



The Kenya Power & Lighting  
Co. Ltd.

TITLE:

**SPECIFICATION 11kV AERIAL  
BUNDLED CABLES (ABC)**

Doc. No.

KPLC1/3CB/TSP/05/005

Issue No.

1

Revision  
No.

0

Date of  
Issue

2010-08-11

Page 1 of 10

## TABLE OF CONTENTS

### 0.1 Circulation List

### 0.2 Amendment Record

## FOREWORD

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

**ANNEX A:** *Guaranteed Technical Particulars (to be filled and signed by the Manufacturer and submitted together with copies of manufacturer's catalogues, brochures, drawings, technical data, sales records and copies of complete type test certificates and complete type test reports for tender evaluation)*

Issued by: Head of Section, Technical Stds & Specs

Authorized by: Head of Department, R&D

Signed:

Signed:

Date: 2010-08-11

Date: 2010-08-11



The Kenya Power & Lighting  
Co. Ltd.

TITLE:

SPECIFICATION 11kV AERIAL  
BUNDLED CABLES (ABC)

Doc. No.

KPLC1/3CB/TSP/05/005

Issue No.

1

Revision  
No.

0

Date of  
Issue

2010-08-11

Page 2 of 10

### 0.1 Circulation List

COPY NO.	COPY HOLDER
1	Research & Development Manager
2	Procurement Manager
3	Stores & Stock Control Manager
4	Chief Manager, Distribution
5	Deputy Manager, Technical Audit

### 0.2 Amendment Record

Rev No.	Date (YYYY-MM-DD)	Description of Change	Prepared by (Name & Signature)	Approved by (Name & Signature)

Issued by: Head of Section, Technical Stds & Specs

Authorized by: Head of Department, R&D

Signed:

Signed:

Date: 2010-08-11

Date: 2010-08-11



The Kenya Power & Lighting  
Co. Ltd.

TITLE:  
**SPECIFICATION 11kV AERIAL  
BUNDLED CABLES (ABC)**

Doc. No.	KPLC1/3CB/TSP/05/005
Issue No.	1
Revision No.	0
Date of Issue	2010-08-11
Page 3 of 10	

## FOREWORD

This specification has been prepared by the Research and Development Department of The Kenya Power and Lighting Company Limited (KPLC) and it lays down requirements for 11kV Aerial Bundled Cable (ABC). It is intended for use by KPLC in purchasing the cables.

The manufacturer shall submit information which confirms satisfactory service experience with products which fall within the scope of this specification.

## 1. SCOPE

This specification is for aerial bundled cables consisting of stranded aluminium conductors insulated with cross-linked polyethylene (XLPE) and a supporting catenary that consists of stranded, galvanized steel wires, PVC covered. The cable shall be suitable for use at operating voltage of 11kV 50Hz with system highest voltage of 12kV.

The specification covers the following sizes:

- a) 3 x 70 mm<sup>2</sup> Aluminium Phase Conductors, with Catenary size of 50 mm<sup>2</sup>.
- b) 3 x 95 mm<sup>2</sup> Aluminium Phase Conductors, with Catenary size of 50 mm<sup>2</sup>.
- c) 3 x 185 mm<sup>2</sup> Aluminium Phase Conductors, with Catenary size of 70 mm<sup>2</sup>.

The specification also covers inspection and test of the cables 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 11kV Aerial Bundled Cable (ABC) acceptable for use in the company and it shall be the responsibility of the Manufacturer to ensure adequacy of the design, good workmanship and good engineering practice in the manufacture of the cables for KPLC.

The specification does not purport to include all the necessary provisions of a contract.

## 2. REFERENCES

Issued by: Head of Section, Technical Stds & Specs

Authorized by: Head of Department, R&D

Signed:

Signed:

Date: 2010-08-11

Date: 2010-08-11



The Kenya Power & Lighting  
Co. Ltd.

TITLE:

**SPECIFICATION 11kV AERIAL  
BUNDLED CABLES (ABC)**

Doc. No.

KPLC1/3CB/TSP/05/005

Issue No.

1

Revision  
No.

0

Date of  
Issue

2010-08-11

Page 4 of 10

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.

IEC 60228: Conductors of insulated cables.

IEC 60888: Zinc-coated steel wires for stranded conductors.

SANS 1713: Electric Cables – Medium-Voltage Aerial Bundled Conductors for Voltages from 3.8/6.6kV to 19/33kV (South African National Standard)

### 3. TERMS AND DEFINITIONS

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

Supporting Catenary: A stranded galvanized steel conductor, with protective covering that is provided to support three laid-up cores.

### 4. REQUIREMENTS

#### 4.1 SERVICE AND SYSTEM CONDITIONS

##### 4.1.1 Operating Conditions

The Aerial Bundled Cables shall be suitable for continuous operation outdoors in tropical areas at altitudes of up to 2200m above sea level, humidity of up to 90%, average ambient temperature of +30°C with a minimum of -1°C and a maximum of +40°C, in direct sunlight, heavy saline conditions along the coast and isokeraunic levels of up to 180 thunderstorm days per year.

##### 4.1.2 System Characteristics

The Aerial Bundled Cables shall be suitable for use in 11(12) kV 50Hz 3-wire system, where a continuous conductor operating temperature of 90°C and a short-circuit temperature of 250°C are not exceeded.

The design system fault level for KPLC 11kV overhead lines is 16kA 3 seconds.

#### 4.1 MATERIALS AND CONSTRUCTION

Issued by: Head of Section, Technical Stds & Specs

Authorized by: Head of Department, R&D

Signed:

Signed:

Date: 2010-08-11

Date: 2010-08-11



The Kenya Power & Lighting  
Co. Ltd.

TITLE:

**SPECIFICATION 11kV AERIAL  
BUNDLED CABLES (ABC)**

Doc. No.

KPLC1/3CB/TSP/05/005

Issue No.

1

Revision  
No.

0

Date of  
Issue

2010-08-11

Page 5 of 10

#### 4.1.1 General

Only compatible materials that are suitable for the specified service conditions shall be used in the construction of the cables.

#### 4.1.2 Phase Cores

4.1.2.1 Each core of the Aerial Bundled Cable shall be suitable for use in a system operating voltage of 11,000V 50Hz.

4.1.2.2 The conductor shall be made from hard drawn, circular, stranded and compacted plain aluminium conductor as per IEC 60228.

4.1.2.3 The conductor screen shall consist of an extruded layer of semi-conducting compound, applied to each conductor direct, in the same operation as the application of the dielectric and of the core screen. The outer surface of the conductor screen shall be in continuous adherent contact with the inner surface of the dielectric. The screen shall be readily removable from the conductor and it shall have a thickness of at least 0.5mm.

4.1.2.4 The insulation (dielectric) shall consist of an extruded sheath of cross-linked polyethylene (XLPE). The nominal thickness of the dielectric shall conform to Table 2 (the thickness of screening materials shall not be included in the measured dielectric thickness).

4.1.2.5 A dielectric screen consisting of a semi-conducting core screen, bedding tape and metallic screen shall be applied to each core.

- a) The core screen shall consist of an extruded layer of semi-conducting compound, applied in intimate contact with the dielectric of each core, in the same operation as the application of the conductor screen and the dielectric. The layer shall be continuous and uniform in quality and shall be removable without causing damage to the dielectric. It shall have a thickness of at least 0.5mm.
- b) A semi-conducting bedding tape shall be applied over the semi-conducting core screen.
- c) The metallic screen shall consist of annealed copper tape helically applied over the bedding tape. The metallic screen shall be electrically continuous and any joints shall be made in an acceptable, workmanlike manner and so finished that no sharp edges or protrusions remain. The copper tape shall be applied with a minimum overlap of 15%.

Issued by: Head of Section, Technical Stds & Specs

Authorized by: Head of Department, R&D

Signed:

Signed:

Date: 2010-08-11

Date: 2010-08-11



The Kenya Power & Lighting  
Co. Ltd.

TITLE:

**SPECIFICATION 11kV AERIAL  
BUNDLED CABLES (ABC)**

Doc. No.	KPLC1/3CB/TSP/05/005
Issue No.	1
Revision No.	0
Date of Issue	2010-08-11
Page 6 of 10	

The metallic screen shall be suitably water blocked.

4.1.2.6 The outer sheath shall be extruded PVC, black and ultra-violet protected for operation in direct sunlight.

4.1.2.7 The following shall be embossed legibly on one side of each core:

- a) The core identification, using the numerals 1, 2 or 3.
- b) The manufacturer's name.
- c) The year of manufacture.
- d) The standard of manufacture.

The following shall be embossed on the opposite side of the core:

- a) The operating voltage 6.35/11kV for which the cable has been designed.
- b) The conductor size.
- c) The words "Property of The Kenya Power & Lighting Co."

The letters and numerals shall be upright characters of minimum height 5mm and of maximum height of 10mm. The gap between the end of one legend and the beginning of the next shall not exceed 150mm.

An indelible marking shall also be given (on each core) at every one meter interval to assist field personal in cutting required length.

#### 4.1.3 Supporting Catenary

4.1.3.1 The supporting catenary shall consist of stranded galvanized steel wires. Galvanizing of the wires shall comply with the requirements of IEC 60888 for class 1.

4.1.3.2 The lay of the wires shall be right-hand (Z) with lay ratio not less than 10 and not more than 14.

4.1.3.3 The covering shall be PVC applied by forced extrusion to provide a smooth outer finish, and shall be ultra-violet protected for operation in direct sunlight.

Issued by: Head of Section, Technical Stds & Specs

Authorized by: Head of Department, R&D

Signed:

Signed:

Date: 2010-08-11

Date: 2010-08-11



The Kenya Power & Lighting  
Co. Ltd.

TITLE:  
**SPECIFICATION 11kV AERIAL  
BUNDLED CABLES (ABC)**

Doc. No.	KPLC1/3CB/TSP/05/005
Issue No.	1
Revision No.	0
Date of Issue	2010-08-11
Page 7 of 10	

Table 1: Supporting Catenary

Catenary Size, mm <sup>2</sup>	50	70
Number of Wires	7	7
Wire Size (diameter), mm	3.00	3.60
Minimum Tensile Strength of each Wire, kN	9.26	13.13
Elongation at break, minimum %	3.5	4
Thickness of protective covering		
Nominal, mm	1.20	1.20
Minimum at any point, mm	0.96	0.96

#### 4.2 Electrical and Mechanical Characteristics

The aerial bundled cables shall comply with the following table:

Table 2: Electrical and Mechanical Characteristics

Conductor size, mm <sup>2</sup>	70	95	185
Diameter over conductor, nominal, mm	9.3-10.2	11.6	16.4
Thickness of dielectric			
Nominal, mm	3.4	3.4	3.4
Minimum at a point, mm	2.96	2.96	2.96
Diameter over insulation Nominal, mm	16.1-17.0	21.3	25.9
Diameter over semi-conducting core screen Nominal, mm	18.1-19	23.3	27.9
Thickness of copper tape Nominal, mm	0.15	0.15	0.15
Thickness of sheath			
Nominal, mm	1.8	1.8	1.9
Minimum at a point, mm	1.43	1.43	1.51
Catenary size, mm <sup>2</sup>	50	50	70
Overall diameter of bundle, Nominal, mm	Bidder to state	67.8	79.2
Nominal mass, kg/m	Bidder to state	3.25	4.65

#### 5. TESTS AND INSPECTION

- 5.1 The cable shall be inspected and tested in accordance with the requirements of this specification, IEC 60228 and SANS 1713. It shall be the responsibility of the manufacturer to perform or to have performed the tests specified.

Issued by: Head of Section, Technical Stds & Specs

Authorized by: Head of Department, R&D

Signed:

Signed:

Date: 2010-08-11

Date: 2010-08-11



The Kenya Power & Lighting  
Co. Ltd.

TITLE:

**SPECIFICATION 11kV AERIAL  
BUNDLED CABLES (ABC)**

Doc. No.	KPLC1/3CB/TSP/05/005
Issue No.	1
Revision No.	0
Date of Issue	2010-08-11
Page 8 of 10	

- 5.2 Copies of previous test certificates and test reports by the relevant International or National Testing/Standards Authority of the country of manufacture (or ISO/IEC 17025 accredited independent laboratory) shall be submitted with the offer for evaluation. A copy of accreditation certificate for the laboratory shall also be submitted (all in English Language).
- 5.3 Routine and sample test reports for the cables to be supplied shall be submitted to KPLC for approval before shipment/delivery of the goods. KPLC Engineers (2) will witness these tests (including verification of length on drum) at the factory before shipment.
- 5.4 During delivery of the cables, KPLC will inspect them and may perform or have performed any of the relevant tests in order to verify compliance with the specification (including verification of length on drum). The manufacturer shall replace/rectify without charge to KPLC, cables which upon examination, test or use fail to meet any or all of the requirements in the specification.

**6. MARKING, LABELLING AND PACKING**

- 6.1 The finished cable shall be wound on wooden drum such as to prevent damage during transportation and handling. The drums shall be made from treated timber resistant to termite attack.
- 6.2 The actual length of cable shall not be less than the length indicated on the drum.
- 6.3 Both ends of every drum length of cable shall have been sealed to prevent the ingress of water during transportation, storage, handling and installation. The sealing shall enclose the oversheath (each core) and shall be by close fitting plastic caps. Both ends of the cable shall be secured to the drum to prevent mechanical damage.
- 6.4 The following information shall be marked legibly and in a permanent manner on the flange of the drum:
- The manufacturer's name;
  - The type and rating of cable;
  - The conductor and catenary cross-sectional area in mm<sup>2</sup>;
  - The length of the cable, in metres;
  - The year of manufacture;
  - The gross mass and net mass, in kilogram;
  - The instructions for handling and use (in English Language);
  - The words "**PROPERTY OF KENYA POWER & LIGHTING CO.**"

*Note: Individual Cores shall have been marked in accordance with clause 4.2*

Issued by: Head of Section, Technical Stds & Specs

Authorized by: Head of Department, R&D

Signed:

Signed:

Date: 2010-08-11

Date: 2010-08-11





The Kenya Power & Lighting  
Co. Ltd.

TITLE:

**SPECIFICATION 11KV AERIAL  
BUNDLED CABLES (ABC)**

Doc. No.	KPLC1/3CB/TSP/05/005
Issue No.	1
Revision No.	0
Date of Issue	2010-08-11
Page 9 of 10	

**ANNEX A: Guaranteed Technical Particulars** (to be filled and signed by the Manufacturer for all clauses and submitted together with copies of manufacturer's catalogues, brochures, drawings, technical data, sales records and type test reports for tender evaluation)

Tender No.....

Description	Bidder's offer
Manufacturer	
Country of manufacture	
Service conditions & application	
Applicable Standard(s)	
Type and design	
Phase Conductor (material & construction)	
Catenary (material & construction)	
Phase Conductor Insulation (material & colour)	
<b>RATINGS/CHARACTERISTICS</b>	
Conductor size, mm <sup>2</sup>	
Diameter over conductor, nominal, mm	
Thickness of dielectric Nominal, mm Minimum at a point, mm	
Diameter over insulation Nominal, mm	
Diameter over semi-conducting core screen Nominal, mm	
Thickness of copper tape Nominal, mm	
Thickness of sheath Nominal, mm Minimum at a point, mm	
Catenary size, mm <sup>2</sup>	
Overall diameter of bundle, Nominal, mm	
Nominal mass, kg/m	
<b>SUPPORTING CATENARY</b>	
Catenary Size, mm <sup>2</sup>	
Number of Wires	
Wire Size (diameter), mm	

Issued by: Head of Section, Technical Stds & Specs

Authorized by: Head of Department, R&D

Signed:

Signed:

Date: 2010-08-11

Date: 2010-08-11



The Kenya Power & Lighting  
Co. Ltd.

**TITLE:**  
**SPECIFICATION 11kV AERIAL  
BUNDLED CABLES (ABC)**

Doc. No.	KPLC1/3CB/TSP/05/005
Issue No.	1
Revision No.	0
Date of Issue	2010-08-11
Page 10 of 10	

Minimum Tensile Strength of each Wire, kN	
Elongation at break, minimum %	
Thickness of protective covering Nominal, mm Minimum at any point, mm	
Power frequency withstand voltage rms	
Impulse withstand voltage 1.2/50µs	
List of Type Test Reports submitted (indicate Test Report Numbers)	
List of Tests to be witnessed by KPLC Engineers at the factory before shipment	
Marking (list parameters to be indicated and method of marking)	Cable
	Drum
Packing	
Installation and technical manuals to be provided during delivery	
List of catalogues, brochures, drawings, technical data and customer sales records submitted to support the offer.	
Manufacturer's production capacity and experience (including list of supporting documents submitted)	
Statement of compliance and or deviations from Tender Specifications	
Inspection/test by KPLC during delivery before acceptance to stores/site	

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

Issued by: Head of Section, Technical Stds & Specs	Authorized by: Head of Department, R&D
Signed:	Signed:
Date: 2010-08-11	Date: 2010-08-11