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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)

FOREWORD

This specification has been prepared by the Research and Development Department of The Kenya Power & Lighting Company Limited (KPLC) while drawings were prepared by the KPLC Central Office Design, Distribution Department.

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.

The specification lays down requirements for Steel Structures for Substations and is intended for procurement. It supersedes all specifications for Steel Structures for Substations issued before the revision date.

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 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 Steel Structures for Substations.

1.2. The specification covers the following Steel 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.

2. REFERENCES

The following documents were referred to during the preparation of this specification. In case of conflict, the requirements of this specification takes precedence.

KS 02 – 572: Kenya Standard Specification for Hot-Rolled Structural Steel Sections

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

BS EN 1011: Welding. Recommendations for welding of metallic materials

ESI 43-95: Steelworks for Overhead Lines

KPLC Central Office Design - Drawings for Steel Structures for Substations.

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 operation 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.

4.2. Materials and Construction

4.2.1 Angle sections (equal and unequal angles), channels and flats shall be hot-rolled and shall comply with the requirements of Kenya Standard KS 02-572.

4.2.2 The tensile strength and yield stress of the steel shall be not less than 430 N/sq. mm and 255 N/sq. mm respectively.

4.2.3 The dimensions and sectional properties, tolerances on mass and dimensional tolerances shall all be in accordance with KS 02-572.

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

4.2.5 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.

4.2.6 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.

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

4.2.8 Bending of flat straps shall be carried out cold.

4.2.9 Welding

a) Welding where specified, shall be by metal-arc welding and shall be as per BS EN 1011.

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

4.2.10 Galvanizing

a) 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.

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

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

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

Table 1: Galvanizing

	Steel Structures for Inland installations	**Steel Structures for installation along the coast**
Minimum Average Coating Weight	610 g/m²	800 g/m²
Post-treatment (chromating)	See Tender Requirements	See Tender Requirements

5 TESTS AND INSPECTION

5.1 The tensile strength, yield strength and elongation tests shall be done in accordance with the requirement of KS 02-572. It shall be the responsibility of the manufacturer to perform or to have performed all the tests specified.

5.2 Tests on galvanizing shall be carried on the finished steel in accordance with the requirement of ISO 1461. It shall be the responsibility of the manufacturer to perform or to have performed all the tests specified.

5.3 Certified true copies of previous test reports by the relevant International or National Testing/Standards Authority of the country of manufacture (or ISO/IEC 17025 accredited laboratory) shall be submitted with the offer for evaluation (all in English Language). A copy of accreditation certificate for the laboratory shall also be submitted.

5.4 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.

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

5.5 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 KPLC drawing number and item description.

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. 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).

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

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ANNEX A

TABLE 1: STRUCTURES FOR 132kV EQUIPMENT

Item No.	Item Description	Drawing SK No
1.	132kV Post Insulators Structure, 4m high	09162 sheet 1
2.	132kV Surge Diverters Structure, 3m high	09162 sheet 2
3.	132kV Gantry Structure, 10m high	09907
4.	132kV Isolators Structure, 4m high	09774 sheet 13A
5.	132kV Isolator Structure, 10m high	09909
6.	132kV Steel Boom Structures, 10m high	09908
7.	132kV Current Transformer Structure, 3m high	08409/A sheet 1
8.	132kV Isolator Structure 5000mm high	08841
9.	132kV Current Transformer Structure	09774 sheet 15
10.	Steel Gantry Structure 12.5mitres high	09111
11.	132kV Surge Diverters Galvanized Steel Structure	09108

TABLE 2: STRUCTURES FOR 66kV EQUIPMENT

Item No.	Item Description	Drawing SK No
1.	66kV Bus Bar; 7600mm high	09110
2.	66kV Voltage Transformer; 3000mm high	09821 sheet 3C
3.	66kV Current Transformer; 2700mm high	08409 sheet 3C
4.	66kV Surge Diverters; 2400mm high	09107
5.	66kV Post Insulator; 4500mm high	9114
6.	66kV Air Break Switch/Isolator; 4500mm high	9114

TABLE 3: STRUCTURES FOR 33kV EQUIPMENT

Item No.	Item Description	Drawing SK No
1.	33kV Voltage Transformer Structure, 3.5m high	07840 sheet 8
2.	33kV Air break Switch Structure, 4.38m high	09774 sheet 19
3.	33kV Current Transformer Structure, 2.4m high	09774 sheet 18/2
4.	33kV Voltage Transformer Structure, 2.4m high	09774 sheet 18/2
5.	33kV Bus Bars; 7000mm high	08675 sheet 8
6.	33kV Gantries; 4870mm high	08786/3
7.	33kV Voltage Transformer/Isolator 4870mm high	08786/3
8.	33kV Current Transformer	09210
9.	33kV Isolators; 4870mm high	08796/1
10.	33kV Neutral Current Transformer	08257 sheet 5
11.	33kV Bus Bars galvanized Steel Structure; 25 feet High	06779 sheet 2
12.	33kV Isolator Structure 6300mm High.	09774 sheet 20
13.	33kV Post Insulator Steel Structure 6000mm High	09769 sheet 3.
14.	33kV Surge Diverters galvanized Steel Structure 6000mm high	09769 sheet 3
15.	VWVE/Switch Galvanized Steel Structure 6300mm high	09774 sheet 20

TABLE 4: STRUCTURES FOR 11kV EQUIPMENT

Item No.	Item Description	Drawing SK No
1.	11kV Neutral Link; 4500mm high	08257/5
2.	11kV Heat Shrink Structure/Double Sealing ends	07750/9A
3.	11kV Local Transformer; 2100mm high	08675/7
4.	11kV Bus Bar galvanized Steel Structure 23 feet high	06779 sheet 2
5.	11kV Post Insulator/surge diverter galvanized steel structure 5000mm high	09769 sheet 3
6.	11kV Switch/KFE galvanized Steel Structure 6000mm high	09769 sheet 3

TABLE 5: STRUCTURES FOR OTHER SUBSTATION EQUIPMENT

Item No.	Item Description	Drawing SK No
1.	Lightning Mast; 16760mm high	09774 sheet 9
2.	Working/Security Lights	09774 sheet 9
3.	Steel Galvanized Security Lighting Pole	09774 sheet 9A