



Kenya Power

TITLE:

**SPECIFICATION FOR 220kV
SUSPENSION/TENSION
COMPOSITE INSULATORS**
Part 1: Insulator without arcing
rings

Doc. No.

KP1/3CB/TSP/04/026-1

Issue No.

2

Revision
No.

0

Date of
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2014-05-09

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(to be filled and signed by the Manufacturer and submitted together with relevant copies of the Manufacturer's catalogues, brochures, drawings, technical data & calculations, sales records for past five years, four customer reference letters, details of manufacturing capacity, the manufacturer's experience, copies of complete type test reports and accreditation certificate to ISO/IEC 17025 for the testing laboratory for tender evaluation, all in English Language)

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0.1 Circulation List

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0.2 Amendment Record

Rev No.	Date (YYYY-MM-DD)	Description of Change	Prepared by (Name & Signature)	Approved by (Name & Signature)
Issue 2 Rev 0	2014-05-09	Cancels and replaces Issue 1 Rev 0 dated 2008- 10-22 & all previous issues	S. Kimitei 	G. Owuor

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FOREWORD

This specification has been prepared by the Research and Development Department in collaboration with the Transmission Department both of The Kenya Power and Lighting Company Limited (abbreviated as KPLC) and it lays down requirements for 220kV suspension/tension type composite insulators. It is intended for use by KPLC in purchasing the insulators.

The bidder shall submit information which demonstrates satisfactory service experience of the manufacturer with products which fall within the scope of this specification.

1. SCOPE

This specification is for composite insulators for use on overhead lines for tension and suspension purposes.

The specification covers 220kV, 50Hz suspension/tension type composite insulators without arcing rings and arcing horns.

The specification also covers inspection and test of the insulators as well as schedule of Guaranteed Technical Particulars to be filled, signed by the manufacturer and submitted together with other required details for tender evaluation.

The specification stipulates the minimum requirements for 220kV, 50Hz suspension/tension type composite insulators without arcing rings and arcing horns acceptable for use in the company and it shall be the responsibility of the supplier to ensure adequacy of the design, good workmanship, good engineering practice and adherence to standards, specifications and applicable regulations in the manufacture of the insulators for The Kenya Power & Lighting Company Ltd.

The specification does not purport to include all the necessary provisions of a contract.

2. REFERENCES

The following standards contain provisions which, through reference in this text, constitute provisions of this specification. Unless otherwise stated, the latest edition of the referenced document (including any amendments) applies.

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- ISO 1461: Metallic Coatings – Hot dip galvanized coatings on fabricated ferrous products – Requirements.
- ISO 1460: Metallic Coatings – Hot dip galvanized coatings on fabricated ferrous metals – Determination of mass per unit area – Gravimetric method.
- IEC 61109: Composite insulators for a.c. overhead lines with a nominal voltage greater than 1000V – Definitions, test methods and acceptance criteria.
- IEC 61466: Composite string insulator units for overhead lines with a nominal voltage greater than 1000 V; Part 1 (Standard strength classes and end fittings) & Part 2 (Dimensional and electrical characteristics).
- IEC 60120: Dimensions of ball and socket couplings of string insulator units.
- IEC 60372: Locking devices for ball and socket coupling of insulator units
- IEC 60815: Guide for the selection of insulators in respect of polluted conditions.
- IEC 60383: Tests on insulators of ceramic material or glass for overhead lines with a nominal voltage greater than 1000V.
- IEC 61284: Overhead lines - Requirements and tests for fittings
- IEC 60507: Artificial pollution tests on high voltage insulator to be used on a.c. systems
- ISO/IEC 17025: General requirements for the competence of testing and calibration laboratories

3. TERMS AND DEFINITIONS

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

4. REQUIREMENTS

4.1 SERVICE CONDITIONS

The insulators 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

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temperature of +30°C with a minimum of -1°C and a maximum of +40°C, heavy saline conditions along the coast and tropical sunshine conditions. The level of galvanizing for all ferrous parts and all materials used shall be suitable for these conditions.

4.2. MATERIALS AND CONSTRUCTION

- 4.2.1. The insulator shall be manufactured to the requirements of IEC 61109, other applicable /latest IEC standards and the requirements of this specification.
- 4.2.2. The insulator shall have a core made of high quality epoxy resin-impregnated glass fibres free from defects. The housing of the insulator shall be manufactured from high temperature vulcanized silicone rubber. The interface formed between rod and housing shall be of a quality to prevent stress corrosion and brittle fracture phenomena. The housing shall be GREY in colour.
- 4.2.3. The housing shall be perfectly (vulcanization chemically) bonded to the core through extrusion technology. The chemical bond between the core and the housing must be stronger than the tear strength of the housing material
- 4.2.4. The insulator shall be of high resistance to moisture and ultraviolet radiation and withstand high tropical sunshine conditions.
- 4.2.5. All ferrous parts shall be made of forged steel, and hot dip galvanized to ISO 1461 to suit stated service conditions. The fittings shall be attached onto the rod by compression method to ensure that there is no damage to the individual fibers of the rod. The gap between fittings and core housing shall be sealed permanently to prevent moisture ingress.
- 4.2.6. In order to achieve an excellent pollution performance and tracking performance (minimum class 1A 3.5 according to IEC 60587), the application of high temperature vulcanizing (HTV) silicon rubber filled with an appropriate amount of aluminium tri-hydrate (ATH) shall be applied.
- 4.2.7. The insulator shall be fitted with ball and socket coupling in accordance with IEC 60120.

The ball pin shall be of medium carbon steel.

The ball pin diameter shall be 16mm and shall be supplied complete with a corresponding "R" retaining clip. The security clip shall be of stainless steel.

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4.2.8 All the accessories and fittings offered against this specification shall be subjected to corona test. The corona shall not take place and shall extinguish at the voltages specified i.e. when a voltage of the specified value is applied (Phase to Neutral) the corona shall appear and shall disappear again at the specified value of voltage.

4.3. RATINGS AND DIMENSIONS

The mechanical and electrical characteristics of the insulators shall be as per Table 1 and General Arrangement Drawing attached.

Table 1: Ratings

Description	Requirement
Nominal System Voltage, system frequency	220kV, 50Hz
Highest System Voltage	245kV
One-Minute Power Frequency Withstand Voltage, 50Hz, Wet.	460kV
Lighting Impulse Withstand Voltage, 1.2/50 Pos.	1050kVp
Minimum Creepage Distance	7595mm
Specified Mechanical Load, Tension	125kN
Corona Extinction Level	Manufacturer to state in offer
Minimum Arc Gap	1900mm
Material of Fittings	Steel hot dip galvanized
Material of Rod	Resin-impregnated Glass Fibres
Material of Housing and Sheds	HTV-Silicone Rubber
Minimum thickness of Silicone rubber housing	3mm
Socket	IEC 60120/16
Ball	IEC 60120/16

4.4. QUALITY MANAGEMENT SYSTEM

4.4.1 The bidder shall submit a quality assurance plan (QAP) that will be used to ensure that the insulator design, material, workmanship, tests, service capability, maintenance and documentation, 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 9001:2008.

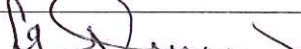
4.4.2 The Manufacturer's Declaration of Conformity to reference standards and copies of quality management certifications including copy of valid and relevant ISO 9001: 2008 certificate shall be submitted with the tender for evaluation.

4.4.3 The bidder shall indicate the delivery time of the insulators, manufacturer's monthly & annual production capacity and experience in the production of the type and size of

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insulators being offered. A detailed list & contact addresses (including e-mail) of the manufacturer's previous customers for similar insulators sold in the last five years as well as reference letters from at least four of the customers shall be submitted with the tender for evaluation.

5. TESTS AND INSPECTION

5.1 Design Tests, Type Tests, Sampling Tests and Routine Tests shall be done to the requirements of IEC 61109, IEC 60383, IEC 60507, ISO 1461 and this specification. It shall be the responsibility of the manufacturer to perform or to have performed all the tests specified.

5.2 Copies of previous test certificates and test reports by a third party testing laboratory that is accredited to ISO/IEC 17025 shall be submitted with the offer for evaluation. A copy of the accreditation certificate to ISO/IEC 17025 for the testing laboratory shall also be submitted. Any translations of certificates and test reports into English language shall be signed and stamped by the Testing Laboratory that carried out the tests.

Copies of the test reports for the following Design and Type Tests shall be submitted for tender evaluation:

- 5.2.1 Tests on interfaces and connections of metal fittings;
 - 5.2.2 Assembled core load-time test;
 - 5.2.3 Test of housing: tracking and erosion test. The test reports MUST include resistance to ageing tests by KEMA or equivalent testing authority (under climate chambers to mimic the conditions – sunshine, salinity, temperature, humidity, spray and so on – typical of tropical climate and those stated in clause 4.1 in addition to the highest system voltage);
 - 5.2.4 Tests for the core material;
 - 5.2.5 Flammability test;
 - 5.2.6 Dry lightning impulse withstand voltage test;
 - 5.2.7 Wet power frequency test;
 - 5.2.8 Mechanical load-time test and test of the tightness of the interface between end fittings and insulator housing.
- 5.3 Routine and sample test reports for the insulators to be supplied shall be submitted to KPLC for approval before shipment/delivery of the goods. KPLC Engineers (2) will witness acceptance tests at the factory before shipment.

Acceptance tests shall include the following tests as per IEC 61109 and applicable latest IEC standards:

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- 5.3.1 Verification of dimensions;
- 5.3.2 Verification of the locking system;
- 5.3.3 Verification of tightness of the interface between end fittings and insulator housing;
- 5.3.4 Verification of the specified mechanical load;
- 5.3.5 Galvanizing test (by Gravimetric method).

5.4 Sampling shall be as per IEC 61109.

5.5 On receipt of the insulators, KPLC will inspect them for acceptance at stores and may perform or have tests performed in order to verify compliance of the insulators with this specification.

The supplier shall replace without charge to KPLC, any insulators which upon examination, test or use fail to meet any or all of the requirements in this specification.

6. MARKING AND PACKAGING

6.1 The following information shall be marked indelibly and legibly on each insulator.

- i) Manufacturer's Name or Trademark;
- ii) Manufacturer's Type Designation;
- iii) Specified Electrical Characteristics;
- iv) Specified Mechanical Load;
- v) Identification code providing traceability.

6.2 All marking shall be permanent and shall be by embossing on the insulator part and any on metal fittings shall be before galvanizing. The marking shall not affect the performance of the insulator. Tags and stickers shall not be accepted.

6.3 The insulators shall be packed in wood crates which are reinforced and held closed by external steel wire bindings. Each crate shall be internally braced to permit stacking and the steel wire bindings shall be designed to keep the crate firmly closed and permit easy and rapid opening at time of installation.

The crates shall then be stacked on sturdy wood pallet. The assembly shall be held tightly in place with steel bands and protected against moisture by a complete covering of heat-shrinkable polyethylene film.

7. DOCUMENTATION

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- 7.1 The bidder shall submit its tender complete with technical documents required by Annex A (Guaranteed Technical Particulars) for tender evaluation. The information shall include the following:
- Schedule of Guaranteed Technical Particulars fully filled and signed by the manufacturer;
 - Copies of the Manufacturer's catalogues, brochures, drawings and technical data;
 - Sales records for the last five years and at least four customer reference letters;
 - Details of manufacturing capacity and the manufacturer's experience;
 - Copies of required test reports by a third party testing laboratory accredited to ISO/IEC 17025;
 - Copy of accreditation certificate to ISO/IEC 17025 for the third party testing laboratory;
 - Manufacturer's warranty and guarantee;
 - Manufacturers letter of authorization, ISO 9001:2008 certificate and other technical documents required in the tender.
- 7.2 The successful bidder (supplier) shall submit the following documents/details to The Kenya Power & Lighting Company for approval before manufacture:
- Schedule of Guaranteed Technical Particulars fully filled and signed by the manufacturer,
 - Design Drawings and construction details of the insulators,
 - Quality assurance plan (QAP) that will be used to ensure that the insulator design, material, workmanship, tests, service capability, maintenance and documentation 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 9001:2008
 - Test Program to be used after manufacture,
 - Marking details and method to be used in marking the insulators,
 - Manufacturer's undertaking to ensure adequacy of the design, good workmanship, good engineering practice and adherence to standards, specifications and applicable regulations in the manufacture of the insulators for The Kenya Power & Lighting Company Ltd;
 - Packaging details (including packaging materials and quantity per package).

The drawings to be submitted by the supplier to KPLC for approval before manufacture shall be in standard format clearly indication drawing number, parts list with material details & quantities, standard of manufacture, ratings, approval details and identify of the manufacturer (as per manufacturer's authorization submitted during tendering).

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**ANNEX A: SCHEDULE OF GUARANTEED TECHNICAL PARTICULARS FOR
OFFERED INSULATORS**

(to be filled and signed by the Manufacturer and submitted together with relevant copies of the Manufacturer's catalogues, brochures, drawings, technical data, sales records, four customer reference letters, details of manufacturing capacity, the manufacturer's experience, copies of complete type test reports and accreditation certificate to ISO/IEC 17025 for the testing laboratory for tender evaluation, all in English Language)

Tender No..... Bidder's Name & Address

CLAUSE	Description/sub-clause	Bidder's offer
	Name and address of the Manufacturer	
	Country of manufacture	
	Manufacturer's Letter of Authorization	
	Model/Type Reference No. of the offered insulators	
	Manufacturer's warranty and guarantee for the offered insulators	
1	Scope: a) Design, manufacture, test, ship and deliver 220kV, 50Hz suspension/tension type composite insulators to KPLC store/site as per terms of contract. b) Ensure adequacy of the design, good workmanship, good engineering practice and adherence to standards, specifications and applicable regulations in the manufacture of the insulators for The Kenya Power & Lighting Co. Ltd	a) b)
2	Applicable standards	
3	Terms and definitions	
4.1	Service condition	
4.2	Materials & construction	
	4.2.1	
	4.2.2	
	4.2.3	
	4.2.4	
	4.2.5	
	4.2.6	
	4.2.7	
	4.2.8	
4.3	Ratings and Dimensions	
	Nominal System Voltage, system frequency	
	Highest System Voltage	

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CLAUSE	Description/sub-clause	Bidder's offer
	One-Minute Power Frequency Withstand Voltage, 50Hz, Wet.	
	Lighting Impulse Withstand Voltage, 1.2/50 Pos.	
	Minimum Creepage Distance	
	Specified Mechanical Load, Tension	
	Corona Extinction Level	
	Minimum Arc Gap	
	Material of Fittings	
	Material of Rod	
	Material of Housing and Sheds	
	Minimum thickness of Silicone rubber housing	
	Socket	
	Ball	
4.4	Quality management system	
	4.4.1	
	4.4.2	
	4.4.3	
5	Tests and inspection	
	5.1	
	5.2 (5.2.1 to 5.2.8)	
	5.3	
	(5.3.1 to 5.3.5)	
	5.4	
	5.5	
6	Marking and packaging	
	6.1	
	6.2	
	6.3	
7	Documentation	
	7.1	
	7.2	
-	Manufacturing capacity of similar insulators (Qty per month)	
	Manufacturer's experience	
	Statement of compliance to Tender Specifications	

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

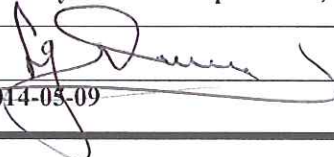
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