TABLE OF CONTENTS

0.1 Circulation List

COPY NO.	COPY HOLDER
1	Research & Development Manager
2	Procurement Manager
Electronic copy (pdf) on Kenya Power Server (currently :Network-\\stima-fprnt-001\techstd&specs	

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	2012-06-11	Cancels and replaces Issue 1 Rev 0 dated July 2005 and all previous issues	S. Thimtec	

Issued by: Head of Section, Tech Stds & Specs	Authorized by: Head of Department , R & D
Signed:	Signed:
Date: 2012-06-11	Date: 2012-06-11

FOREWORD

This specification has been prepared by the Research and Development Department of The Kenya Power and Lighting Company Limited (Kenya Power) and it lays down requirements for Low Voltage Aerial Bundled Cables (LV ABC). It is intended for use by Kenya Power in purchasing Low Voltage Aerial Bundled Cables.

It shall be the responsibility of the supplier to ensure adequacy of the design and good engineering practice in the manufacture of the Low Voltage Aerial Bundled Cables. for Kenya Power. The supplier shall also 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 low voltage aerial bundled cables consisting of XLPE insulated aluminium phase conductors and aluminium alloy strain-bearing neutral conductor.

1.2 The specification covers the following sizes:

(a) ABC 1x54.6 + 3x35

(b) ABC 1x54.6 + 3x70

(c) ABC 1x70 + 3x120

When specifically requested, up to two (2 No.) cores for street lighting shall be provided.

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.

IEC 228: Conductors of insulated cables.

NFC 33-209: French National Standard for Low Voltage Aerial Bundled Cables.

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

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, humidities 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 and heavy saline conditions along the coast.

4.1.2 System Characteristics

The Aerial Bundled Cables shall be suitable for use in a 4-wire system operating at voltages not exceeding 600/1000V 50Hz.

4.2 Materials and Construction

4.2.1 Phase Cores

4.2.1.1 Each core of the Aerial Bundled Cable shall be suitable for use in a system operating voltage not exceeding 600/1000V 50Hz.

4.2.1.2 The conductor shall be made from hard drawn, circular, stranded and compacted plain aluminium conductor as per IEC 228.

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

4.2.1.4 The insulation shall consist of an extruded sheath of cross-linked polyethylene (XLPE) black in colour, weather-resistant and ultra-violet radiation protected. The insulation shall easily be removed.

4.2.1.5 Each of the phase cores shall be marked legibly throughout its length by embossment or indenting on the insulation for identification. The marking shall be by means of the number 1, 2 or 3 as appropriate spaced at intervals not exceeding 100mm. None of the phase cores shall have longitudinal ridge.

In addition, the following information shall be embossed or indented on phase core at intervals not exceeding 1 000mm:

a) Manufacturer's Name

b) Voltage Rating 600V/1000V
c) Nominal Current Rating (Amps)
d) The year of manufacture
e) The words "PROPERTY OF KPLC"

The height of the characters used for marking shall be not less than 5mm and not more than 10mm.

4.2.2 Supporting Conductor (Neutral)

4.2.2.1 The neutral conductor shall be strain bearing and shall be suitable for use in a system operating voltage not exceeding 600/1000V 50Hz.

4.2.2.2 The neutral conductor shall be stranded compacted aluminium-magnesium-silicon alloy. The wires shall have, before stranding, tensile strength not less than 295N/sqmm.

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

4.2.2.4 The insulation shall consist of an extruded sheath of cross-linked polyethylene (XLPE) black in colour, weather-resistant and ultra-violet radiation protected.

4.2.2.5 The neutral core shall be identified by one continuous rib on its insulation jacket throughout its length. The rib shall be not less than 0.5mm in height.

4.2.3 Aerial Bundled Cable

4.2.3.1 Laying-up of cores

a) The cores of aerial bundled cable shall be laid-up with a left-hand lay.

b) The length of lay shall be 55 to 75 times the diameter of a phase conductor.

4.2.3.2 Configuration of bundles

a) The bundle shall consist of three phase cores of the same size laid-up around the supporting conductor that was kept straight and taut throughout the laying process.

b) The configuration shall be read in the following manner:

ABC 1xM + nxS + kxP

Where:

ABC: Aerial Bundled Cable
M: Cross section area of neutral strain bearing conductor; in mm²
n: Number of phases
S: Cross sectional area of phase conductor; in mm²
k: No. of cores for street lighting circuit; it may be zero or 1 or 2
P: Cross section area of street lighting conductor; in mm² (when specified)
(x is the multiplication sign)

4.3 Electrical and Mechanical Characteristics

The aerial bundled cables shall comply with the following table:

Table 1: Electrical and Mechanical Characteristics

Parameter	Unit	Size		
		1x54.6 + 3x35	1x54.6 + 3x70	1x70 + 3x120
Nominal area of phase conductor	mm²	35	70	120
Nominal area of neutral conductor	mm²	54.6	54.6	70
DC resistance of phase conductor at 20°C, max	Ω/km	0.868	0.433	0.253
DC resistance of neutral conductor at 20°C, max	Ω/km	0.63	0.63	0.50
Minimum insulation thickness	mm	1.6	1.6	1.7
Minimum tensile strength of neutral conductor	kN	16.6	16.6	20.0

5. TESTS AND INSPECTION

5.1 The cable shall be tested and inspected in accordance with the requirements of clauses 5.3, 5.4 and 5.5 of this specification and IEC 228 and NFC 33 – 209 as applicable. It shall be the responsibility of the manufacturer to perform or to have performed the tests specified and whatever other tests normally performed at works.

5.2 Copies of previous Test Reports from an independent and ISO/IEC 17025 accredited testing Laboratory shall be submitted with the tender for the purpose of technical evaluation, all in the English Language. The test reports shall include the tests in clause 5.1 of this specification.

5.3 Routine Tests

5.3.1 Conductor resistance

The d.c. resistance of each phase conductor and of the neutral conductor shall be measured together with the temperature of the cable at the time of measurement in accordance with IEC 228. The result when corrected to 20°C shall not exceed the maximum values given in Table 1.

5.3.2 Dimensions

The measurement of dimensions of the cable components as specified in Table 1 shall be made on three test pieces taken at 3 points (at least 1m apart) from the core under test.

The measurement shall be done in accordance with French National Standard, NFC 33-209, sub-clause 3.2.1.

5.3.3 Dielectric Strength of Cores

Each completed drum length of ABC shall be immersed in a waterbath and be subjected to an overvoltage test in accordance with NFC 33-209 Appendix VII.2. The ABC shall withstand, without breakdown of the insulation, an ac power frequency voltage of r.m.s. value of 4kV between the conductors and the waterbath.

5.4 Sample Tests

5.4.1 Testing the adherence of the insulating sheath on the strain-bearing neutral core conductor:

When a supporting neutral core is tested in accordance with clause 5.5. of NFC 33-209 the force required to initiate sliding of the dielectric over the conductor shall be at least 180N.

5.4.2 Measurement of Insulation Resistance

Insulation resistance of all cores shall comply with NFC 33-209 clause 5.3.

5.5 Type Tests

5.5.1 Mechanical Strength

The mechanical strength shall be determined in accordance with the requirements of NFC 33-209 clause 5.1.

5.5.2 Weather Resistance

The weather resistance shall be determined in accordance with the requirement of NFC 33-209 clause 5.2.

5.5.3 Performance of Supporting Cores

The stability of the strain-bearing neutral under thermal and mechanical loading shall be verified in accordance with NFC 33-209 clause 5.8.

5.5.4 Impulse (Voltage) Withstand

Compliance with NFC 33-209 clause 5.7 shall be verified.

6. MARKING, LABELLING AND PACKING

6.1 The finished cable shall be wound on wooden drum such as to prevent damage during transportation. The drums shall be made from treated timber resistant to termite attack.

6.2 Both ends of every core of every drum length of cable shall have been sealed to prevent the ingress of water during transportation, handling and storage. Both ends shall be secured to the drum to prevent mechanical damage.

6.3 The following information shall be marked legibly and in a permanent manner on the flange of the drum:

a) The manufacturer's name
b) The type of cable i.e. ABC 600/1000V 50Hz
c) The number of conductors and size
d) The length of the cable, in metres
e) The year of manufacture
f) The gross mass and net mass, in kilogram
g) The instructions for handling and installation (in the English Language)

Note: individual cores shall have been marked in accordance with clause 4.2.

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

Tender No. .....

Clause number	**Bidder's offer** (indicate full details of the offered equipment for each requirement of the specification)
1. Scope	
1.1	
1.2	
4. Requirements	
4.1 Service Conditions	
4.1.1	
4.1.2	
4.2 Material and Construction	
4.2.1 Phase Cores	
4.2.1.1	
4.2.1.2	
4.2.1.3	
4.2.1.4	
4.2.1.5	
4.2.2 Supporting Conductor	
4.2.2.1	
4.2.2.2	
4.2.2.3	
4.2.2.4	
4.2.2.5	
4.2.3 Aerial Bundled Cable	
4.2.3.1	
4.2.3.2	
4.3	
Test & Inspection	
5.1	
5.2	
5.3 Routine Tests	
5.3.1	
5.3.2	
5.4 Sample Tests	
5.4.1	
5.4.2	
5.5 Type tests	

5.5.1	
5.5.2	
5.5.3	
5.5.4	
Marking, labelling & Packing	
6.1	
6.2	
6.3	

.....

Supplier's Name, Signature, Stamp and Date

Issued by: Head of Section, Tech Stds & Specs	Authorized by: Head of Department , R & D
Signed:	Signed:
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