

 Eskom	Standard	Technology
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Title: **OUTDOOR POST AND LONG
ROD INSULATORS FOR NEW
AND REFURBISHED POWER
LINES UP TO AND INCLUDING
33KV.**

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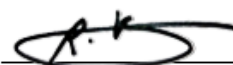


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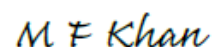


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1. Introduction

This standard has been produced in order to rationalize and achieve maximum standardization of the use of insulators in the Distribution Group.

Certain electrical and mechanical characteristics are fixed in order to achieve standardization. For those parameters, which can be varied, the preferred values are quoted.

It is intended that the insulators specified in this document are used for the construction of all new or refurbished overhead lines. The connecting lengths and end fittings specified are critical and deviation from these and the tolerances provided may result in an offer not being considered unless these have been specifically altered in schedule A of an enquiry document.

The procurement of insulators for maintenance purposes may be achieved using this standard. Insulators for maintenance may not have standard connecting lengths and/or standard end fittings as specified in this standard. In these cases this standard must be used as a basis for most requirements whilst specifying the particular connecting lengths and/or end fittings for the maintenance insulators required in schedule A of an enquiry document.

2. Supporting Clauses

2.1 Scope

2.1.1 Purpose

The purpose of this document is to standardise on the technical requirements relating to outdoor post and long rod insulators for new and refurbished power lines up to and including 33kV.

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 lists.

2.2.1 Normative

- [1] IEC 60437, Radio interference test on high voltage insulators
- [2] IEC 61473, Insulators for overhead lines with a nominal voltage above 1 000 V — AC power arc tests on insulator sets.
- [3] SANS 1019, Standard voltages, currents and insulation levels for electricity supply.
- [4] SANS 61109, Insulators for overhead lines – Composite suspension and strain insulators for a.c. systems with a nominal voltage greater than 1000V – Definitions, test methods and acceptance criteria.
- [5] SANS 61952, Insulators for overhead lines – Composite line post insulators for a.c. systems with a nominal voltage greater than 1000V – Definitions, test methods and acceptance criteria.
- [6] SANS 62217, Polymeric insulators for indoor and outdoor use with nominal voltage > 1000V – General definitions, test methods and acceptance criteria.
- [7] SANS 121 / ISO 1461, Hot dip galvanized coatings on fabricated iron and steel articles – Standards and test methods.
- [8] SANS 60120, Dimensions of ball and socket couplings of string insulator units.
- [9] SANS 60383-1, Insulators for overhead lines with a nominal voltage above 1000 V Part 1 Ceramic or glass insulator units for a.c. systems – Definitions, test methods and acceptance criteria.

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- [10] SANS 60383-2, Insulators for overhead lines with a nominal voltage above 1000 V Part 2 Insulator strings and insulator sets for a.c. systems – Definitions, test methods and acceptance criteria.
- [11] SANS 60471, Dimensions of clevis and tongue couplings of string insulator units.
- [12] SANS 60720, Characteristics of line post insulators.
- [13] SANS 60815, Selection and dimensioning of high-voltage insulators intended for use in polluted conditions. (All parts)
- [14] 240-75906867, Guide for the storage, transport and handling of composite insulators.
- [15] 240-82421511, Standard for maintenance of insulators.
- [16] DST_34-705, Quality requirements for qualified suppliers
- [17] 240-75883140, Standard for spindles and spindles with collar for distribution lines.
- [18] 240-75883164, Humpback split pins for new and refurbished power lines up to 132kV.
- [19] 240-75881756, KIPTS Natural ageing test procedure for outdoor insulator products section 1 – particular requirements for post, long rod and stand-off insulators.
- [20] 240-100495413, KIPTS Natural ageing test procedure for outdoor insulator products section 0 – General requirements.
- [21] 240-75661511, Landing tests for imported porcelain line post and long rod insulators, rated up to 33kV.

2.2.2 Informative

None

2.3 Definitions

2.3.1 General

Definition	Description
Cantilever load	A load applied at the conductor position on the insulator, perpendicular to the conductor, and perpendicular to the longitudinal axis of the insulator. This load is commonly also called “bending load”.
Capped line post insulator	A rigid insulator consisting of one or more insulating parts with metal base, and intended to be mounted rigidly on a supporting structure with the metal base attached by means of a stud or one or several bolts.
Chips, pits or blisters	Surface marks on insulator shed material usually caused during the manufacturing process.
Class A insulator	An insulator or insulator unit in which the length of the shortest puncture path through solid insulating material is at least equal to half the arcing distance.
Delamination	The loss of bonding of fibres to the matrix.
Insulator	A device that provides both electrical insulation and mechanical linkage between live conductor and a structure.
Shed	A projecting portion of the housing intended to increase the creepage distance.
Visual inspection	An inspection carried out by a competent person sufficiently experienced to identify any signs indicating anything detrimental to the insulator’s performance.

2.3.2 Disclosure Classification

Controlled disclosure: controlled disclosure to external parties (either enforced by law, or discretionary).

2.4 Abbreviations

Abbreviation	Description
BIL	Basic Insulation Level – Identical to lightning impulse withstand level.
EPDM	Ethylene Propylene Diene Monomer – A polymeric material used for the manufacture of housings.
KIPTS	Koeberg Insulator Pollution Test Station – Station where all insulation material is tested in relation to the pollution performance as defined in the various KIPTS testing procedures
LIWL	Lightning impulse withstand level
PDE	Power Delivery Engineering
STP	Standard Temperature and Pressure – Standard temperature = 273,15 K and standard atmospheric pressure = 1,013 x 10 ⁵ Pa.

2.5 Roles and Responsibilities

The Distribution Line Insulator Performance Care Group is responsible for maintaining this document.

2.6 Process for monitoring

This document will be reviewed every 5 years or as required.

2.7 Related/Supporting Documents

Not applicable.

3. Requirements

3.1 General

Nothing in this standard shall lessen the obligations of the supplier as detailed in any other documents forming part of a contract. The insulators shall be designed, manufactured and tested as specified herein and in schedule A of an enquiry document.

3.2 Insulator Manufacturer/Supplier

The manufacturer/supplier shall have access to the engineering facilities necessary to provide a technical service and information, advice and after-sales service related to the products under consideration.

The manufacturer/supplier may be requested to provide a list of references indicating the country, name of the customer, system voltage, quantity and year of delivery for substantial previous orders. Comparison of these details with the type of insulator being offered against the enquiry may also be requested. A reference list of technical specialist contact details must be included as part of each reference. This information shall be made available in electronic format.

3.3 Insulator acceptance and tenders

The insulators shall be assessed in accordance with PSCM document (Procurement and Supply Chain Management). The results of the assessment shall be published in a technical bulletin.

The supplier shall be fully responsible for his designs and their satisfactory performance in service. Acceptance by Eskom shall not relieve the supplier of his responsibility for the adequacy of the design, dimensions and details.

Manufacturers' catalogues shall not refer to any product as "Eskom approved". Eskom may only be mentioned as a reference.

3.4 Quality System

Quality assessment of any supplier forms part of the evaluation process. This does not override any quality requirements that are specified in a contract document.

3.5 Samples

Samples of insulators shall be submitted in accordance with the evaluation process. Samples may be retained for future reference. The selection of samples for submission and retention shall be at Eskom's discretion.

3.6 Drawings

An evaluation submission shall include one copy of the general arrangement drawings of the insulator offered. The drawings shall clearly show the following information:

- a) All relevant dimensions and tolerances, including threaded insert. The drawing shall show a section through the insulator showing the dimensions of the hole for the insert;
- b) Detail dimensions of the shed profile. In case of alternating sheds, the detail dimension of the shed pair shall be provided;
- c) Material description, mass and fabrication details;
- d) Mechanical strength and associated mechanical properties;
- e) Electrical properties such as BIL, wet and dry power frequency voltages;
- f) Physical properties such as total creepage distance and arcing distance;
- g) Location and description of product identification and markings;
- h) Supplier product code the drawing belongs to; and
- i) Clear identification of the drawing number and revision. Revision control shall be indicated in the title block of the drawing indicating the changes made from previous revisions.

Note: Only electronic versions of drawings shall be accepted. The drawings shall be non-CAD drawings and shall be converted to a suitable format for easy viewing.

3.7 Insulation material

Only porcelain or silicon rubber insulators will be accepted, the insulation type will be specified in an enquiry document. Only insulators that have passed the requirements of 240-75881756, 240-100495413 and 240-142598739 will be acceptable.

3.8 Minimum creepage distance

The minimum total creepage distance (TCD) requires for the insulators shall be in accordance with Table 1b and Table 1c below. Eskom has standardised in accordance to IEC 60815 as follows:

- a) 20mm/kV for Light to Medium (LM) pollution level zones.
- b) 31mm/kV for Heavy to Very Heavy (HVH) pollution level zones

The specific creepage distance is calculated using the following equation:

$$SCD = \frac{TCD}{U_m} \quad [\text{mm/ kV}]$$

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Where:

TCD = Total Creepage Distance of the insulator [mm]

U_m = System highest voltage [kV]

Note: SANS 60815 defines a unified specific creepage distance (USCD) that uses the maximum phase voltage to define this value. For the purpose of standardisation and to prevent misunderstanding, the USCD shall not be specified by Eskom, but the actual total creepage required by the insulator.

3.9 Electrical, mechanical and physical properties

All insulators shall comply, as a minimum, with the parameters laid out in Table 1 to Table 3. For 11 kV networks, the 22 kV insulator will be used as a standard.

Table 1: Electrical Properties – MV Insulators

Description	22kV	33kV
Rated lightning impulse withstand voltage at STP kV_{peak}	170	200
Rated short duration wet power frequency withstand voltage kV_{rms}	50	70

Note: These values are in accordance with SANS 1019

Table 2: Physical Properties – Longrod Insulators

Description	22kV	33kV
Connecting length mm	450 ± 15	570 ± 15
Long rod end fitting – live end	SANS 60471 16L tongue-	SANS 60471 16L tongue / SANS 60120 ball 16
Long rod end fitting – dead end	SANS 60471 16L clevis -	SANS 60471 16L clevis / SANS 60120 socket 16
Orientation of clevis / tongue	In-line	In-line
Failing load: clevis tongue kN ball / socket kN	40 -	40 120
Minimum creepage distance: LM mm HVH mm	480 744	720 1116
Minimum distance between end fittings mm	220	286
Minimum sheath and shed thickness mm	2,5	3,0

Table 3: Physical Properties – Line Post Insulators**Note:** Typical F-neck is shown in figure 1 and typical trunnion head shown in figure 2

Description		22kV	33kV
Maximum overall insulator length (mm)	F-Neck	400	490
	Trunnion/Tongue	430	520
End fitting – live end		F-Neck, or	F-Neck, or
		Trunnion, or	Trunnion, or
		Tongue	Tongue
End fitting – dead end		M20 Insert	M20 Insert
Minimum base diameter mm		110	110
Failing load:	low strength unit kN	4	4
	High strength unit kN	10	10
Minimum creepage distance:	LM mm	480	720
	HVH mm	744	1116
Minimum base diameter- Porcelain		110	110
Minimum base diameter- Composite		67	67

3.9.1 Shed design

3.9.1.1 Sheds shall have an open aerodynamic profile. Insulator shed profiles shall be designed in accordance with SANS 60815.

3.9.1.2 The insulator shed diameter for all types of MV insulators shall not be greater than 255 mm.

3.9.1.3 Sheds shall be strong enough to withstand the expected handling stresses.

3.9.1.4 In the case of non-ceramic insulators the sheds shall maintain their shape during handling storage and in-service operation.

3.9.1.5 Handling, storage and precautionary installation equipment and information shall be made available for insulator products offered on request.

3.10 Split pins

All split pins employed for end fittings for longrod insulators shall be of the hump back type. This split pin shall be manufactured and tested in accordance with 240-75883164.

3.11 Specific requirements – Longrod insulators

3.11.1 Ceramic Longrod Insulators

The insulators shall be glazed porcelain and shall comply with SANS 60383-1.

The end fittings shall be clevis / tongue fittings in accordance with 2 and be manufactured from ductile or malleable cast iron galvanised to comply with SANS 121 / ISO 1461.

3.11.2 Composite longrod insulators

3.11.2.1 Composite insulators consist of a core, housing (including weather sheds and sheath, where applicable) and metal end fittings.

3.11.2.2 End fittings shall be the galvanized steel crimped type and not the wedge type.

3.11.2.3 The core, which provides the strength, shall be an acid resistant glass fibre reinforced rod.

3.11.2.4 The housing and sheds are the external insulating part of the insulator and provides the necessary creepage distance and shall be in accordance with Table 2.

3.11.2.5 The insulators shall be designed, manufactured and tested in accordance with SANS 61109 with the exception of test of housing: tracking and erosion tests in SANS61109.

3.11.2.6 The insulation material covering the core and forming the sheds shall be in accordance with Table 2

3.11.2.7 The insulator design shall ensure that the core is totally sealed and no part of the core shall be exposed during normal handling and use. The design shall be proven by means of the required design tests.

3.11.2.8 Insulators affected by chips, pits or blisters in any part of the housing, with the exception of sheds, will be rejected. Chips, pits and blisters, if they only affect sheds, as well as scratches and shrink marks will be accepted, provided that each single defective area is less than 25 mm² and its depth less than 1 mm. Moreover the total defective area shall not exceed 0,2 % of the whole composite insulator surface.

3.12 Specific requirements – Line post insulators

3.12.1 The insulators shall be of a material with suitable electrical, mechanical and environmental properties. For composite line post insulators, the material for the live-end fitting shall be manufactured from aluminium or galvanized (malleable) cast iron based on the conductor application. Details of the end-fitting material shall be specified in Technical Schedule A.

3.12.2 Insulators shall be suitable for mounting in the vertical and horizontal planes. Other special arrangements required by Eskom shall be dealt with at the time of the requirement.

3.12.3 Insulators shall be the top groove tie type with an F-neck insulator top with critical dimensions as shown by Figure 1.

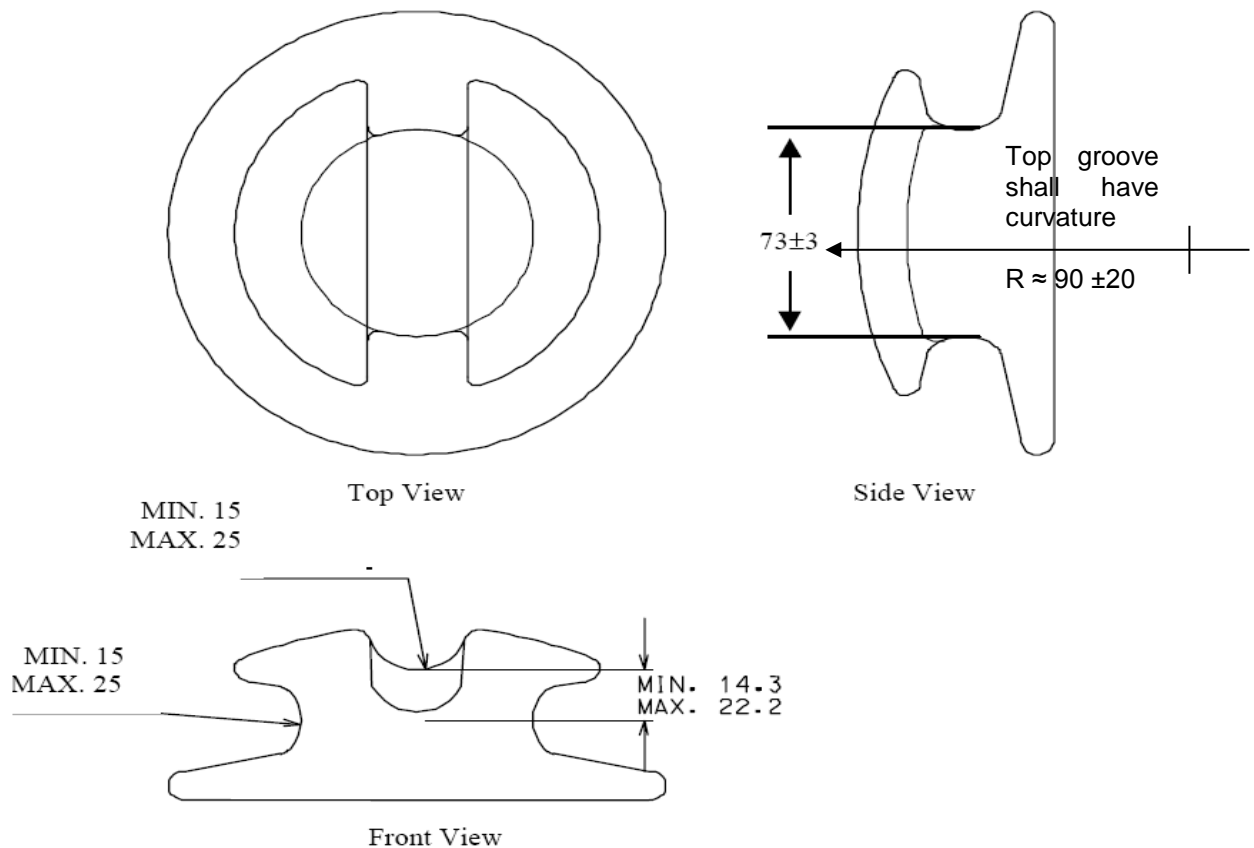


Figure 1: F-Neck dimensions for Line Post Insulators

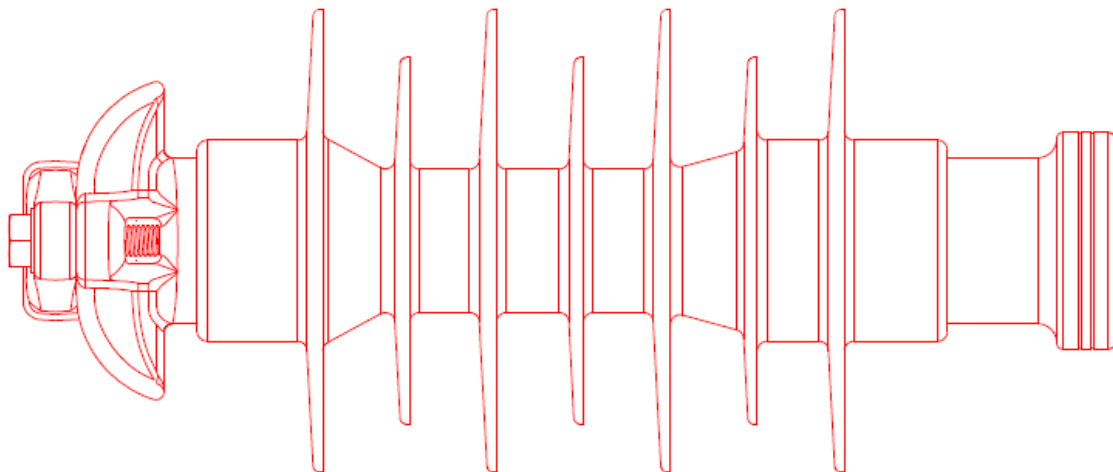


Figure 2: Typical line post insulator with Trunnion head

3.12.4 Post insulators shall have a maximum length and minimum base diameter as specified in Table 3. If these requirements are not met the insulator must pass the cantilever test (given in 240-75883140, Standard for spindles and spindles with collar for distribution lines.) with an accepted spindle.

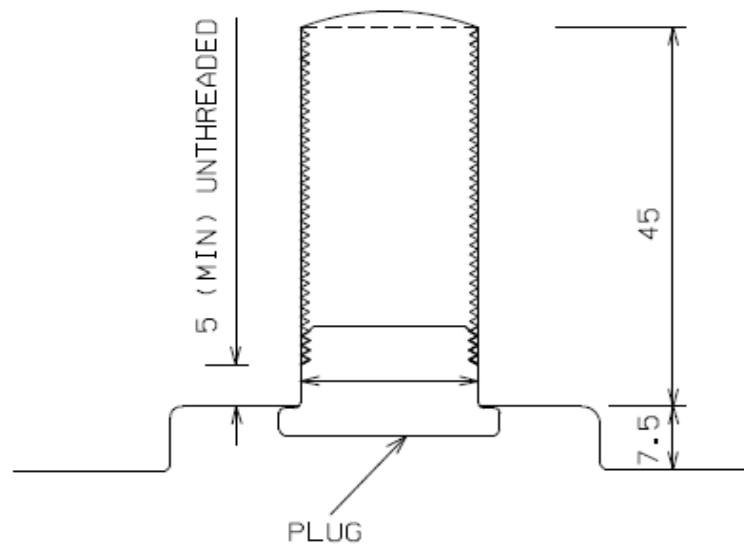


Figure 3: Line post insert

3.12.5 Insulators shall have a M20 oversized female thread, that accepts a rod or spindle compliant with 240-75883140. The recommended length of thread in the insert is 55 mm. The specification for the thread employed for inserts and end-caps shall be M20 x 2,5 (thread pitch) / 6H(class) - 0,38 mm oversize

3.12.6 The female threads of inserts and end-caps shall be coated with an anti-corrosion compound and sealed with a removable cap or plug so that the threads cannot become corroded or the anti-corrosion compound contaminated by sand or other foreign matter.

3.12.7 The external surface of inserts shall be galvanized.

3.13 Identification

3.13.1 The insulator shall be permanently marked with the following information:

- Manufacturer's name or trademark;
- Name and location of the manufacturing premises (only applicable to ceramic insulators);
- Mechanical failing load or specified mechanical load;
- Product code; and
- Batch number.

Note: The information on the insulator shall be that of the manufacturer, irrespective of the supplier / agent supplying the insulator to Eskom.

3.13.2 The markings shall be legible and durable. The markings on sheds or the housing shall remain legible following the relevant tests and during the life of the insulator.

3.13.3 Where markings are mechanically stamped / embossed on the end fittings, it shall be done before galvanising of the end fittings. The markings shall still be clearly readable after galvanising is done.

3.13.4 The batch number may be displayed on a permanently fixed pigeon ring type label on the earth end fitting (clevis or socket end) if this suits the manufacturing process.

3.13.5 For ceramic insulators, the markings shall be a transfer that is fired into the glaze of the top shed.

3.13.6 For composite insulators, the markings shall be indelibly marked, moulded or engraved in or on the material of the insulator or on the end fittings. No removable or stick on labels will be accepted as permanent marking.

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3.14 Packaging

- 3.14.1** Details of the proposed packaging method shall accompany the evaluation offer and shall be subject to Eskom acceptance.
- 3.14.2** The packaging shall protect the insulator from the normal handling that can be expected from the point of dispatch to the point of construction.
- 3.14.3** Any special handling requirements, not covered in 240-75906867, shall be clearly specified in the evaluation offer.
- 3.14.4** The packaging shall be capable of protecting the insulators for sustained periods in storage.
- 3.14.5** The manufacturer/supplier shall notify the purchaser of any special methods recommended for storage.
- 3.14.6** The packaging shall not disintegrate due to any wetting and drying that may occur during the line construction.
- 3.14.7** The transporter shall, at his expense and at Eskom's discretion, replace insulator units that are damaged during transit.
- 3.14.8** The manufacturer/supplier shall, at his expense and at Eskom's discretion, replace insulator units that are damaged due to unsuitable packaging. This includes the chipping of glazed surfaces.
- 3.14.9** If insulators are packed in boxes or crates on pallets, the gross weight of the pallets shall not exceed 1800 kg.
- 3.14.10** Pallets shall be suitable for handling by fork lift trucks, capable of two-way entry and be reversible.
- 3.14.11** All boxes, pallets or containers shall be numbered and marked in accordance with the following example:

Project Name: (if applicable)	Supplier Name
Project Number: (if applicable)	Delivery address
Eskom Purchase Order No:	
Description of material	
Batch number	Crate XX of XXX
Gross mass of packaging (kg)	

Figure 4: Example of Package Label

3.15 Storage, handling and transport

Storage, transport and handling of insulators shall be in accordance with 240-75906867

4. Tests

4.1 General

4.1.1 Manufacturer's testing capabilities

The manufacturer shall be fully responsible for performing or having performed all the required tests as specified. Tenderers shall confirm the manufacturer's capabilities in this regard when submitting tenders. Any deviations shall be clearly stated. The manufacturer shall bear all additional costs related to not being able to test as tendered at their own works.

4.1.2 Witnessing of tests

The purchaser reserves the right to be present at any of the tests specified. The supplier shall ascertain the sequence of tests required in each particular case and whether witnessing of tests is required, and, after completion of all works preliminary tests, shall then give the purchaser not less than 14 days' notice of the firm date when the insulators will be ready for the witnessing of testing. **For overseas suppliers the minimum required notification time period is 12 weeks.**

The purchaser shall be notified as soon as possible of all test failures and corrective measures. This shall take the form of abbreviated reports that shall, upon request, be supported by more detailed reports. It is desirable that the purchaser is notified of test failures to allow in situ inspection if desired.

4.1.3 Test certificates

Test certificates together with the complete test report (in English) shall be supplied to the purchaser in electronic format.

4.1.4 Testing by Eskom

At its discretion, Eskom reserves the right to subject randomly selected insulators that have been delivered to site, to qualifying design tests. The costs of such testing shall be for Eskom's account only for those insulators that pass the tests. However, for the insulators that fail these tests, the cost shall be for the supplier's account. Failure to pass qualifying design tests will result in rejection of all insulators from the supplier, until the problem is satisfactorily resolved.

Note: A condition of acceptance on imported products may be to perform landing routine and sample tests completed in South Africa on each batch imported. These tests are covered in 240-75661511 and must be witnessed by a representative from Distribution's Quality Assurance section. In these cases each batch must obtain a passed landing test in order that the batch acceptance will be reflected on acceptance lists.

4.2 Tests by the Manufacturer

The manufacturer shall perform the required design and type tests as defined by the various SANS product standards as well as special tests as defined in Table 4. The design and type test shall be reviewed during the product evaluation stage.

The manufacturer shall perform the routine and sample tests on units during the various stages of manufacturing as required by the relevant SANS product standards as well as the special routine and sample tests as defines in Table 4.

Table 4: Special test applicability

Insulator Type	Standard	Test Category	Test Description
Longrods – Composite	SANS 61109	Design Test	KIPTS Test (or equivalent)
	SANS 61109	Design Test	Brittle fracture resistance test
Longrods – Ceramic	SANS 60383	Design Test	KIPTS Test (or equivalent)
Line post – Composite	SANS 61109	Design Test	KIPTS Test (or equivalent)
	SANS 61109	Sample Test	Cantilever test
Line post – Ceramic	SANS 60383	Design Test	KIPTS Test (or equivalent)
	SANS 60383	Sample Test	Cantilever test

4.2.1 Special Design Test – Natural ageing and pollution performance testing (KIPTS)

All insulators shall be tested in accordance with 240-75881756 at Koeberg insulator test station. The period of test at KIPTS shall be:

- a) 6 months for Light to Medium Zone insulators; or
- b) 12 months for Heavy to Very Heavy Zone insulators.

Composite insulators subjected to the KIPTS design test need **not** be tested in accordance with Appendix C of SANS 61109.

In the absence of a KIPTS design test, alternative requirements as specified in engineering instruction 240-142598739 may be stated in an enquiry/tender document for consideration.

4.2.2 Special Design Test – Brittle fracture resistance test for longrod insulators

All longrod insulators shall be subjected to the following test as outlined in SANS 61109.

4.2.2.1 Complete an assembled core load time test with container that contains 1n-HNO₃ concentrated acid that is applied at the naked rod.

4.2.2.2 The rod should be held at a minimum of 40 % of mechanical failing load for the duration of the test.

4.2.2.3 The rod should not fail within the 96 hour test duration.

4.2.2.4 The temperature shall be held at 20° ± 5 for the duration of testing.

This test will be accepted for all longrod insulators having the same or thicker core diameter.

4.2.3 Special Sample Test – Cantilever test for line post insulators

The line post insulators shall be mounted on a fixed frame using an Eskom approved insulator spindle manufactured in accordance with 240-75883140. The mechanical load shall be applied on the neck perpendicular to the axis of the insulator and to the axis of the conductor and in the direction of the flat side of the collar. The insulator and spindle system shall withstand 90 % of the mechanical failing load determined in the insulator's type test. Under the applied load, contact of the insulator base with the fixed mounting frame will be permitted. The insulator shall be tested in all four perpendicular directions.

5. Authorisation

This document has been seen and accepted by:

Name and surname	Designation
Amish Roopnarain	Engineer
Jason Blaauw	Senior Engineer
Gavin Strelec	Chief Engineer/ Care Group Chairman
Sanjay Narain	Chief Engineer
Wallace Vosloo	Corporate Specialist
Mohamed Khan	MV & LV Study Committee Chairman
Riaz Vajeth	Senior Manager Lines Engineering Services

6. Revisions

Date	Rev	Compiler	Remarks
Oct 2020	2	Amish Roopnarain	2.4 BIL abbreviation added 3.9 Table 3 – End fitting – live end: add Trunnion as option 3.12 Added Trunnion head drawing to figure 2 4.2.1 Allowance made for alternative tests in the absence of a KIPTS design test, as per engineering instruction 240-142598739.
Feb 2014	1	Gavin Strelec	Document formatted onto new template. New 240-number created which supersedes DSP 34-1677. No content change. Compiler changed from JJ Jordan to Gavin Strelec.
Aug 2009	0	JJ Jordaan	Document revised during normal document revision cycle. Whole doc- Re-arranged the clauses to align with the new TESCO template. Whole doc-Updated all references of old document numbers to the new numbers allocated by PDE. 4.2- Removed requirements for hardcopy information. 4.3- Updated reference of the evaluation process in accordance with the Committee for Accepted Products and the listing on LAP> 4.6- Updated drawing requirements. 4.8-Updated paragraph in relation with changed in calculation for specific creepage distances. Table1- Updated table 1a to 1c. 4.13- Added requirements for insert design. 4.14- Added the additional markings that must be added to the insulator. 5-Updated testing requirements. Removed the interface integrity test from this specification. This test forms part of the SANS design tests.

7. Development team

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

This specification was developed with the inputs from the Distribution Workgroup meeting and insulator suppliers.

This standard was revised in 2020 by Amish Roopnarain, Jason Blaauw and Gavin Strelec.

8. Acknowledgements

Not applicable.

Annex A – Guide for purchasers in preparing an enquiry (Normative)

1) General

The purchaser is provided with a model form as a convenient aid to the purchasing process. The form is intended to obviate the need for preparing a detailed technical standard.

The purchaser needs only specify compliance with this standard, provide the tenderers with details of his/her particular requirements, and set out the information he requires the tenderer to provide, as indicated below.

A model form is provided to assist the purchaser in completing a schedule in which the tenderer is required to declare all deviations between his/her offer and this standard.

2) Schedules

The model form provides the purchaser with examples of schedule A and schedule B. In his/her enquiry, the purchaser should provide his/her own schedule A and schedule B, based on these examples. The schedules attached in this document must be used as a template when a commercial enquiry is issued.

Schedule A

Schedule A lists the requirements to be specified by the purchaser in enquiries and orders. Where the text of any referenced standard stipulates that the purchaser shall indicate his/her requirements, these requirements should also be specified in schedule A.

The purchaser should set out his/her particular requirements and choices in his/her own schedule A.

Schedule B

The purchaser should draw up his/her own schedule B (based on the schedule B in the model form), and require the tenderer to fill in this schedule. By doing this, the tenderer will state compliance with this standard and provide the information the purchaser has requested.

Deviation Schedule

If a purchaser requires a deviation schedule to be completed, he/she should state this in the enquiry standard.

Notes:

- Where this standard allows the purchaser to make a choice, the example of schedule A (in the model form) lists the preferred items/values/quantities. In the interests of standardisation, purchasers are encouraged not to deviate from these preferences.
- When preparing his/her own schedule A and schedule B from the examples in the model form, the purchaser need only include those items that he/she considers to be relevant or necessary.

These schedules, when completed, become normative Appendixes to the enquiry standard.

3) Commercial conditions

The 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.

4) Testing

Attention should be paid to the subject of testing, and the related costs. All design and type test should be carried out by an independent accredited laboratory or test facility. Type tests shall be according to this standard and the type test reports shall not be older than ten years. Price schedules should be drawn up and covering letters should be worded in such a way that the costs of all services (such as tests, delivery and spares) are declared and allowed for in the tender.

Before type tests and routine tests are carried out on samples, the number of samples used and the frequency of sampling should be agreed upon with the supplier.

**Annex B – - Example of Technical Schedules A and B for a MV Long Rod
Insulators in accordance with 240–75883174**

Schedule A: Purchasers specific requirements

Schedule B: Guarantees and technical particulars of equipment offered

1	2	3	4
Item	Description	Schedule A	Schedule B
1	General information		
1.1	<input type="checkbox"/> Purchasing details		
1.1.1	Quantity of units required	Batch order	
1.1.2	SAP No		XXXXXXXXXX
1.2	<input type="checkbox"/> Environmental Conditions		
1.2.1	Ambient air temperature range °C	-15 to +50	XXXXXXXXXX
1.2.2	Maximum diurnal temperature variation °C	30	XXXXXXXXXX
2	Insulator Design		
2.1	<input type="checkbox"/> General		
2.1.1	Manufacturer	XXXXXXXXXX	
2.1.2	Country of origin	XXXXXXXXXX	
2.1.3	Manufacturer's Product Code	XXXXXXXXXX	
2.1.4	Drawing number & Revision number	XXXXXXXXXX	
2.2	<input type="checkbox"/> Electrical Properties		
2.2.1	Highest system voltage (Um) kV		
2.2.2	Lightning impulse withstand voltage @ STP kV peak		
2.2.3	Wet P.F withstand voltage kV r.m.s		
2.2.4	Insulation material	XXXXXXXXXX	
2.2.5	Minimum composite insulation/shed thickness mm		
2.2.6	Shed Profile (Regular / Alternating)	Reg / Alt	
	<u>Shed Design Parameters (SANS 60185):</u>		
2.2.7	- Shortest distance between sheds [c] mm	XXXXXXXXXX	
2.2.8	- Shed overhang [p1] mm	XXXXXXXXXX	
2.2.9	- Shed overhang [p2] (alternating sheds) mm	XXXXXXXXXX	
2.2.10	- Shed type (Plain / Under rib)	Plain / Undrb	
2.2.11	- Vertical desistance between 2 similar points on successive sheds (shed spacing) [s] mm	XXXXXXXXXX	
2.2.12	- Straight air distance between 2 points on sheds [d] mm	XXXXXXXXXX	
2.2.13	- Creepage distance between 2 points on sheds [ld] mm	XXXXXXXXXX	
2.2.14	- Total creepage distance [li] mm		
2.2.15	- Dry arcing distance [Si] mm		
2.2.16	Specific creepage @ Um mm/kV		
2.2.17	Arc ring rating (where applicable)	50kA @ 70ms	

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2.3	<input type="checkbox"/> Mechanical Properties		
2.3.1	Specific Mechanical Load (SML) kN		
2.3.2	Mass of insulator kg	xxxxxxxxxx	
2.3.3	Minimum distance between end-fittings mm		
2.3.4	Connecting length mm		
2.3.5	Hump back split pin compliance (where applicable)	Test Cert No.	
2.4	<input type="checkbox"/> End Fitting Properties		
2.4.1	Live end side		
2.4.2	Earth end side		
2.4.3	End fitting material	xxxxxxxxxx	
2.4.4	Minimum galvanising thickness <input type="checkbox"/> m	105	
2.4.5	Galvanising certificate No	xxxxxxxxxx	
2.4.6	Live to earth end fitting orientation		
2.4.7	Corona-ring on live end required	NO	
3	Documentation (to be submitted with tender)		
	Note: All documentation to be provided in electronic format.		
3.1	<input type="checkbox"/> General		
3.1.1	Outline drawings of insulator Sets	1	
3.1.2	Units used in Republic of South Africa	In tender/offer	
3.1.3	Project reference list, service to Eskom	In tender/offer	
3.2	<input type="checkbox"/> Design Test Reports	Spec Clause	Report Number
3.2.1	Test on interfaces and connections of end fittings (5.1)	SANS 61109	
3.2.2	Assembled core load-time test (5.2)	SANS 61109	
3.2.3	Test on shed and housing material (5.3)	SANS 61109	
3.2.4	Test on core material (5.4)	SANS 61109	
3.2.5	KIPTS natural aging test (5.1.2)	240-100495413	
3.3	<input type="checkbox"/> Type Test Reports	Spec Clause	Report Number
3.3.1	Dry lightning impulse withstand test (6.1)	SANS 61109	
3.3.2	Wet power frequency withstand test (6.2)	SANS 61109	
3.3.3	Mechanical load-time test (6.4)	SANS 61109	
3.3.4	Radio Interference Voltage test ($U_m \geq 145kV$)	IEC 60437	
3.3.5	Power arc test	SANS 61467	

Note: DEVIATION SCHEDULE CONTINUES ON NEXT PAGE.

IF NO DEVIATIONS ARE MENTIONED ON THE DEVIATION SCHEDULE IT WILL BE ACCEPTED THAT THE SUPPLIER AND MANUFACTURER FULLY COMPLIES WITH THE REQUIREMENTS OF THE ESKOM STANDARDS(S).

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	Description of Deviation

SIGNATURES

Supplier

Name (Print)

Sign

Date

Manufacturer

Name (Print)

Sign

Date

Eskom

Name (Print)

Sign

Date

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**Annex C – Example of Technical Schedules A and B for a MV Line Post
Insulators in Accordance with 240–75883174**

Schedule A: Purchasers specific requirements

Schedule B: Guarantees and technical particulars of equipment offered

1	2	3	4
Item	Description	Schedule A	Schedule B
1	General information		
1.1	<input type="checkbox"/> Purchasing details		
1.1.1	Quantity of units required	Batch order	
1.1.2	SAP No		xxxxxxxxxx
1.2	<input type="checkbox"/> Environmental Conditions		
1.2.1	Ambient air temperature range °C	-15 to +50	xxxxxxxxxx
1.2.2	Maximum diurnal temperature variation °C	30	xxxxxxxxxx
2	Insulator Design		
2.1	<input type="checkbox"/> General		
2.1.1	Manufacturer	xxxxxxxxxx	
2.1.2	Country of origin	xxxxxxxxxx	
2.1.3	Manufacturer's Product Code	xxxxxxxxxx	
2.1.4	Drawing number & Revision number	xxxxxxxxxx	
2.2	<input type="checkbox"/> Electrical Properties		
2.2.1	Highest system voltage (Um) kV		
2.2.2	Lightning impulse withstand voltage @ STP kV peak		
2.2.3	Wet P.F withstand voltage kV r.m.s		
2.2.4	Insulation material	xxxxxxxxxx	
2.2.5	Minimum composite insulation/shed thickness mm		
2.2.6	Shed Profile (Regular / Alternating)	Reg / Alt	
	<u>Shed Design Parameters (SANS 60185):</u>		
2.2.7	- Shortest distance between sheds [c] mm	xxxxxxxxxx	
2.2.8	- Shed overhang [p1] mm	xxxxxxxxxx	
2.2.9	- Shed overhang [p2] (alternating sheds) mm	xxxxxxxxxx	

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**OUTDOOR POST AND LONG ROD INSULATORS FOR
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2.2.10	- Shed type (Plain / Under rib)	Plain / Undrb	
2.2.11	- Vertical desistance between 2 similar points on successive sheds (shed spacing) [s]	mm xxxxxxxxxx	
2.2.12	- Straight air distance between 2 points on sheds [d]	mm xxxxxxxxxx	
2.2.13	- Creepage distance between 2 points on sheds [ld]	mm xxxxxxxxxx	
2.2.14	- Total creepage distance [li]	mm	
2.2.15	- Dry arcing distance [Si]	mm > 300	
2.2.16	Specific creepage @ Um	mm/kV	
2.2.17	Arc ring rating (where applicable)	50kA @ 70ms	
2.3	<input type="checkbox"/> Mechanical Properties		
2.3.1	Cantilever Strength	kN	
2.3.2	Mass of insulator	kg xxxxxxxxxx	
2.3.3	Insulator Length	mm	
2.3.4	Shed Diameter	mm < 255	
2.4	<input type="checkbox"/> End Fitting Properties		
2.4.1	Live end side	F-Neck	
	<u>Insert / CAP:</u>		
2.4.2	- Depth of insert thread	mm 55	
2.4.3	- Thread size (where applicable)	M20x2,5/6H 0,38 mm oversize	
2.4.4	- Cap compliant with SANS 60720 (where applicable)		
2.4.5	End fitting material	xxxxxxxxxx	
2.4.6	Minimum galvanising thickness	mm 105	
2.4.7	Galvanising certificate No	<input type="checkbox"/> xxxxxxxxxx	
2.4.8	Corona-ring on live end required	NO	
3	Documentation (to be submitted with tender)		
	Note: All documentation to be provided in electronic format.		
3.1	<input type="checkbox"/> General		
3.1.1	Outline drawings of insulator	Sets 1	
3.1.2	Units used in Republic of South Africa	In tender/offer	

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3.1.3	Project reference list, service to Eskom	In tender/offer	
3.2	<input type="checkbox"/> Design Test Reports	Required	Report Number
3.2.1	Test on interfaces and connections of end fittings	YES	
3.2.2	Assembled core load-time test	YES	
3.2.3	Test on shed and housing material	YES	
3.2.4	Test on core material	YES	
3.3.5	KIPTS natural aging test	YES	
3.3	<input type="checkbox"/> Type Test Reports	Required	Report Number
3.3.1	Dry lightning impulse withstand test	YES	
3.3.2	Wet power frequency withstand	YES	
3.3.3	Mechanical load-time test	YES	
3.3.4	Radio Interference Voltage test - $U_m \geq 145\text{kV}$	YES	
3.3.5	Power arc test (SANS 61467)	YES	

NOTE: DEVIATION SCHEDULE CONTINUES ON NEXT PAGE.

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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	Description of Deviation

SIGNATURES

Supplier

Name (Print)_____
Sign_____
Date

Manufacturer

Name (Print)_____
Sign_____
Date

Eskom

Name (Print)_____
Sign_____
Date**ESKOM COPYRIGHT PROTECTED**