

	Standard	Technology
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with Rated Voltage Standard**

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Compiled by  B Mwarehwa Senior Engineer Date: <u>25-02-2013</u>	Functional Responsibility  TP Du Plessis Chief Engineer Date: <u>25/02/2013</u>	Authorised by  R Cormaek Senior Manager HV Plant Date: <u>25/2/2013</u>
		Supported by TDAC  D. Odendaal TDAC Chairperson Date: <u>18/3/2013</u>

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1. INTRODUCTION

The Eskom has undertaken to utilize the SABS support structures that monitor compliance to specification and quality of manufacture of LV cables. Therefore the Distribution Group will only purchase cable that bears the SABS mark.

This Eskom Specification is based on the requirements of NRS 074-1 Edition 2.

Compulsory safety specification VC 8075 stipulates that all low voltage cables in South Africa shall comply with the requirements of SANS 1507.

1.1 KEYWORDS

Insulation; LV; PVC; Stranded copper; Specifications;

2. SUPPORTING CLAUSES

2.1 SCOPE

This specification covers Eskom's requirements for LV power and control cables in accordance with SANS 1507.

2.1.1 Purpose

None

2.1.2 Applicability

This document shall apply throughout Eskom Holdings Limited Divisions.

2.2 NORMATIVE/INFORMATIVE REFERENCES

Parties using this document shall apply the most recent edition of the documents listed in the following paragraphs.

2.2.1 Normative

- [1] **DST 34-1176**, *Distribution Standard Part 22: General information and requirements for low-voltage cable systems*
- [2] SANS 1507, Electric cables with extruded solid dielectric insulation for fixed installations (300/500 V to 1 900/3 300 V).
- [3] SANS 1411-2, Materials of insulated electric cables and flexible cords – Part 2: Polyvinyl chloride (PVC).
- [4] VC 8075, Compulsory specification for the safety of electric cables with extruded solid dielectric insulation for fixed installations (300/500 V to 1 900/3 300 V).

2.2.2 Informative

None

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2.3 DEFINITIONS

Definition	Description
Interval	The distance between the end of a mark and the beginning of the next mark

2.3.1 Disclosure Classification

Controlled Disclosure: Controlled Disclosure to External Parties (either enforced by law, or discretionary).

2.4 ABBREVIATIONS

The abbreviations in **SANS 1507** shall apply to this specification.

2.5 ROLES AND RESPONSIBILITIES

None

2.6 PROCESS FOR MONITORING

None

2.7 RELATED/SUPPORTING DOCUMENTS

None

3. LV POWER AND CONTROL CABLE WITH RATED VOLTAGE

3.1 REQUIREMENTS

3.1.1 Rated voltages

The rated voltage of the cable shall be 600/1000 V.

3.1.2 Materials and construction

3.1.2.1 Conductors

The conductors shall be copper stranded for power and multi-core control LV cable. The conductor size required will be specified in schedule A.

3.1.2.2 Insulation

The cables shall be PVC insulated.

3.1.2.3 Number of cores and core identification

3.1.2.3.1 The number of cores required will be specified in schedule A.

3.1.2.3.2 Core identification of power cables shall be as indicated in Table 1:

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Table 1: Core identification

1	2	3
Number of phase cores	Colour(s) of phase cores	Colour of neutral core
1	Red	Black Black Black
2	Red and yellow Red, yellow and blue	
3		

3.1.2.4 Bedding under armouring

The cables shall have PVC bedding.

3.1.2.5 Armour

- Single-core cables shall have aluminium wire armour, unless otherwise specified in schedule A.
- Multi-core cables shall have galvanized steel wire armour.
- Outer sheath
- The cables shall have PVC outer sheathing.
- The outer sheath shall be ultraviolet (UV) radiation stabilised.
- Fire performance requirements

The cables shall be flame retardant. If specified in schedule A, the cable shall have a reduced halogen emission property.

NOTE: The use of cables having a reduced halogen property is restricted to Generation applications only.

3.2 PACKAGING AND MARKING AND LABELING

3.2.1 Packaging

3.2.1.1 The wood in wooden drums

The wood in wooden drums shall be resistant to biological attack and therefore be treated in accordance with the relevant SANS standard.

3.2.1.2 Unless otherwise specified in schedule A

Unless otherwise specified in schedule A, cables shall be supplied in the following drums lengths:

- cables having conductor sizes up to and including 16 mm²: drum lengths of 500 m; and
- cables having conductor sizes larger than 16 mm²: drum lengths of 300 m.

3.2.2 Marking of conductor

3.2.2.1 Each individual conductor

Each individual conductor shall be marked with a unique and traceable identification system.

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NOTE: The purpose of marking the conductor is to be able to prove ownership through traceability of the conductor using the identification system

3.2.2.2 The manufacturer

The manufacturer shall keep a secure database of all uniquely marked conductors supplied to Eskom.

3.2.2.3 The conductor identification system

The conductor identification system shall comply with the following minimum requirements:

3.2.2.3.1 Durable and withstand the expected conditions

The identification system shall be durable and withstand the expected conditions during the manufacturing processes and operating conditions of the cable over its life. If requested, sufficient proof shall be provided that the identification system offered is chemically compatible with the various materials it may be in contact with inside the cable;

3.2.2.3.2 Withstand, without melting or other deleterious effects

The identification system shall withstand, without melting or other deleterious effects, continuous conductor operating temperatures of 90 °C and short-circuit conductor temperatures of at least 250 °C;

3.2.2.3.3 Shall not negatively impact the electrical and mechanical integrity and performance

The identification system shall not negatively impact the electrical and mechanical integrity and performance of the cable over its expected life;

3.2.2.3.4 The identification system

The identification system shall not negatively impact the environment in which the cable is installed over its expected life;

3.2.2.3.5 The identification code shall consist of alpha-numeric characters;

3.2.2.3.6 Be visible to the naked eye

The identification system used shall be visible to the naked eye so as to readily identify that the conductor is marked;

3.2.2.3.7 The identification code shall be marked (i.e. appear) at intervals not exceeding 100 mm;

3.2.2.3.8 The identification code shall be sequential and unique for every meter of conductor;

NOTE: The identification code will therefore be repeated for up to a maximum distance of one meter of conductor.

3.2.2.3.9 The characters used to uniquely identify the conductor

The characters used to uniquely identify the conductor shall be legible with the naked eye or, at most, with the assistance of a portable hand-held magnifying glass. The font size offered and, if applicable, the magnification factor required to read the characters shall be stated in schedule B; and

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3.2.2.3.10 The algorithm

The algorithm used to generate the identification code shall be unique for each manufacturer. Details of the proposed conductor identification system shall be submitted with the tender cable identification system location shall be stated in schedule B.

3.2.3 Marking of cable

3.2.3.1 Cable shall be marked with a unique and traceable identification / serial number system

Cable shall be marked with a unique and traceable identification / serial number system. The cable identification system location shall be stated in schedule B.

NOTE: The purpose is to provide asset management information relating to the cable manufacturer, order number, date of manufacture, drum number, conductor identification code range, etc.

3.2.3.2 The manufacturer shall keep a secure database

The manufacturer shall keep a secure database of all uniquely marked cables supplied to Eskom, linking the following minimum information:

- Manufacturer's name;
- Purchaser's order number;
- Cable technical information (i.e. voltage, conductor size, conductor material, number of cores, SANS specification, etc.);
- Date of manufacture;
- Drum number; and
- Conductor unique identification code range.
- The cable identification system shall comply with the following minimum requirements:
- The identification

The identification system shall be durable and withstand the expected conditions during the manufacturing processes and operating conditions of the cable over its life. If requested, sufficient proof shall be provided that the identification system offered is chemically compatible with the various materials it may be in contact with inside the cable;

3.2.3.2.2 The identification system shall withstand

The identification system shall withstand, without melting or other deleterious effects, continuous conductor operating temperatures of 85 °C;

3.2.3.2.3 The identification system shall not negatively impact

The identification system shall not negatively impact the electrical and mechanical integrity and performance of the cable over its expected life;

3.2.3.2.4 The identification system

The identification system shall not negatively impact the environment in which the cable is installed over its expected life;

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3.2.3.2.5 The identification code shall consist of alpha-numeric characters;**3.2.3.2.6 The identification system**

The identification system used shall be visible to the naked eye so as to readily identify that the cable is marked;

3.2.3.2.7 The identification code

The identification code shall be marked (i.e. appear) at intervals not exceeding 100 mm;the

3.2.3.2.8 The identification code

Identification code shall be sequential and unique for every one meter of cable;

NOTE The identification code will therefore be repeated for up to a maximum distance of one meter of cable.

3.2.3.2.9 The characters used to uniquely identify the conductor

The characters used to uniquely identify the conductor shall be legible with the naked eye without the need for any magnification. The font size offered shall be stated in schedule B; and

3.2.3.2.10 The algorithm

The algorithm used to generate the identification code shall be unique for each manufacturer.

3.2.3.3 Details of the proposed cable identification system

Details of the proposed cable identification system shall be submitted with the tender documentation. The system shall be subject to approval by Eskom.

3.2.4 Marking of cable sheath**3.2.4.1 Cables shall be legibly marked in accordance with the requirements of SANS 1507**

Cables shall be legibly marked in accordance with the requirements of SANS 1507, but the marking shall include the specification number to which the cable has been manufactured, the word "ESKOM", the conductor size in mm² and material e.g. Cu (Copper). A typical legend would be:

"XXXXXXXXX CABLES 2000 600/1000 V 70 mm² Cu SANS 1507 ESKOM"

3.2.4.2 The cable shall bear the SABS mark.**3.2.4.3 The cable shall be sequentially marked at one metre intervals with the legend 000 m, 001 m**

The cable shall be sequentially marked at one metre intervals with the legend 000 m, 001 m etc. starting with 000 m at the barrel of the drum and finishing with the number indicating the length of cable on the drum at the outer end of the cable. The error in the length marking shall be less than 1 %.

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3.2.4.4 Cables shall have a colour coded stripe in accordance with SANS 1507.**3.2.5 Marking of cable drums**

In addition to the requirements of SANS 1507, cable drums shall be clearly and indelibly marked with the Eskom stock (SAP) number (i.e. "Eskom SAP Number: XXXXXXXX").

All LV cable drums destined for Eskom shall be branded with the Eskom logo on one of its flat sides (the flange). The Eskom logo shall be printed in Eskom blue or black on a white-coloured background. For metal or wooden drums, a portion of the flange surface shall be painted in white to provide a rectangular background on which the signature shall be printed. The height of the white rectangular background shall be three times the diameter of the "circle" part of the Eskom logo. The printed Eskom logo shall appear centrally on the white rectangular background leaving a space equal to at least one logo "circle" before and after the Eskom logo. The Eskom logo printing shall be made using a stencil technique or other equivalent techniques which shall be demonstrated to and approved by Eskom. The dimensions of Eskom logo shall be a minimum length and height of 820 mm and 210 mm respectively. The Eskom logo and standard requirements are shown in Appendix A.

All other printing on the flange shall be positioned so as to ensure a minimum clearance of one logo circle ("circle") diameter away from the Eskom logo

3.2.6 Documentation

A catalogue that gives the following information shall be provided at the time of tender for the full range of cables manufactured in accordance with SANS 1507:

3.2.6.1 Cable dimensional data:

- a. Diameter over conductor;
- b. Diameter over insulation;
- c. Diameter over bedding;
- d. Diameter over armour wires (if applicable); and
- e. Diameter over sheath.

3.2.6.2 Maximum sustained current rating in ground, air and ducts.

NOTE: The standard installation conditions assumed shall be stated.

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3.2.6.3 Short-circuit ratings**3.2.6.4 Cable mass(kg/m).****3.2.6.5 Gross mass per standard drum length (kg).****3.2.6.6 The 50 Hz a.c. resistance at maximum sustained conductor operating temperature (ohm/km).****3.2.6.7 Reactance per phase (ohm/km).****3.2.6.8 Capacitance per phase (Nf/km).****3.2.6.9 Zero sequence impedance and capacitance per phase at maximum sustained conductor operating temperature (ohm/km).**

NOTE The sequence impedances need only be provided for the range of cables required with an enquiry.

3.3 TESTS

The cable shall be tested in accordance with **SANS 1507**

4. AUTHORISATION

This document has been seen and accepted by:

Name & Surname	Designation
	Document Approved by TDAC Rod 13 March 2013

5. REVISIONS

Date	Rev.	Compiler	Remarks
November 2012	0	B Mwarehwa	Draft document for review created from 32-1272
May 2013	1	B Mwarehwa	Final for Publication

6. DEVELOPMENT TEAM

None

7. ACKNOWLEDGEMENTS

None

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APPENDIX A: ESKOM LOGO: PRINTING GUIDE AND FORMAT

(Normative)

The Eskom logo printing guide and format

The logo circle ("circle") and the logo word (the word "Eskom") shall always appear together as one unit. **A.1.1 Colour specifications**

The Eskom logo shall appear in the Eskom corporate blue or in black. The Eskom corporate blue is as follows:

Pantone 287C

100%C + 70%M + 0%Y + 10%K

A.1.2 Relationship between the logo circle ("circle") and the logo word (the word "Eskom")

The relationship between the logo circle ("circle") and the logo word (the word "Eskom") shall always be followed as indicated in the graphic. The measurement between the logo circle ("circle") and the logo word (the word "Eskom") is twice the line-width of the "circle".

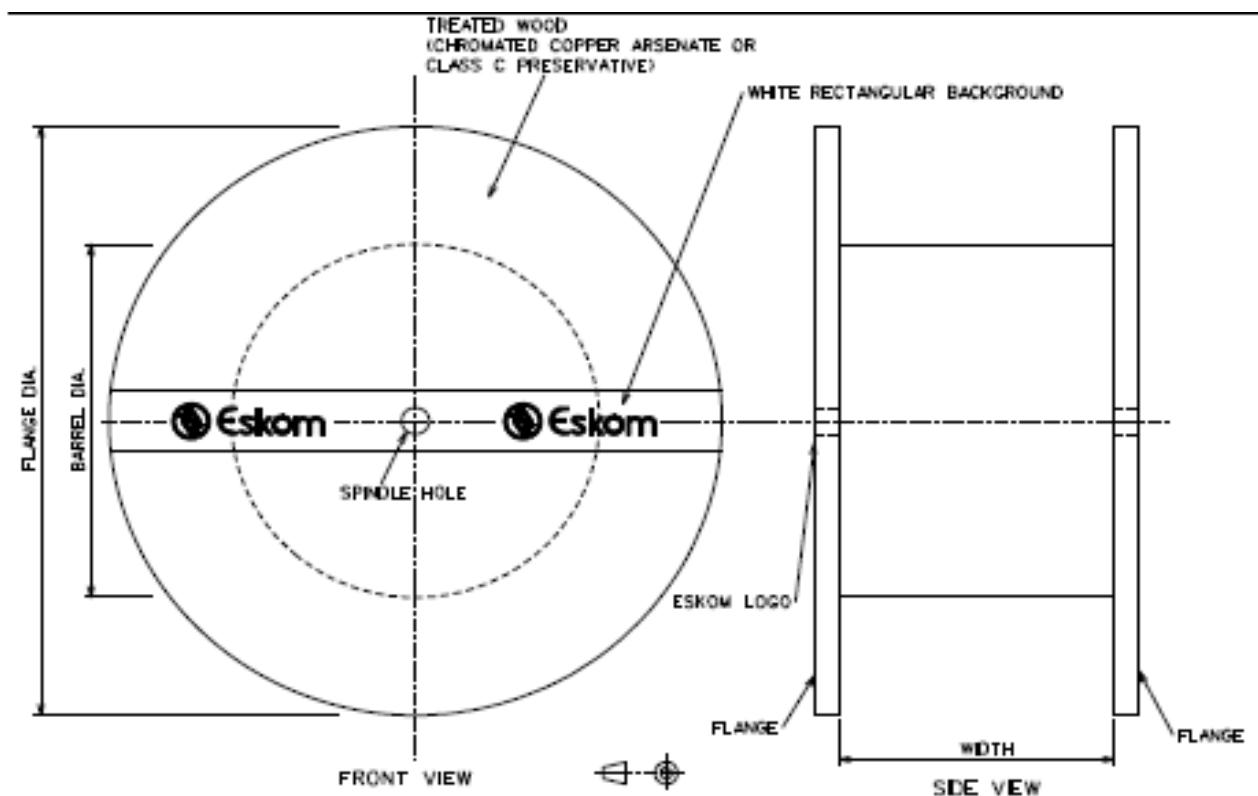


Figure A.1 – Typical wooden drum showing Eskom logo branded flange

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Figure A.2: The Eskom logo format

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Technical schedules A and B

for a

600/1000 V power cable

Schedule A: Purchaser's specific requirements

Schedule B: Guarantees and technical particulars of equipment offered

Item	Subclause of DSP 34-1048	Description	Schedule A	Schedule B
1		Standard Buyers guide drawing		XXXXXXXXXX
2		Symmetrical fault level kA		XXXXXXXXXX
3		Earth fault level kA		XXXXXXXXXX
4	4.2.1	Cable mm ²		XXXXXXXXXX
5		Diameter over insulation mm	XXXXXXXXXX	
6		Diameter over sheath mm	XXXXXXXXXX	
7	4.2.3.1	Number of cores		XXXXXXXXXX
8	4.2.5.1	Single Core Armour Al or Unarmoured		XXXXXXXXXX
9	4.2.7	Field Performance Reduced Harmonic emission		XXXXXXXXXX
10	4.3.1	Total length required m		XXXXXXXXXX
11		Drum length required if other than that specified in 4.3.1 m		XXXXXXXXXX
12	5.2	Is conductor identification system details supplied with tender? Yes/No	XXXXXXXXXX	
	5.2.3	Does the conductor marking comply with the requirements of 5.2.3? Yes/No	XXXXXXXXXX	

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Enquiry No.: Tenderer's name:

Project Name: Date:

Item	Subclause of DSP 34-1048	Description	Schedule A	Schedule B
13	5.2.3.9	Font size for conductor marking mm characters	xxxxxxxxxx	
	5.2.3.9	Magnification factor required to read font size for conductor marking Factor characters	xxxxxxxxxx	
	5.3	Is marking of cable identification system details supplied with tender? Yes/No	xxxxxxxxxx	
	5.3.3	Does the cable identification system comply with the requirements of Yes/No 5.3.3?	xxxxxxxxxx	
	5.3.1	Cable identification system location	xxxxxxxxxx	
	5.3.3.9	Font size for the cable identification mm system characters	xxxxxxxxxx	
14	5.6	Catalogue supplied with tender? Yes/No		xxxxxxxxxx
15	6	Certified copy of type tests to be provided with tender documentation? Yes/No		xxxxxxxxxx

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Enquiry No.: Tenderer's name:

Project Name:

Technical schedules A and B for a 600/1000 V power cable Deviation schedule

Any deviations offered to this specification shall be listed below with reasons for deviation. In addition, evidence shall be provided that the proposed deviation will at least be more cost-effective than that specified by Eskom.		
Item	Clause	Proposed deviation

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