TABLE OF CONTENTS

0.1 Circulation List

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

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	2015-12-08	Cancels and replaces Issue 1 Rev 0 dated 07-07-2005	S. Nguli	P. Kimemia
Issue 2 Rev 1	2016-06-23	Tables 1,2,3,4 and 5 were inserted	S. Nguli J. Ng'ang'a	P. Kimemia

FOREWORD

This specification has been prepared by the Standards Department of The Kenya Power and Lighting Company Limited (abbreviated as KPLC) and it lays down requirements for Concrete Poles for use on overhead power lines. It is intended for use by the company in purchasing Concrete Poles.

1. SCOPE

1.1 This specification is for concrete poles for use on overhead power lines operating at voltages of up to 132kV 50Hz.

1.2 The specification covers poles for the following:

a) Overhead Lines
b) Pole Mounted Substations
c) Line Switchgear and Equipment.

1.3 The specification covers pole sizes 10m, 11m, 12m, 14m and 15m without holes and without joints.

1.4 The specification also covers sampling, inspection and test of the concrete poles as well as schedule of Guaranteed Technical Particulars to be filled, signed by the manufacturer and submitted for tender evaluation.

The specification stipulates the minimum requirements for concrete poles acceptable for use in the company and it shall be the responsibility of the supplier 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 concrete poles for The Kenya Power & Lighting Company.

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 documents (including any amendments) applies.

KS 1933:	Kenya Standard- Concrete Poles for Telephone, Power and Lighting Purposes – Specification.
KS 95:2003	Kenya Standard-Specification for natural aggregates for use in concrete
KS EAS 18-1:2001	Kenya Standard- Cement — Part 1: Composition, specification and conformity criteria for common cement
AS 4065-1992:	Australian Standard- Concrete Poles for overhead lines and street lighting

3. TERMS AND DEFINITIONS

H.S bar: Horizontal Steel Bars

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

4. REQUIREMENTS

4.1 Service Conditions

The concrete poles shall be suitable for continuous outdoor operation in tropical areas with the following conditions.

a) Altitude: up to 2,200m above sea level;

b) Temperature: average of +30°C with a minimum of -1°C and max +40 °C;

c) Humidity: up to 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.

4.2 **Design, Materials and Construction**

4.2.1 The concrete poles shall be designed, manufactured and tested to KS 1933 and the requirements of this specification. The earthing details shall be as per this specification based on AS 4065-1992.

4.2.2 The poles shall be round, pre-stressed or reinforced concrete poles as per KS 1933.

4.2.3 The materials used shall be in conformity with the design standard (KS 1933) and shall be selected to suit intended application. The minimum design requirements shall be as per table 1 for class 50SC and table 2 for class 75SC.

Table 1 Pole design parameters for 50SC

SC	50				
Pole size(m)	10	11	12	14	15
Spiral ϕ wire(mm)	3	3	3	3	3
Ring bar ϕ (mm)	6	6	6	6	6
H.S bar ϕ(mm)	5	5	5	5	5
No. of H.S bar	14	16	18	22	24
Spacing of ring bar (tip to bottom (mm)	500	500	500	500	500
Spacing of spiral wire(mm)	tip <50 centre <75 bottom<50	tip <50 centre <75 bottom<50	tip <50 centre <75 bottom<50	tip <50 centre <75 bottom<50	tip <50 centre <75 bottom<50
Butt ϕ(mm)	330	340	350	380	390
Average Thickness of Butt(mm)	55	55	55	55	55

4.2.4 The pole shall be so designed that its strength in transverse direction shall be sufficient to take the load due to wind on conductors, fittings and the pole.

4.2.5 In accordance with Annex A of KS 1933, the aggregates used in the manufacturer of the pole shall be free from veins and adherent coating and free from injurious amount of disintegrated pieces, alkali, vegetable matter and other deleterious substances. As far as possible, flaky, sconaceous and elongated pieces shall be avoided.

Table 2: Pole design parameters for 75SC

SC	75				
Pole size(m)	10	11	12	14	15
Spiral ϕ wire(mm)	3.0	3.0	3.0	3.0	3.0
Ring bar ϕ (mm)	6.0	6.	6.0	6.0	6.0
H.S bar ϕ(mm)	7.0	7.0	7.0	7.0	7.0
No. of H.S bar	14	16	18	22	24
Spacing of ring bar (tip to bottom (mm)	500	500	500	500	500
Spacing of spiral wire(mm)	tip <50 centre <75 bottom<50	tip <50 centre <75 bottom<50	tip <50 centre <75 bottom<50	tip <50 centre <75 bottom<50	tip <50 centre <75 bottom<50
Butt ϕ(mm)	330	340	350	380	390
Average Thickness of wall(mm)	55	55	55	55	55

Note. *The manufacture shall submit drawings with tender to confirm the design offered*

4.2.6 The surface of all reinforcement shall be free from loose scale, oil, grease, clay or other material that may have deleterious effect on the bond between the reinforcement and concrete.

4.2.7 The mix design, mixing and compaction of the concrete shall be such that the necessary strength in the pole is obtained after curing in accordance with KS 1933.

4.2.8 The admixture shall constitute the components as per table 3 below.

4.2.9 Concrete shall be compacted by vibration, centrifugation or other efficient means. Hand compaction shall not be permitted.

4.2.10 The finished pole shall have a smooth external surface that is free from honeycombing.

4.2.11 The concrete pole shall incorporate an integral earthing system in accordance with Drawing Number TSP/03/05-12 and TSP/03/05-11 for pre-stressed concrete pole and reinforced concrete pole respectively. The quantities required will be stated in each tender.

Table 3: Admixture components

Component	Specification
Cement	At least Strength Class 42.5N as per KS EAS 18-1:2001
Sand	Clean uncrushed gravel sand (River sand) size between 0-5.0mm as per KS 95: 2003 clause 3.3
Course aggregate	Machine crushed as per KS 95: 2003 preferably of size between 1/4" and 1/2".

4.3 Sizes

4.3.1 The concrete poles shall conform to the following standard sizes as per table 4 for class 50SC and table 5 for class 75SC below

Table 4: 50SC pole parameters as per KS 1933

Pole Length (M)	Top Diameter (mm)	Ultimate Load (as per KS 1933) kN	Strength Class (as per KS 1933)	Ground line (as per KS 1933) m
10	190	5.0	50 SC	1.6
11	190	5.5	50 SC	1.7
12	190	6.0	50 SC	1.8
14	190	7.0	50 SC	2.0
15	190	7.5	50 SC	2.1

Table 5: 75SC pole parameters as per KS 1933

Pole Length (M)	Top Diameter (mm)	Ultimate Load (as per KS 1933) kN	Strength Class (as per KS 1933)	Ground line (as per KS 1933) m
10	190	7.5	75 SC	1.6
11	190	8.3	75 SC	1.7
12	190	9.0	75 SC	1.8
14	190	9.8	75 SC	2.0
15	190	11.3	75 SC	2.1

4.3.2 Pole taper for each concrete pole shall be 13mm per meter.

4.3.3 The required safety factor is 2.

4.4 **Color codes**

Each pole shall be color coded to facilitate size identification during handling and storage. The paint used for color coding shall be indelible and in accordance with the table 6 below.

Table 6: Color Codes

STANDARD POLE LENGTH (M)	COLOUR OF PAINT
10.0	GREEN
11.0	NAVY BLUE
12.0	YELLOW
14.0	RED
15.0	SKY BLUE

4.5 Quality Management System

4.5.1 The supplier shall submit a quality assurance plan (QAP) that will be used to ensure that the concrete poles material, manufacture, 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 for imported poles and the Diamond Mark of Quality for locally produced poles.

4.5.2 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 (or for locally manufactured poles, the Diamond Mark of Quality from KEBS) shall be submitted with the tender for evaluation.

5. TESTS AND INSPECTION

5.1 The concrete poles shall be inspected and tested in accordance with the requirement of KS 1933 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 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. The Test Reports to be submitted with the tender shall not be more than five years old.

The accreditation certificate for the third party testing laboratory shall also be submitted with the tender (all in English Language.

5.3 After manufacture, Sampling, Inspection and Methods of Test shall be in accordance with KS 1933 and this specification. The tests shall be done at the manufacturer's works in the presence of KPLC Engineers.

Complete test reports for the poles shall be submitted to KPLC for approval before delivery. The test reports shall include ultimate load test.

5.4 Upon delivery of the concrete poles, 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/rectify without extra or additional charge to KPLC, concrete poles which upon examination, test or use fail to meet any of the requirements in the specification and reference standards.

5.5 Sampling

5.5.1 Lot: In a consignment, 500 poles or a part thereof of the same overall length, same dimensions and belonging to the same batch of manufacture shall be grouped together to constitute a lot.

5.5.2 For ascertaining the conformity of the poles in the consignment to the requirements of this specification, samples shall be tested from each lot separately.

5.5.3 The number of poles to be selected from the lot shall depend on the size of the lot and shall be according to the sampling table 7 below.

5.5.4 All the poles selected according to 5.5.3 shall be tested for defects, physical dimensions and straightness. A pole failing to satisfy one or more of these requirements shall be considered as defective. All the poles in the lot shall be considered as conforming to these requirements if the number of defective poles found in the sample is less than or equal to the corresponding acceptance number given in Column 3 of the sampling table.

5.5.5 The lot having been found satisfactory according to 5.5.4 shall be further tested for ultimate load of the poles. For this purpose, the number of poles given in column 4 of the sampling table shall be tested, these poles may be selected from those already tested according to 5.5.4 and found satisfactory. All these poles tested for ultimate load shall satisfy the corresponding specification requirements. If one or more poles fail, twice the number of poles required for ultimate load tests shall be selected from the lot again and subjected to this test. If there is no failure among these poles, the lot shall be considered to have satisfied the requirements of this test. If there is failure then the entire lot shall be rejected.

Table 7: Sampling Table

No. of poles in the lot	Sample size	Defects and Dimensional Requirements acceptance number	Ultimate load test
Up to 100	10	1	1
101 to 200	15	1	1
201 to 300	20	2	1
301 to 500	30	3	2

6. MARKING

6.1 Each concrete pole shall be marked permanently by impressing on the pole (or by use of a permanently secured plate) at a position 1.5m above the pole Ground line with the following details.

a) Manufacturer's name
b) Date of manufacture (mm/yy)
c) Length of pole (meters) and Tip dimensions (mm)
d) Ultimate/Working load/Strength Class
e) Type of pole
f) Weight of pole
g) Standard to which the pole complies
h) The words "PROPERTY OF KPLC"

Ground line reference mark as determined in 4.3.1 shall be conspicuous on the pole.

Where a plate is used it shall be made of stainless steel, securely affixed to the pole. In all cases the lettering shall be not less than 5mm high legibly impressed.

7. DOCUMENTATION

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

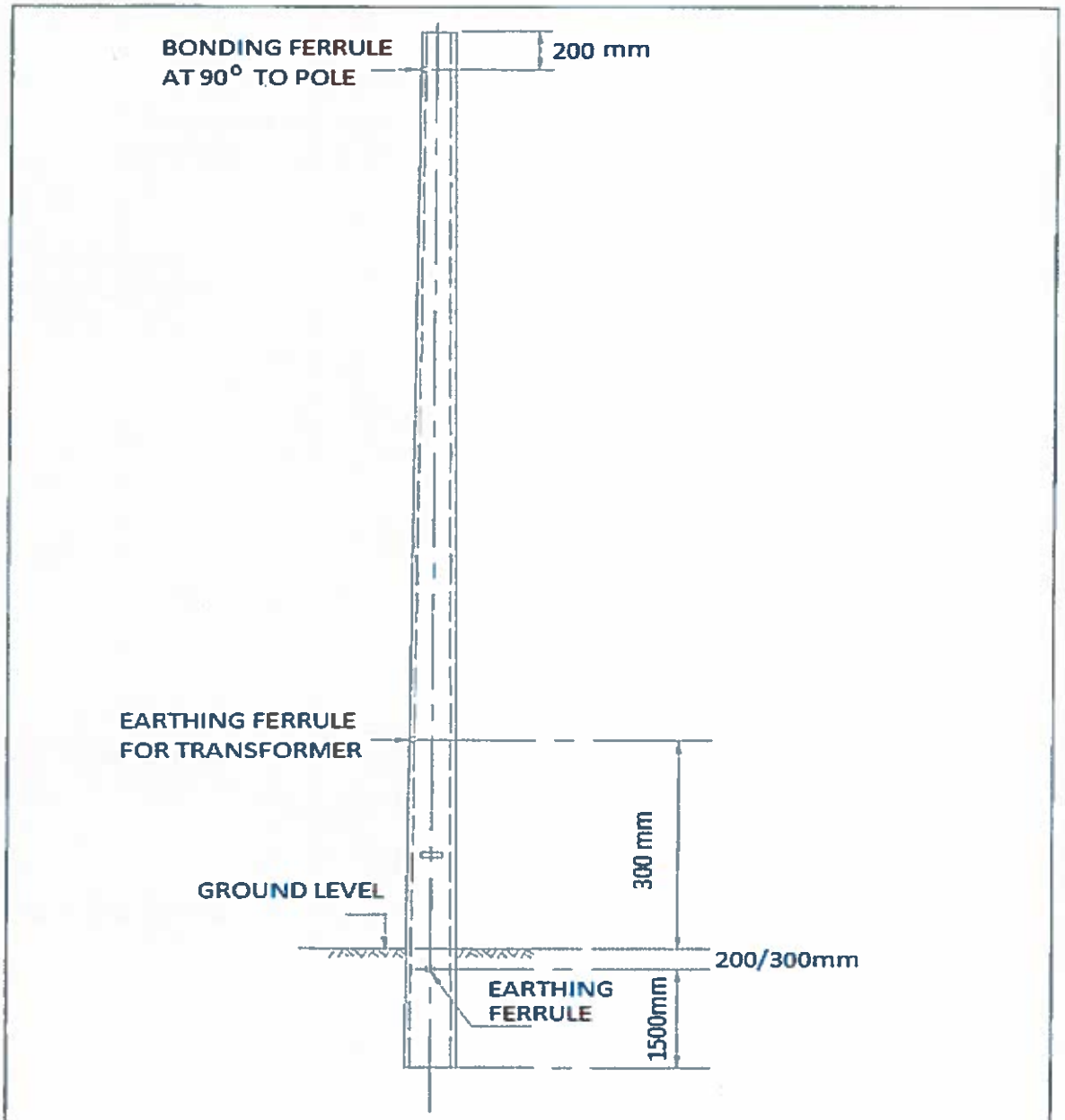
a) Guaranteed Technical Particulars;
b) Copies of the Manufacturer's catalogues, brochures, drawings and technical data;
c) Sales records for the last five years and at least four customer reference letters;
d) Details of manufacturing capacity and the manufacturer's experience;
e) Copies of required test reports by a third party testing laboratory accredited to ISO/IEC 17025. The test reports shall not be more than five years old.
f) Copy of accreditation certificate for the testing laboratory.

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

a) Guaranteed Technical Particulars,
b) Design Drawings with details of concrete poles 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 9001:2008
d) Detailed test program to be used during factory testing,
e) Marking details and method to be used in marking the concrete poles
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 concrete poles for The Kenya Power & Lighting Company

7.3 Installation and technical instructions for the concrete poles shall be supplied with the poles during delivery.

----------**Blank Space** ----------



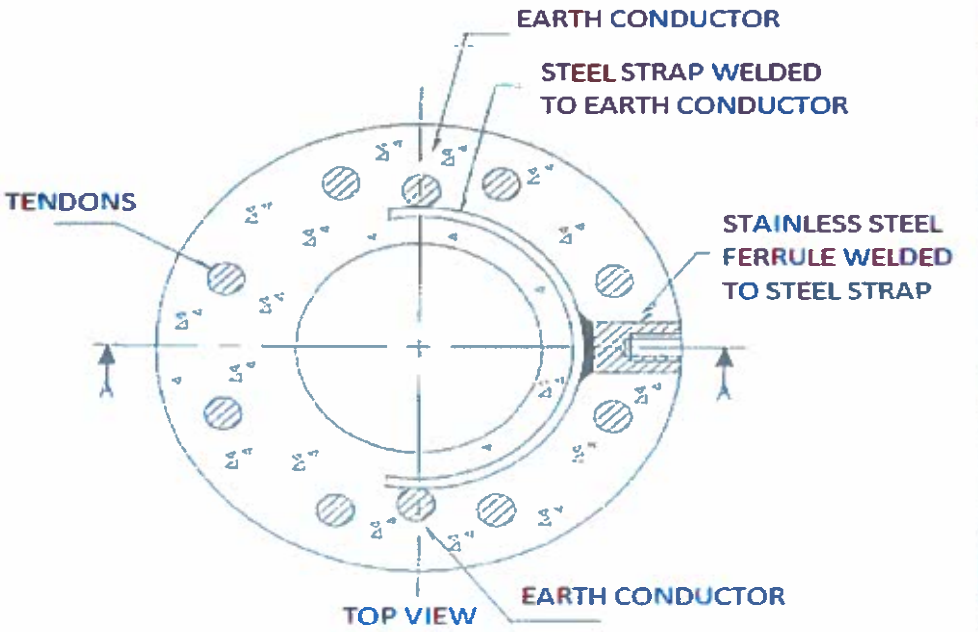
POSITION OF EARTHING FERRULES

DRG. No. TSP/03/05-11

Drawn by J. Kahare

Kenya Power

Issued by: Head of Section, Standards Development	Authorized by: Manager Standards
Signed:	Signed:
Date: 2016-06-23	Date: 2016-06-23



NOTE: Steel spirals and longitudinal bars are not shown

PRESTRESSED CONCRETE POLE EARTHING DETAILS FOR 11M AND 12M CONCRETE POLES	DRG No. TSP/03/05-12	Kenya Power
	Drawn: J. Kahare	

ANNEX A: Guaranteed Technical Particulars *(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 and copies of complete type test certificates and type test reports for tender evaluation, all in English Language)*

Bidder Name.....

Tender No. .....

Clause	**Guaranteed Technical Particulars Conductor offered**		**Bidder's offer**
	Name and address of the Manufacturer		state
	Country of manufacture		state
	Manufacturer's Letter of Authorization		provide
	Model/Type Reference No. of the offered poles		state
	Drawing Reference Number		state
	Manufacturer's warranty and guarantee certificate for the offered poles		provide
1.0	Type and Size		state
2.0	Reference Standard of manufacture		state
3.0	Terms and definitions		
4.1	Service Conditions		specify
4.2.1	Design, manufacture and Test Standard		state
4.2.2	Type of pole offered	Reinforced	state
		Pre-stressed	state
4.2.3	Minimum material requirement		Specify as per table 1&2
4.2.4	Design Strength		State
4.2.5	Workmanship and material finish		state
4.2.6	Quality of finish		state
4.2.7	Design, mixing and compaction achieves the necessary strength		state
4.2.8	Admixture		Specify as per table 3
4.2.9	Mode of compaction		specify
4.2.10	Finished pole free from honeycombing		Provide
4.2.11	Earthing (conductor material and size, steel strap and stainless steel ferrules)		Specify/ provide drawing
	Provision of Earthing Ferrules		state
4.3.1	Size ,strength class and material		Provide detailed drawings

4.3.2	Pole taper	state
4.3.3	Safety Factor	state
4.4	Color Codes	specify
4.5	Quality Management System	Provide
	Quality Assurance Plan	Provide
	Copy of ISO 9001:2008 Certificate	Provide
	Manufacturer's experience	Provide
	Manufacturing Capacity (units per month)	Provide
	List of previous customers	Provide
	Customer reference letters	Provide
5.1	Test standards and responsibility of carrying out tests	state
5.2	List of copies of Design and Type Test Reports submitted (indicate Test Report Numbers, Testing Authority and contact addresses)	List
5.3	Copies of previous Test Reports from an ISO/IEC 17025	Specify
5.4	List Acceptance Tests to be witnessed by KPLC Engineers at the factory	List
5.5	Sampling Procedures for Test and Inspection	State compliance
5.5.	Inspection and Acceptance at KPLC stores	State compliance
	Replacement of rejected poles at no extra cost to KPLC	State compliance
6.1	Marking (indicate parameters and method of marking to be used during manufacture)	Specify
6.2	Packaging (indicate parameters and method of packaging to be used during and after manufacture)	Specify
6.3	Handling and storage instruction to be provided during delivery	Specify
7.1	Documents submitted with tender	list
7.2	Documents to be submitted to KPLC for approval before manufacture	specify
Other details required with the tender	List of catalogues, brochures, technical data, drawings and customer sales records submitted to support the offer.	specify
	Deviations from tender specifications and supporting data, test reports, technical documents etc.	specify

.....

Manufacturer's Name, Signature, Stamp and Date