

DOCUMENT NO.: KP1/6C/4/1/TSP/04/021



Kenya Power

**11kV & 33kV COMPOSITE LINE POST INSULATORS – VERTICAL & HORIZONTAL
MOUNTING - SPECIFICATION**

A Document of the Kenya Power & Lighting Co. Ltd
June 2018



TITLE:
**11kV & 33kV COMPOSITE
 LINE POST INSULATORS –
 VERTICAL & HORIZONTAL
 MOUNTING -
 SPECIFICATION**

Doc. No.	KP1/6C/4/1/TSP/04/021
Issue No.	2
Revision No.	0
Date of Issue	2018-06-27
Page 2 of 21	

Table of Contents

0.1	CIRCULATION LIST	3
0.2	AMENDMENT RECORD	4
	FOREWORD	5
1.	SCOPE	6
2.	NORMATIVE REFERENCES	6
3.	DEFINITIONS AND ABBREVIATIONS	7
4.	REQUIREMENTS.....	7
4.1.	SERVICE CONDITIONS	7
4.2.	DESIGN AND CONSTRUCTION.....	8
4.2.1.	General.....	8
4.2.2.	Core.....	8
4.2.3.	Housing and Weathersheds.....	9
4.2.4.	Metallic end fittings	10
4.2.5.	Mounting	11
4.2.6.	Insulator shed profile.....	11
4.2.7.	Finish	12
4.2.8.	Galvanizing.....	12
4.3.	CHARACTERISTICS	13
5.	TESTS REQUIREMENTS.....	13
6.	MARKING AND PACKING	13
6.1.	Marking.....	13
6.2.	Packing.....	14
	APPENDICES	15
A.	TESTS AND INSPECTION (Normative)	15
B.	QUALITY MANAGEMENT SYSTEM (Normative).....	16
C.	DOCUMENTATION (Normative).....	17
D.	GUARANTEED TECHNICAL PARTICULARS (Normative).....	18

Issued by: Head of Section, Standards Development	Authorized by: Head of Department, Standards
Signed:	Signed:
Date: 2018-06-27	Date: 2018-06-27



TITLE:
**11kV & 33kV COMPOSITE
LINE POST INSULATORS –
VERTICAL & HORIZONTAL
MOUNTING -
SPECIFICATION**

Doc. No.	KP1/6C/4/1/TSP/04/021
Issue No.	2
Revision No.	0
Date of Issue	2018-06-27
Page 3 of 21	

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

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

© Kenya Power & Lighting Co. Ltd.

Users are reminded that by virtue of section 25 of the Copyright Act, 2001 (Revised 2009) Cap 130 of the Laws of Kenya copyright subsists in all KPLC Standards and except as provided under section 26 of this act, no KPLC Standard produced by KPLC may be reproduced, stored in retrieval system by any means without prior permission from the Managing Director & CEO, KPLC.

Issued by: Head of Section, Standards Development	Authorized by: Head of Department, Standards
Signed: 	Signed: 
Date: 2018-06-27	Date: 2018-06-27



TITLE:
**11kV & 33kV COMPOSITE
LINE POST INSULATORS –
VERTICAL & HORIZONTAL
MOUNTING -
SPECIFICATION**

Doc. No.	KP1/6C/4/1/TSP/04/021
Issue No.	2
Revision No.	0
Date of Issue	2018-06-27
Page 4 of 21	

0.2 AMENDMENT RECORD

Rev No.	Date (YYYY-MM-DD)	Description of Change	Prepared by (Name & Signature)	Approved by (Name & Signature)
0	2006-06-15	New Issue		D.M. Mwangi
Issue 2	2018-06-27	Cancel and replaces issue 1 KPLC1/3CB/TSP/04/021 dated 2006-06-15	John Ng'ang'a	Dr. Eng. Peter Kimemia

Issued by: Head of Section, Standards Development

Authorized by: Head of Department, Standards

Signed:

Signed:

Date: 2018-06-27

Date: 2018-06-27



Kenya Power

TITLE:
**11kV & 33kV COMPOSITE
LINE POST INSULATORS –
VERTICAL & HORIZONTAL
MOUNTING -
SPECIFICATION**

Doc. No.	KP1/6C/4/1/TSP/04/021
Issue No.	2
Revision No.	0
Date of Issue	2018-06-27
Page 5 of 21	

FOREWORD

This specification has been prepared by the Standards Department in collaboration with Network Management, both of The Kenya Power & Lighting Company Limited (KPLC) and it lays down requirements for 11kV and 33kV Composite Line Post Insulators for use on power lines. It is intended for use by KPLC in purchasing the insulators.

In preparation of this specification, reference was made to IEC 61952.



One main objective of reviewing this specification is to address the concern of clearance between the middle insulator and the pole, which in some instances has resulted in flashover to, especially, concrete poles.

This specification stipulates the minimum requirements for the Composite Line Post Insulators acceptable for use in the company and it shall be the responsibility of the supplier and manufacturer to ensure that the offered design is of the highest quality and guarantees excellent service to KPLC. The manufacturer shall exhibit good workmanship and good engineering practice in the manufacture of the Composite Line Post Insulators for KPLC.

Users of Kenya Power specifications are responsible for their correct interpretation and application.

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

Name	Division
James Njuguna	Network Management
John Ng'ang'a	Infrastructure Development

Issued by: Head of Section, Standards Development	Authorized by: Head of Department, Standards
Signed: 	Signed: 
Date: 2018-06-27	Date: 2018-06-27



TITLE:
**11kV & 33kV COMPOSITE
LINE POST INSULATORS –
VERTICAL & HORIZONTAL
MOUNTING -
SPECIFICATION**

Doc. No.	KP1/6C/4/1/TSP/04/021
Issue No.	2
Revision No.	0
Date of Issue	2018-06-27
Page 6 of 21	

1. SCOPE

1.1. This specification for 11kV & 33kV Composite Line Post Insulators – Vertical & Horizontal Mounting covers requirements for 11kV and 33 kV composite line post insulators for use on overhead power lines operating at a nominal voltage of 11kV with highest system voltage of 12 kV at a frequency of 50Hz and nominal voltage of 33kV with highest system voltage of 36kV at a frequency of 50Hz. The insulator category and their mounting brackets in this scope are as follows:

- a) Composite Vertical Line Post Insulator – Rated 12kV
- b) Composite Vertical Line Post Insulator – Rated 36kV
- c) Composite Horizontal Line Post Insulator – Rated 12 kV
- d) Composite Horizontal Line Post Insulator – Rated 36kV

1.2. The specification stipulates minimum requirements, inspection and tests of the Composite Line Post Insulators as well as schedule of Guaranteed Technical Particulars.

2. NORMATIVE REFERENCES

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.

- IEC 61952: Insulators for Overhead Lines – Composite Line Post Insulators for A.C. Systems with a Nominal Voltage Greater Than 1 000 V – Definitions, Test Methods and Acceptance Criteria
- IEC 60120: Dimensions of ball and socket couplings of string insulator units
- IEC 60471: Dimensions of clevis and tongue couplings of string insulator units
- IEC 60587: Electrical insulating materials used under severe ambient conditions - Test methods for evaluating resistance to tracking and erosion
- IEC 60720: Characteristics of line post insulators
- IEC 60815-1&3: Selection and dimensioning of high-voltage insulators intended for use in polluted conditions – Part 1: Definitions, information and general principles; Part 3: Polymer insulators for a.c. systems
- IEC 61466-1: Composite string insulator units for overhead lines with a nominal voltage greater than 1 000 V - Part 1: Standard strength and end fittings

Issued by: Head of Section, Standards Development

Authorized by: Head of Department, Standards

Signed:

Signed:

Date: 2018-06-27

Date: 2018-06-27



TITLE:
**11kV & 33kV COMPOSITE
LINE POST INSULATORS –
VERTICAL & HORIZONTAL
MOUNTING -
SPECIFICATION**

Doc. No.	KP1/6C/4/1/TSP/04/021
Issue No.	2
Revision No.	0
Date of Issue	2018-06-27
Page 7 of 21	

- ISO 1461: Metallic Coatings – Hot dip galvanized coatings on fabricated ferrous products – Requirements.
- ISO 48: Rubber, vulcanized or thermoplastic -- Determination of hardness (hardness between 10 IRHD and 100 IRHD).
- ISO 9001: Quality Management Systems -- Requirements
- ISO/IEC 17025:2017 General requirements for the competence of testing and calibration laboratories
- ANSI C29-7 American National Standard for Wet-Process Porcelain Insulators - High-Voltage Line-Post Type

3. DEFINITIONS AND ABBREVIATIONS

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

- KPLC The Kenya Power & Lighting Co. Ltd.
- Shed A projection from the core of the insulating part of an insulator intended to increase the creepage distance.
- Under-ribs Ribs in the lower surface of the shed used to increase creepage distance
- Trunnion A supporting cylindrical projection that supports the clamp

4. REQUIREMENTS

4.1. SERVICE CONDITIONS

The insulators 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 and humidity of up to 95%,
- b) Average ambient temperature of +30°C with a minimum of -1°C and a maximum of +40°C, in direct sunlight,
- c) Humidity: upto 95%
- 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.
- f) Tropical sunshine conditions

Issued by: Head of Section, Standards Development	Authorized by: Head of Department, Standards
Signed:	Signed:
Date: 2018-06-27	Date: 2018-06-27



TITLE:
**11kV & 33kV COMPOSITE
LINE POST INSULATORS –
VERTICAL & HORIZONTAL
MOUNTING -
SPECIFICATION**

Doc. No.	KP1/6C/4/1/TSP/04/021
Issue No.	2
Revision No.	0
Date of Issue	2018-06-27
Page 8 of 21	

NOTE: *The level of galvanizing for all ferrous parts except those that are stainless steel and materials used shall be suitable for these conditions.*

4.2. DESIGN AND CONSTRUCTION

4.2.1. General

4.2.1.1 The Composite Line Post Insulators shall be designed, manufactured and tested in accordance with IEC 61952, IEC 61109, IEC 60815-3, IEC 60720 and other applicable /latest IEC standards and the requirements of this specification.

4.2.1.2 The Composite Line Post Insulator in this specification shall be a rigid insulator consisting of one piece of insulating material permanently assembled with a metal base cap intended to be mounted rigidly on a supporting structure by means of a central stud or one or more bolts as per IEC 60815-3.

4.2.1.3 The Composite Line Post Insulators shall have a core, an insulating housing and weather-shed housing both manufactured by the same manufacturer and a forged steel hardware components for attaching it to the support and conductor.



4.2.1.4 The Composite Line Post Insulators shall be an open shed profile type with excellent self-cleaning properties and a provision for easy cleaning when maintenance is required.

4.2.1.5 The insulators shall maintain satisfactory electrical and mechanical performance throughout their lifetime, which is specified as over 40 years. Evidence in support of the reliability and performance for this period including information on Failure Mode and Effect Analysis shall be submitted for purposes of tender evaluation.

NOTE: *Suppliers/Manufacturers shall be required to comment on the environmental soundness of the design and the materials used in the manufacture of the Composite Line Post Insulators offered. In particular, comments should address such issues as recyclability and disposability at the end of service life.*

4.2.2. Core

4.2.2.1 The Composite Line Post Insulators core shall be made of brittle fracture-resistant electrical grade solid high density, axially aligned, fibre-glass-reinforced, epoxy resin rod, of uniform cross-section to achieve maximum failing load. The core shall be mechanically and electrically sound, free from voids, foreign substances and manufacturing flaws as the primary mechanical load-bearing component of the insulator.

Issued by: Head of Section, Standards Development	Authorized by: Head of Department, Standards
Signed: 	Signed: 
Date: 2018-06-27	Date: 2018-06-27



TITLE:
**11kV & 33kV COMPOSITE
LINE POST INSULATORS –
VERTICAL & HORIZONTAL
MOUNTING -
SPECIFICATION**

Doc. No.	KP1/6C/4/1/TSP/04/021
Issue No.	2
Revision No.	0
Date of Issue	2018-06-27
Page 9 of 21	

4.2.2.2 The Composite Line Post Insulators design shall ensure that the core is totally encapsulated and fully sealed, from the live to the earthed ends, by the insulating material from the environment, in order to avoid ingress of moisture. If any tacky substances are used as sealers, they shall not be exposed to environmental influence.

4.2.2.3 Special care shall be taken in connecting the fiber-glass-reinforced, epoxy resin rod, to the metal end fittings that allows having high bending, traction, torsion and compression loads and eliminating water penetration which happens in the usual execution of compression end fittings.

4.2.2.4 The core material shall have four (4) essential requisites:

- a) The capacity to withstand mechanical stresses that come from a specific use.
- b) Sufficient insulating properties to withstand, with an adequate safety-margin, the electrical stresses of usage and those resulting from over voltages of internal and external origin.
- c) Power arc resistance.
- d) Positive results at the tests according to the standard IEC 61952.

4.2.3. Housing and Weathersheds

4.2.3.1 The weathersheds shall be made of polymer materials such as ethylene, propylene or silicone elastomers such as reinforced high temperature vulcanized (HTV) silicone rubber based on dimethyl siloxane, which exhibit hydrophobicity with the capability to transfer hydrophobicity to the layer of pollution.

4.2.3.1.1 The silicon rubber shall be treated with additive packages to modify their behavior for satisfactory performance in an outdoor polluted environment. The additives (fillers) shall include but not limited to anti-tracking agents, ultra-violet screens and stabilizers, antioxidants, ionic scavengers, etc.

4.2.3.1.2 Proof of the type of base polymer used and the additives shall be provided to support the tender during evaluation.

4.2.3.2 The reinforced HTV silicone rubber shall have a Shore 'A" hardness of not less than 60 as per ISO 48 and the track resistance of the sheath and shed materials shall meet the requirements of IEC 60587 Method 1 Class 1A4.5 or 1B4.5 or Method 2 Class 2A4.5.

4.2.3.3 A minimum sheath thickness of 3.0 mm of silicone rubber shall be extruded or injection moulded on the reinforced fiberglass rod. The polymer sleeve and weather-shed insulating material shall have a chemical structure of 100 percent silicone rubber before fillers are added.

Issued by: Head of Section, Standards Development

Authorized by: Head of Department, Standards

Signed:

Signed:

Date: 2018-06-27

Date: 2018-06-27



TITLE:
**11kV & 33kV COMPOSITE
LINE POST INSULATORS –
VERTICAL & HORIZONTAL
MOUNTING -
SPECIFICATION**

Doc. No.	KP1/6C/4/1/TSP/04/021
Issue No.	2
Revision No.	0
Date of Issue	2018-06-27
Page 10 of 21	

4.2.3.4 The silicone rubber shall be firmly bonded to the rod, be seamless, smooth and free from imperfections. The strength of the silicone rubber to rod interface shall be greater than the tearing strength of the silicone rubber.

4.2.3.5 The weather-sheds shall be firmly bonded to the sheath, vulcanized to the sheath or moulded as part of the sheath and be seamless smooth and free from imperfections. The strength of the silicone rubber weather-shed to sheath interface shall be greater than the tearing strength of the silicone rubber.

4.2.3.6 Weather-sheds shall be at intervals to provide optimum electrical performance and the weather-shed designs shall provide a protected bottom surface that tends to keep dry in wet conditions.

4.2.3.7 The Composite Line Post Insulators shall be capable of withstanding high pressure power washing. A power wash test shall be performed on polymer insulators to demonstrate that the units can be power washed. This test shall be a water spray at a shed seam of approximately 3m from the insulators. The spray shall be a solid stream through a 6mm diameter nozzle at 3.79Mpa for a period of ten minutes. There shall be no signs of water entering through or under the outside weather-shed into the core or at the polymer hardware interface into the core.

4.2.3.8 The gap between hardware base and the housing shall be sealed by an elastomer with permanent elasticity. The sealing shall stick permanently to the surface of the material as well as to the housing.

4.2.3.9 Cracks on the insulator surface shall not be allowed. Superficial defects or cavities are allowed provided the total defective area does not exceed 0.2% of the total insulator surface and the individual defective areas do not exceed 25mm². The depth of any cavities shall not exceed 1 mm or 5% of the layer thickness of the blanket material in the area under consideration. Individual protrusions on the insulator surface are allowed up to 2 mm as long as their total protruded area shall not exceed 0.2% of the total surface of the insulator and the individual protruded area shall not exceed 25 mm².

4.2.4. Metallic end fittings

4.2.4.1 The metallic end fittings placed at the end of the fiberglass rod shall be:

- a) **Clamp- top type** – designation “HC” for Horizontal mounting or designation “VC” for vertical mounting complete with stud base (complete with two (2) trunnion bolts and locknut) as per ANSI C29-7 with:
 - i) Sufficient mechanical features to take the stresses that insulators are subjected to.

Issued by: Head of Section, Standards Development	Authorized by: Head of Department, Standards
Signed:	Signed:
Date: 2018-06-27	Date: 2018-06-27



TITLE:
**11kV & 33kV COMPOSITE
LINE POST INSULATORS –
VERTICAL & HORIZONTAL
MOUNTING -
SPECIFICATION**

Doc. No.	KP1/6C/4/1/TSP/04/021
Issue No.	2
Revision No.	0
Date of Issue	2018-06-27
Page 11 of 21	

- ii) Conventional horizontal and vertical trunnion to accommodate a standard Line Post Insulator, bolted conductor clamp.
- iii) A design with an additional eye for the attachment of other devices during installation or maintenance activities.
- b) **K-Clamp** – designation “C” and made of corrosion resistant aluminum casting with:
 - i) A long, smooth contoured conductor clamping zone that accommodates the following conductor diameter sizes; 25mm² (φ 7mm), 75mm² (φ 14mm), 150mm² (φ 18mm) and 300mm² (φ 25mm)
 - ii) A single captive live-line operable bolt.
 - iii) Overall length shall permit standard cover-up hoods to effectively cover all insulator sheds.
 - iv) A design can be installed in either a horizontal or vertical configuration.

4.2.4.2 These terminals shall be manufactured according to the IEC 60120, IEC 60471, and IEC 61466-1 standards and according to the characteristics requested by KPLC or their use. The terminals shall be manufactured as follows:

- a) Forged steel of class C 30 or C 40, worked and then hot dip galvanized.
- b) Casting steel of class C 30 or C 40, worked and then hot dip galvanized.

4.2.5. Mounting

4.2.5.1 The insulators shall be installed horizontally at an angle between 5° and 15° from the horizontal and vertically towards the top of the pole on wooden or concrete round poles.

4.2.5.2 It shall be possible to mount the insulators on poles by means of pole bolts M20 for wooden poles and universal/multipurpose clamps for concrete poles. Other mounting arrangements shall be accepted if the insulator comes complete with all mounting accessories.

4.2.6. Insulator shed profile

4.2.6.1 Insulator shed profiles shall be designed in accordance with IEC 60815-3 for universal application. Alternating sheds with an ‘open’ or ‘aerodynamic’ profile are preferred. Designs utilizing ‘Under-ribs’ in order to increase the creepage distance shall not be accepted.

4.2.6.2 The following parameters apply to the shed profile and are the recommended minimum values in IEC 60815-3 for full compliance:

Issued by: Head of Section, Standards Development

Signed:

Date: 2018-06-27

Authorized by: Head of Department, Standards

Signed:

Date: 2018-06-27



TITLE:
**11kV & 33kV COMPOSITE
LINE POST INSULATORS –
VERTICAL & HORIZONTAL
MOUNTING -
SPECIFICATION**

Doc. No.	KP1/6C/4/1/TSP/04/021
Issue No.	2
Revision No.	0
Date of Issue	2018-06-27
Page 12 of 21	

- a) The shed spacing-projection (s/p) ratio shall be at least 0.65.
- b) The minimum distance between sheds shall be 30 mm;
- c) The creepage to clearance ratio (l/d) shall not exceed 5.
- d) The shed angle shall be between 5° and 22.5°.

NOTE: Besides the dimensional constraints of the shed profile, the sheds shall be sufficiently robust to withstand reasonable handling and transportation stresses.

4.2.7. Finish

4.2.7.1 The Composite Line Post Insulators shall be supplied as one complete unit.

4.2.7.2 The finished product shall be of high resistance to moisture, high salinity, ultraviolet radiation, high temperatures and tropical sunshine conditions.

4.2.7.3 The final colour of the insulator housing shall be dark admiralty grey color, shade 632 of BS 381C.

4.2.7.4 The under surface and grooves of sheds or skirts shall be easy cleaning. Sheds shall be substantially symmetrical in shape without appreciable warping.

4.2.7.5 The top and side grooves shall be galvanized steel and be designed to accept conductor sizes in the range 7mm to 25mm overall diameter.

4.2.8. Galvanizing

4.2.8.1 All steel hardware components shall be galvanized after they are machined, bent or worked on in any manner. The zinc coating shall adhere tightly to the surface of the base metal. The zinc coated parts shall not have any un-coated spots.

4.2.8.2 The coating shall be uniform and free from blisters, flux, black spots, dross, tear drop edges, flaking zinc, rough appearance and in general shall be smooth, clean and unscarred when received. The minimum thickness of the coating of the steel or iron base shall conform to ISO 1461 and Table 1.

Issued by: Head of Section, Standards Development

Authorized by: Head of Department, Standards

Signed:

Signed:

Date: 2018-06-27

Date: 2018-06-27



TITLE:
**11kV & 33kV COMPOSITE
 LINE POST INSULATORS –
 VERTICAL & HORIZONTAL
 MOUNTING -
 SPECIFICATION**

Doc. No.	KP1/6C/4/1/TSP/04/021
Issue No.	2
Revision No.	0
Date of Issue	2018-06-27
Page 13 of 21	

4.3. CHARACTERISTICS

The mechanical and electrical characteristics of the insulators shall be as follows

Table 1: Mechanical and electrical characteristics of the insulators as per IEC 61952, IEC 60720 table 2 and ISO 1461

CHARACTERISTICS	12kV	36kV
System Highest Voltage	12 kV, 50Hz	36 kV, 50Hz
Creepage Distance - Minimum	300 mm	900 mm
Minimum Power Frequency Withstand Voltage (wet), 50Hz, 1min	38 kV	90 kV
Minimum Lightning Impulse Withstand Voltage, 1.2/50µs, dry, positive	95 kV	200 kV
Minimum bending failing Load	12.5 kN	12.5 kN
Nominal total height	270 mm	495 mm
Specified cantilever load (SCL)	Manufacturer to state	
Maximum design cantilever load (MDCL)	Manufacturer to state	
Specified tensile load (STL)	Manufacturer to state	
Minimum coating thickness for iron and steel castings and forgings	610 g/m ² or 85µm	
Minimum coating thickness for bolts, nuts and washers	375 g/m ² or 54µm	

5. TESTS REQUIREMENTS

The Composite Line Post Insulators shall be inspected and tested in accordance with the requirements of IEC 61952, IEC 60815-1&3, IEC 60720, ISO 48, ISO 1461 and provisions of this specification.

6. MARKING AND PACKING

6.1. Marking

6.1.1. The following information shall be marked indelibly and legibly and in a permanent manner on each insulator in English Language.

- a) Manufacturer's name and trademark;
- b) Manufacturer's type designation;

Issued by: Head of Section, Standards Development	Authorized by: Head of Department, Standards
Signed:	Signed:
Date: 2018-06-27	Date: 2018-06-27



TITLE:
**11kV & 33kV COMPOSITE
LINE POST INSULATORS –
VERTICAL & HORIZONTAL
MOUNTING -
SPECIFICATION**

Doc. No.	KP1/6C/4/1/TSP/04/021
Issue No.	2
Revision No.	0
Date of Issue	2018-06-27
Page 14 of 21	

- c) Specified electrical characteristics;
- d) Maximum design cantilever load.
- e) The letters '**Property of KPLC**'.

6.1.2. All marking shall be by embossing on the insulator housing and marking on metal fittings shall be before galvanizing. The marking shall not affect the performance of the insulator.

NOTE: *Markings on loose tags/ties shall not be accepted.*

6.1.3. A set of three(3) installation and technical manuals for the insulators shall be submitted during delivery

6.2. Packing



6.2.1 All insulators shall be packaged in individual wooden weatherproof crates to protect them against damage during shipping, inland transportation and storage. The crates shall be secured to pallets for handling by forklifts. Pallets shall not exceed 4 feet in height or 500Kg in weight. The packages shall be weatherproof and designed to be removable by hand without cutting.

6.2.2 Each package shall have a packing list and in addition, shall be marked with the following information in English Language.

- a) Descriptive name
- b) Rated voltage
- c) Quantity packed in package
- d) Contract and lot number
- e) Gross weight of package
- f) Volume of package
- g) Applicable standards
- h) Label "**Property of The Kenya Power & Lighting Co. Ltd.**"

----- SPACE IS LEFT INTENTIONALLY BLANK -----

--

Issued by: Head of Section, Standards Development	Authorized by: Head of Department, Standards
Signed: 	Signed: 
Date: 2018-06-27	Date: 2018-06-27



TITLE:

**11kV & 33kV COMPOSITE
LINE POST INSULATORS –
VERTICAL & HORIZONTAL
MOUNTING -
SPECIFICATION**

Doc. No.

KP1/6C/4/1/TSP/04/021

Issue No.

2

Revision No.

0

Date of Issue

2018-06-27

Page 15 of 21

APPENDICES

A. TESTS AND INSPECTION (Normative)

- A.1. It shall be the responsibility of the manufacturer to perform or to have performed all the tests specified. Bidders shall confirm the manufacturer's capabilities in this regard when submitting tenders. Any limitations shall be clearly specified.
- A.2. Copies of Type Test Certificates and Type Test Reports issued by a third party testing laboratory that is accredited to ISO/IEC 17025 shall be submitted with the tender for the purpose of technical 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.
- A.3. Copies of type test reports to be submitted with tender (by bidder) for evaluation shall be as stated below as per IEC 61952
- A. Tests on interfaces and connections of end fittings
- a) Pre-stressing
 - (i) Thermal-mechanical pre-stressing
 - (ii) Water immersion test
 - b) Verification tests
 - (i) Visual examination
 - (ii) Steep-front impulse voltage test
 - (iii) Dry power frequency voltage test
- B. Assembled core load tests
- a) Test for verification of the maximum design cantilever load (MDCL)
 - b) Tensile load test
- C. Test of sheds and housing material
- a) Hardness test
 - b) Accelerated weathering test
 - c) Tracking and erosion test
 - d) Flammability test
- D. Test for the core material
- a) Dye penetration test

Issued by: Head of Section, Standards Development

Authorized by: Head of Department, Standards

Signed:

Signed:

Date: 2018-06-27

Date: 2018-06-27



TITLE:
**11kV & 33kV COMPOSITE
LINE POST INSULATORS –
VERTICAL & HORIZONTAL
MOUNTING -
SPECIFICATION**

Doc. No.	KP1/6C/4/1/TSP/04/021
Issue No.	2
Revision No.	0
Date of Issue	2018-06-27
Page 16 of 21	

- b) Water diffusion test
- c) Voltage test

NOTE: Any translations of certificates and test reports into English language shall be signed and stamped by the third party ISO/IEC 17025 accredited Testing Laboratory that carried out the tests.

- A.4. The Insulators shall be subject to acceptance tests at the manufacturer's works before dispatch. Acceptance tests shall be witnessed by two Engineers appointed by The Kenya Power and Lighting Company Limited (KPLC). Routine and Sample Test Reports for the insulators to be supplied shall be submitted to KPLC for approval before dispatch of the goods.
- A.5. Tests to be witnessed by KPLC Engineers at the factory before shipment shall be in accordance with IEC 61952 and this specification and shall include the following:
 - a) Verification of dimensions
 - b) Dry lightning impulse withstand test
 - c) Wet power frequency test
 - d) Cantilever failing load test
 - e) Galvanizing test
 - f) Verification of the specified cantilever load
 - g) Tensile load test
- A.6. On receipt of the product, KPLC will perform any of the tests specified in order to verify compliance with this specification. The supplier shall replace without charge to KPLC the insulators which upon examination, test or use, fail to meet any of the requirements in the specification.

B. QUALITY MANAGEMENT SYSTEM (Normative)

- B.1 The bidder shall submit a quality assurance plan (QAP) that will be used to ensure that the design, material, workmanship, tests, service capability, maintenance and documentation of the insulators 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 or later.
- B.2 The Manufacturer's Declaration of Conformity to applicable standards and copies of quality management certifications including copy of valid and relevant ISO 9001 certificate shall be submitted with the tender for evaluation.
- B.3 The bidder shall indicate the delivery time of the insulators, manufacturer's monthly and annual production capacity and experience in the production of the type of insulators being offered. A detailed list and contact addresses (including e-mail) of the manufacturer's previous customers

Issued by: Head of Section, Standards Development	Authorized by: Head of Department, Standards
Signed:	Signed:
Date: 2018-06-27	Date: 2018-06-27



Kenya Power

TITLE:

**11kV & 33kV COMPOSITE
LINE POST INSULATORS –
VERTICAL & HORIZONTAL
MOUNTING -
SPECIFICATION**

Doc. No.

KP1/6C/4/1/TSP/04/021

Issue No.

2

Revision No.

0

Date of Issue

2018-06-27

Page 17 of 21

outside the country of manufacture for exact or similar rating items sold in the last five years shall be submitted with the tender for evaluation.

C. DOCUMENTATION (Normative)

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

- a) Fully filled clause by clause Guaranteed Technical Particulars (GTP) stamped and signed by the manufacturer,
- b) Copies of the manufacturer's catalogues, brochures, drawings and technical data,
- c) Sales records for the last five years and at least four customer reference letters,
- d) Details of manufacturing capacity and the manufacturer's experience,
- e) Copies of required type test certificates and type test reports by a third party testing laboratory accredited to ISO/IEC 17025,
- f) Copy of accreditation certificate to ISO/IEC 17025 for the third party testing laboratory,
- g) Manufacturer's warranty and guarantee;
- h) Manufacturer's letter of authorization, copy of the manufacturer's ISO 9001:2008 or 2015 certificate, ISO 17025(2005) certificate.

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 (GTP) signed by the manufacturer,
- b) Design drawings and construction details of the insulator including 3-D views,
- c) Quality assurance plan (QAP) that will be used to ensure that the design, material, workmanship, tests, service capability, maintenance and documentation will fulfill the requirements stated in the contract documents, standards, specifications and regulations. The QAP shall be based on and include relevant parts to fulfill the requirements of ISO 9001:2008 or later,
- d) Detailed test program to be used during factory testing,
- e) Marking details and method to be used in marking each insulator
- f) Manufacturer's undertaking to ensure adequacy of the design, good engineering practice, adherence to the specification and applicable standards and regulations as well as ensuring good workmanship in the manufacture of the insulators for The Kenya Power & Lighting Company,

g) Packaging details

Issued by: Head of Section, Standards Development

Authorized by: Head of Department, Standards

Signed:

Signed:

Date: 2018-06-27

Date: 2018-06-27



TITLE:
**11kV & 33kV COMPOSITE
 LINE POST INSULATORS –
 VERTICAL & HORIZONTAL
 MOUNTING -
 SPECIFICATION**

Doc. No.	KPI/6C/4/1/TSP/04/021
Issue No.	2
Revision No.	0
Date of Issue	2018-06-27
Page 18 of 21	

D. GUARANTEED TECHNICAL PARTICULARS (Normative)

To be filled 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 type test certificates and test reports for tender evaluation, all in English Language)

Tender No.

Clause	KPLC requirement	Bidder's offer
	Manufacturer's Name and address	Specify
	Country of Manufacture	Specify
	Bidder's Name and address	Specify
1.	Scope	Specify
1.1-1.2		
2.	Applicable Standards	Specify
3.	Terms & Definitions	Specify
4.	Requirements	
4.1	Service Conditions	Specify
4.2	DESIGN AND CONSTRUCTION	
4.2.1	General	
4.2.1.1	Type of insulator	Specify
	Standard/s of manufacture	Specify
4.2.1.2	Insulator designed as one complete unit	Specify
4.2.1.3	Insulator with core, an insulating housing and weather-shed housing manufactured by the same manufacturer and a forged steel hardware components.	Specify
4.2.1.4	Type of shed profile	Specify
4.2.1.5	Life-span	Provide evidence
	Environmental soundness, recyclability and disposal at end of life	Specify
4.2.2	Core	
4.2.2.1	Material of core	Specify
4.2.2.2	Safely sealed	Specify
4.2.2.3	Connection of core with end fittings eliminates possibility of water ingress	Specify
4.2.2.4	Core material requisites	
	a) Capacity to withstand mechanical stresses	Specify
	b) Sufficient insulating properties	Specify

Issued by: Head of Section, Standards Development

Authorized by: Head of Department, Standards

Signed:

Signed:

Date: 2018-06-27

Date: 2018-06-27



Kenya Power

TITLE:

**11kV & 33kV COMPOSITE
LINE POST INSULATORS –
VERTICAL & HORIZONTAL
MOUNTING -
SPECIFICATION**

Doc. No.

KPI/6C/4/1/TSP/04/021

Issue No.

2

Revision No.

0

Date of Issue

2018-06-27

Page 19 of 21

Clause	KPLC requirement	Bidder's offer
	c) Power arc resistance	Specify
	d) Positive results at the tests according to the standard IEC 61952.	Specify
4.2.3	Housing and Weathersheds	
4.2.3.1	Material of weather-sheds	Specify
4.2.3.1.1	Silicon rubber treatment	Specify
4.2.3.1.2	Proof of base polymer	Specify
4.2.3.2	Hardness class of the reinforced HTV silicone rubber	Specify
	Track resistance class	Specify
4.2.3.3	Sheath thickness	Specify
	Polymer sleeve and weather-shed material	Specify
4.2.3.4	Bonding of silicon rubber to the rod and finish	Specify
	The strength of the silicone rubber to rod interface shall be greater than the tearing strength of the silicone rubber.	Specify
4.2.3.5	Bonding of the weather-sheds to the sheath and finish	Specify
	The strength of the silicone rubber weather-shed to sheath interface shall be greater than the tearing strength of the silicone rubber.	Specify
4.2.3.6	Spacing of weather sheds.	Specify
	No water retention in rainy conditions	Specify
4.2.3.7	Shall be capable of withstanding high pressure power washing.	Specify
4.2.3.8	The gap between hardware base and the housing shall be sealed by an elastomer with permanent elasticity and sticks permanently	Specify
4.2.3.9	Cracks on the insulator surface shall not be allowed.	Specify
4.2.4	Metallic end Fittings	
4.2.4.1	The metallic end fittings placed at the end of the fiberglass rod shall be:	Specify
	Clamp- top type – with	Specify
	i) Sufficient mechanical features	
	ii) Conventional horizontal and vertical trunnion	
	iii) Design with an additional eye	
	K-Clamp –with:	Specify
	i) Design of conductor clamping zone & conductor diameter sizes;	
	ii) A single captive live-line operable bolt.	
	iii) Overall length requirements	
	iv) Horizontal or vertical installation configuration	
4.2.4.2	Standards of manufacture of terminals	Specify
	Material of manufacture and class	Specify

Issued by: Head of Section, Standards Development

Signed:

Date: 2018-06-27

Authorized by: Head of Department, Standards

Signed:

Date: 2018-06-27



TITLE:
**11kV & 33kV COMPOSITE
 LINE POST INSULATORS –
 VERTICAL & HORIZONTAL
 MOUNTING -
 SPECIFICATION**

Doc. No.	KP1/6C/4/1/TSP/04/021
Issue No.	2
Revision No.	0
Date of Issue	2018-06-27
Page 20 of 21	

Clause	KPLC requirement	Bidder's offer
4.2.5	Mounting	Specify
4.2.5.1	Installation	Specify
4.2.5.2	Mounting arrangement	Specify
4.2.6	Insulator shed profile	Specify
4.2.6.1	Shed profile designs	Specify
4.2.6.2	a) The shed spacing-projection (s/p) ratio b) distance between sheds c) The creepage to clearance ratio (l/d) d) The shed angle	Specify
	Robustness	Specify
4.2.7	Finish	
4.2.7.1	Supplied as one complete unit	Specify
4.2.7.2	The finished product shall be of high resistance to moisture, high salinity, ultraviolet radiation, high temperatures and tropical sunshine conditions.	Specify
4.2.7.3	The final colour	Specify
4.2.7.4	The under surface shall be easy cleaning. Sheds shall be substantially symmetrical in shape	Specify
4.2.7.5	The top and side grooves shall be galvanized steel and be designed to accept conductor sizes in the range 7 – 18.2mm overall diameter.	Specify
4.2.8	Galvanizing	
4.2.8.1	All steel hardware components shall be galvanized after their machined bent or worked operations of any manner.	Specify
4.2.8.2	Finish and coating thickness	Specify
4.3	Characteristics	
	System Highest Voltage	Specify
	Creepage Distance - Minimum	Specify
	Power Frequency Withstand Voltage (wet), 50Hz, 1min	Specify
	Lightning Impulse Withstand Voltage, 1.2/50µs, dry, positive	Specify
	Bending failing Load	Specify
	Nominal total height	Specify
	Specified cantilever load (SCL)	Specify
	Maximum design cantilever load (MDCL)	Specify
	Specified tensile load (STL)	Specify
	Galvanization coating thickness ferrous castings and forgings	Specify
	Galvanization coating thickness for bolts, nuts and washers	Specify

Issued by: Head of Section, Standards Development	Authorized by: Head of Department, Standards
Signed:	Signed:
Date: 2018-06-27	Date: 2018-06-27



Kenya Power

TITLE:

**11kV & 33kV COMPOSITE
LINE POST INSULATORS –
VERTICAL & HORIZONTAL
MOUNTING -
SPECIFICATION**

Doc. No.

KP1/6C/4/1/TSP/04/021

Issue No.

2

Revision No.

0

Date of Issue

2018-06-27

Page 21 of 21

Clause	KPLC requirement	Bidder's offer
5	Test requirements	State
6	Marking and packing	Specify
6.1	Marking	Specify
6.2	Packing	Specify
A	Tests and Inspection	
A.1	Responsibility of carrying out tests	State
A.2	Copies of Type Test Reports submitted with tender	State
A.3	Copies of type test reports to be submitted with tender (by bidder) for evaluation	State
A.4	Acceptance tests to be witnessed by KPLC at factory before shipment	State
A.5	Test to be witnessed by KPLC Engineers at Factory before shipment	State
A.6	Inspection at the stores and replacement of rejected tools	State compliance
B	Quality Management System	
B.1	Quality Assurance Plan	Provide
B.2	Copy of ISO 9001:2008 (or later) Certificate or KEBS Diamond mark of quality	Provide
B.3	Manufacturer's experience	Provide
	Manufacturing Capacity (units per month)	Provide
	List of previous customers	Provide
	Customer reference letters	Provide
C	Documentation and demonstration	
C.1	Documents submitted with tender	Provide
C.2	Documents to be submitted for approval before manufacture	Provide
	Statement of compliance to specification (indicate deviations if any & supporting documents)	Provide

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

Issued by: Head of Section, Standards Development

Authorized by: Head of Department, Standards

Signed:

Signed:

Date: 2018-06-27

Date: 2018-06-27

