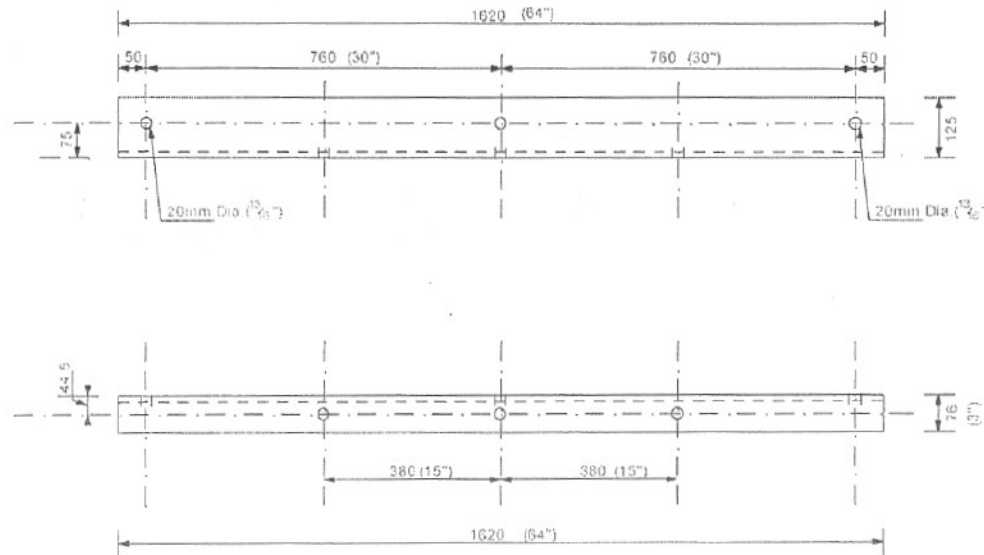


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**FIG. 8B: 11kV TERMINAL CROSS ARM: KPLC CODE 182914** (1620mm x 125mm x 76mm x 9.5mm mild steel angle, galvanized)

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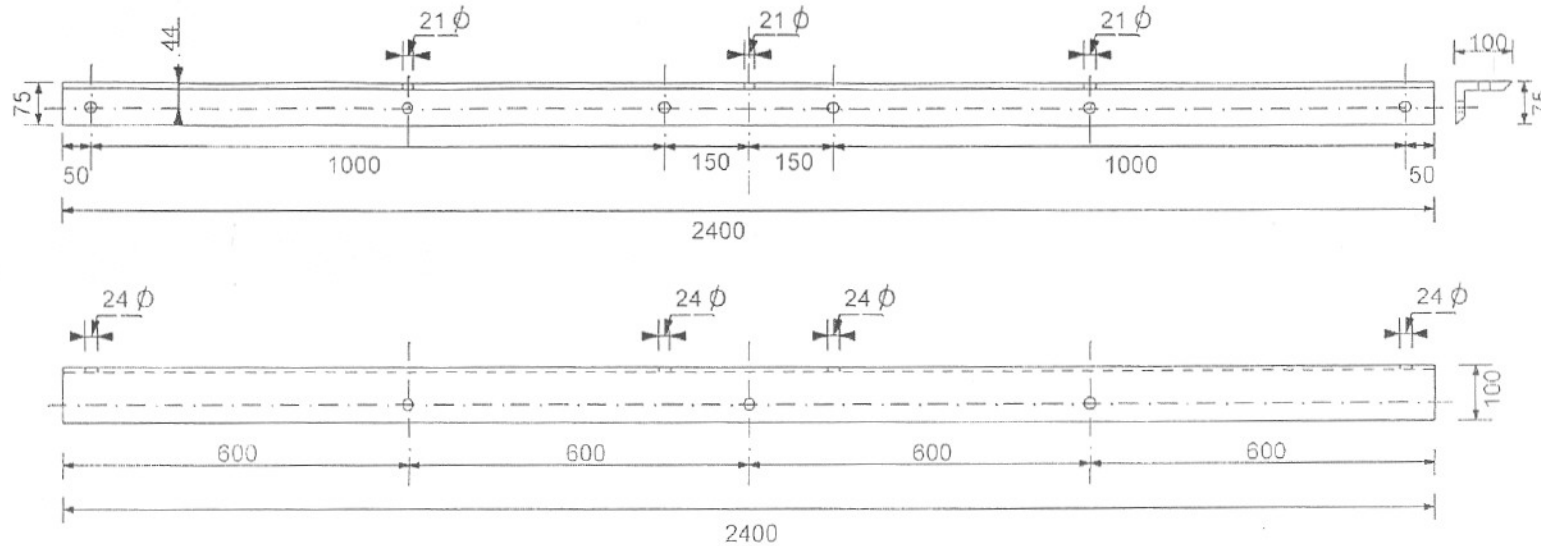


FIG. 9: 33kV CROSS ARM: KPLC CODE 182960 (2400mm x 100mm x 75mm x 9.5mm mild steel angle, galvanized)

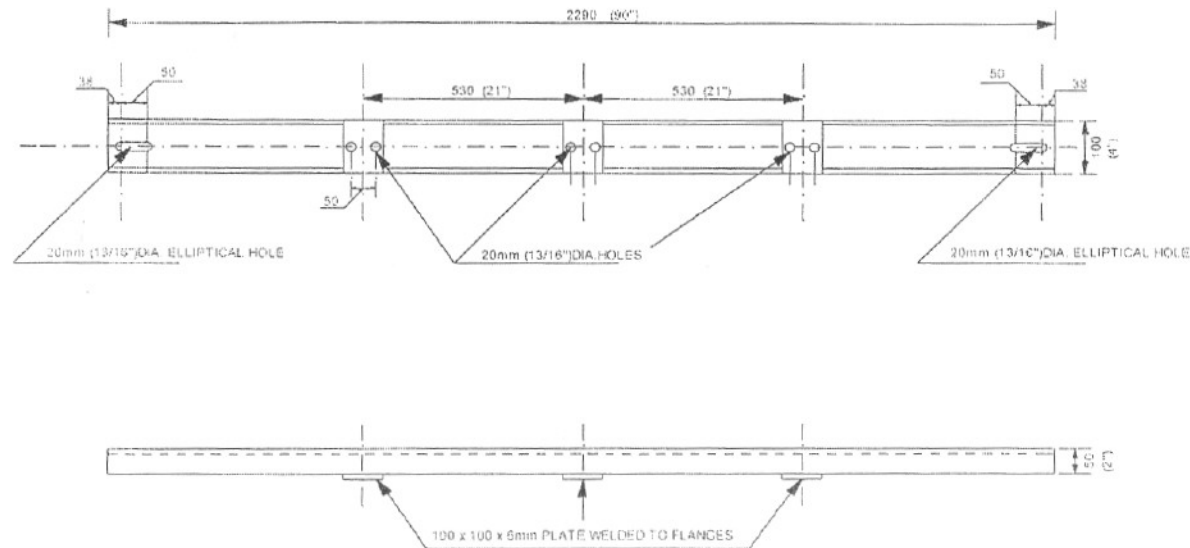
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**FIG. 10: FUSE/SOLID LINK CROSS MEMBER CHANNEL: KPLC CODE 186925 - (2290 x 100 x 50x6mm mild steel, galvanized)  
KPLC CODE 186926 - (2290 x 125 x 64x6mm mild steel, galvanized)**

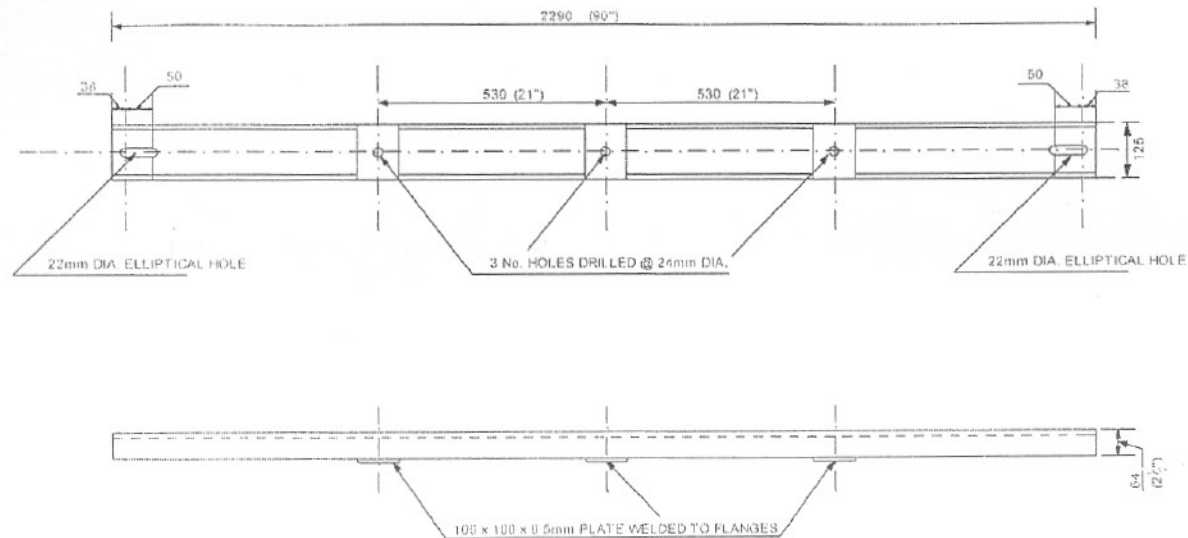
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**FIG. 11: STEADY CROSS MEMBER**

**KPLC CODE 186921 FOR TX UP TO 200 KVA:** (2290mm x 100mm x 50mm x 6mm mild steel, galvanized)  
**KPLC CODE 186922 FOR TX 200 TO 315 KVA:** (2290mm x 125mm x 64mm x 6mm mild steel, galvanized)

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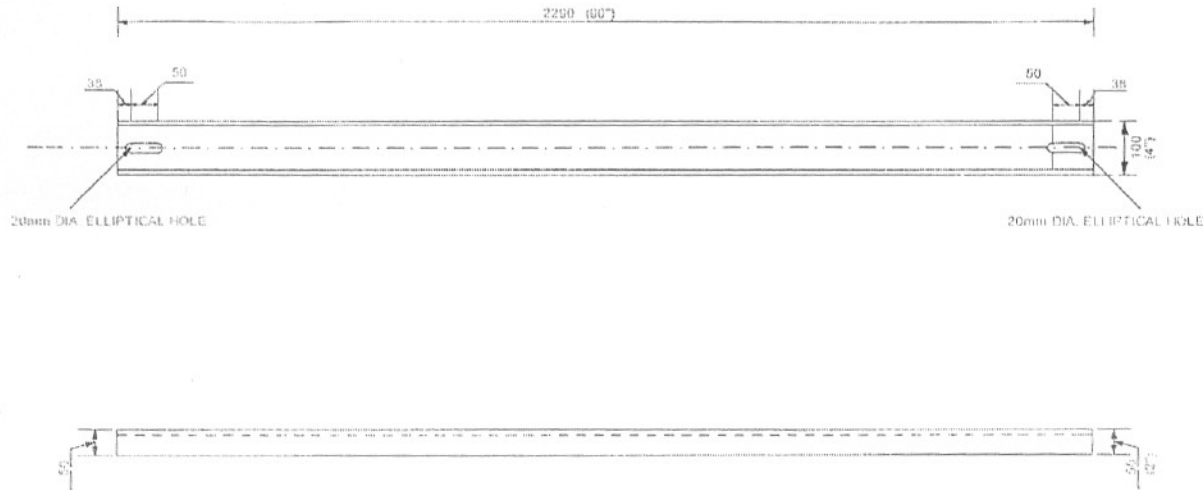


FIG. 12: TRANSFORMER PLATFORM UP TO 200 KVA KPLC CODE 186923: (2290mm x100mm x 50mm x 6mm mild steel, galvanized)

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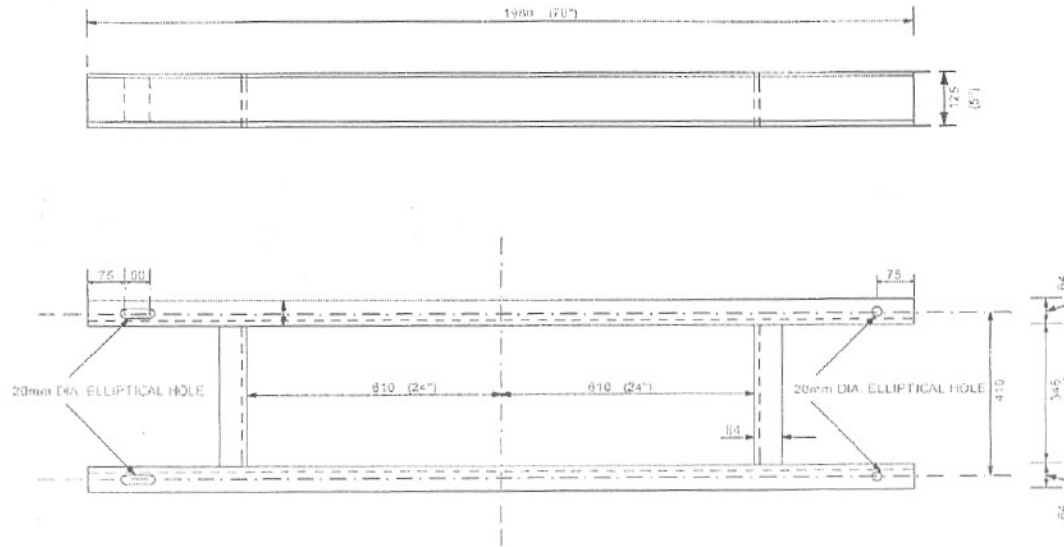


FIG. 13A: TRANSFORMER PLATFORM 315 KVA KPLC CODE 186924 (1980mm x 125mm x 64mm x 6mm mild steel, galvanized)  
(To be complete with mounting brackets in Fig. 13B)

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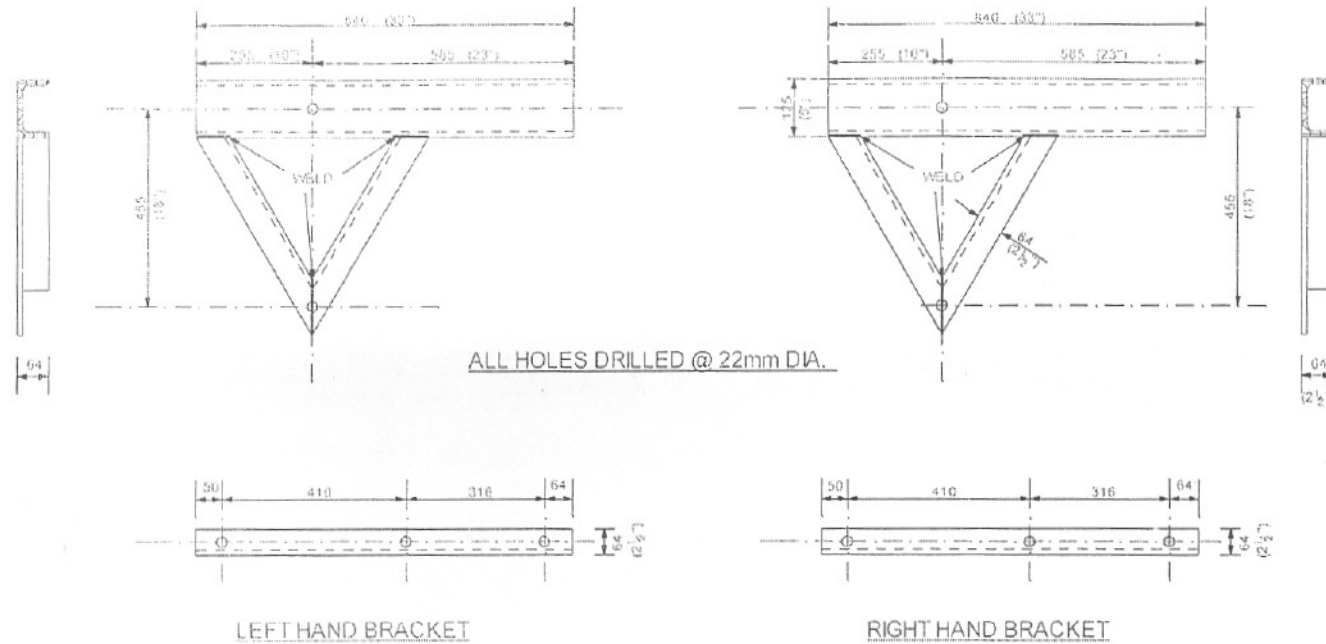
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**FIG. 13B: MOUNTING BRACKETS FOR TRANSFORMER PLATFORM 315 KVA (see Fig 13A)**  
(840mm x 125mm x 64mm x 6mm 'U' Channel mild steel, galvanized), (64mm x 64mm x 6mm mild steel angle, galvanized)

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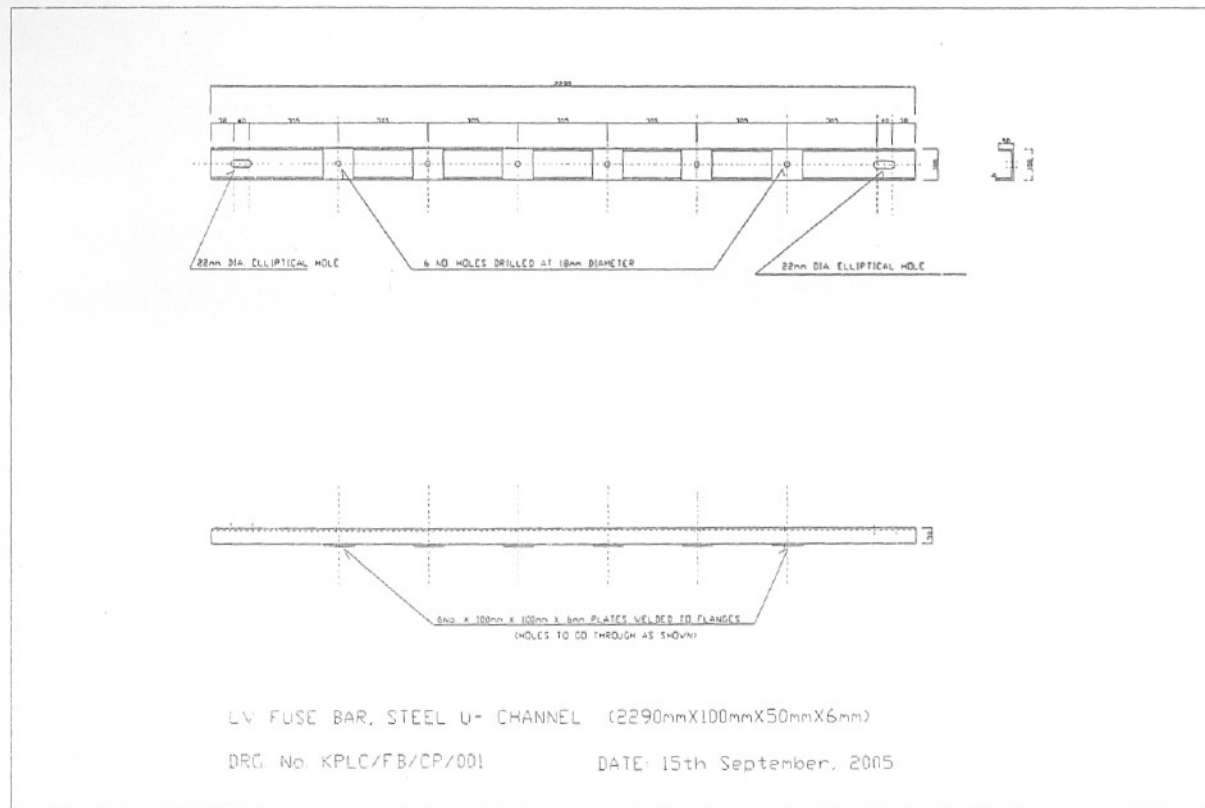
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**FIG. 14: LV FUSE BAR U-CHANNEL (2290x100x50x6mm), CODE 186927**



Issued by: Margaret Kanini; for R&D Manager

Authorized by: David Mwangi, Chief Manager, PR&PM

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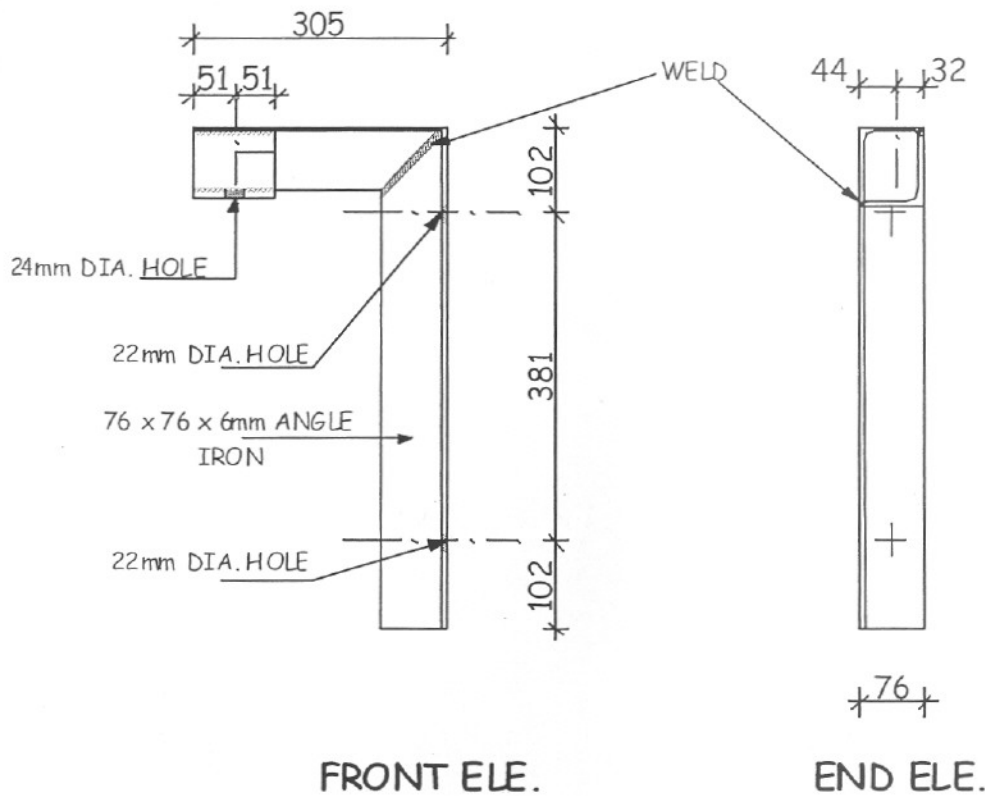
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TITLE

**FIG. 15: CODE181228 -  
BRACKET TOP POLE 33KV DELTA CONS.**

CHECKED BY:

S. KIMITEI

Date:

10/Apr 11/07

DRAWN BY:

J. M.KAHARE

Date:

10/Apr 11/07

Issued by: Margaret Kanini; for R&D Manager

Authorized by: David Mwangi, Chief Manager, PR&PM

Signed:

Signed:

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