

TABLE OF CONTENTS

0.1 Circulation List

0.2 Amendment Record

FOREWORD

1. SCOPE
2. REFERENCES
3. TERMS AND DEFINITIONS
4. REQUIREMENTS
- ANNEXES
5. TESTS AND INSPECTION
6. MARKING, LABELLING AND PACKING

Issued by: : Head of section, standards Development

Authorized by: : Manager, Standards

Signed:



Signed:



Date: 2016-09-06

Date: 2016-09-06

0.1 Circulation List

COPY NO.	COPY HOLDER
1	Manager Standards
2	Electronic copy (pdf) on KPLC server currently: 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 1 Rev 0	2016-09-06	Clause 5.1 Tests standard to be used included	S. Nguli	Dr. Eng. Kimemia
		Clause 6.1: added "Each conductor drum shall contain only one continuous length of conductor"		
		Changed title		

Issued by: : Head of section, standards Development

Authorized by: : Manager, Standards

Signed:



Signed:



Date: 2016-09-06

Date: 2016-09-06



TITLE:

**ALL ALUMINIUM
CONDUCTORS HARD
DRAWN
(BARE & PVC COVERED) -
SPECIFICATION**

Doc. No.

KP1/6C.1/13/TSP/06/020

Issue No.

1

Revision
No.

0

Date of
Issue

2016-09-06

Page 3 of 11

FOREWORD

This specification has been prepared by the Standards Department of The Kenya Power and Lighting Company Limited (KPLC) and it lays down requirements for all Aluminium Conductors (AAC), hard drawn, bare and PVC covered. It is intended for use by KPLC in purchasing the items.

It shall be the responsibility of the manufacturer to ensure adequacy of the design and good engineering practice in the manufacture of the conductors for KPLC. The manufacturer shall submit information which confirms satisfactory service experience with products which fall within the scope of this specification.

1. SCOPE

1.1. This specification is for All Aluminium Conductors for low voltage overhead power distribution lines.

1.2. This specification covers the following conductor sizes:

50 sq. mm All aluminium Conductor, Bare.

50 sq. mm All aluminium Conductor, PVC covered.

100 sq. mm All aluminium Conductor, Bare.

100 sq. mm All aluminium Conductor, PVC covered.

2. REFERENCES

The following documents were referred to during the preparation of this specification, in case of conflict, the provisions of this specification shall take precedence.

BS 215: Specification for Aluminium Conductors and Aluminium Conductors Steel - Reinforced for Overhead Power Transmission. Part I: Aluminium Stranded Conductors

Issued by: : Head of section, standards Development

Authorized by: : Manager, Standards

Signed:

Signed:

Date: 2016-09-06

Date: 2016-09-06

**ALL ALUMINIUM
CONDUCTORS HARD
DRAWN
(BARE & PVC COVERED) –
SPECIFICATION**

BS 2627: Specification for Wrought Aluminium for Electrical Purposes. Wire.

BS 6485: PVC Covered Conductors for Overhead Power Lines.

IEC 60207: Aluminium Stranded Conductors

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

3. TERMS AND DEFINITIONS

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

4. REQUIREMENTS

4.1. SERVICE CONDITIONS

The conductor 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 in accordance with IEC 60815.

4.2. MATERIALS

4.2.1. Aluminium wires used in the construction of the conductor shall be material GIE in the H9 condition as specified in BS 2627.

4.2.2. The PVC covering shall conform to the type TI 1 compound specified in BS 6485.

Issued by: : Head of section, standards Development

Authorized by: : Manager, Standards

Signed:



Signed:



Date: 2016-09-06

Date: 2016-09-06

**ALL ALUMINIUM
CONDUCTORS HARD
DRAWN
(BARE & PVC COVERED) -
SPECIFICATION**

4.3. CONSTRUCTION

4.3.1 Bare Conductor

4.3.1.1 The conductor shall be manufactured as per BS 215 Part 1.

4.3.1.2 The conductor shall be concentrically stranded, with successive layers in opposite lay, but such that the outermost layer shall be in the right hand spiral (Z).

4.3.1.3 The wires in each layer shall be evenly and closely stranded. The complete conductor and its layers shall be firm and solid.

4.3.1.4 In conductors having multiple layers of wires, the lay ratio of any layer shall be not greater than the lay ratio of the layer immediately beneath it.

4.3.1.5 The completed conductor shall be free from dirt, grit, excessive amounts of drawing oil and other foreign deposits.

4.3.2 PVC Covered Conductor

4.3.2.1 PVC covered conductors shall be manufactured in accordance with BS 6485.

4.3.2.2 The material, construction and physical properties of the conductor shall, after covering, conform to BS 215 Part 1 and clause 4.3.1 of this specification.

4.3.2.3 The PVC covering shall conform to the type TI 1 compound as per BS 6485.

4.3.2.4 The color of the covering shall be BLACK.

4.3.2.5 When tested in accordance with BS 6485, the thickness of the PVC covering at any point shall be not less than 0.8mm.

4.4. CONDUCTOR SIZES AND CHARACTERISTICS

4.4.1 The sizes for the aluminium wires used in the construction of the conductors and the conductors sizes shall be as follows:-

Issued by: : Head of section, standards Development

Authorized by: : Manager, Standards

Signed:



Signed:



Date: 2016-09-06

Date: 2016-09-06

Table 1: Characteristics of the All Aluminium Conductors (AAC), hard drawn, bare and PVC covered

CONDUCTOR	Bare (ANT)	PVC Covered	Bare (WASP)	PVC Covered
Nominal Area of aluminium (mm ²)	50	50	100	100
Approximate overall diameter of bare conductor (mm)	9.30	9.30	13.17	13.17
Overall diameter of covered conductors (mm)	-	11.7	-	16.0
Stranding No/mm Al.	7/3.10	7/3.10	7/4.39	7/4.39
Calculated maximum d.c. resistance at 20°C (ohm/km)	0.5419	0.5419	0.2702	0.2702
Calculated minimum breaking load (kN)	8.28	8.28	16.00	16.00
Approximate mass of conductor (kg/km), <i>without grease</i>	145	200	290	360

Note: The current carrying capacities of each conductor shall be stated by the manufacturer in Appendix B attached. The applicable installation conditions shall also be specified.

4.4.2 Variation in diameter shall not exceed $\pm 1\%$ for aluminium wires.

Issued by: : Head of section, standards Development

Authorized by: : Manager, Standards

Signed:



Signed:



Date: 2016-09-06

Date: 2016-09-06

ANNEXES

5. TESTS AND INSPECTION

- 5.1. The conductors shall be inspected, sampled and tested in accordance with the requirement of BS 215-1 (Bare Conductors), BS 6485 (PVC Covered Conductors) 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 Type Test and Routine Test Reports issued by the National Testing/ Standards Authority of the country of manufacture or accredited testing laboratory shall be submitted with the tender for the purpose of technical evaluation, all in English.
- 5.3. The following are some of the tests that shall be done at the manufacturer's works in the presence of KPLC Engineers (2) and in accordance with BS 215-1, BS 6485 and this specification.

5.3.1 All Aluminium Conductors, bare

Table 2: Tests for All Aluminium Conductors, bare

ALUMINIUM WIRES	COMPLETE CONDUCTOR
1. Tensile test	1. Lay ratio of each layer
2. Wrapping test	2. Tensile strength
3 Resistivity	3. Measurement of weight
	4. Resistance test

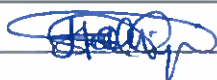
5.3.2 All aluminium Conductor, PVC Covered:

- a) The aluminium wires shall be tested in accordance with BS 215-1 and clause 5.3.1 above.
- b) The following tests shall be carried out on the PVC covered conductor in accordance with BS 6485:
- i). Spark Test
 - ii). Conductor Resistance
 - iii). Thickness of PVC Covering
 - iv). Conductor Examination and Test
 - v). PVC material

Issued by: : Head of section, standards Development

Authorized by: : Manager, Standards

Signed:



Signed:



Date: 2016-09-06

Date: 2016-09-06

5.3.3 Construction/workmanship:

The Manufacturer shall demonstrate during factory inspection/tests that the complete conductor is of good workmanship and that it shall not unwind during stringing.

- 5.4. Test reports shall be completed for the above tests and submitted to KPLC for approval before shipment/delivery of the conductor.
- 5.5. On receipt of the conductors the purchaser (KPLC) shall perform or have performed any of the tests specified in order to verify compliance with specification.

The manufacturer shall replace without charge to the purchaser (KPLC) unused conductors, which upon examination or test within the guarantee period, fail to meet any of the requirements in the specification.

6. MARKING AND LABELLING

- 6.1 The complete conductor shall be rolled on wooden drums such as to prevent damage during transportation. Each conductor drum shall contain only one continuous length of conductor. The wooden drums shall be made from treated timber resistant to termite attack.
- 6.2 The following information shall be marked (in a permanent manner) on one flange of the reel:
- (a) Direction of rotation of the reel
 - (b) Type of conductor and size
 - (c) Length (m)
 - (d) Gross weight and net weight (kg)
 - (e) Manufacturer's name and mark
 - (f) Year of manufacture
 - (g) Standard of manufacture
 - (h) KPLC Order Number
 - (i) The words "Property of KPLC"

Issued by: : Head of section, standards Development

Authorized by: : Manager, Standards

Signed:



Signed:



Date: 2016-09-06

Date: 2016-09-06

**ALL ALUMINIUM
CONDUCTORS HARD
DRAWN
(BARE & PVC COVERED) -
SPECIFICATION**

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 conductors 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 conductor drums
- 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 conductors for The Kenya Power & Lighting Company
- g) Packaging details (including packaging materials and their dimensions).

Issued by: : Head of section, standards Development

Authorized by: : Manager, Standards

Signed:



Signed:



Date: 2016-09-06

Date: 2016-09-06

Technical Particulars

To be filled and signed by the Manufacturer for each size offered and submitted together with Catalogues, brochures, drawings, technical data and test reports for tender evaluation)

Bidder Name

TENDER NO.

Clause	Guaranteed Technical Particulars for Conductor offered		Bidders offer
1	Name and address of the Manufacturer		
	Country of manufacture		
	Manufacturer's Letter of Authorization		
	Model/Type Reference No. of the offered transformer		
	Drawing Reference Number		
	Manufacturer's warranty and guarantee certificate for the offered conductor		
2	Type and Size		
3	Reference Standard of manufacture		
4.1	Service Conditions		
4.2	Materials	aluminium	
		PVC covering	
4.3	Construction & Standard	Bare conductor	
		PVC covered conductor	
4.4 Size and technical parameters	Nominal area of aluminium, mm ²		
	Approx overall diameter of bare conductor, mm		
	Overall diameter of covered conductor, mm		
	Stranding, No./mm	aluminium	
		Tolerance on diameter	

Issued by: : Head of section, standards Development

Authorized by: : Manager, Standards

Signed:



Signed:



Date: 2016-09-06

Date: 2016-09-06

**ALL ALUMINIUM
CONDUCTORS HARD
DRAWN
(BARE & PVC COVERED) -
SPECIFICATION**

Clause	Guaranteed Technical Particulars for Conductor offered	Bidders offer
	Calculated maximum d.c. resistance at 20°C, ohm/km	
	Calculated minimum breaking load, kN	
	Approximate mass of conductor, kg/km	
	Current carrying capacity, A	
5.1	Test standard(s) for bare and covered conductors	
5.2	List test reports submitted (indicate test report numbers, date, Testing Institution and their contact addresses)	
5.4	Test reports to be submitted to KPLC before delivery	
5.5	Replacement of non-compliant conductor	
6.1	Mode of Packing, & Length on drum	
6.3	Mode of Sealing of both end of conductor	
6.4	Permanent Marking on the drum	
7.1	Documents submitted with tender	
7.2	Documents to be submitted to KPLC for approval before manufacture	
Other details required with the tender	Manufacturer's Guarantee and Warranty	
	List catalogues, brochures, technical data, drawings and customer sales records submitted to support the offer	
	List Acceptance Tests to be witnessed by KPLC Engineers at the factory	
	Statement of compliance to specification	

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

Issued by: : Head of section, standards Development

Authorized by: : Manager, Standards

Signed:



Signed:



Date: 2016-09-06

Date: 2016-09-06

