



**TITLE:**  
**SPECIFICATION FOR TREATED WOOD POLES. Part 1: Eucalyptus Poles**

<b>Doc. No.</b>	KP1/3CB/TSP/03/001-1
<b>Issue No.</b>	6
<b>Revision No.</b>	2
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**ANNEX A: SCHEDULE OF GUARANTEED TECHNICAL PARTICULARS FOR THE OFFERED TREATED WOOD POLES**

*(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 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 third party testing laboratory for tender evaluation, all in English Language)*

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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 6 Rev 1	2014-03-30	Included pole top diameter of 140mm for 10m poles for low voltage lines	Head of Section TS&S & Senior Wood Scientist	Head of Department, R&D
Issue 6 Rev 2	2015-02-19	Included requirement on maturity, testing capacity, nail plates & steel wire banding	Head of Section Standards Dev, CE QA&C & Wood Scientist <i>[Signature]</i>	Head of Department, Standards <i>[Signature]</i>

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## FOREWORD

This specification has been prepared by the Standards Department in collaboration with the Supply Chain – Logistics Department and Distribution Division all of The Kenya Power and Lighting Company Limited (abbreviated as KPLC) and it lays down requirements for treated wooden poles (eucalyptus). It is intended for use by KPLC in purchasing treated wooden poles.

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

### 1. SCOPE

This specification is for treated wooden poles of eucalyptus timber preserved with creosote or with a solution of copper, chromium and arsenic salts (or oxides), and intended to be used as upright supports for power transmission and distribution lines.

The specification also covers inspection and test of the 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 treated wooden poles of eucalyptus timber acceptable for use in the company (KPLC) and it shall be the responsibility of the supplier to ensure adequacy of the design, good workmanship, good engineering practice and adherence to applicable standards, regulations and specifications in the manufacture of the treated wooden poles for The Kenya Power and Lighting Company Limited.

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 editions (including amendments) apply.

ISO 9001: Quality Management System-Requirements

ISO/IEC 17025: General requirements for the competence of testing and

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calibration laboratories

KS 02-93 Glossary of terms used in timber

KS 02-94 Kenya standard specification for Preservation of timber

KS 516:2008 Kenya standard specification for Wood poles for power and telecommunications lines

### 3. TERMS AND DEFINITIONS

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

### 4. REQUIREMENTS

#### 4.1. PREPARATION AND SEASONING

##### 4.1.1. Species

Wood Poles shall be of any species of wood given in KS 516 as shown in Table 1.

Table 1: Species of Wood

Standard or Trade Name	Scientific Name	Other Names
Iron Bark	<i>Eucalyptus paniculata</i>	Gum or Eucalyptus
Spotted Gum	<i>Eucalyptus citriodora</i> ( <i>corymbia citiodora</i> ) or <i>Eucalyptus maculata</i> ( <i>corymbia maculate</i> )	Lemon Scented Gum or Eucalyptus
Tallow Wood	<i>Eucalyptus microcorys</i>	Spotted Gum or eucalyptus blue gum
Blue Gum	<i>Eucalyptus globulus</i>	
Regnans saligna gum	<i>Eucalyptus regnans</i> <i>Eucalyptus saligna</i> Or <i>Eucalyptus grandis</i>	Giant Gum (mountain ash) Blue gum (Saligna gum) Or River Red Gum

##### 4.1.2. Felling

Only mature trees shall be felled and the trees shall be cut as close to the ground level as possible. The ends shall be sawn to give a flat section and branches shall be

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dressed down flush with the trunk. The poles shall then be stacked in open crib formation on flat clear ground.

Full details on planting dates and felling dates shall be submitted with the tender.

#### 4.1.3. Moisture content

The average moisture content of individual poles at the time of treatment shall not exceed 25%.

#### 4.1.4. Defects

The poles shall be of sound wood, free from decay, insect attack, rot pockets and any damages caused by handling and processing that would affect the strength of the poles.

Growth and seasoning defects (knots, spiral grain, end check, surface check and ring shakes) shall be limited to the requirements as set in KS 516:2008.

#### 4.1.5. Straightness

A straight line from the centre of the butt to the centre of the tip shall lie entirely within the body of the pole.

Poles shall be free from crooks that deviate more than 75mm from straightness in any 2m length as shown in KS 516:2008.

#### 4.1.6. Dimensions

4.1.6.1 The length of the pole shall conform to the values specified in the tables in clause 4.4, with a tolerance of  $\pm 75$ mm.

4.1.6.2 Holes shall be drilled in the pole to support fittings and shall have a diameter of 18mm for pole size 10.0m and diameter of 24mm for all other pole sizes, with a tolerance of  $\pm 1$ mm.

Holes shall be on a straight line parallel to the axis of the pole and  $90^{\circ}$  to the diameter.

The table below shows the required drilling positions, measured from the top of the pole for each pole category:

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a) 10m Poles - four holes positioned as follows:

STANDARD POLE LENGTH	POSITION OF EACH HOLE FROM THE TOP OF THE POLE (mm)			
Hole No. ⇒	1	2	3	4
10m	150	455	760	1065

b) Other pole sizes: one hole positioned at 150mm from the top

4.1.6.3 The butt end of the pole shall be cut square to within 5°. The top end shall be cut to a slant angle of 60° (- 0° + 5°) to the longitudinal axis (longer side).

4.1.6.4 Shaping and cutting of poles as well as drilling of holes shall be carried out before impregnation. Poles shall be shaved free of the bark, and branches shall be cut off neatly in the direction of growth and be dressed down flush with the trunk before impregnation.

#### 4.2. IMPREGNATION

4.2.1. The poles shall have a minimum sap wood thickness of 15mm as observed at each end of pole.

4.2.2 The average moisture content of the pole at the time of impregnation shall be as indicated in clause 4.1.3, being expressed as a percentage on dry weight before treatment.

4.2.3. Impregnation shall be carried out using the full cell (vacuum-pressure) process according to Kenya standard specification KS 02-94.

4.2.4. The preservative used **shall be specified in the Tender document** but shall be either creosote in mineral oil base, or formulations of water soluble compounds of copper, chromium and arsenic (CCA), in accordance with Kenya standard specification KS 02-94; but as specifically required by KPLC in clause 4.2.5.

4.2.5. The penetration shall be complete in the sapwood and the retention shall be at levels not less than the following:

a) 100 kg/m<sup>3</sup> for Creosote

b) 20 kg/m<sup>3</sup> specific sapwood retention for CCA

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Please note that these are weights of the Creosote and CCA retained per meter cubed of treated wood respectively. These preservatives are defined in KS 02-94.

4.2.6 Care shall be taken to ensure that the poles have undergone complete preservative fixation and are safe to handle before delivery. Fixation period shall not be less than 72 hours after preservative impregnation.

### 4.3 BANDING AND COLOUR CODING

#### 4.3.1. Banding

4.3.1.1. Each end of each pole shall be banded by one band of galvanized mild steel strapping of width not less than 19mm and thickness not less than 1.2mm. The strapping is to be firmly tensioned into position by the use of a suitable strapping machine capable of applying a tensile force of not less than one half of the ultimate tensile strength of the strapping being used. Each band is to be nailed to the pole at four different positions evenly located on the pole using galvanized clout nails of not less than 3mm diameter and length not less than 38mm.

Two traps of hot dip galvanized steel wire of diameter of at least 3.15mm with a tensile strength of at least 450Mpa may similarly be used (at each end of the pole) in place of the flat steel strap.

4.3.1.2. The bands are to be applied at  $100\text{mm} \pm 10\text{mm}$  away from each end of the pole.

4.3.1.3. The banding shall be done before seasoning and dressing of the poles and prior to treatment.

#### 4.3.2. Nail Plates

4.3.2.1. Both ends of each pole shall be covered by anti-split plate (gang nails plate). The nail plate shall be made of galvanized steel with a zinc coating of at least  $610\text{ g/m}^2$ . The plate shall have a minimum thickness of 1.2mm and have a minimum nail length of 14mm. The size of the plate shall be such that the area covered by the plate is at least 60% of the area of applicable pole end.

4.3.2.2. Each nail shall be fully embedded in the pole end and no nail shall be bent. The nail plate shall be so positioned in the middle of a cut end that its edges do not protrude over the round face of the timber.

#### 4.3.3. Colour Coding

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The nail plate used on the poles shall be colour coded to facilitate size identification during handling and storage. The paint used for colour coding shall be indelible and in accordance with the table below:

STANDARD POLE LENGTH (M)		COLOUR OF PAINT
10.0	182.5 TGL (140mm top diameter)	BLACK
	202.5mm TGL (160mm top diameter)	PINK
	222.5mm TGL(180mm top diameter)	GREEN
11.0		NAVY BLUE
12.0		YELLOW
14.0		RED
15.0		SKY BLUE
17.0		WHITE
18.0		ORANGE

**4.4 DIMENSIONS AND STRENGTH VALUES FOR POLES (as per KS 516:2008)**

LENGTH m	MINIMUM TOP DIAMETER mm	MINIMUM DIAMETER AT THEORETICAL GROUNDLINE mm	THEORETICAL GROUNDLINE (TGL) FROM BUTT m	FORCE REQUIRED TO CAUSE A FIBRE STRESS OF 55MPa (CANTILEVER LOADING) kN
10.0	140	182.5	1.8	4.15
10.0	160	202.5	1.8	5.67
10.0	180	222.5	1.8	7.52
11.0	180	227.5	1.8	7.13
12.0	180	232.5	1.8	6.85
14.0	200	262.5	2.0	8.20
15.0	220	287.5	2.0	9.93
16.0	220	292.5	2.0	9.71
18.0	200	282.5	2.0	7.65

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#### 4.5 Quality Management System and Capacity

- 4.5.1 The supplier shall submit a quality assurance plan (QAP) that will be used to ensure that the treated wood poles material, manufacture, workmanship, tests, service capability, maintenance and documentation, will fulfil the requirements stated in the contract documents, standards, specifications and regulations.
- 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 treated poles, the Diamond Mark of Quality from Kenya Bureau of Standards) shall be submitted with the tender for evaluation.
- 4.5.3 Details on the manufacturing experience, production capacity and testing capacity of the manufacturer shall be submitted with the tender.
  - 4.5.3.1 Details on manufacturing capacity to be submitted with the tender shall include detailed list of manufacturing facilities, number and capacity of each cylinder, drying kiln and total monthly production of the whole plant.
  - 4.5.3.2 Details on testing capacity to be submitted with the tender shall include quantities and calibration status of all necessary test and measuring equipment and shall include spectrometric analyzer, moisture meter, strength testing facility, hydrometer, increment borer, calipers and band strapping machine.
  - 4.5.3.3 Details on manufacturer's experience to be submitted with the tender shall include list of previous customers and reference letters from at least four of the previous customers.

#### 5. TESTS AND INSPECTION

- 5.1 The treated wooden poles shall be inspected and tested in accordance with the requirements of this specification, KS 02-94 and KS 516: 2008. It shall be the responsibility of the supplier to perform or to have performed the tests specified. The poles shall be tested against the relevant minimum dimensions and strength values as per clause 4.4 among other parameters as per this specification and applicable standards.
- 5.2 Copies of previous test certificates and test reports by a third party testing laboratory accredited to ISO/IEC 17025 shall be submitted with the offer for evaluation. A copy of the accreditation certificate for the testing laboratory shall also be submitted with the

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

Copies of Test Reports to be submitted shall include the following tests as per KS 02-94 and KS 516:

- 5.2.1 Ultimate Strength Test
- 5.2.2 Preservative Penetration Test;
- 5.2.3 Dimensions Test
- 5.2.4 Preservative Retention Test
- 5.2.5 Knots' Test
- 5.2.6 Splits and Checks Tests
- 5.2.7 Marking for Serialization and Traceability
- 5.2.8 Banding
- 5.2.9 Straightness Test
- 5.2.10 General Defects Tests

- 5.3 Routine test reports for the treated wooden poles shall be submitted to KPLC for approval before shipment/delivery of the goods. KPLC appointed inspectors (2) will witness acceptance tests at the factory before shipment and such consignments presented for inspection shall not consist of less than 2,000 poles unless the order quantity is less. The sampling and testing shall be as per clause 5.
- 5.4 All test and measuring equipment to be used during acceptance testing shall be validly calibrated and proof shall be provided by the supplier.
- 5.5 On receipt of the treated wooden 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 charge to KPLC, wooden poles which upon examination, test or use fail to meet any of the requirements in this specification.
- 5.6 Sampling**
- 5.6.1 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.
- 5.6.2 For ascertaining the conformity of the poles in the consignment to the requirements of this specification, samples shall be tested from each lot separately.

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- 5.6.3 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 below.
- 5.6.4 All the poles selected according to 5.6.3 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.
- 5.6.5 The lot having been found satisfactory according to 5.6.4 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 5.6.4 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.

**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 pole shall be marked with the following information:
- The words '**PROPERTY OF KPLC**';
  - Manufacturer's name or trade mark;
  - Date of treatment, comprising the first two digits of the month followed by the last two digits of the year separated by a slash;
  - The number of the Kenya Standard to which the pole is manufactured, in this case, KS 516 & KS 02-94;
  - Length of the pole (in metres);
  - Top diameter (in mm);

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- g) Hazard class (In this case H4);
- h) Species of timber;
- i) Preservative used and applicable standard;
- j) Ground line
- k) Marking for serialization and traceability.

All the markings shall be legible and permanent.

- 6.2 The marking in 6.1 above shall be on a plate made of aluminium and of at least 60mm x 60mm x 1.2mm in dimensions.
- 6.3 The aluminium plate shall be secured to the pole by at least four galvanized steel wire nails of at least 50mm length.
- 6.4 The aluminium plate shall be placed at a depth of 3mm from the surface of the pole and positioned 3.5m from the butt end of the pole.

## 7. DOCUMENTATION

- 7.1 The bidder shall submit its tender complete with technical documents required by this specification and Annex A (Guaranteed Technical Particulars) for tender evaluation.
- 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 of the poles to be manufactured for KPLC,
  - b) Quality assurance plan (QAP) that will be used to ensure that the design, material, workmanship, tests, service capability, maintenance and documentation will fulfil the requirements stated in the contract documents, standards, specifications and regulations.
  - c) Test Program to be used after manufacture,
  - d) Marking details and method to be used in marking the poles,
  - e) Manufacturer's undertaking to ensure adequacy of the design, good workmanship, good engineering practice and adherence to applicable standards, regulations and specifications in the manufacture of the poles for KPLC,
  - f) Packaging details.

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**ANNEX A: SCHEDULE OF GUARANTEED TECHNICAL PARTICULARS FOR THE OFFERED TREATED WOOD POLES**

*(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 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 third party testing laboratory for tender evaluation, all in English Language)*

**TENDER NO. .... BIDDER'S NAME & ADDRESS .....**

<b>CLAUSE NUMBER</b>	<b>DESCRIPTION</b>	<b>BIDDER'S OFFER</b>
	Name & address of Manufacturer	
	Country and forest where the trees were grown	
	Country of manufacture	
	Manufacturer's Letter of Authorization	
	Manufacturer's warranty and guarantee for the offered treated wooden poles	
	Capacity of manufacturer (number of treated wood poles produced in a day)	
	List & contact addresses of previous customers of manufacturer for similar poles (last five years)	
	Reference letters from at least four of the previous customers	
1	Scope	
2	Reference Standards	
3	Definitions	
4.1.1	Species	
4.1.2	Felling	Maturity (age at felling)
		Date of planting
		Date of felling
4.1.3	Moisture content	
4.1.4	Defects	
4.1.5	Straightness	
4.1.6	Dimensions (tolerances)	
4.2.1	Sapwood thickness	
4.2.2	Moisture content at impregnation	
4.2.3	Impregnation (indicate process & standard)	

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4.2.4	Preservative (indicate type & standard)		
4.2.5	Penetration & retention		
4.2.6	Fixation		
4.3.1	Banding		
4.3.2	Nail Plates		
4.3.3	Colour coding		
4.4	Length		
	Minimum top diameter		
	Minimum diameter at theoretical groundline		
	Theoretical groundline diameter from butt		
	Force required to cause a fibre stress of 55MPa (cantilever loading), kN		
4.5	Quality Management System and Capacity	Quality Management System certificate	
		Production capacity – number produced in a month	
		List and calibration details of test and measuring equipment	
5.1	Test Standards		
5.2	List copies of previous test reports submitted to support the offer		
5.3	Routine/acceptance tests (also indicate quantities to be presented for inspection)		
5.4	Inspection & acceptance to KPLC stores		
5.5	Sampling		
6.	Marking (indicate parameters to be marked, method of marking & position of marking)		
7.1 – 7.2	Documentation		

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

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