

Title: **STANDARD FOR CONCENTRIC SERVICE CABLE WITH COMMUNICATION CORES, TINNED COPPER AND COATED STEEL** Unique Identifier: **240-61704085**

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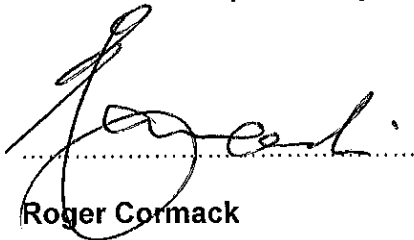


Riaz Asmal

MV/LV Study Committee Chairman

Date: 20/8/2013

Functional Responsibility

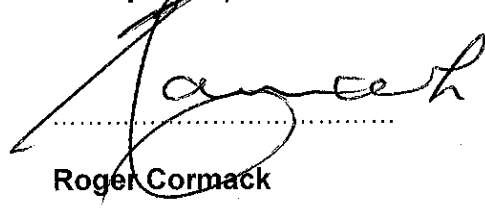


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Foreword

Not applicable.

Revision history

This is a new document.

Date	Rev.	Compiled By	Clause	Remarks
Aug 2013	0	J Maudu	Clause no.	First issue.

Acceptance

This document has been seen and accepted by:	
Name	Designation
P Moyo	Power Delivery Engineering GM
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This standard shall apply throughout Eskom Holdings Limited, its divisions, subsidiaries and entities wherein Eskom has a controlling interest.

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Introduction

This specification covers requirements for the tinned copper and coated steel concentric type of service cable to connect customers to the low voltage reticulation system and to enable the purchaser to acquire the cable without the need for detailed and extensive contract documents.

The preceding specification is DSP 34-2023 concentric cable with communication cores for split metering.

The design shall address issues of contact between wires and fusing of individual strands.

Mechanical strength of the cable is addressed by steel galvanised steel wires as gap fillers.

Tinning of copper is required to ensure corrosion compatibility between steel and copper.

Tinning and mixed metals might reduce theft by:

- Mimicking an Al cable
- Contaminate metallurgical meltdown of stolen cable

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Keywords

Insulation; service cable; single-phase; concentric cable, galvanised steel wire, tinned copper wire; conductor and current rating.

Bibliography

The following document, in addition to those listed in the specification, was a source of reference in compiling this specification. It does not constitute provisions of this specification but is referenced for further information.

IEC 50:1984, *International Electrotechnical Vocabulary (IEV) - Chapter 461: Electric cables.*

1 Scope

This specification specifies Eskom's requirements for the manufacture and supply of 8mm² concentric service cable for nominal system a.c. voltages up to and including 1kV. It is intended for use in overhead, single-phase connections to a customer's installation, but it may also be installed underground. There are two communication cores included in the design.

2 Normative references

Parties using this document shall apply the most recent edition of the documents listed below (list the references below):

International document(s):

For the purpose of this specification, the references given in SANS 1507-6 will apply.

South African National document(s):

SANS 1507-1

SANS 1411-1

SANS 1411-6

Eskom National document(s):

None

Eskom Divisional documents(s):

None

3 Definitions and abbreviations

3.1 Definitions

For the purpose of this specification, the definitions (for terms not given below) and abbreviations given in SANS 1507-1 shall apply.

NOTE: The terms used in this specification are generally consistent with the definitions given in the International Electrotechnical vocabulary (IEV) (see annex C)

binder: A layer incorporated in a cable with the specific functions of holding the components within the layer together.

breaking load: The tensile load applied during testing, when the cable finally breaks or becomes permanently deformed.

compacted conductor: A stranded conductor in which the interstices between the component wires have been reduced by mechanical compression or by drawing.

concentric cable: A cable consisting of a central phase core surrounded by a concentrically applied layer of strands, comprising the neutral/earth conductor.

conductor: A part of a cable which has the specific function of carrying current.

current rating: The rated normal current of a cable is the r.m.s. value of current that the cable can carry continuously under the specified conditions of use and behaviour.

insulation: Insulating materials incorporated in a cable with the specific function of withstanding voltage.

stranded conductor: A conductor consisting of a number of individual wires, all or some of which generally have a helical form.

UV stabilized: Modified by methods to withstand ultraviolet radiation.

3.2 Abbreviations

XLPE: Cross-linked polyethylene

GSW: Galvanised steel wire

TCU: Tin coated copper wire

4 Requirements

4.1 General

4.1.1 The cable shall comply with this specification and SANS 1507-6.

4.1.2 The GSW strands shall comply with this specification and SANS 1411-6.

4.1.3 The TCU strands shall comply with this specification and SANS 1411-1

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4.2 Construction Requirements

4.2.1 Conductor

4.2.1.1 The central conductor of the cable referred as the phase or live conductor see figure 1 for a typical construction shall consist of 6 circular tin coated copper strands and 1 galvanised steel wire. The tin coated copper strands and GSW shall be a similar diameter.

4.2.1.2 The phase conductor nominal cross-sectional (excluding the GSW) area shall be 8 mm²

4.2.1.3 The central insulated core shall be surrounded by:

- an equal number of GSW and TCU strands and
- two insulated copper communication cores.

4.2.1.4 The neutral/earth strands must be in a single layer and in continuous physical contact with each other at all times.

4.2.2 Insulation

4.2.2.1 The core insulation of the conductor shall be red UV stabilized XLPE type B that complies with the requirements of SANS 1411-4.

4.2.2.2 The concentric assembly shall be enclosed in a black sheath of a weather stabilized grade polyethylene that complies with material type PD1 in accordance with SANS 1411 - 7. A black sheath shall have a single line ridge.

4.2.2.3 A ripcord laid under the sheath shall be provided for stripping of the cable.

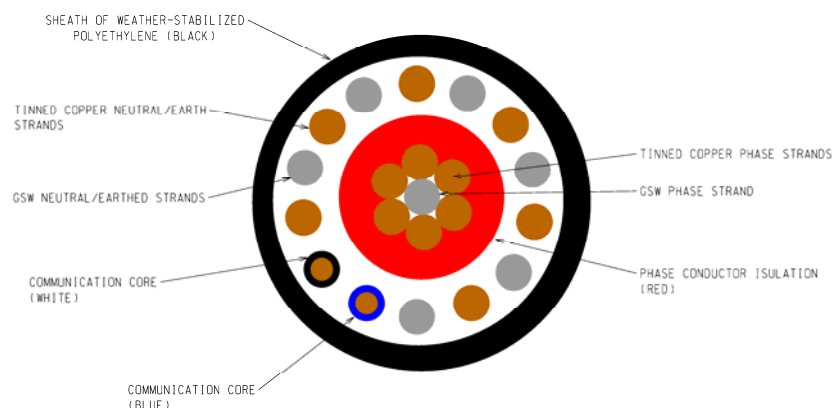


Figure 1: Typical construction: Concentric service cable with communication cores and GWS

4.3 Dimensions

The cable shall comply with the following overall diameters:

- Minimum – 10.7mm
- Maximum – 12.0mm

4.4 Mechanical requirements

4.4.1 When a cable is tested in accordance with 5.1.2, there shall be no signs of distortion or cracking of the insulation or sheath.

4.4.2 When a cable is tested in accordance with 5.3.1 the slippage of the outer sheath with respect to the commercial clamps specified shall comply with the following requirements:

slippage after 15 minutes at 0,7 kN	$S_1 \leq 2\text{mm}$
slippage after 1 hour at 1,0 kN	$S_2 \leq S_1 + 3\text{mm}$

4.5 Electrical requirements

4.5.1 When tested in accordance with SANS 1411-1 the resistance of the phase and neutral conductors (including the GSW) at 20 °C shall not exceed 2.4 Ω/km.

4.5.2 The continuous current rating in air at 30°C shall be not less than 60A when the phase conductor is at 90 °C.

4.5.3 The continuous current rating of the cable when installed in air at 30°C and when installed, underground at 25°C shall be stated in Schedule B.

5 Tests

5.1 Type tests

5.1.1 General

For the purpose of this specification the type tests of the cable given in SANS 1507-6 shall apply.

The type tests shall be performed by the manufacturer or a recognized test authority approved by the purchaser. If a previous report on an identical cable has been produced, a copy of this report may be submitted.

If any changes in the cable design are made, such as change of conductor type, change of insulation thickness, change of conductor diameter or change of insulation material, then the type test shall be repeated.

5.1.2 Bending radius

Carefully bend the sample around a mandrel of diameter equal to eight times the diameter of the cable, carefully bend a cable sample around the mandrel to make a 180° turn and check for compliance with 4.4.1.

5.2 Routine tests

The Routine tests shall be performed on each completed cable drum and complied with SANS 1507-6.

5.3 Sample tests

The Sample tests shall comply with SANS 1507-6.

NOTE: It is intended that the sample tests be conducted at the manufacturer's works on a regular basis.

5.3.1 Adherence of cable sheath to concentric layer test

Conduct the tests at an ambient temperature between 10°C and 30°C and at a humidity of less than 80%.

5.3.1.1 Test procedure

- Mount a reference clamp and a commercially available clamp on opposite ends of a section of service cable of length about 4m, at least 2m apart.
- Apply a steady increasing load (in Newton) up to a value of 0,7kN onto the cable and allow it to settle for a period of 5 minutes.
- Mark the cable at the inner end of the commercial clamp so that any slippage of the cable sheath over the concentric layer is measurable.
- Maintain the tension on the cable at a constant load of 0,7kN for 15 minutes.
- Mark the cable at the inner end of the commercial clamp and record the slippage.
- Increase the load steadily to 1,0kN.
- Maintain the tension on the cable at a constant 1,0kN load for 1 hour.
- After the 1 hour has elapsed, mark and record the slippage from the 0,7kN point.

6 Marking, labeling and packaging

- a) The requirements of section 5 of SANS 1507 shall apply.
- b) If so specified in Schedule A, the outer sheath of the cable shall be sequentially marked at 1 m intervals. Lengths of cable may be wound on drums, commencing at any sequential mark. The "start" and "finish" lengths of sequential marking shall be shown on the drum label in those instances where the start is not zero.
- c) The year of manufacture shall be indicated. The method of indication shall be an embossed mark or colour coded thread.

d) Unless otherwise specified in Schedule A the standard length of supply shall be:

cable size (mm ²)	supply length (m)
8	500

Annex A - Miscellaneous information for purchasers (Informative)

A.1 Schedules A and B

The schedules A and B in annex B are included in this document for information only: they are intended to be guides to purchasers, in the areas of format and Eskom's specific technical requirements, to help them to prepare schedules which are applicable to a particular enquiry or tender.

A.2 Commercial conditions

A purchaser will need to indicate the commercial conditions applicable and draw up a price schedule. Requirements for delivery, storage, packing and marking should be attended to in this part of the enquiry.

A.3 Quality assurance

The specification requires the manufacturer to comply with either:

- Eskom EVS 005
- SABS ISO 9000 listing
- An Eskom approved Quality Assurance system

A.4 Testing

Attention should be paid to the subject of tests and the related costs. Type and routine tests should be carried out by an Eskom approved party and tenderers should be requested to provide assurances on this point. Price schedules should be so drawn up and covering letters so worded that the costs of all services such as tests, delivery and spares are declared and allowed for in the tender.

A.5 Revisions of standards used as normative references

This specification, as has been indicated, is based on a set of defined standards which may have been revised or amended. It may be expected that most purchasers would in principle wish to employ the latest standards. It is recommended that an approach to this question be to secure an undertaking from a supplier to review the latest versions and amendments and incorporate these where possible and agreeable to both parties. A blanket commitment to work to the "latest" versions of standards creates risks for both parties and should be properly assessed. This invariably cannot be done in the time available.

Annex B - Model Form for Schedules A and B
(Continued)

Model form for schedules A and B

Schedule A: Eskom’s specific requirements

Schedule B: Guarantees and technical particulars of equipment.

1	2	3	4	5
Item	Sub clause of this document	Description	Schedule A	Schedule B
1		Quantity of cable required		
2		Approximate length per drum	xxxx	
3		Approximate mass per drum	xxxx	
4	4.2.1	Phase core		
		- Material	xxxx	
		- size; mm ²	8	
		- no of Copper strands	6	
		- no of GSW	1	
		- size of Copper strands; mm ²	xxxx	
		- size of GSW strands; mm ²	xxxx	
		Insulation material	XLPE	
	4.2.1	Insulation thickness	xxxx	
		Tolerance mm ±	xxxx	
	4.5	Resistance at 20°C	xxxx	
		Ω		
5	4.2.1	Neutral earth conductor		
		Size of copper strands; mm ²	xxxx	
		Size of GSW strands; mm ²	xxxx	
		Material	xxxx	
		Number of Copper stands	xxxx	
		Number of GSW strands	xxxx	
6	4.3	Thickness of outer sheath	xxxx	
		mm		
7	4.3	Overall diameter of cable	xxxx	
		mm		
		Tolerance mm ±	xxxx	
8		Nominal mass of cable	xxxx	
		kg/km		
9	4.4	Minimum bending radius of cable	xxxx	
		mm		

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10	4.5	Continuous current rating at 90°C - in air at 30°C A - underground at 25°C A	xxxx	
11	4.5	Dielectric resistance at 20°C MΩ.km	xxxx	
12		Sequential marking on cable and length marking shown on drum label	Yes / No	
	5	Did the cable pass the adherence of sheath to concentric layer test	xxxx	
13	6	Method of indication on cable	xxxx	
14		Does the cable comply fully with this specification, If not, state exceptions	xxxx	

Annex C - Impact assessment (Normative)

Impact assessment form to be completed for all documents.

1 Guidelines

- All comments must be completed.
- Motivate why items are N/A (not applicable)
- Indicate actions to be taken, persons or organisations responsible for actions and deadline for action.
- Change control committees to discuss the impact assessment, and if necessary give feedback to the compiler of any omissions or errors.

2 Critical points

2.1 Importance of this document. E.g. is implementation required due to safety deficiencies, statutory requirements, technology changes, document revisions, improved service quality, improved service performance, optimised costs.

Safety deficiencies and technology changes.

2.2 If the document to be released impacts on statutory or legal compliance - this need to be very clearly stated and so highlighted.

N/A

2.3 Impact on stock holding and depletion of existing stock prior to switch over.

Existing stock will still be used.

2.4 When will new stock be available?

Soon as the this document is published.

2.5 Has the interchangeability of the product or item been verified - i.e. when it fails is a straight swop possible with a competitor's product?

Yes

2.6 Identify and provide details of other critical (items required for the successful implementation of this document) points to be considered in the implementation of this document.

N/A

2.7 Provide details of any comments made by the Regions regarding the implementation of this document.

None

Annex C
(continued)

3 Implementation timeframe

3.1 Time period for implementation of requirements.

N/A

3.2 Deadline for changeover to new item and personnel to be informed of DX wide change-over.

No deadline.

4 Buyers Guide and Power Office

4.1 Does the Buyers Guide or Buyers List need updating?

Buyer's guide to be created

4.2 What Buyer's Guides or items have been created?

New buyer's guide to be created

4.3 List all assembly drawing changes that have been revised in conjunction with this document.

N/A, new document

4.4 If the implementation of this document requires assessment by CAP, provide details under 5

4.5 Which Power Office packages have been created, modified or removed?

None

5 CAP / LAP Pre-Qualification Process related impacts

5.1 Is an ad-hoc re-evaluation of all currently accepted suppliers required as a result of implementation of this document?

No

5.2 If NO, provide motivation for issuing this specification before Acceptance Cycle Expiry date.

New specification

5.3 Are ALL suppliers (currently accepted per LAP), aware of the nature of changes contained in this document?

N/A

Annex C

(continued)

5.4 Is implementation of the provisions of this document required during the current supplier qualification period?

N/A

5.5 If Yes to 5.4, what date has been set for all currently accepted suppliers to comply fully?

N/A

5.6 If Yes to 5.4, have all currently accepted suppliers been sent a prior formal notification informing them of Eskom's expectations, including the implementation date deadline?

N/A

5.7 Can the changes made, potentially impact upon the purchase price of the material/equipment?

Yes

5.8 Material group(s) affected by specification: (Refer to Pre-Qualification invitation schedule for list of material groups)

Tinned copper and Galvanised steel wire

6 Training or communication

6.1 Is training required?

No

6.2 State the level of training required to implement this document. (E.g. awareness training, practical / on job, module, etc.)

N/A

6.3 State designations of personnel that will require training.

N/A

6.4 Is the training material available? Identify person responsible for the development of training material.

N/A

6.5 If applicable, provide details of training that will take place. (E.G. sponsor, costs, trainer, schedule of training, course material availability, training in erection / use of new equipment, maintenance training, etc).

N/A

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Annex C
(continued)

6.6 Was Technical Training Section consulted w.r.t module development process?

N/A

6.7 State communications channels to be used to inform target audience.

Through Operating Units

7 Special tools, equipment, software

7.1 What special tools, equipment, software, etc will need to be purchased by the Region to effectively implement?

None

7.2 Are there stock numbers available for the new equipment?

To be created.

7.3 What will be the costs of these special tools, equipment, software?

8 Finances

8.1 What total costs would the Regions be required to incur in implementing this document? Identify all cost activities associated with implementation, e.g. labour, training, tooling, stock, obsolescence

Comment:

.....
.....
.....

Impact assessment completed by:

Name: Jutas Maudu

Designation: Senior Engineer