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Kenya Power

# STEEL STRUCTURES FOR SUBSTATIONS — SPECIFICATION

A Document of the Kenya Power & Lighting Co. Ltd
November 2019

## 0.1 Circulation List

| COPY NO. | COPY HOLDER |
|---|---|
| 1 | Manager, Standards |
| 2 | Electronic copy (pdf) on Kenya Power server (http://172.16.1.40/dms/browse.php?fFolderId=23) |

## REVISION OF KPLC STANDARDS

To keep abreast of progress in the industry, KPLC standards shall be regularly reviewed. Suggestions fo improvements to approved standards, addressed to the Manager, Standards department, are welcome.

## 0.2 Amendment Record

| Rev No. | Date (YYYY-MM-DD) | Description of Change | Prepared by (Name & Signature) | Approved by (Name & Signature) |
|---|---|---|---|---|
| Issue 1 Rev 0 | 2004-April | New issue | R & D | S. Kimitei |
| Issue 2 Rev 0 | 2019-11-15 | 1. Cancels and replaces Issue 1 Rev 0<br>2. Updated drawings | Rotich Benard | Dr. Eng. P. Kimemia |
| | | | | |
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## FOREWORD

This Specification has been prepared by the Standards Department in collaboration with the Power System Design and Development Department, both of the Kenya Power and Lighting Company Plc (Kenya Power). The Power System Design & Development (PSD&D) Department prepared the drawings.

The specification lays down requirements for Steel Structures for use in Kenya Power's Substations. It supersedes all specifications for Steel Structures for Substations issued before the revision date.

This specification is based on the latest revisions of the standards quoted on the drawings and the relevant Kenya Standard. Where an equivalent standard has not been quoted in the specification, then the standard (including its revision) quoted on the drawings prevails.

If the Specifications and/or Drawings do not contain particulars of materials or components which are necessary for the proper and safe completion, operation and maintenance of the structure in question, all such materials shall be deemed to be included in the supply.

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 Kenya Power. The manufacturer shall submit information which confirms satisfactory service experience with products which fall within the scope of this specification.

The following are members of the team that developed this specification:

| Name | Department |
|---|---|
| Emmanuel B. Buluma | Power System Design & Development |
| Rotich Benard | Standards |
| Stephen Nguli | Standards |

## 1. SCOPE

This Specification is for Steel Structures for Substations and covers the following structures:

i. Steel Structures for 132kV Equipment including Post Insulators, Surge Diverters, Isolators, Gantries, Steel Boom Structures and Current Transformer Structures.

ii. Steel Structures for 66kV Equipment including Bus Bars, Voltage Transformers, Current Transformers, Surge Diverters, Post Insulators and Air Break Switches/Isolators.

iii. Steel Structures for 33kV Equipment including Voltage Transformers, Air Break Switches/Isolators, Bus Bars, Gantries, and Current Transformers.

iv. Steel Structures for 11kV Equipment including Neutral Link, Heat Shrink Structure/Double Sealing ends and Local Transformer.

v. Steel Structures for Lighting Masts, Working/Security Lights and other associated equipment/fittings.

**Note:** The specific description being procured shall be indicated in the tender documents.

## 2. REFERENCES (NORMATIVE)

The following standards contain provisions which through reference in this text constitute provisions of this specification. For dated editions, the cited edition shall apply; for undated editions, the latest edition of the referenced document shall apply.

| | |
|---|---|
| BS EN 1011: | Welding. Recommendations for welding of metallic materials |
| ESI 43-95: | Steelworks for Overhead Lines |
| ISO 1461: | Metallic Coatings – Hot dip galvanized coatings on fabricated ferrous products – Requirements |
| KS 18: | Specification for steel for building and construction |
| KS 572 - 2017: | Kenya Standard Specification for Hot-Rolled Structural Steel Sections |

## 3. DEFINITIONS AND ABREVIATION

For this specification, the definitions and abbreviations given in the reference standards shall apply.

# 4. REQUIREMENTS

## 4.1. SERVICE CONDITIONS

The steel structures shall be suitable for use outdoors in tropical areas and harsh climatic conditions including areas exposed to:

a) Altitudes of up to 2200m above sea level

b) Humidity of up to 95%

c) Average ambient temperature of +30°C with a minimum of -1°C and a maximum of +40°C, in direct sunlight,

d) Pollution: Design pollution level to be taken as "*Heavy*" (Pollution level III) for inland and "*Very Heavy*" (Pollution level IV) for coastal applications in accordance with IEC 60815.

e) *Isokeraunic* levels of up to 180 thunderstorm days per year.

## 4.2. MATERIALS AND CONSTRUCTION

### 4.2.1. Material of Manufacture

4.2.1.1. The steel structures shall be manufactured from hot-rolled structural steel sections in accordance with KS 18 Table 1 and KS 572:2017.

4.2.1.2. The hot-rolled sections for use in the manufacture of steel structures shall be free from pipe, harmful segregation, surface flaws, foreign bodies, mill scales, which cannot be removed by manual wire brushing and other defects detrimental to their use.

4.2.1.3. Angle sections (equal and unequal angles), channels and flats shall be hot-rolled and shall comply with the requirements of Kenya Standard KS 572:2017.

4.2.1.4. The tensile strength and yield stress of the steel shall be not less than 430 N/mm$^2$ and 255 N/mm$^2$ respectively.

4.2.1.5. The dimensions and sectional properties, tolerances on mass and dimensions shall all be in accordance with KS 02-572 and as given in Table 1.

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

4.2.1.7. 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.

**Table 1: Mechanical Properties**

| S/.No. | Material Parameter | KPLC Requirements |
|---|---|---|
| **A.** | **ANGLES** | |
| 1 | Tensile strength | 430-460 $N/mm^2$ |
| 2 | Yield strength | 255 $N/mm^2$ |
| 3 | Tolerances<br>• mass<br>• Leg Length<br>• Thickness<br>• Out of square<br>• straightness | <br>4%<br>±1mm to 3mm<br>± 0.5mm<br>Max deviation 2mm<br>0.3 % of length |
| 4 | Elongation | 24-26% |
| 5 | Galvanizing Thickness | >110 microns |
| 6 | Modulus of Elasticity | $20*10^9$ |
| 7 | Density | 7860 $kg/m^3$ |
| 8 | Nominal length | ±0.4% |
| **B** | **CHANNELS** | |
| 1 | Tensile strength | 430-460 $N/mm^2$ |
| 2 | Yield strength | 255 $N/mm^2$ |
| 3 | Tolerances<br>• depth<br>• width of flange<br>• flange thickness<br>• thickness of web<br>• flange out of square<br>• flatness of web | <br>1.5-3mm<br>2.5mm<br>-0.5mm<br>±5mm<br>Max deviation 2mm<br>Concave –max 15% |
| 4 | Elongation | 24-26% |
| 5 | Galvanizing Thickness | >110 microns |
| 6 | Modulus of Elasticity | $20 \times 10^9$ |
| 7 | Density | 7860$kg/m^3$ |
| 8 | Nominal length | ±0.4% |
| **C** | **HOLLOW SECTIONS** | |
| 1 | Tensile strength | 430-460 $N/mm^2$ |
| 2 | Yield strength | 255 $N/mm^2$ |
| 3 | Tolerances<br>• Length | <br>4% |

| S/.No. | Material Parameter | KPLC Requirements |
|---|---|---|
| | • Thickness<br>• Out of square<br>• straightness | ±1mm to 3mm<br>± 0.5mm<br>Max deviation 2mm<br>0.3 % of length |
| 4 | Elongation | 24-26% |
| 5 | Galvanizing Thickness | >110 Microns |
| 6 | Modulus of Elasticity | $20 \times 10^9$ |
| 7 | Density | 7860 kg/m$^3$ |
| 8 | Nominal Length | ±0.4% |
| **D.** | **BOLTS, NUTS AND WASHERS** | |
| 1 | Safe working shear stress | 120 N/mm$^2$ |
| 2 | Grade (Bolts/Nuts) | 4.6/4 |
| 3 | Tolerances<br>• threads | <br>0.01mm |
| 4 | Galvanizing Thickness | >110 microns |

4.2.1.8. 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.

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

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

### 4.2.2. Welding

4.2.2.1. Welding shall be by metal-arc welding and shall be as per BS EN 1011.

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

### 4.2.3. Galvanizing

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

4.2.3.2. 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 and Table 1.

4.2.3.3. Bolts shall be completely galvanized including the threads, but the threads shall be left uncoated in the case of nuts.

4.2.3.4. The zinc coating shall be uniform, clean, smooth and as free from spangle as possible.

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

### 4.2.4. Other Requirements

4.2.4.1. Extra 2% of additional bolts/nuts/washers (both connection and anchor) of all sizes used in the structure shall be supplied with the steel structures.

4.2.4.2. 2 nos. coating thickness measuring equipment with valid calibration certificate (not less than one year) shall be supplied with the structures.

4.2.4.3. The contractor/supplier shall furnish Kenya Power with shop drawings 'As fabricated' in soft copy (.pdf and .dwg) in portable device upon award of the tender.

**Table 2: Additional Requirements**

| | CONTRACTOR COMPLIANCE SHEET | |
|---|---|---|
| **No.** | **Item** | **KPLC Requirements** |
| 1 | Confirm supply of shop drawings 'As fabricated, upon award successful bid in portable device | 2 No's |
| 2 | Supply of additional bolts/nuts/washers ( both connection and anchor) | Extra 2% |
| 3 | Supply calibrated coating thickness measuring equipment | 2 no. |

## 4.3. DRAWINGS

The General Arrangement Drawings given in Tables 3 shall be used in the design of the steel structures. The manufacturer shall be responsible for the adequacy of the design and of ensuring good engineering practice and good workmanship in the manufacture of the steel structures.

**Table 3: Structures For Equipment**

| No. | Item Description | Drawing SK No |
|---|---|---|
| 1. | 132kV & 66kv Surge Arrester Steel Structure | 11260 Sheet 1 |
| 2. | 132kV and 66 kV CTs, VTs & CVTs Steel Structure | 08409/A Sheet 1 |
| 3. | 132kV Post Insulator structure | 09162/A Sheet 4C |
| 4. | 132kV terminal gantry galvanized steel structure | 09111/A |
| 5. | 66kV isolator galvanized steel structure | 08409 Sheet 3D |
| 6. | 33 & 11 kV CT & VT Structure | 09774 Sheet 18 |
| 7. | 33kV Air Break Switch galvanized steel structure | 09774 Sheet 20 |
| 8. | 33kV Bus Bars; (33/11 kV) | 06779 Sheet 2 |
| 9. | 33/11kV cable support galvanized steel structure | 09769 Sheet 4 |
| 10. | Lightning Mast & Steel Galvanized Security Lighting Pole | 09774 Sheet 9/A |

## 5. MARKING AND PACKING

### 5.1. Packing

5.1.1. 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. The composite packages shall contain an additional 5% of the bolts, nuts and washers needed for erection of the packed structure. Each package shall contain an erection/ installation drawing and instructions in a sealed weather proof envelope (all in English Language).

5.1.2. All galvanized parts shall be protected from injury to the zinc coating due to abrasion during periods of transit, storage and erection

### 5.2. Marking:

Each assembly and package of items associated with this specification shall be suitably marked with manufacturer's identity, KPLC drawing number and item description.

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## APPENDICES

### APPENDIX A: TESTS AND INSPECTION (NORMATIVE)

A.1. It shall be the responsibility of the manufacturer to perform or to have performed the tests specified and whatever other tests normally performed at works including the following:

a) Chemical composition of the steel
b) Tensile test
c) Yield strength
d) Hardness tests
e) Galvanization tests

A.2. 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 with all necessary facilities (by the manufacturer) for inspection during fabrication.

A.3. All the manufactured structures shall be offered for factory acceptance tests and inspection in the presence of KPLC engineers. During the FAT at the manufacturer's works, the quantities which will be ready and offered for inspection and tests shall be considered already tested.

A.4. On receipt of the structures, Kenya Power shall inspect them and may perform or have performed any of the relevant tests to verify compliance with the specification. The supplier shall replace without charge to Kenya Power items which upon examination, test or use fail to meet any of the requirements in the specification.

### APPENDIX B: QUALITY MANAGEMENT SYSTEM (NORMATIVE)

B.1. The supplier shall submit a Quality Assurance Plan (QAP) that shall be used to ensure that the steel structure material, workmanship, tests, service capability, etc. will fulfil the requirements stated in the contract documents, standards, specifications and regulations. The QAP shall be based on and include relevant parts to fulfil the requirements of ISO 9001:2015

B.2. The bidder shall indicate the delivery time of the steel structure, manufacturer's monthly and annual production capacity and experience in the production of the items. A detailed list and contact addresses (including e-mail) of the manufacturer's previous customers outside the country of manufacture for the steel structure sold in the last five years together with reference letters from four of the customers shall be submitted with the tender for evaluation.

## APPENDIX C: TECHNICAL DOCUMENTATION (NORMATIVE)

C.1. The bidder shall submit its tender complete with technical documents for tender evaluation. The technical documents to be submitted (all in English language) for tender evaluation shall include the following:

a) Fully-filled clause by clause Guaranteed Technical Particulars (GTPs)- Appendix D - stamped and signed by the manufacturer.

b) Shop drawings in soft copy (.pdf and .dwg)

c) Copies of the Manufacturer's catalogues, brochures and technical data;

d) Copies of required test certificates and test reports

e) Details of manufacturing capacity and the manufacturer's experience

f) Sales records for previous five years and reference letters from at least four of the customers;

C.2. The successful bidder (supplier) shall submit the following documents/details to The Kenya Power & Lighting Company for approval before manufacture:

a) Fully filled clause by clause Guaranteed Technical Particulars (GTPs) stamped and signed by the manufacturer **(Please note these are not the ones submitted with the tender but ones based)**;

b) Shop drawings 'As fabricated' in soft copy (.pdf and .dwg) in portable device Drawings shall have technical data of the galvanized steel structure; stamped and signed by the manufacturer.

c) Marking and packaging details.

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## APPENDIX D: GUARANTEED TECHNICAL PARTICULARS (GTPS) — NORMATIVE

*(to be filled, stamped and signed by the Supplier and submitted together with relevant copies of the Manufacturer's catalogues, brochures, drawings, technical data, sales records for previous five years, four customer reference letters, details of suppliers' capacity and experience; and copies of complete test certificates and test reports for tender evaluation or approval, all in English Language, as per clauses C.1 and C.2)*

**Tender No. .....**

**Bidder's name and Address.....**

| **Description** | | | | **Bidder's offer** |
|---|---|---|---|---|
| 1. Manufacturer's Name & Country of manufacture | | | | State |
| 2. Name of item to be supplied | | | | State |
| 3. Type of galvanized steel structure | | | | Specify |
| **Clause** | **Description** | | | **Bidders offer*** |
| 1. | Scope | | | State |
| 2 | Applicable Standards | | | List |
| 4.1 | Service conditions | | | Specify |
| **4.2.1** | **General Requirements** | | | |
| 4.2.1.1 | Manufacturing standards | | | State |
| 4.2.1.2 | Surface integrity of hot-rolled sections for use in the manufacture of steel structures | | | Specify |
| 4.2.1.3 | Angle sections, channels and flats are hot-rolled and complies with the requirements of Kenya Standard KS 02-572 | | | |
| 4.2.1.4 | Tensile strength of the steel | | | State |
| | Yield stress of the steel | | | State |
| 4.2.1.5 | Mechanical Properties | | | State |
| | A. ANGLES | | | |
| | **Sr.No** | **Material Parameter** | **KPLC Requirements** | |
| | 1 | Tensile strength | 430-460 N/mm$^2$ | State value |
| | 2 | Yield strength | 255 N/mm$^2$ | State value |
| | 3 | Tolerances<br>• mass<br>• Leg Length<br>• Thickness<br>• Out of square<br>• straightness | <br>4%<br>+/- 1mm to 3mm<br>+/- 0.5mm<br>Max deviation 2mm<br>0.3 % of length | State values |
| Table 1 | 4 | Elongation | 24-26% | State value |

| **Issued by:** Head of Section, Standards Development | **Authorized by:** Head of Department, Standards |
|---|---|
| **Signed:** | **Signed:** |
| **Date: 2019-11-15** | **Date: 2019-11-15** |

| | | | | |
|---|---|---|---|---|
| | 5 | Galvanizing Thickness | >110 µm | State value |
| | 6 | Modulus of Elasticity | $20 \times 10^9$ | State value |
| | 7 | Density | $7860 kg/m^3$ | State value |
| | 8 | Nominal length | +/-0.4% | State value |
| | B. | CHANNELS | | |
| | 1 | Tensile strength | $430\text{-}460 N/mm^2$ | State value |
| | 2 | Yield strength | $255 N/mm^2$ | State value |
| | 3 | Tolerances<br>• depth<br>• width of flange<br>• flange thickness<br>• thickness of web<br>• flange out of square<br>• flatness of web | <br>1.5-3mm<br>2.5mm<br>-0.5mm<br>+/-5mm<br>Max deviation 2mm<br>Concave –max 15% | State values |
| | 4 | Elongation | 24-26% | State value |
| | 5 | Galvanizing Thickness | >110 µm | State value |
| | 6 | Modulus of Elasticity | $20 \times 10^9$ | State value |
| | 7 | Density | $7860 kg/m^3$ | State value |
| | 8 | Nominal length | +/-0.4% | State value |
| | C. | HOLLOW SECTIONS | | |
| | 1 | Tensile strength | $430\text{-}460 N/mm^2$ | State value |
| | 2 | Yield strength | $255 N/mm^2$ | State value |
| | 3 | Tolerances<br>• Length<br>• Thickness<br>• Out of square<br>• straightness | <br>4%<br>+/- 1mm to 3mm<br>+/- 0.5mm<br>Max deviation 2mm<br>0.3 % of length | State values |
| | 4 | Elongation | 24-26% | State value |
| | 5 | Galvanizing Thickness | >110 µm | State value |
| | 6 | Modulus of Elasticity | $20 \times 10^9$ | State value |
| | 7 | Density | $7860 kg/m^3$ | State value |
| | 8 | Nominal Length | +/-0.4% | State value |
| | D. | BOLTS,NUTS,WASHER | | |
| | 1 | Safe working shear stress | $120 N/mm^2$ | State value |
| | 2 | Grade (Bolts/Nuts) | 4.6/4 | State value |
| | 3 | Tolerances<br>• threads | <br>0.01mm | State value |
| | 4 | Galvanizing Thickness | >110 µm | State value |
| 4.2.1.6 | Materials before and after fabrication are straight and free from twists | | | Specify |

| | | |
|---|---|---|
| 4.2.1.7 | Sheared or cropped edge are dressed to a neat finish and are free from distortion | Specify |
| | All holes are drilled in one operation and burrs are removed | Specify |
| | Holes are not be formed by a gas cutting process | Specify |
| 4.2.1.8 | All matching holes for bolts registers with each other so that a gauge 2mm less in diameter than the diameter of the bolt passes freely through the assembled members in a direction at right angle to such members | Specify |
| 4.2.1.9 | Erection clearances for cleated ends of members connecting steel to steel | Specify |
| 4.2.1.10 | Bending of flat straps are carried out cold | Specify |
| 4.2.2 | **Welding** | State |
| 4.2.2.1 | Type of welding | State |
| 4.2.2.2 | Mode of cleaning of welds | State |
| 4.2.3 | **Galvanizing** | |
| 4.2.3.1 | All punching, cutting, drilling, screw tapping and the removal of burrs are completed before the galvanizing process commences | Specify |
| 4.2.3.2 | Type of galvanization | Specify |
| 4.2.3.3 | Bolts are completely galvanized including the threads, and the threads are left uncoated in the case of nuts | Specify |
| 4.2.3.4 | Uniformity of the zinc coating | Specify |
| 4.2.3.5 | Post-treatment (chromating) | State |

4.2.4 Table 2 — CONTRACTOR COMPLIANCE SHEET

| No. | Item | KPLC Requirements | Bidders values |
|---|---|---|---|
| 1 | Confirm supply of shop drawings 'As fabricated, upon award successful bid in portable device | 2 No's | Specify |
| 2 | Supply of additional bolts/nuts/washers ( both connection and anchor) | Extra 2% | Specify |
| 3 | Supply calibrated coating thickness measuring equipment | 2 no. | Specify |

4.3 — **Drawings**

**Table 3**

| No. | Item Description | Drwg No |
|---|---|---|
| 1. | 132kV Surge Arrester Steel Structure | Specify Drwg No |
| 2. | 132kV Current Transformer Structure, 3m high | Specify Drwg No |
| 3. | 132kV Isolator Structure | Specify Drwg No |
| 4. | 132kv bus bar galvanized steel structure 9000mm high | Specify Drwg No |
| 5. | 132kv terminal gantry galvanized steel structure | Specify Drwg No |
| 6. | 66kV Current Transformer & Voltage Transformer Structure | Specify Drwg No |
| 7. | 66kV isolator galvanized steel structure | Specify Drwg No |

| | | | | |
|---|---|---|---|---|
| | | 8. | 66kv surge diverter galvanized steel structure 2400mm high | Specify Drwg No |
| | | 9. | 33 & 11 kV CT & VT Structure, 2.4m high | Specify Drwg No |
| | | 10. | 33kv Air break switch galvanized steel structure 5000mm high | Specify Drwg No |
| | | 11. | 33kV Bus Bars; (33/11 kV) | Specify Drwg No |
| | | 12. | 33/11Kv cable support galvanized steel structure 4000mm high | Specify Drwg No |
| | | 13. | 11kV Post Insulator/surge diverter galvanized steel structure 5000mm high | Specify Drwg No |
| | | 14. | Lightning Mast & Steel Galvanized Security Lighting Pole | Specify Drwg No |
| 5 | **Marking & Packing** | | | |
| 5.1.1 | Where an item includes a number of components to form a complete assembly, all component parts are included in one composite package which shall be firmly strapped or bound together | | | State |
| 5.1.2 | All galvanized parts are protected from injury to the zinc coating due to abrasion during periods of transit, storage and erection | | | State |
| 5.2 | Markings | | | State |
| A1 | Tests to be performed | | | State |
| | Responsibility to perform all the tests specified | | | State |
| | Responsibility to perform all the tests on galvanization | | | State |
| A2 | Standards for inspection and testing | | | State |
| A3 | All manufactured galvanized steel structure shall be offered for FATs and inspection in the presence of KPLC engineers at manufacturers site | | | State |
| A4 | Supplier shall replace without charge to KPLC items that don't meet specification | | | State |
| B1 | QAP | | | State |
| B2 | Delivery time, Production capacity & experience of the manufacturer | | | State |
| C1 | Technical documents to be submitted with tender documents | | | |
| | a. Fully-filled clause by clause Guaranteed Technical Particulars (GTPs)-Appendix D - stamped and signed by the manufacturer. | | | Specify |
| | b. Shop drawings in soft copy (.pdf and .dwg) | | | state |
| | c. Manufacturer's catalogues, brochures, and technical data; | | | Specify |
| | d. Copies of required test certificates and test reports | | | State |
| | e. Details of manufacturing capacity | | | State |

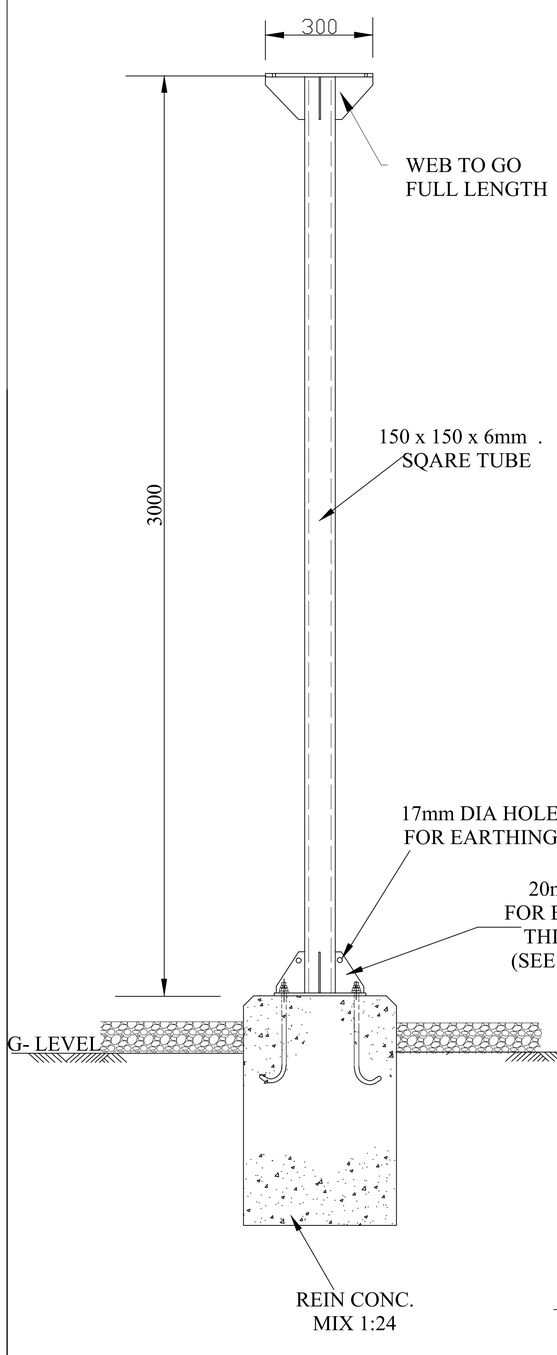
| | | |
|---|---|---|
| | f. Sales records for previous five years and reference letters from at least four of the customers; | State |
| C2 | Documents to be submitted for approval before manufacture | |
| | a. Fully filled clause by clause Guaranteed Technical Particulars (GTPs | State |
| | b. Drawings and technical data of the galvanized steel structure; stamped and signed by the manufacturer. | State |
| | c. Marking and packaging details | State |

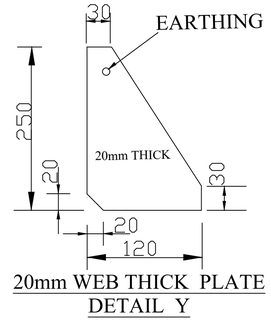
***NOTE:***

1) *Bidders shall give full details of the items on offer as per the specification and applicable standards. The details provided shall conform to the test reports and their certificates, as well as labeled drawings complete with dimensions, catalogues and/or brochures for the purpose of tender evaluation.*
2) *Bidders should note that the above Guaranteed Technical Particulars Schedules must be fully completed and submitted with the bid. Wherever there is conflict between the GTPs and the clauses in the specification, the clauses in the specification take precedence. Failure to complete the schedules shall lead to rejection of the bid.*
3) *Guaranteed values shall be specified. * Words like 'agreed', 'confirmed', 'As per KPLC specifications', etc. shall not be accepted and shall be considered non-responsive.*

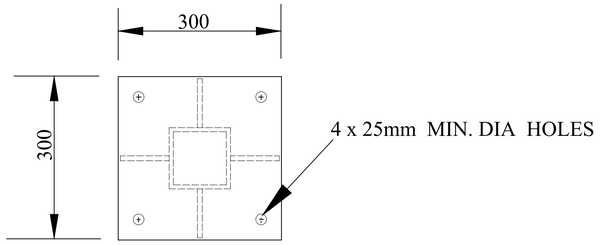
.....

**Manufacturer's Name, Signature, Stamp and Date**

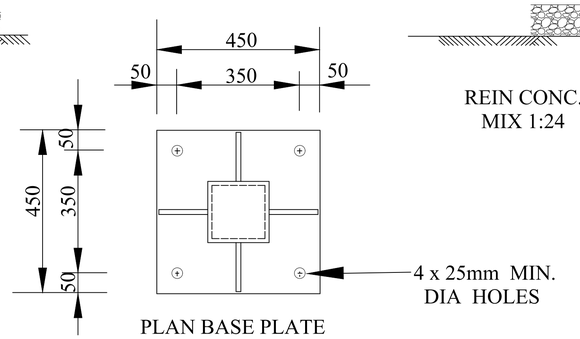


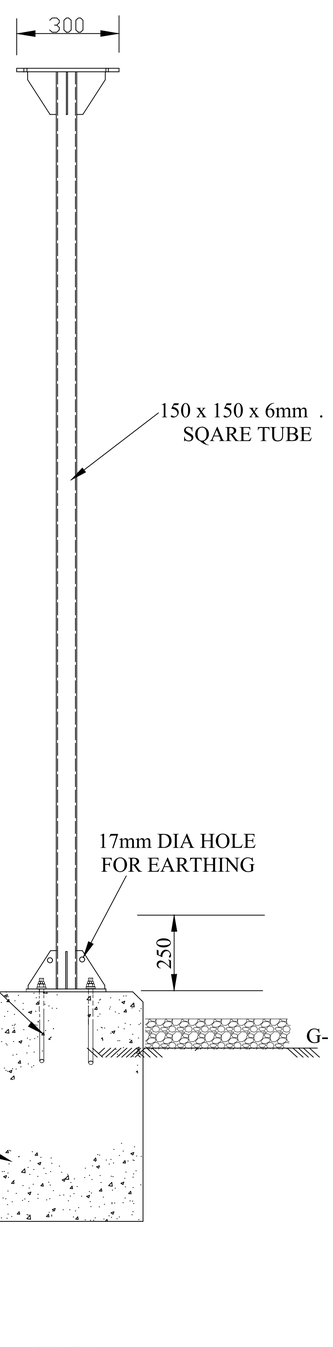

20mm WEB THICK PLATE
DETAIL Y




TOP PLATE 10mm THICK




PLAN BASE PLATE
20mm THICK




NOTES : -

1. ALL MATERIALS TO BE MILD STEEL TO BSS 4360
2. ALL STEEL WORK TO BE FREE FROM RUST DIRT BURRS E.T.C AND THEN GALVANIZED BY HOT DIP. PROCESS, THICKNESS AND QUALITY OF ZINC COATING TO WITHSTAND TESTS OF BSS 729.
3. EQUIPMENT CONNECTING BOLTS NUTs AND WASHERS TO BE SUPPLIED BY THE MANUFACTURERS.
4. BOLT THREADS TO BE RECUT WITH SLACK DIES AFTER GALVANIZING AND THEN GREASED.
5. SUPPLIED BOLTS,NUTS, AND WASHERS TO INCLUDE 10% SPARE ,AND TO COMFORM TO TO BSS 916
6. FABRICATORS ARE TO DESIGNATE ALL STEEL WORK ITEM AS PER THIS DRAWING AND ARE TO PROVIDE ERECTION MARK.

| | DATE | NAME | SIGN |
|---|---|---|---|
| APPROVED | | | |
| CHECKED ENGINEER I/C | | | |
| CHECKED PRINCIPAL D'MAN | | B.Gaitho | |
| DRAWN | 21/07/2009 | S.M.Kimani | |
| TRACED | | | |

| REF | REVISION | DATE | SIGN | CHECKED | DATE |
|---|---|---|---|---|---|
| 1 | | | | | |
| 2 | | | | | |
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| 5 | | | | | |
| 6 | | | | | |

**DETAILS OF 132kv And 66kv SURGE ARRESTER STEEL STRUCTURE**

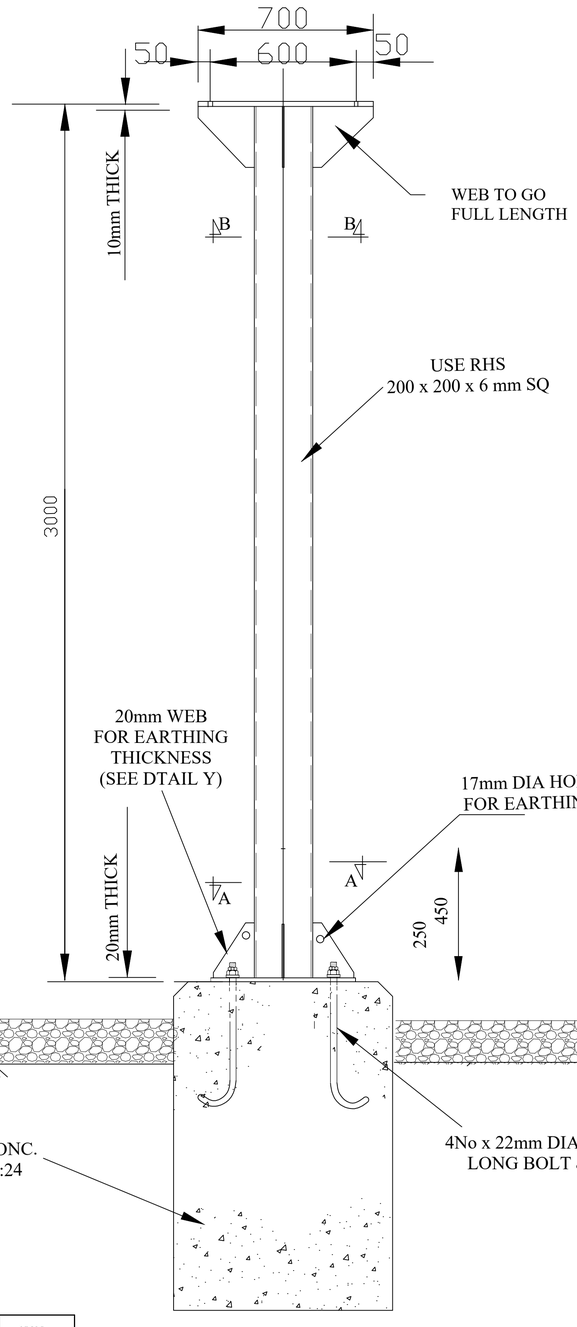
SCALE : not to scale

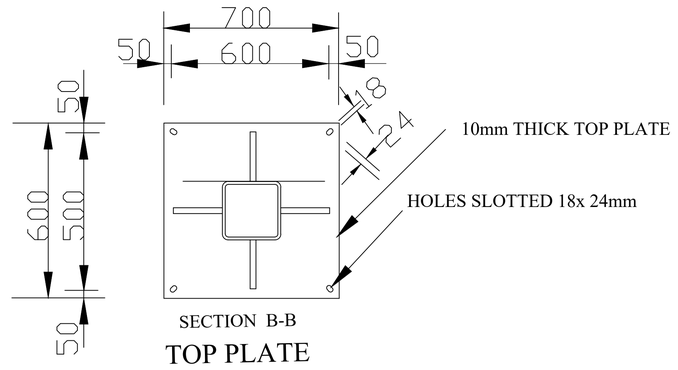
Kenya Power

**KENYA POWER**

**SK. No.11260**

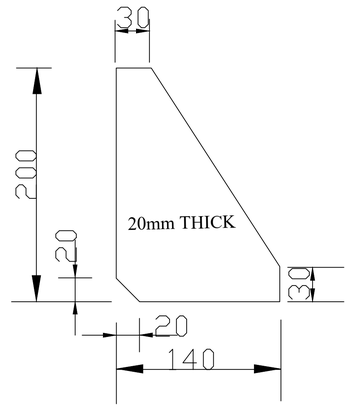
**SHEET 1**



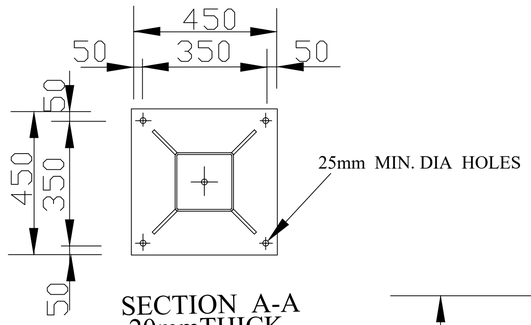




SECTION B-B

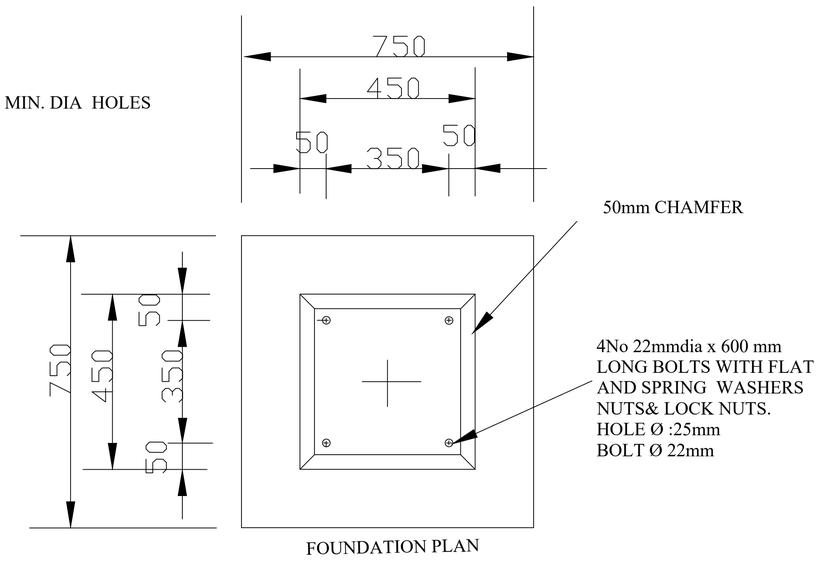
TOP PLATE




DETAIL 'Y'




SECTION A-A
20mmTHICK
BASE PLATE




FOUNDATION PLAN

NOTES : -
1. ALL MATERIALS TO BE MILD STEEL TO BSS 4360
2. ALL STEEL WORK TO BE FREE FROM RUST DIRT BURRS E.T.C AND THEN GALVANIZED BY HOT DIP. PROCESS, THICKNESS AND QUALITY OF ZINC COATING TO WITHSTAND TESTS OF BSS 729.
3. EQUIPMENT CONNECTING BOLTS NUTs AND WASHERS TO BE SUPPLIED BY THE MANUFACTURERS.
4. BOLT THREADS TO BE RECUT WITH SLACK DIES AFTER GALVANIZING AND THEN GREASED.
5. SUPPLIED BOLTS,NUTS, AND WASHERS TO INCLUDE 10% SPARE ,AND TO COMFORM TO TO BSS 916
6. FABRICATORS ARE TO DESIGNATE ALL STEEL WORK ITEM AS PER THIS DRAWING AND ARE TO PROVIDE ERECTION MARK.

| | DATE | NAME | SIGN |
|---|---|---|---|
| APPROVED | | | |
| CHECKED ENGINEER I/C | | | |
| CHECKED PRINCIPAL D'MAN | | B.Gaitho | |
| DRAWN | 21/07/2009 | S.M.Kimani | Kimani |
| TRACED | | | |

| REF | REVISION | DATE | SIGN | CHECKED | DATE |
|---|---|---|---|---|---|
| 1 | | | | | |
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| 6 | | | | | |

# DETAILS OF 132kv And 66kv CTs,VTs, CVTs STEEL STRUCTURE

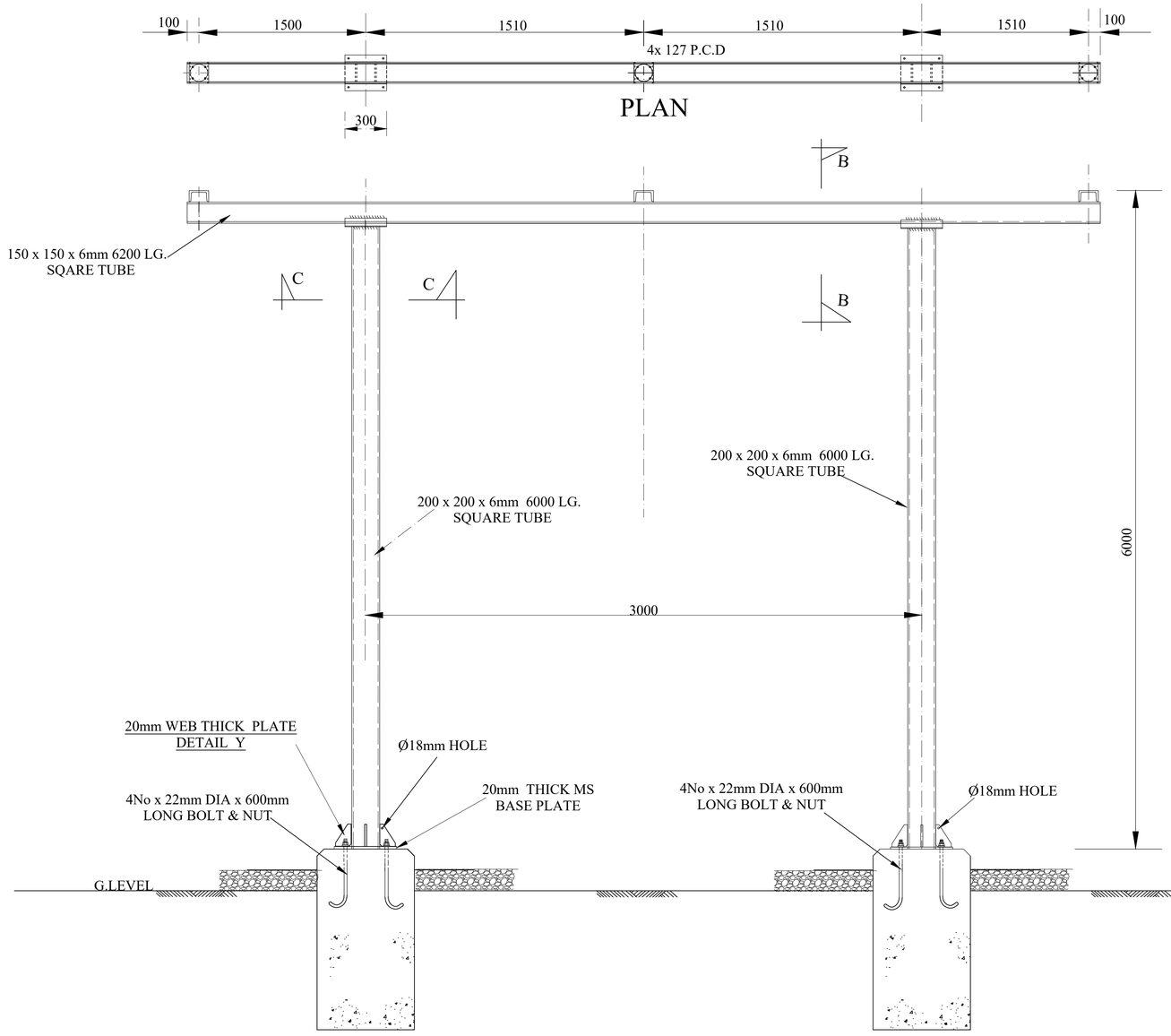
**SCALE : not to scale**

Kenya Power

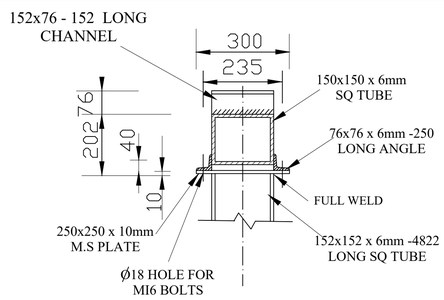
**SHEET 1**

**KENYA POWER**

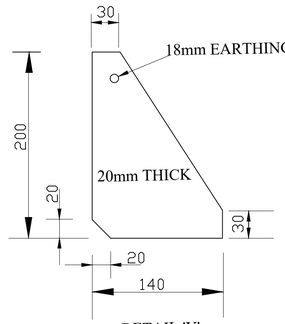
**SK. No.08409/A**



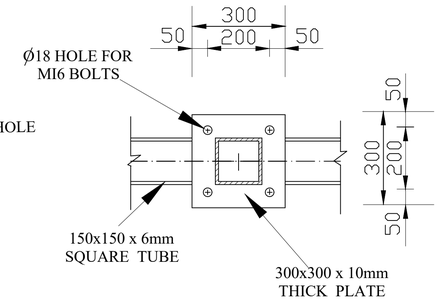

ELEVATION



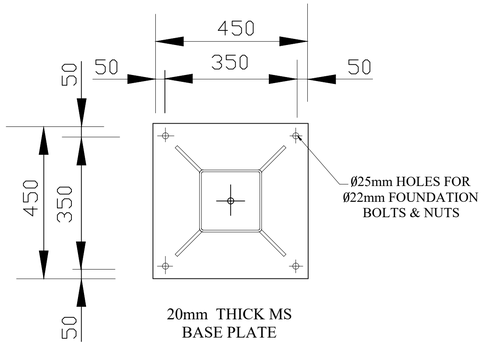

SECTION B-B




DETAIL 'Y'




SECTION C-C




NOTES

1) ALL HOLES TO BE O18 FOR M16 BOLTS UNLESS OTHERWISE STATED .
2) ALL STEELWORK TO BE FREE FROM RUST, RUST, DUST BURRS E.T.C THEN GALVANISED BY HOT DIP. PROCESS, THICKNESS AND QUALITY OF ZINC COATING TO WITHSTAND TEST OF 729.
3) ALL BOLTS& NUTS CONNECTING EQUIPMENT TO BE SUPPLIED BY EQUIPMENT MANUFACTUREERS.
4) BOLTS & NUTS TO CONFORM TO BSS 916 AND THE QUANTITY SUPPLIED TO INCLUDE 10% SPARE ALLOWANCE.
5) FABRICATORS ARE TO DESIGNATE ALL STEELWORK ITEMS AND PROVIDE ERECTION MARK PLANS.

| | NAME | DATE | SIGN |
|---|---|---|---|
| APPROVED | | | |
| CHECKED ENGINEER I/C | | | |
| CHECKED PRINCIPAL D'MAN | B. Gaitho | | |
| DRAWN | S.M Kimani | 3/07/2010 | Kimani |
| TRACED | | | |

| REF | REVISION | DATE | SIGN | CHECKED | DATE |
|---|---|---|---|---|---|
| 1 | | | | | |
| 2 | | | | | |
| 3 | | | | | |
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# DETAILS OF 132KV POST INSULATOR STRUCTURE

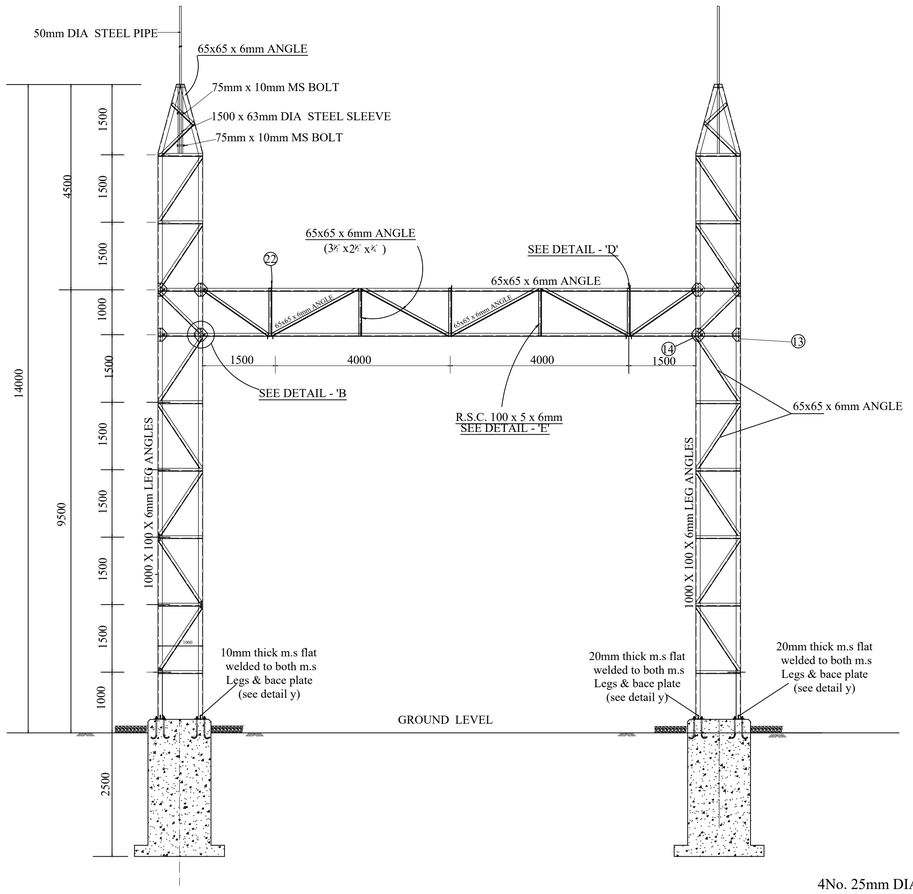
SCALE 1:100

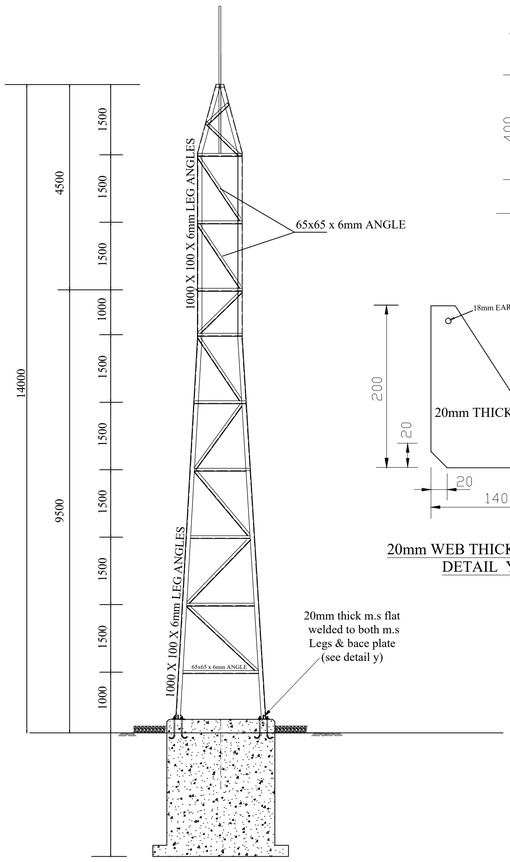
Kenya Power

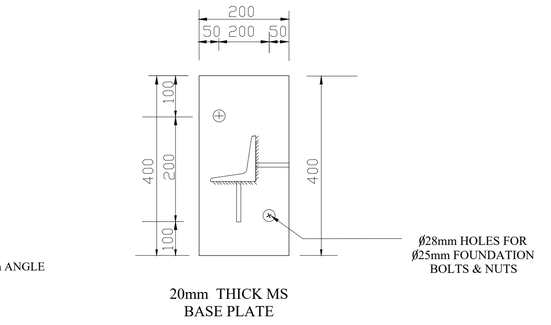
**KENYA POWER**

**SK. No. 09162/A**

**SHEET 4C**



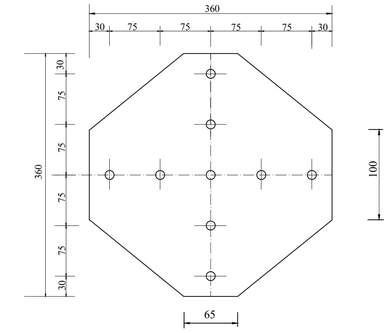



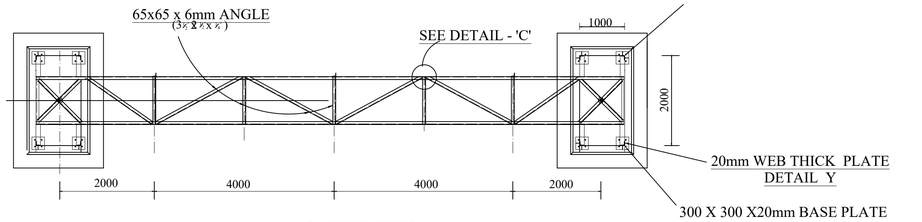

20mm THICK MS BASE PLATE



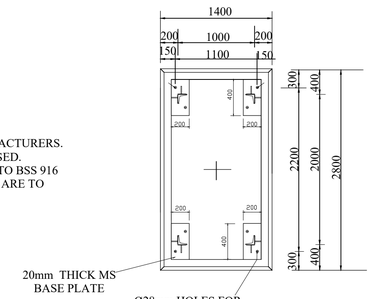

20mm WEB THICK PLATE DETAIL Y

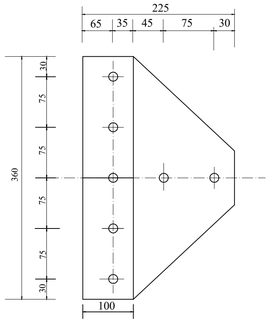



ITEM- 14 - 360 x 360 6mm MS PLATE

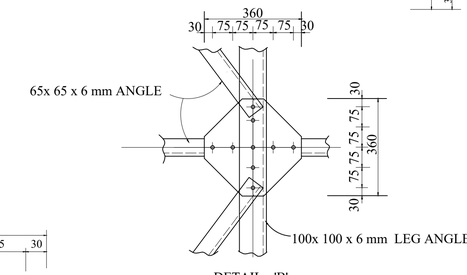



PLAN VIEW OF TOP

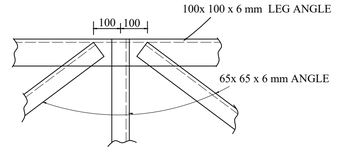


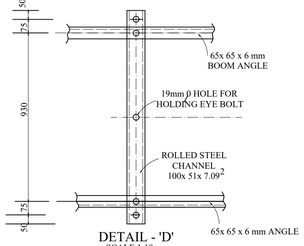

ITEM- 13 - 225 x 360 6mm MS PLATE



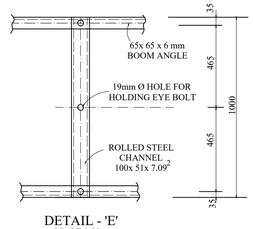

DETAIL - 'B'
SCALE 1:10




DETAIL - 'C'
SCALE 1:10




DETAIL - 'D'
SCALE 1:10




DETAIL - 'E'
SCALE 1:10

NOTES : -

1. ALL MATERIALS TO BE MILD STEEL TO BSS 4360
2. ALL STEEL WORK TO BE FREE FROM RUST DIRT BURRS E.T.C AND THEN GALVANIZED BY HOT DIP. PROCESS, THICKNESS AND QUALITY OF ZINC COATING TO WITHSTAND TESTS OF BSS 729.
3. EQUIPMENT CONNECTING BOLTS NUTs AND WASHERS TO BE SUPPLIED BY THE MANUFACTURERS.
4. BOLT THREADS TO BE RECUT WITH SLACK DIES AFTER GALVANIZING AND THEN GREASED.
5. SUPPLIED BOLTS,NUTS, AND WASHERS TO INCLUDE 10% SPARE ,AND TO COMFORM TO TO BSS 916
6. FABRICATORS ARE TO DESIGNATE ALL STEEL WORK ITEM AS PER THIS DRAWING AND ARE TO PROVIDE ERECTION MARK.

| | NAME | DATE | SIGN |
|---|---|---|---|
| APPROVED | | | |
| CHECKED ENGINEER I/C | S. Njoroge | | |
| CHECKED PRINCIPAL D'MAN | B. Gaitho | | |
| DRAWN | S.M Kimani | 3/02/2008 | Kimani |
| TRACED | | | |

| REF | REVISION | DATE | SIGN | CHECKED | DATE |
|---|---|---|---|---|---|
| 1 | | | | | |
| 2 | | | | | |
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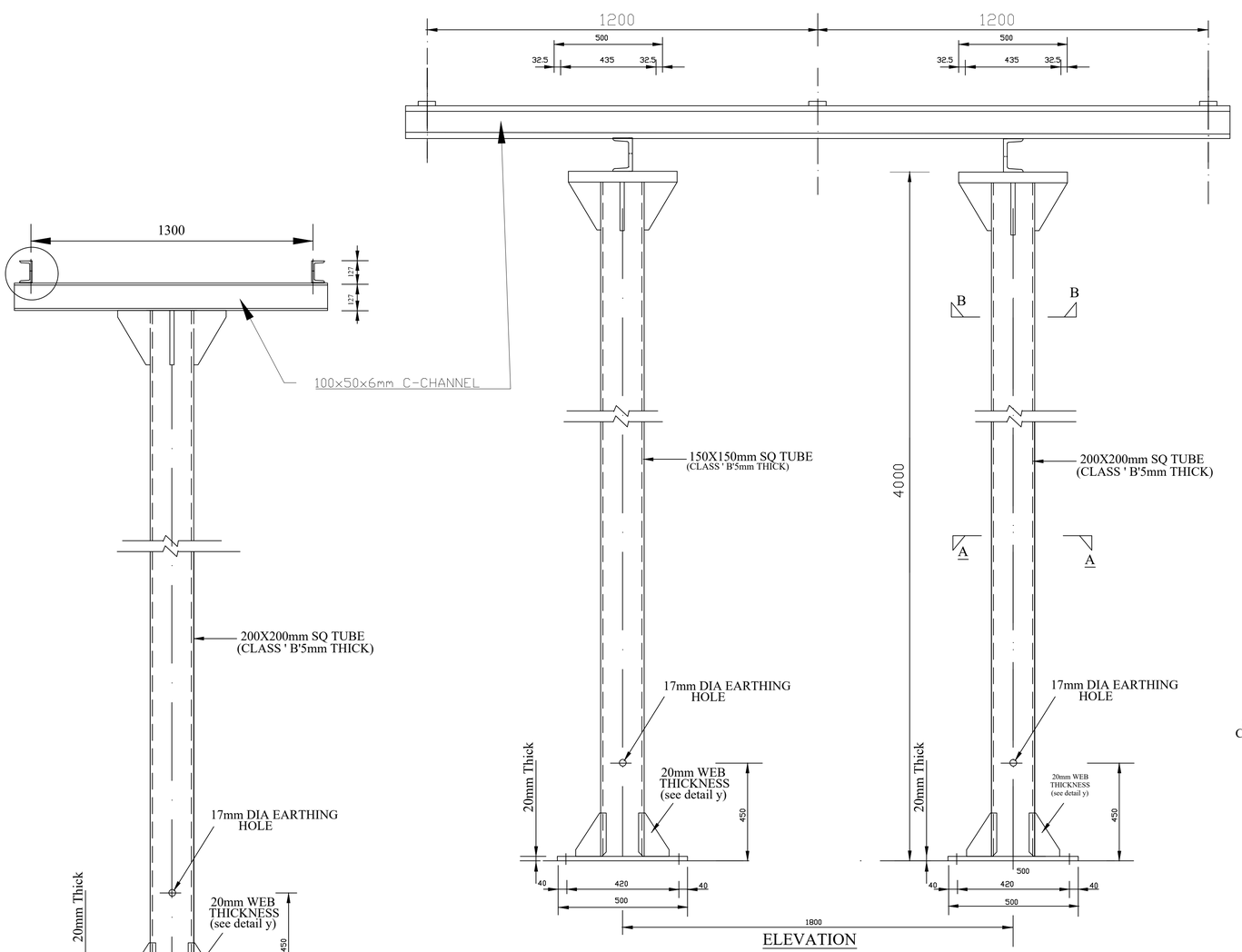
# DETAILS OF 132KV STEEL TERMINAL GANTRY STRUCTURE

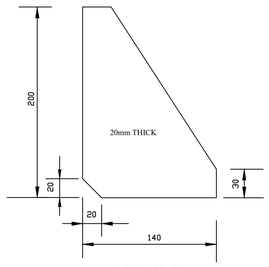
SCALE 1:100

SHEET 1/A

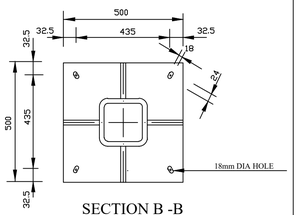
KENYA POWER

SK. No. 09111/A



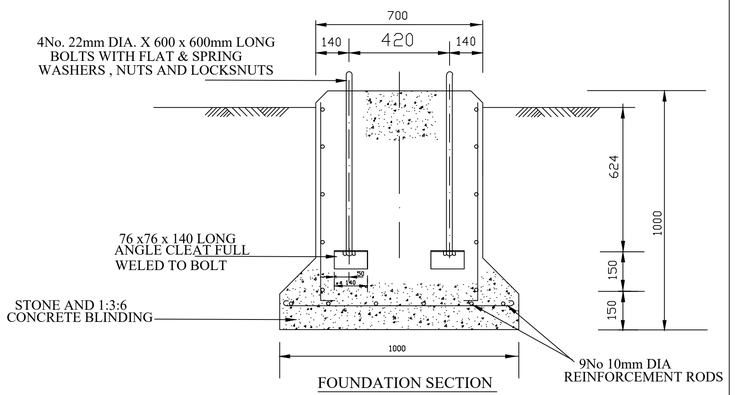

DETAIL Y
8No. OFF
SCALE 1:25



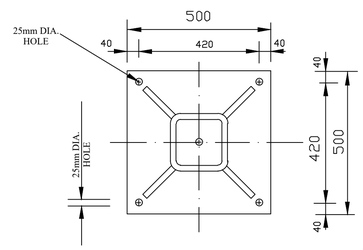

SECTION B -B




PLAN




FOUNDATION SECTION




SECTION A-A
20mm THICK

| | DATE | NAME | SIGN |
|---|---|---|---|
| APPROVED | | | |
| CHECKED ENGINEER I/C | | | |
| CHECKED PRINCIPAL D'MAN | | B.Gaitho | |
| DRAWN | 21/07/2009 | S.M.Kimani | Kimani |
| TRACED | | | |

| REF | REVISION | DATE | SIGN | CHECKED | DATE |
|---|---|---|---|---|---|
| 1 | | | | | |
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# DETAILS OF 66KV ISOLATOR STRUCTURE - STEEL

**SCALE : not to scale**

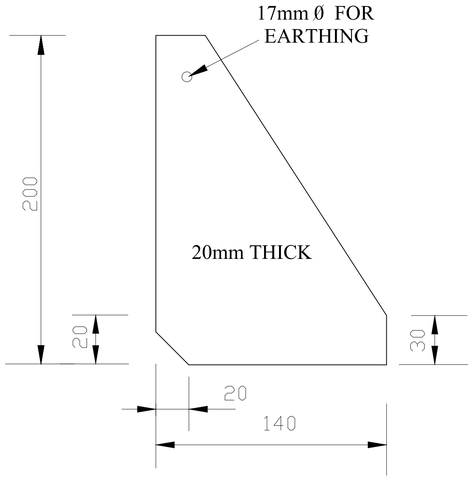
Kenya Power

**SHEET 3D**

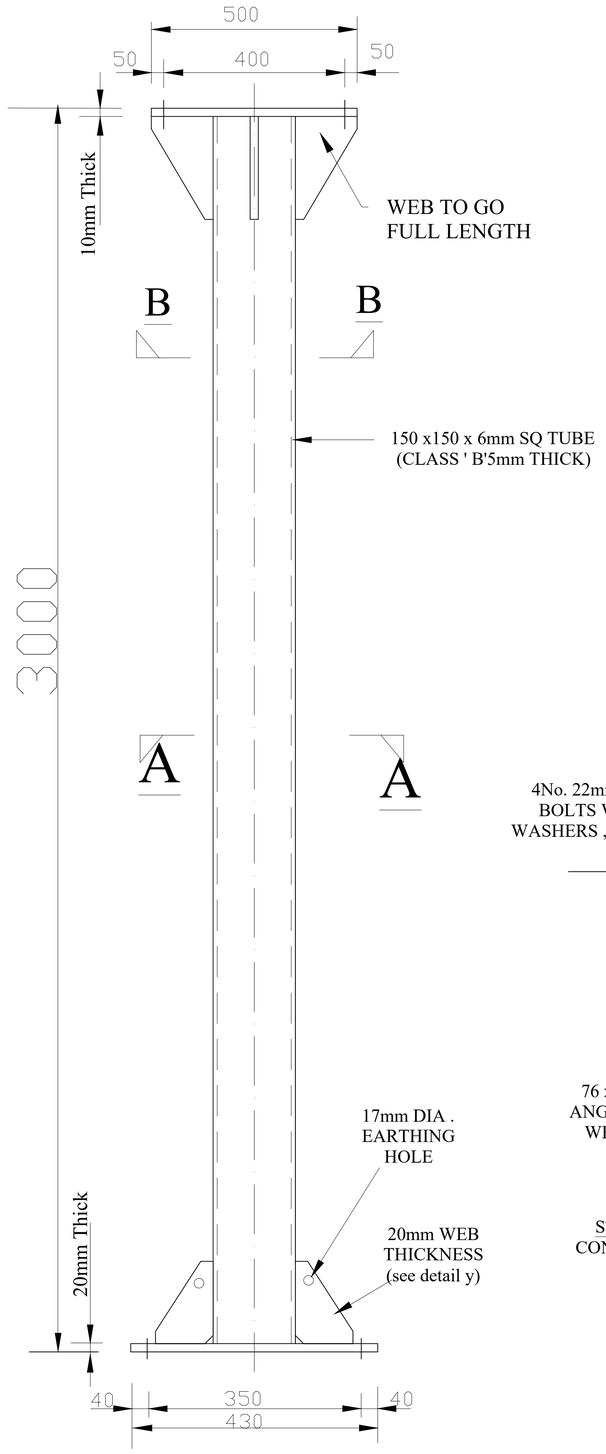
**KENYA POWER**

**SK. No.08409**

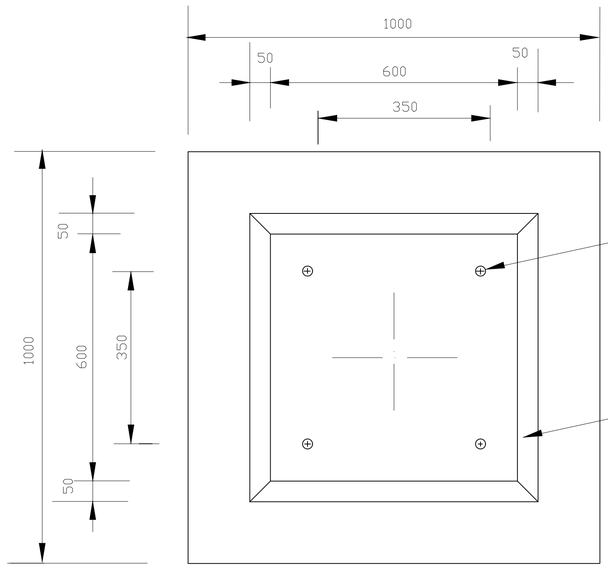
A2



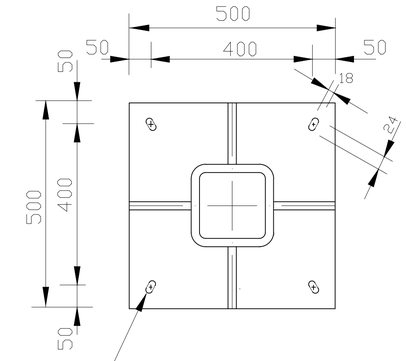

DETAIL Y
8No. OFF
SCALE 1:25



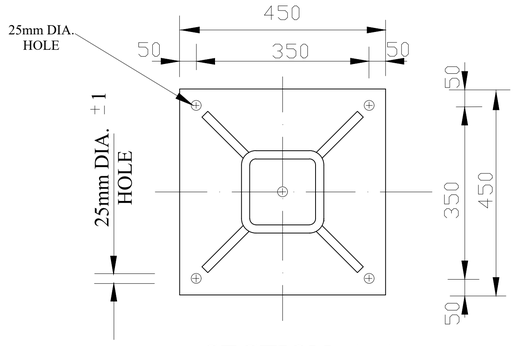

CTs ELEVATION



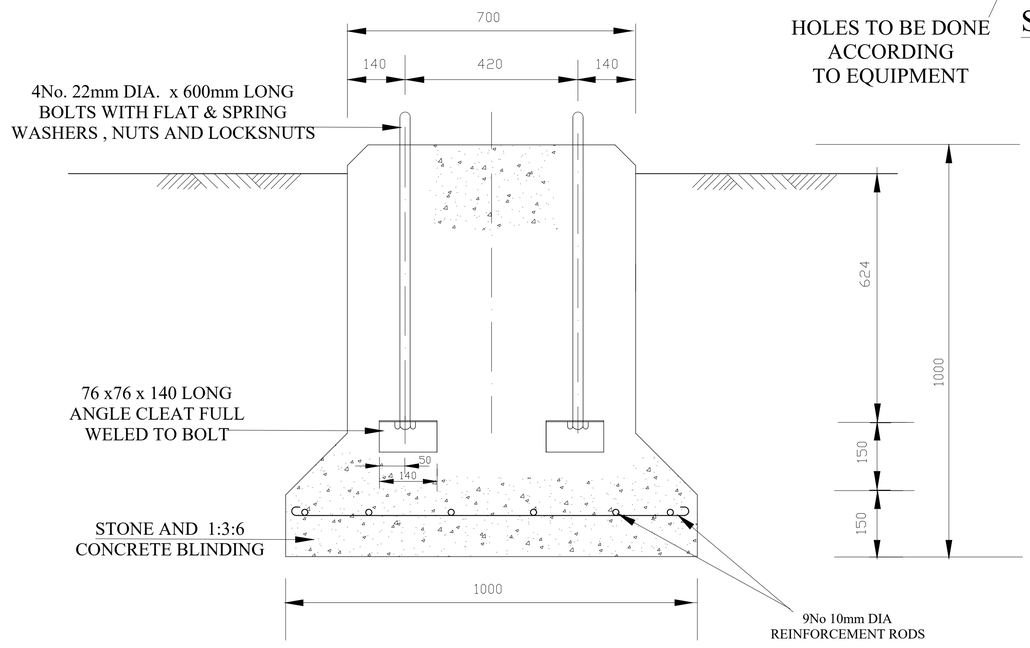

FOUNDATION PLAN




SECTION B -B




SECTION A-A
BASE PLATE
20mm THICK




FOUNDATION PLAN

| | DATE | NAME | SIGN |
|---|---|---|---|
| APPROVED | | | |
| CHECKED ENGINEER I/C | | | |
| CHECKED PRINCIPAL D'MAN | | B.Gaitho | |
| DRAWN | 21/07/2009 | S.M.Kimani | Kimani |
| TRACED | | | |

| REF | REVISION | DATE | SIGN | CHECKED | DATE |
|---|---|---|---|---|---|
| 1 | | | | | |
| 2 | | | | | |
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**SHEET 18**

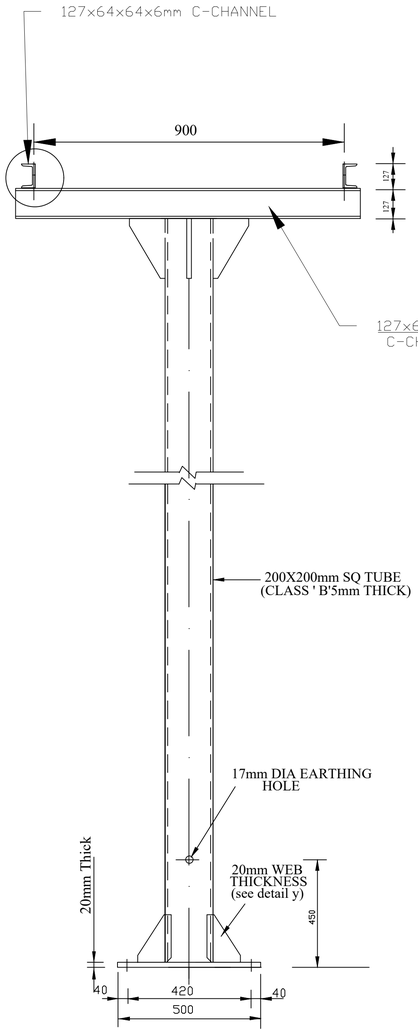
**DETAILS OF 33& 11KV CTs & VTs. STRUCTURE - STEEL**

**SCALE 1:10**

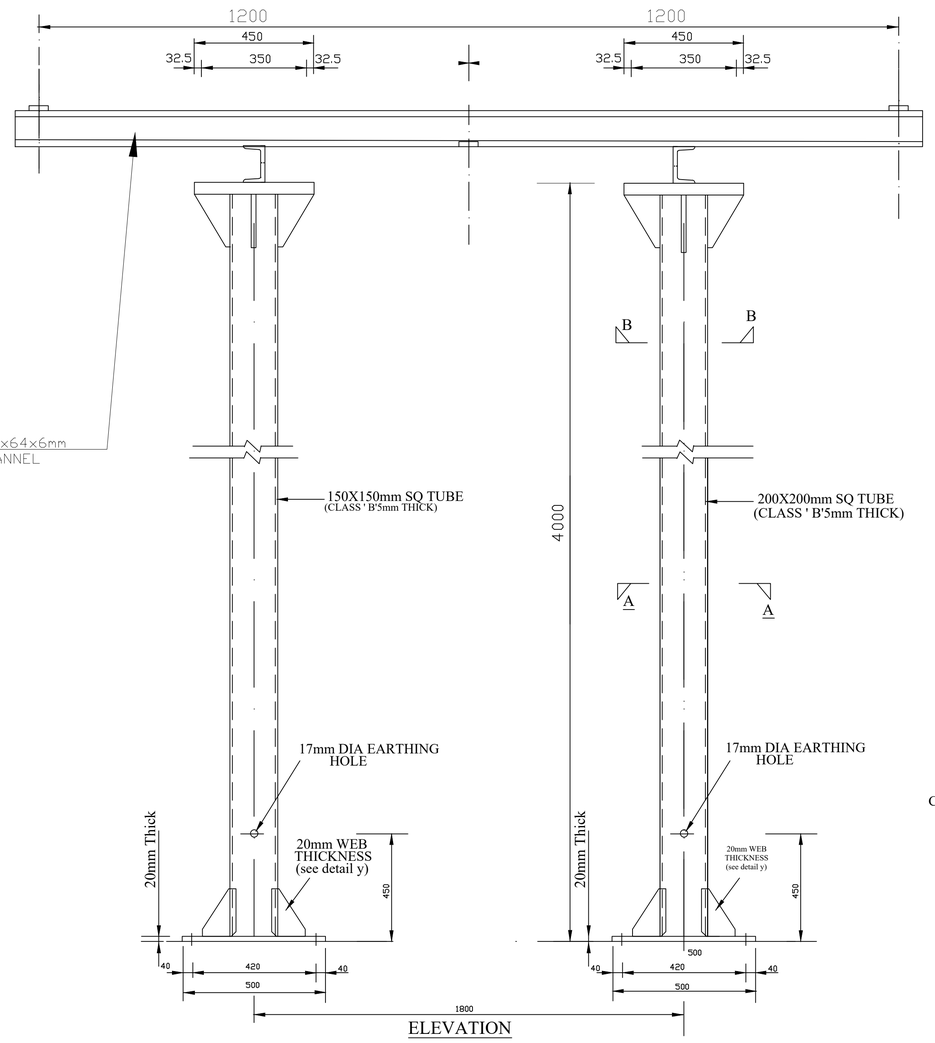
Kenya Power

**KENYA POWER**

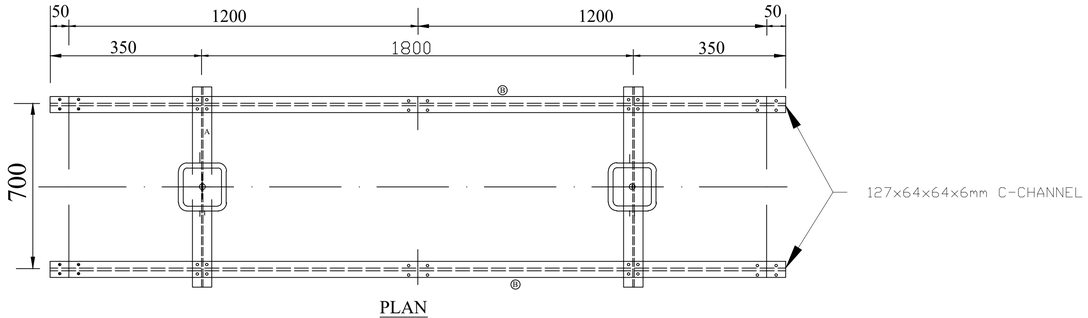
**SK. No.09774**



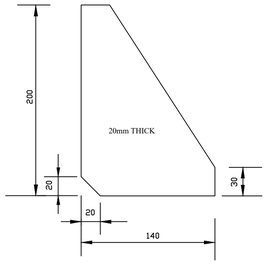

SIDE ELEVATION




ELEVATION

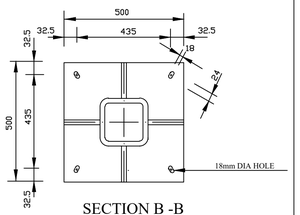



PLAN

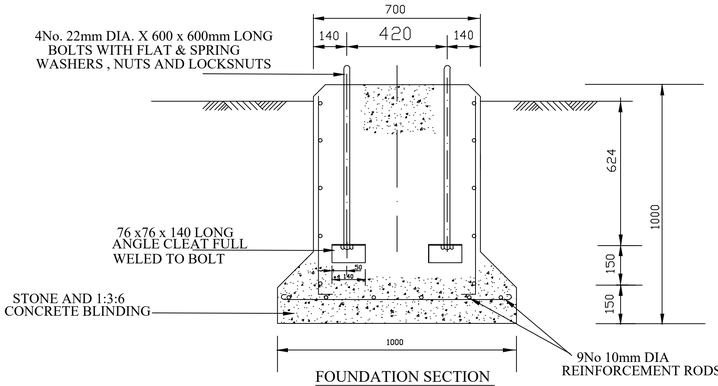



DETAIL Y

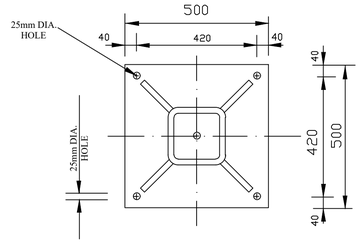
8No. OFF
SCALE 1:25




SECTION B -B
10mm THICK




FOUNDATION SECTION




SECTION A-A
20mm THICK

| | DATE | NAME | SIGN |
|---|---|---|---|
| APPROVED | | | |
| CHECKED ENGINEER I/C | | | |
| CHECKED PRINCIPAL D'MAN | | B.Gaitho | |
| DRAWN | 21/07/2009 | S.M.Kimani | Kimani |
| TRACED | | | |

| REF | REVISION | DATE | SIGN | CHECKED | DATE |
|---|---|---|---|---|---|
| 1 | | | | | |
| 2 | | | | | |
| 3 | | | | | |
| 4 | | | | | |
| 5 | | | | | |
| 6 | | | | | |

# DETAILS OF 33kv and 11kv AB/S STRUCTURE - STEEL

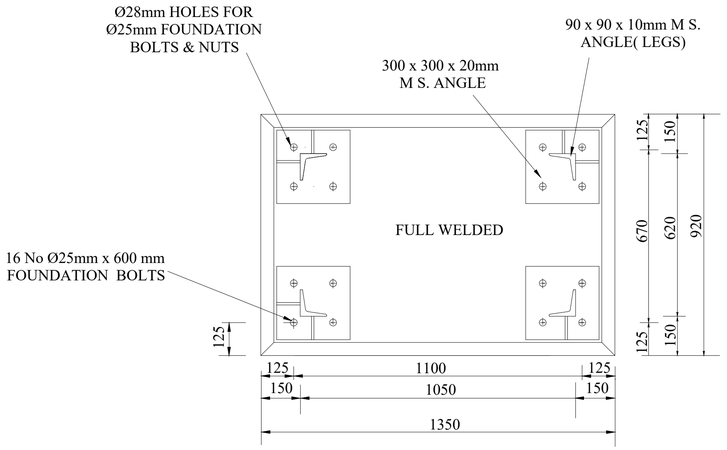
**SCALE : not to scale**

Kenya Power

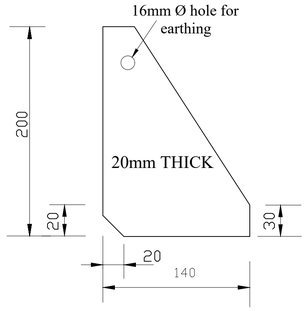
**SHEET 20**

**KENYA POWER**

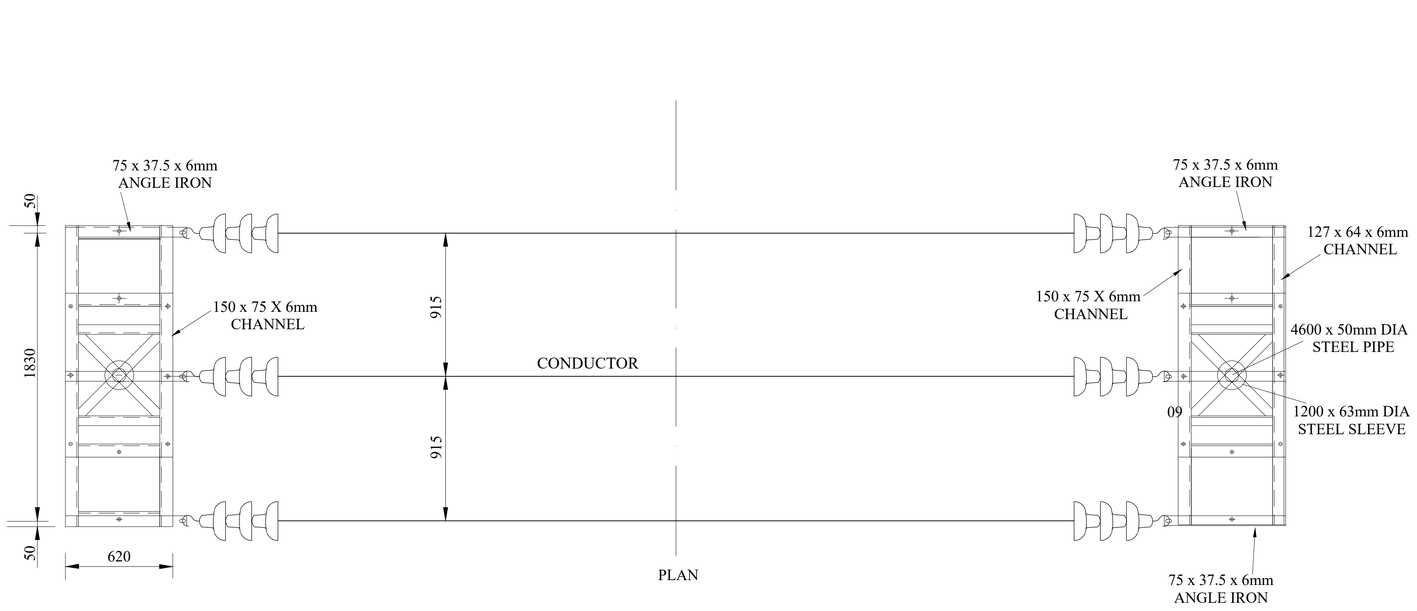
**SK. No.09774**

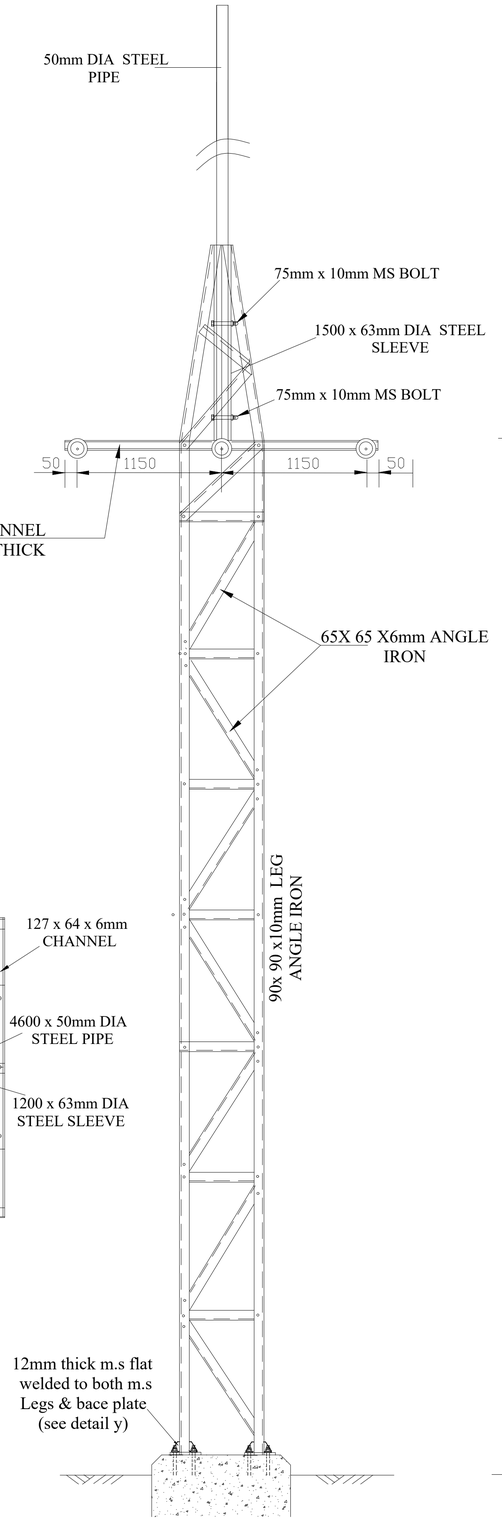


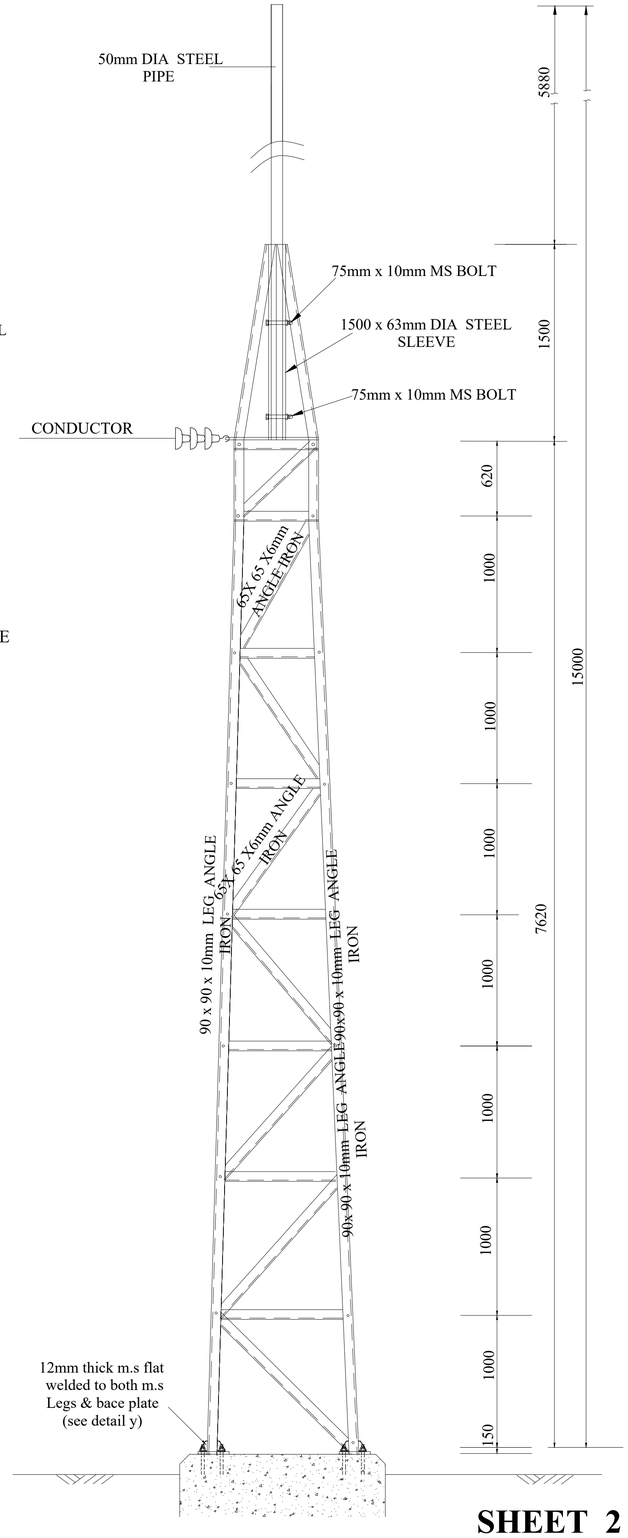

**BOTTOM PLAN**




DETAIL Y
8No. OFF
SCALE 1:25




**SHEET 2**

| | DATE | NAME | SIGN |
|---|---|---|---|
| APPROVED | | | |
| CHECKED ENGINEER I/C | | | |
| CHECKED PRINCIPAL D'MAN | | B.Gaitho | |
| DRAWN | 21/07/2009 | S.M.Kimani | *Kimani* |
| TRACED | | | |

| REF | REVISION | DATE | SIGN | CHECKED | DATE |
|---|---|---|---|---|---|
| 1 | | | | | |
| 2 | | | | | |
| 3 | | | | | |
| 4 | | | | | |
| 5 | | | | | |
| 6 | | | | | |

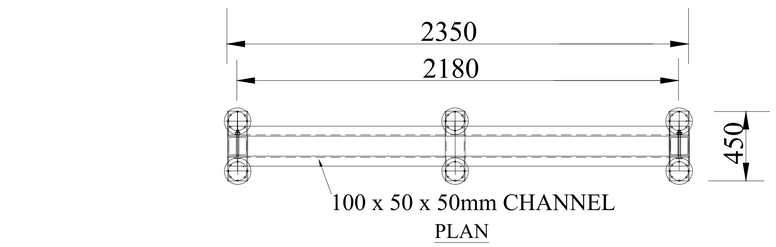
# DETAILS OF STEEL STRUCTURES FOR 33KV BUS BAR (33/11KV)

**SCALE 1:100**

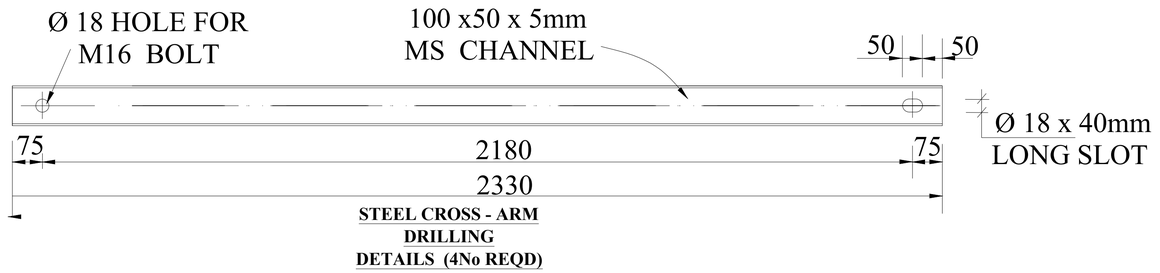
Kenya Power

**KENYA POWER**

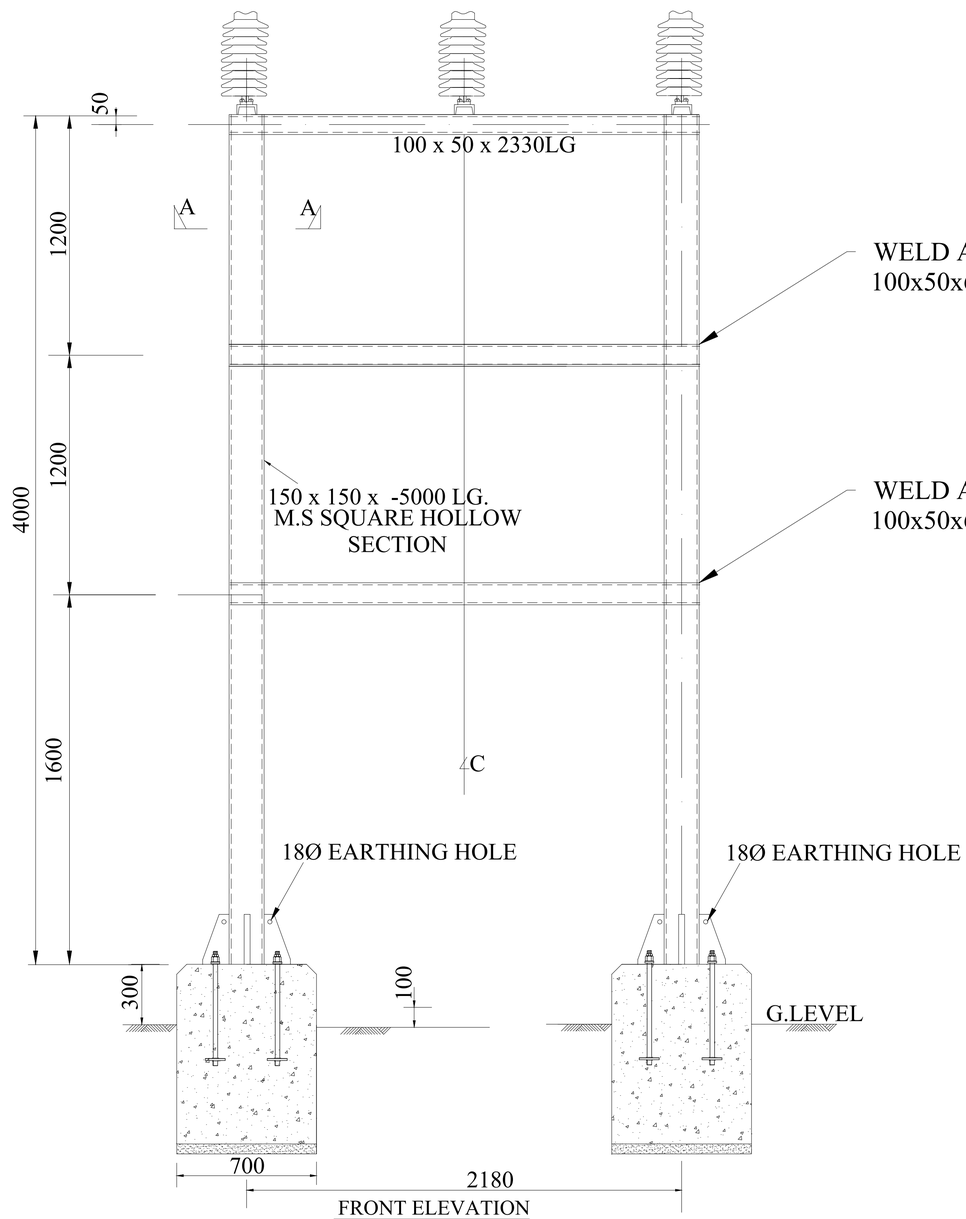
**SK. No.06779**



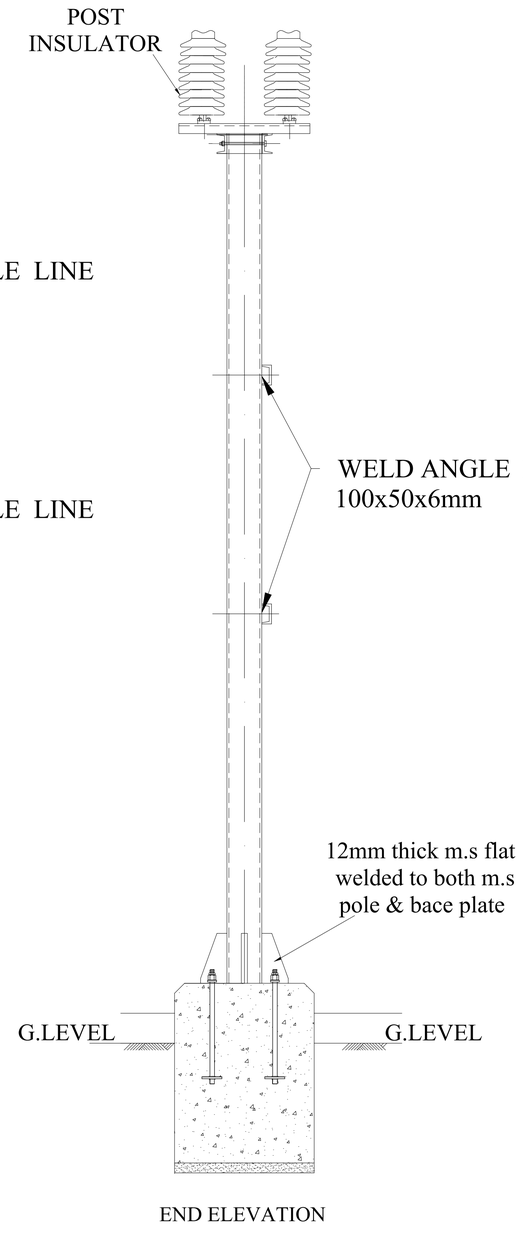

PLAN



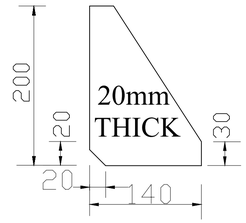

**STEEL CROSS - ARM DRILLING DETAILS (4No REQD)**



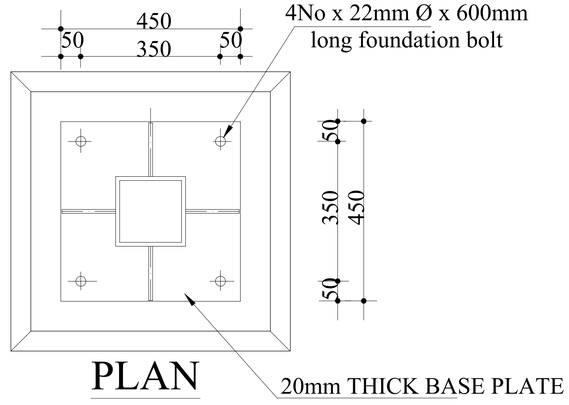

FRONT ELEVATION




END ELEVATION




DETAIL Y
8No. OFF
SCALE 1:25




PLAN

| | DATE | NAME | SIGN |
|---|---|---|---|
| APPROVED | | | |
| CHECKED ENGINEER I/C | | | |
| CHECKED PRINCIPAL D'MAN | | B.Gaitho | |
| DRAWN | 21/07/2009 | S.M.Kimani | *Kimani* |
| TRACED | | | |

| REF | REVISION | DATE | SIGN | CHECKED | DATE |
|---|---|---|---|---|---|
| 1 | | | | | |
| 2 | | | | | |
| 3 | | | | | |
| 4 | | | | | |
| 5 | | | | | |
| 6 | | | | | |

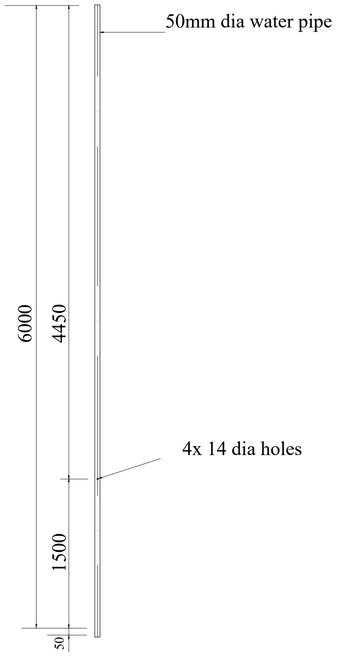
# 33/11 CABLE SUPPORT STRUCTURE

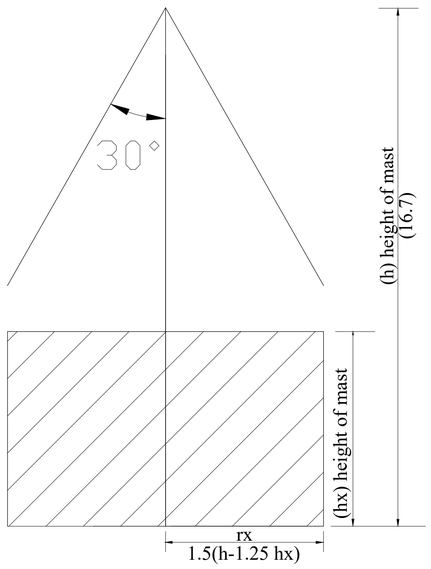
SCALE : 1: 100

SHEET 4

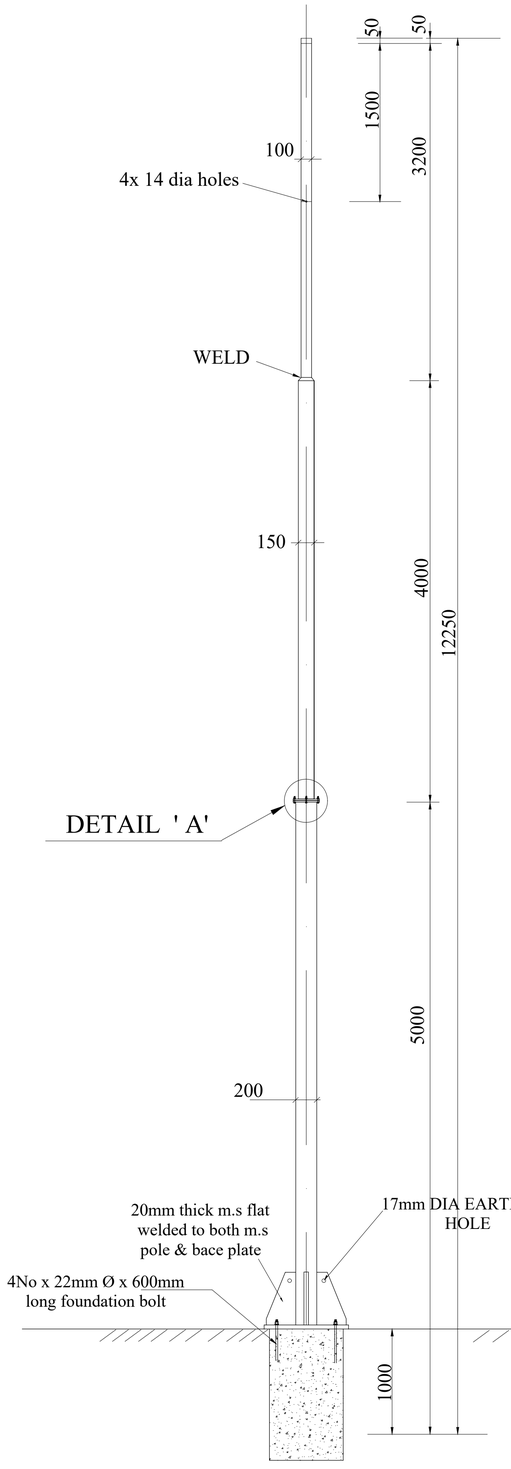
KENYA POWER

SK. No.09769



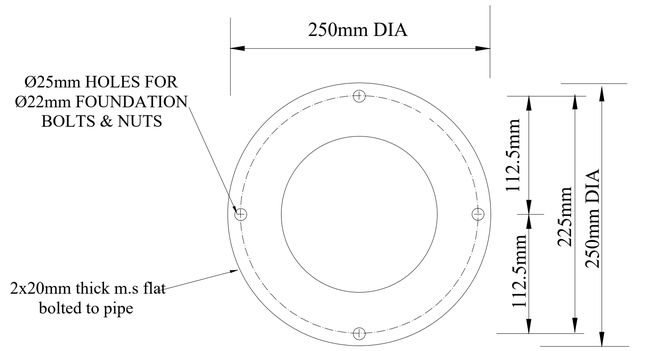




RADIUS OF COVERAGE

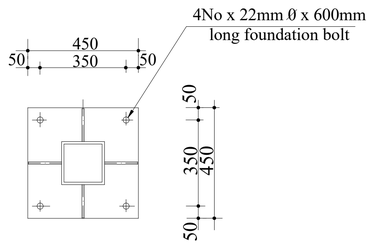



DETAILS OF 16.7m HIGH
LIGHTING MAST

SCALE 1:50




DETAILS ' A'




DETAILS OF 20mm THICK
PLATE BASE

NOTE

25x 3mm coper strip to be connected to the holes of indicated items and buried on theground accordingly

12mm bolt & washer to be used on the indicated holes

50mm dia. water pipe class 'b'

ALL DIMENSIONS ARE IMM

**SHEET 9/A**

| | DATE | NAME | SIGN |
|---|---|---|---|
| APPROVED | | | |
| CHECKED ENGINEER I/C | | | |
| CHECKED PRINCIPAL D'MAN | | B.Gaitho | |
| DRAWN | 21/07/2009 | S.M.Kimani | *Kimani* |
| TRACED | | | |

| REF | REVISION | DATE | SIGN | CHECKED | DATE |
|---|---|---|---|---|---|
| 1 | | | | | |
| 2 | | | | | |
| 3 | | | | | |
| 4 | | | | | |
| 5 | | | | | |
| 6 | | | | | |

# DETAILS OF LIGHTNING MAST AND STEEL SECURITY LIGHTING

Kenya Power

**KENYA POWER**

**SK. No. 09774**