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Kenya Power

POWER LINE AERIAL MARKERS – SPECIFICATION

A Document of the Kenya Power & Lighting Co. Plc
November 2020

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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 for improvements to approved Standards, addressed to the Manager, Standards Department, are welcome.

Issued by: Head of Section, Standards Development	Authorized by: Head of Department, Standards
Signed:	Signed:
Date: 2020-11-18	Date: 2020-11-18

0.2 AMENDMENT RECORD

Rev No.	Date (YYYY-MM-DD)	Description of Change	Prepared by (Name & Signature)	Approved by (Name & Signature)
0	2020-11-18	New Issue	Nancy Wairimu	Dr. Eng. Peter Kimemia

FOREWORD

This Specification has been prepared by the Standards Department in collaboration with Transmission department both of The Kenya Power and of Lighting Company Plc. (KPLC) and it lays down requirements for Power Line Aerial Markers.

Power Line Aerial Markers are installed on distribution and transmission Lines to enhance awareness of their presence as well as warn aircraft pilots during day and night.

There are no other specifications in this series.

This specification stipulates the minimum requirements for Power Line Aerial Markers acceptable for use in the company and it shall be the responsibility of the suppliers and manufacturer to ensure that the offered design is of the highest quality, guarantees excellent service to KPLC and exhibits good workmanship and good engineering practice in the manufacture.

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

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

Name	Division
Dedan Njoroge Kuria	Network Management
Nancy Wairimu Mungai	Institute of Energy Studies & Research

1. SCOPE

This specification specifies the materials, design, size, test methods, marking and packaging of Power Line Aerial Markers.

2. NORMATIVE REFERENCE

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

ICAO Annex 14: Aerodromes. Volume 1, Aerodrome Design and Operations.

FAA AC 70/7460-1L: Obstruction marking and Lighting

ISO 9001: 2015: Quality Management System

3. DEFINITIONS AND ABBREVIATIONS

For the purpose of this specification, the definitions and abbreviations given in the reference standards shall apply together with the following:

3.1. ABBREVIATIONS

KPLC: Kenya Power and Lighting Company Plc

ICAO: – International Civil Aviation Organization

FAA: Federal Aviation Administration

4. REQUIREMENTS

4.1. SERVICE CONDITIONS

The Power Line Aerial Markers shall be suitable for installations 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 $+30^0$C with a minimum of -1^0C and a maximum of $+55^0$C;
d) Heavy Saline conditions along the coast.
e) Wind load of 80m/sec.

4.2. DESIGN AND CONSTRUCTION

4.2.1. The Power Line Aerial Markers shall be free of gouges, cracks, and sharp corners or points.

4.2.2. The Power Line Aerial Markers shall be furnished with suitable spiral-formed lineguards as shown in figure 1.

4.2.3. The Power Line Aerial Markers mechanical structure and dimensions shall be as per figure 1.

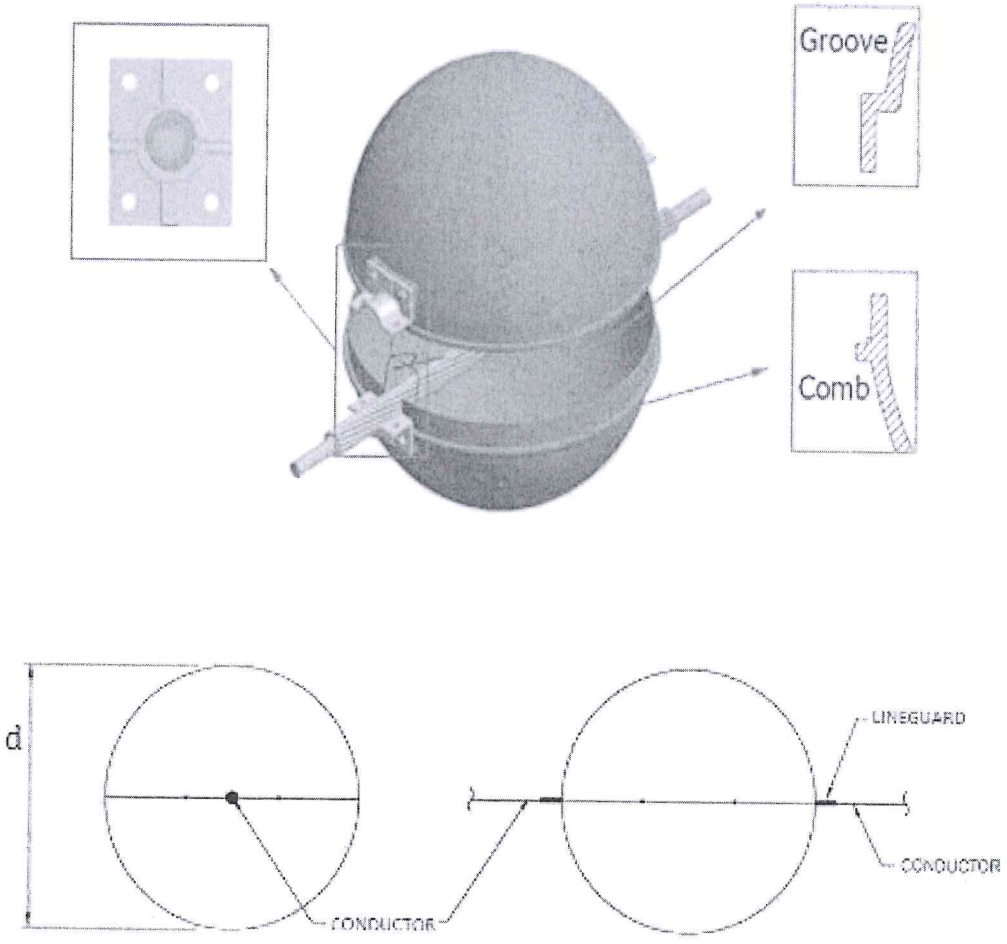

Figure 1: Typical Mechanical Structure - Power Line Aerial Markers

4.2.4. The Power Line Aerial Markers shall be light and durable. They shall be made from material that is UV-stabilized, and with UV-resistant coating to ensure exceptional color stability over their life. Its properties shall not change when exposed to environment specified in clause 4.1.

4.2.5. The Power Line Aerial Markers shall have drain holes to prevent rain accumulating in the sphere.

4.2.6. The Power Line Aerial Markers shall be supplied with preformed armour rods can decrease vibration and abrasion for the conductors as shown in figure 2.

Figure 2: Preformed Armour rods

4.2.7. The Power Line Aerial Markers shall have a reflective tape to ensure night visibility.

4.2.8. The clamps, bolts and nuts used in Power Line Aerial Markers shall be resistant to corrosion.

4.2.9. The Power Line Aerial Markers particular requirement shall be specified in Table 1 below.

Table 1: Power Line Aerial Markers Particular requirement

PARAMETERS	REQUIREMENTS
Operation	
Visible Distance	1250m
Voltage Range	Up to 1000kV
Conductor Diameter	6.5 – 35mm
Mechanical Structure	
Colour	Orange, Red, Yellow and White
Sphere Body Material	Fiberglass Reinforced Polymer (FRP) [*Tensile Strength > 128MPa, Flexural Strength > 230MPa, Barcol Hardness > 44*]
Cable Clamp	Aluminium Alloy
Bolts/Nuts/Washers	Stainless Steel 304
Diameter	9", 12", 24", 36"
Thickness	2.5 – 3.0 mm
Drain Holes	10mm
Preformed Armor Rods	Yes
Reflective Tape	Yes
Weight	7 – 9 kg
Reflective Coefficient	0.3 – 0.7
Environment	
Operating Temperature	-1°C to +55°C
Wind Load	80 m/sec

Note: *The colour and the diameter will be specified in the tender*

4.2.10. The design of the Power Line Aerial Markers shall be stacking compatible to save on storage space and transportation cost.

5. TESTS REQUIREMENTS

The Power Line Aerial Markers shall be inspected and tested in accordance with relevant International Standards and the requirements of this specification.

6. MARKING AND PACKING

6.1. MARKING

The Power Line Aerial Markers shall be legibly and indelibly marked with the following information:

a) Model or reference type;
b) Name or Trade name of the manufacturer;
c) Year of Manufacture;
d) Batch or serial number;
e) The words "PROPERTY OF KENYA POWER AND LIGHTING COMPANY';

6.2. PACKING

6.2.1. The Power Line Aerial Markers shall be packed in a manner to protect it from damage during transportation and storage.

6.2.2. Instruction of storage, handling and installation shall be included in each package, all in English language.

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APPENDICIES

A: TESTS AND INSPECTION (Normative)

A.1 It shall be the responsibility of the supplier to test or to have all the relevant tests performed.

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 for the testing laboratory shall also be submitted with the tender (all in English Language). Any translations of certificates and test reports into English language shall be signed and stamped by the Testing Authority.

A.3 The bidder shall provide current e-mail address, fax and telephone numbers and contact person at the Testing Laboratory where Type Tests were carried out.

A.4 The Power Line Aerial Markers shall be subjected to acceptance tests at the manufacturer's works before dispatch. Two Engineers appointed by KPLC shall witness acceptance tests.

A.5 Test certificates for the Power Line Aerial Markers to be supplied shall be submitted to KPLC for approval before shipment/delivery of the equipment.

A.6 On receipt of the Power Line Aerial Markers, KPLC will inspect them and may perform or have performed any of the relevant tests in order to verify compliance with the specification. The supplier shall replace without charge to KPLC the Power Line Aerial Markers, which upon examination, test or use fail to meet any or all of the requirements in the specification.

B: QUALITY MANAGEMENT SYSTEM (Normative)

B.1 The supplier shall submit a Quality Assurance Plan (QAP) that will be used to ensure that the Power Line Aerial Markers physical properties, tests 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: 2015.

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: 2015 certificate shall be submitted with the tender for evaluation.

B.3 The bidder shall indicate the delivery time of the Power Line Aerial Markers, manufacturer's monthly and annual production capacity and experience in the production of the type and size of items being offered. A detailed list and contact addresses (including e-mail) of the manufacturer's previous customers for similar type of the Power Line Aerial Markers 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.

C: 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 (GTP) signed by the manufacturer, specific values shall be filled in, terms like "yes", "Agree" , "complied" shall not be acceptable;
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 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) Manufacturers Letter of Authorization, ISO 9001:2015 Certificate and other technical documents required in the tender.
h) Manufacturer's warranty and guarantee; subject to at least 12 months from date of delivery to KPLC stores

C.2 The successful bidder (supplier) shall submit the following documents/details to KPLC for approval before manufacture:

a) Fully filled clause by clause Guaranteed Technical Particulars (GTP) stamped and signed by the manufacturer, specific values shall be filled in, terms like "yes", "Agree" , "complied" shall not be acceptable;
b) Design Drawings with details of the Power Line Aerial Markers to be manufactured for KPLC.
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 9001:2015.
d) Detailed test program to be used during factory testing;
e) Marking details and method to be used in marking the Power Line Aerial Markers;
f) Packaging details (including packaging materials).

C.3 Statement of compliance to specification (indicate deviations if any provide supporting documents)

D: GUARANTEED TECHNICAL PARTICULARS (Normative)

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 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 number	KPLC requirement		Bidder's offer (indicate full details)
Manufacturer's Name and address			Specify
Country of Manufacture			Specify
Bidder's Name and address			Specify
1.	Scope		Specify
	Item on offer - Description		Specify
2.	References		Specify
3.	Definitions and Abbreviations		
3.1	Abbreviations		Specify
4.	Requirements		
4.1	Service Conditions		Specify
	Operating conditions	Altitude	State
		Humidity	State
		Average Ambient temperature	State
		Saline Condition	
		Wind load	State
.2	**Design and Construction**		
4.2.1	Free of gouges, cracks, and sharp corners or points		Specify
4.2.2	Spiral-formed lineguards		Specify
4.2.3	Mechanical Structure and Dimensions		Provide drawing
4.2.4	Features	Light and durable	Specify
		UV-stabilized material	Specify
		UV-resistant coating	Specify
		Properties shall not change when exposed to environment specified in 4.1	Specify
4.2.5	Shall have drain holes		Provide

Clause number	KPLC requirement		Bidder's offer (indicate full details)
4.2.6	Shall be supplied preformed armour rods		Provide
4.2.7	Shall have a reflective tape		Provide
4.2.8	Clamps, bolts and nuts used in Power Line Aerial Markers shall be resistant to corrosion		Specify
4.2.9	**Particular requirements specify**		
	Parameters	**Requirements**	
	Visible Distance	1250m	Specify
	Voltage Range	Up to 1000kV	Specify
	Conductor Diameter	6.5 – 35mm	Specify
	Colour	Orange, Red, Yellow and White	Specify
	Sphere Body Material	Fiberglass Reinforced Polymer (FRP) [Tensile Strength > 128MPa, Flexural Strength > 230MPa, Barcol Hardness > 44]	Specify
	Cable Clamp	Aluminium Alloy	Specify
	Bolts/Nuts/Washers	Stainless Steel 304	Specify
	Diameter	9", 12", 24", 36"	Specify
	Thickness	2.5 – 3.0 mm	Specify
	Drain Holes	10mm	Specify
	Preformed Armor Rods	Yes	Specify
	Reflective Tape	Yes	Specify
	Weight	≤ 9kg	Specify
	Reflective Coefficient	0.3 – 0.7	Specify
	Operating Temperature	-55°C to +55°C	Specify
	Wind Load	80m/sec	Specify
4.2.10	Shall be stacking compatible		Specify
5.	Test Requirements		Specify
6	Marking and Packing		
6.1	Marking		Specify
6.2	Packing		Specify
A	Test and inspection		
A.1	Responsibility of carrying out tests		State
A.2	Copies of Type Test Reports submitted with tender		Provide

Clause number	KPLC requirement	Bidder's offer (indicate full details)
A.3	Contacts of testing laboratory	Provide
A.4	Acceptance tests at the manufacturers works	State compliance
A.5	Test certificates to be submitted by supplier to KPLC for approval before supply/delivery	State compliance
A.6	Inspection at the stores and replacement of rejected items	State compliance
B	Quality Management System	
B.1	Quality Assurance Plan	Provide
B.2	Manufacturer's Declaration of Conformity to applicable standards and copy of ISO 9001:2015 Certificate	Provide
B.3	Delivery time	State
	Manufacturer's experience	State
	Manufacturing Capacity (units per month, per year)	State
	List of previous customers	Provide
	Customer reference letters	Provide
C	Documentation	
C.1	Documents submitted with tender	State compliance
C.2	Documents to be submitted by supplier to KPLC for approval before manufacture	State compliance
C.3	Statement of compliance to specification (indicate deviations if any & provide supporting documents)	State compliance

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Manufacturer's Name, Signature, Stamp and Date