

 Eskom	Standard	Technology
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Title: RTV SILICONE RUBBER
INSULATOR COATING AND
SHED EXTENDER SUPPLIER
STANDARD

Unique Identifier: 240-56062705

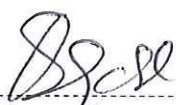
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COE Acceptance

DBOUS Acceptance




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Date: 16/8/2019

Date: 21/08/2019

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1	A specific plant, project or solution	
2	A mature and stable technical area/technology	
3	Established and accepted practices.	x

This letter is for multiple Terms of Reference documents that need to be Stabilized:

PCM Reference: <xxxxxx>

SCOT Study Committee Number/Name: <Number or name>

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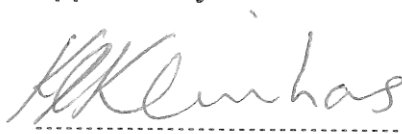
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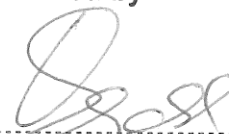
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Date: 6/2/2017

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Date: 6/2/2017

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1. Introduction

This specification outlines the requirements for room temperature vulcanized (RTV) silicone rubber coatings and shed extenders for application on ceramic HV equipment insulation in Eskom substations for the purpose of upgrading and hence improving their pollution performance.

2. Supporting Clauses

2.1 Scope

2.1.1 Purpose

This specification sets out Eskom's minimum requirements for RTV silicone rubber insulator coatings and shed extenders for application on ceramic insulation in Eskom substations.

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 below (list the references below):

2.2.1 Normative

- [1] International document(s):
- [2] IEC 60815, "Guide for the Selection of Insulators in Respect of Polluted Conditions".
- [3] IEC 62073, "Guidance on the Measurement of Wettability of Insulator Surfaces".
- [4] Eskom Divisional documents(s):
- [5] 240-56063877, "RTV Silicone Rubber Insulator Coating and Shed Extender Application Specification", Eskom Transmission.

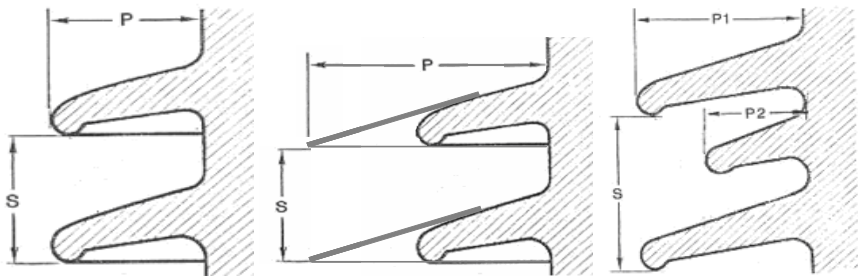
2.2.2 Informative

None

2.3 Definitions

2.3.1 General

Definition	Description
Arcing distance	Shortest distance in air external to the insulator between metallic parts which normally have the operating voltage between them. Note: The term "dry arcing distance" is also used.
Creepage distance	The shortest distance, or sum of the shortest distances, along the surface of an insulator between those parts which normally have the operating voltage between them. Note: Only the insulating dielectric should be measured (end fittings are excluded).
Creepage factor	Is the creepage distance divided by the arcing distance of the insulator.

Definition	Description
Hydrophobicity	Relates to the wettability of an insulating surface. Hydrophobic and hydrophilic describe the two extreme levels of wettability of a surface by water. A hydrophobic surface has low surface tension and is water-repellent. The opposite of this is a hydrophilic surface, which has a high surface tension and is thus wetted by water (in the form of a film). The actual wetting appearance on the insulator is identified according to one of seven wettability classes (WC 1 to WC 7), as per IEC 62073.
Insulator	A device intended for electrical insulation and mechanical fixing of equipment or conductors which are subject to potential differences.
Insulator Set	An assembly of one or more insulator strings suitably connected together, complete with fixing and protective devices as required in service.
Intershed spacing-to-projection ratio	<p>Defined as the ratio of S/P, where: P, P1, P2 = Shed projection and represents the horizontal distance measured from the rod to the end of the shed. S = Shed spacing, which is the vertical distance between two similar points of successive sheds.</p>  <p>Figure 1: Insulator Shed Parameters</p>
Room Temperature Vulcanised (RTV) silicone rubber insulator coating	A hydrophobic (water repellent) compound system which typically consists of a base silicone polymer, alumina trihydrate or alternative fillers for increased tracking and erosion resistance, a catalyst, reinforcing filler or a pigment and a cross linking agent.
Shed extender	A polymeric disc-shaped device which is attached to the perimeters of an insulator shed, thus changing the profile and creepage distance of the insulator.
Specific creepage distance (mm/kV)	The specific creepage distance is defined as the total creepage distance divided by the highest phase to phase system voltage (U_{max}).
Unified creepage distance (mm/kV)	The unified creepage distance is defined as the total creepage distance divided by the highest phase to earth system voltage (U_{max}).

2.3.2 Disclosure Classification

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

2.4 Abbreviations

Abbreviation	Description
HV	High Voltage
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
QITP	Quality Inspection Test Plan
RTV	Room Temperature Vulcanized
SCD	Specific Creepage Distance
USCD	Unified Specific Creepage Distance

2.5 Roles and Responsibilities

Not applicable.

2.6 Process for monitoring

Not applicable.

2.7 Related/Supporting Documents

Not applicable.

3. RTV Silicone Rubber Insulator Coating and Shed Extender Supplier Standard

3.1.1 Substation – Insulation Evaluation/Site Severity Assessment by Eskom

The following information, specific to each substation where insulation is to be upgraded, shall be supplied to the product supplier by Eskom for tender purposes. This will be done in accordance to IEC 60815 and the insulation assessment checklist (see Addendum). Items to be noted per insulator product include:

- a) Photograph and/or drawing of each insulator product to be upgraded
- b) Condition of existing insulator surface
- c) Insulation material
- d) Shed profile
- e) Creepage distance
- f) Dry arcing distance
- g) Diameter of insulator trunk and sheds
- h) Surface area of insulator (to be calculated by supplier)
- i) Intershed spacing
- j) Shed projection
- k) Site severity pollution level of substation (if previously measured)

3.1.2 Product Approval

- a) Only RTV silicone rubber coatings and shed extenders that have been technically evaluated by Eskom are permitted for use.
- b) Suppliers shall provide proof, in the form of a test certificate, that their products have been tested in accordance with IEC 587 Class 1A 4.5.
- c) Eskom reserves the right to perform in-house testing using its test facilities as part of product evaluation.
- d) Suppliers shall provide Eskom with information on the service experience of their products. Information supplied as such shall be verifiable. Therefore, suppliers shall supply Eskom with the names and contact details of utilities where their products have been applied.

3.1.3 Shed Extenders

- a) The need for shed extenders shall be determined by the supplier on the basis of information supplied to him by Eskom for tender purposes. The quantity and placement of shed extenders must be such that the Eskom required minimum creepage distance is attained, and comply with all the requirements as stipulated in IEC 60815 and Section 2.4 of 240-56063877. The position of the shed extenders shall be indicated in the applicator's QITP.

Note: The insulator with installed shed extenders shall fully comply with IEC 60815. However, a minimum shed spacing to projection ratio of 0.5 and a maximum creepage factor of 4 will be accepted.

- b) The entire porcelain and shed extender surfaces need to be coated with an Eskom approved RTV silicone rubber coating.

3.1.4 Application of RTV Silicone Rubber Coatings and Shed Extenders

In addition to the requirements herein, the applicator is to apply the guidelines as outlined in 240-56063877. The position of all shed extenders shall be approved by Eskom prior installation

- a) Prior to application of an RTV silicone rubber coating onto a ceramic insulator, the surface must be cleaned and de-greased with a suitable de-greaser. The de-greasing material used should be an environmentally friendly product and should have the following characteristics:
 - Non-corrosive
 - Should not leave a conductive layer on the insulator surface
 - Should not damage the insulator surface and surrounding hardware
- b) After cleaning, the insulators must be rinsed thoroughly to ensure no conductive residue remains on the surface.
- c) Cleaning and degreasing agents used should not damage the porcelain, metalware, galvanising or cementing materials.
- d) Cleaning should include removal of all conductive contaminants and loose material on the ceramic surface.
- e) All surfaces are to be RTV silicone rubber coated including the breaker chamber porcelains of circuit breakers.
- f) RTV silicone rubber coating shall be applied by supplier accredited persons, in accordance with supplier specifications.
- g) Shed extenders, where necessary, shall be installed by supplier accredited persons according to the manufacturer's installation procedure.

3.1.5 Life Expectancy

The life expectancy for both the RTV silicone rubber coating and shed extenders, where applicable, should be 15 years.

3.1.6 Tests

- a) Hydrophobicity test
- b) Coating Thickness test

3.2 Marking, labelling and packaging

None

3.3 Spares

None

4. Authorisation

This document has been seen and accepted by:

Name and surname	Designation
	This Document has been approved by TDAC ROD 13 February 2013
B Ntshangase	Senior Manager PDE – HV
F Witbooi	Chief Technologist
K Kleinhans	Chief Engineer

5. Revisions

Date	Rev	Compiler	Remarks
Feb 2017	2	K. Kleinhans	Draft Document for Review created from TSP 41-223
June 2013	1	K. Kleinhans	Final Document for Publication

6. Development team

The following people were involved in the development of this document:

- Kevin Kleinhans Technology
- Lester Geldenhuis Transmission
- Dr Wallace Vosloo Resources and Strategy Division
- Raphael Swinny Resources and Strategy Division

7. Acknowledgements

Not applicable.

Annex A – : Schedule A/B: Details of Eskom's Technical Requirements

Item number	Description	Schedule A Eskom's minimum requirements	Schedule B Equipment Guarantees and Particulars.
1.	Coating		
1.1	Coating material	Silicone based	
1.2	Minimum coating thickness (dry)	0.3mm	
2.	Shed extenders (if required)		
2.1	Shed material	Silicone based	
2.2	Shed profile	Aerodynamic	
2.3	Minimum shed thickness	3mm	
2.4	Adhesive material	Silicone based	
3	Degreasing material (if required)	Eskom approved (toluene), compliant with SABS 1365	
4	Primer material (if required)	Spraying preferred.	
5	Method of application of coating	WC 1	
6	Hydrophobicity (IEC 62073)		
7	Cleaning of existing insulation		

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Annex B – : Substation Insulation Assessment Checklist

Addendum: Substation Insulation Assessment Checklist (checklist to be completed for each insulator component of the HV equipment, where applicable)

Substation Insulation Assessment Checklist	
Substation	
Bay	
Phase (R, W or B)	
Equipment / item	
System maximum voltage (U _{max}) (kV)	
Insulator component type	
Number of insulator components in series per phase (Insulator Set)	
Material	
Condition of insulator surface	
Creepage from top to first shed (mm)	
Creepage per shed pair (mm)	
Number of shed pairs per insulator component	
Creepage from bottom to last shed pair (mm)	
Creepage distance (mm) per insulator component	
Total creepage distance (mm) of insulator components in series per phase	
Dry arcing distance (mm) per insulator component	
Total dry arcing distance (mm) of insulator components in series per phase	
Alternating sheds (Yes/no)	
Under ribs present (Yes/no)	
Number of Large sheds	
Large shed projection (mm)	
Large shed circumference (mm)	
Number of small sheds	
Small shed projection (mm)	
Small shed circumference (mm)	
Large shed spacing (mm)	
Minimum distance between sheds (mm)	
Large shed spacing to large shed projection ratio	
Trunk diameter Top (mm)	
Trunk diameter Bottom (mm)	
Site pollution severity level (if measured)	
Additional comments:	
Name:	Signature:
Date:	

Note: The above checklist is an example for typical insulator types and does not cover insulators with barrel or beehive shapes, nor non-consistent tapers or varying shed projections.