Eskom	Standard	Group Technology

Title: **STANDARD FOR THE TRANSPORT, HANDLING, STORAGE AND PRESERVATION OF HV AND MV SWITCHGEAR**

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Content

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Not applicable

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Acceptance

This document has been seen and accepted by:

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Introduction

A standard was required for the transport, handling and storage of switchgear, either indoors or outdoors. This shall ensure that the Original Equipment Manufacturer (OEM) warranties are complied with.

Keywords

Switchgear handling, storage, transport.

1. Scope

1.1 Purpose

The purpose of this document is to ensure that all switchgear is transported, handled and stored correctly.

1.2 Applicability

This standard is applicable to all Eskom personnel and Eskom appointed contractors.

2. References

Parties using this document shall apply the most recent edition of the following documents:

2.1 Normative references

2.1.1 International document(s)

Document number	Document title	Preparer/author	Revision or date of issue
None			

2.1.2 South African national document(s)

Document number	Document title	Preparer/author	Revision or date of issue
[1] Act No. 85	Occupational Health and Safety Act and Regulations (OHS Act)	-	1993

2.1.3 Eskom national document(s)

Document number	Document title	Preparer/author	Revision or date of issue
[2] DSP_34-1157	Distribution group's requirements for 11kV, 22kV and 33kV indoor switchgear manufactured in accordance with NRS 003	Eskom	Latest
[3] DSP 34-1658	Corrosion protection specification for new indoor and outdoor distribution equipment manufactured from steel	Eskom	Latest
[4] DSP_34-2207	Switchgear training requirements from original equipment manufacturer's	Eskom	Latest
[5] 34-1150	Lifting machine operators training	Eskom	Latest
[6] DST 34-1153	Standard for lifting plant and/or equipment with hoists fitted to vehicles	Eskom	Latest
[7] ESP_32-536	Specification for high voltage outdoor disconnectors and earthing switches	Eskom	Latest
[8] ESP_32-1166	Specification for outdoor circuit-breakers for systems with nominal voltages from 11kV up to and including 765kV	Eskom	Latest

Document number	Document title	Preparer/author	Revision or date of issue
[9] ESP_34-1188	Eskom health and safety management – supplier requirements	Eskom	Latest
[10] QM – 58	Supplier contract quality requirements specification	Eskom	Latest
[11] TPC 41-141	Check sheets for HV substation work to be taken over by the asset owner	Eskom	Latest
[12] 10TB030	MV & HV Outdoor post type breaker product evaluation & national contract	Eskom	Rev. 1

2.1.4 Eskom divisional document(s)

Document number	Document title	Preparer/author	Revision or date of issue
None			

2.2 Informative references

Document number	Document title	Preparer/author	Revision or date of issue
[13] 32-9	Definition of Eskom documents	Eskom Document Centre	Latest
[14] 32-644	Eskom documentation management standard	Eskom Document Centre	Latest
[15] 474-65	Operating manual of the Steering Committee of Technologies (SCOT)	Vinod Singh	Latest

3. Definitions and abbreviations

3.1 Definitions

Definition	Explanation
Preservation	Preservation is the art of storing equipment in a fit for purpose state by applying appropriate procedures.
Storage	For the purposes of this document, storage shall include storage inside and outside of a building.
Switchgear	A general term covering switching devices and their combination with associated control, measuring, protective and regulating equipment; also assemblies of such devices and equipment with associated interconnections, accessories, enclosures and supporting structures, intended in principle for use in connection with generation, transmission, distribution and conversion of electric energy.
White Rust	Discoloration is known as ‘white rust’. It consists mainly of zinc oxide and zinc hydroxide and is a result of a chemical reaction between the pure zinc on the surface and moisture, even though the metal is galvanized.

3.2 Abbreviations

Abbreviation	Explanation
CAP	Committee for Accepted Products
DBOUS	Design Base and Operating Unit Support
EDC	Eskom Documentation Centre
GM	General Manager
HV	High Voltage
ID	Identification
LAP	List of Accepted Products
MV	Medium Voltage
n/a	not applicable
NCR	Nonconformance Report
OEM	Original Equipment Manufacturer
OHS	Occupational Health and Safety
OU	Operating Unit
SAP	System Application Protocol

4. Responsibilities

NOTE 1: All departments that are not stated in 4.1 to 4.5 that encounter quality and procedural issues shall raise them with their respective Quality Management and Standards Implementation departments.

NOTE 2: All departments that receive and store equipment shall ensure that the equipment is stored correctly with anti-condensation heaters connected in accordance with Eskom specifications.

4.1 Quality Management

Quality Management shall ensure that:

a) All quality checks are carried out and recorded at relevant holding points to ensure that equipment is supplied as per specification.

b) The requirements of a switchgear quality and test inspection plan are complied with.

c) All non-compliances are recorded and followed through to ensure compliance.

d) The transport companies safely transport and handle the switchgear equipment as per OEM requirements.

4.2 Warehousing (Stores)

Warehousing (Stores) shall ensure that:

a) The switchgear is received and delivered in accordance with the equipment specification to ensure that the equipment remains as it left the OEM/Supplier.

b) Quality checks at receiving points are carried out and complied with as per Annex B and Annex C.

c) All non-compliances are recorded and reported to the Quality Management Department.

d) Switchgear is stored in accordance with the requirements specified in this document.

4.3 Plant (High Voltage and Operating Unit) Department

The Plant (High Voltage (HV) and Operating Unit (OU)) Department shall ensure that assessments are performed on switchgear in storage in accordance with Annex B.

4.4 Project Management

Project Management shall ensure that:

a) The switchgear is received and delivered in accordance with the equipment specification to ensure that the equipment remains as it left the OEM/Supplier.

b) Quality checks at receiving points are carried out and complied with as per Annex B or Annex C.

c) All non-compliances are recorded and reported to the Quality Management Department.

d) Switchgear is stored in accordance with the requirements specified in this document.

4.5 Commercial

Commercial shall ensure that:

a) Quality checks at holding points are carried out and complied with as per Annex B and Annex C. That is, completed quality documents are furnished by the Quality Management Department.

b) Any Nonconformance Reports (NCRs) that are raised are followed through.

5. Requirements

NOTE: Over and above the requirements listed here, requirements from OEMs shall also be complied with. The OEM requirements will be supplied with each switchgear unit.

To ensure that equipment is retained at OEM factory quality, the following hold points apply, and inspections shall be carried out as per Annex B and Annex C.

5.1 Transport

Transport shall ensure that:

a) Only approved transport contractors are used to transport equipment.

b) Equipment is loaded, secured and delivered in the condition in which it was loaded; the onus is on the approved transportation company.

c) Transportation of equipment is in accordance with [8] ESP_32-1166.

d) Adequate precautionary measures are provided for the packaging and protection of sensitive components such as insulating parts and operating mechanisms during transport (including corrosion of exposed parts). For example, vibrations and impacts during transport shall be considered. Conditions during transport can be expected to be onerous.

e) After loading the equipment, the signed-off checklist accompanies the delivery note.

5.2 Loading

Loading shall ensure that:

a) Safety measures are implemented as per [9] ESP_34-1188.

b) Only approved lifting methods and lifting points are used.

c) Forklifting points and/or slinging points used for offloading are clearly marked.

d) Units with matching serial numbers are loaded. That is, complete units are packed and despatched with matching serial numbers. Where more than one crate is used per circuit-breaker, ensure that each crate is clearly and sequentially marked in order to identify each crate as belonging to a specific circuit-breaker (e.g. 'CRATE 1 of 3', 'CRATE 2 of 3'). The serial numbers shall be the same for each of these crates for the one complete breaker.

e) After loading is completed, inspections are carried out as per Annex B. A copy of the signed inspection sheet at loading shall be forwarded to the receiver of the goods.

5.3 Offloading switchgear/receiving

Upon receiving the switchgear equipment, the receiver shall ensure the following:

a) Upon arrival and whilst on the delivery vehicle, the package shall be inspected. In particular, check that the delivery documentation corresponds with the order number and that the specified quantities tie up.

b) Switchgear (circuit-breakers, isolators and kiosk breakers) and associated components shall be supplied and packaged as per 5.25 in [8] ESP_32-1166; [2] DSP_34-1157 and 9.2 in [7] ESP_32-536. Serial numbers shall also be checked for correctness.

c) Shock indicators/detectors shall be checked to detect if there has been any excessive impact and that they have not operated. In the case of the shock indicator operating, the receiver shall immediately report this to the Quality Management Department for immediate follow up.

d) Under no circumstances shall any equipment be rejected without consultation with the Quality Management Department and/or Project Manager. In the case of discrepancies in the packaging, this shall be reported to the Quality Management Department.

e) The store person or receiver shall conduct visual checks and record any abnormalities on the delivery note.

f) (Quality Management) Quality inspections shall be carried out at all receiving points as per Annex B. These inspections shall be compared to those inspections that were completed after loading the transport vehicle. Variances shall be recorded and escalated to Quality Management.

5.4 Storage and preservation

5.4.1 Storage conditions

a) Indoors: The minimum requirement is to keep all operating mechanisms indoors.

EXAMPLE: All circuit-breakers and motor-operated disconnectors.

b) Outdoors: Switchgear shall be stored under a roof structure or under a tarpaulin cover with a firm raised base and adequate drainage.

c) Where applicable, anti-condensation heaters shall be connected as per Eskom specifications.

d) During inspections, should switchgear units be found damaged, they shall be booked out of serviceable stock and booked into System Application Protocol (SAP) (damaged location) for investigation.

e) It shall be ensured that complete units are packed and stored with matching serial numbers (and/or as per manufacturer requirements). That is, where more than one crate is used per circuit-breaker, it shall be ensured that each crate is clearly and sequentially marked in order to identify each crate as belonging to a specific circuit-breaker (e.g. ‘CRATE 1 of 3’, ‘CRATE 2 of 3’, ‘CRATE 3 of 3’.

5.4.2 Storage bays

a) Storage bays shall have electrical power supply points available.

b) For outdoors, tarpaulin covers shall be installed so as to allow for adequate air circulation (ventilation) to the zinc-coated surfaces and to allow condensation to be easily drained off.

c) For indoors, the units shall not stand in water and shall primarily be kept in a horizontal position and above ground level, so as to avoid cracking or water damage.

d) Storage bays shall have adequate drainage for rain/storm water.

e) Critical maintenance spares shall be stored separately from project units.

f) All units shall be clearly labelled.

g) Critical maintenance spares bays and project unit bays shall be clearly demarcated.

h) Stock rotation shall be implemented into the process of issuing breakers. The first breaker delivered to the storage facility shall be the first breaker issued out of the storage facility.

i) All switchgear components shall be kept in a bay that is easily accessible.

j) All nonconforming units shall be clearly marked and segregated from compliant equipment.

k) The supplier or end-user shall be notified of the nonconformance.

5.4.3 Packaging

a) Packaging shall be as per [8] ESP_32-1166 and [7] ESP_32-536.

b) Switchgear shall be stored in its original packaging to protect it from damage.

c) Packaging shall be fit for purpose and suitable for long-term storage.

d) Packaging shall be clearly marked to indicate what it contains.

e) Complete units shall be checked to ensure that they are packed, stored, despatched and transported with matching serial numbers. That is, where more than one crate is used per circuit-breaker, ensure that each crate is clearly and sequentially marked in order to identify each crate as belonging to a specific circuit-breaker (e.g. ‘CRATE 1 of 3’, ‘CRATE 2 of 3’).

f) Packaging shall be inspected as per Annex B

5.4.3.2 Maintenance spares

a) Spares shall be stored indoors in their original packaging, especially rubber components such as seals that need to be protected from sunlight.

b) Note that gaskets have a limited shelf life.

5.4.4 Labelling

a) Labelling of containers/crates shall be as per [8] ESP_32-1166 and [7] ESP_32-536.

b) Each container/crate shall be clearly marked with a durable label using an indelible font at least 30 mm high, indicating the following information:

1) Eskom order number;
2) Eskom SAP number;
3) short circuit-breaker description (including the rated voltage, normal current, rated short-circuit;
4) breaking current, auxiliary DC control voltage; specific creepage; ‘1P’ or ‘3P’);
5) manufacturer’s name (i.e. make of circuit-breaker);
6) manufacturer’s circuit-breaker product designation/code (i.e. type of circuit-breaker);
7) manufacturer’s serial number(s);
8) contents of the crate (i.e. a parts list);
9) crate number (e.g. ‘CRATE 1 of 2’, ‘CRATE 2 of 2’);
10) crate overall dimensions (in millimetres);
11) total mass of each crate (e.g. ‘TOTAL MASS: 1 000 kg’);
12) pictograms/symbols showing correct storage and stacking instructions for crates.

c) The operations controller from the warehouse shall label the package as either spares or project units.

d) If it is a project unit, the breaker shall have a label indicating name of the substation.

5.5 Assessments

a) Assessments shall be conducted once every three months.

b) All departments listed in 4 shall support the assessments.

Annex A – Impact assessment

(Normative – for Eskom internal use only)

A.1 Guidelines

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

A.2 Critical points

A.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 and optimized costs.

Comment: Implementation is required to improve service quality and performance.

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

Comment: No impact.

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

Comment: No impact.

A.2.4 When will new stock be available?

Comment: No new items are created.

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

Comment: No new products are created.

A.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.

Comment: All persons shall exercise duty of care when transporting, handling and storing switchgear equipment. The Quality Management, Stores Management and Standards Implementation departments shall take heed of, and implement the requirements.

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

Comment: (n/a during commenting phase).

A.3 Implementation time frame

A.3.1 Time period for implementation of requirements.

Comment: As soon as possible, or it may depend on Distribution Operating Units and Transmission Grids.

A.3.2 Deadline for changeover to new item and personnel to be informed of DX wide changeover.

Comment: n/a

A.4 Buyer's guide and power office

A.4.1 Does the Buyer's Guide or Buyer's List need updating?

Comment: n/a

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

Comment: n/a

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

Comment: n/a

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

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

Comment: n/a

A.5 CAP/LAP pre-qualification process-related impacts

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

Comment: n/a

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

Comment:

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

Comment: n/a

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

Comment: n/a

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

Comment: n/a

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

Comment: n/a

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

Comment: n/a

A.5.8 Material group(s) affected by specification (refer to Pre-qualification invitation schedule for list of material groups).

Comment: n/a

A.6 Training or communication

A.6.1 Is training required?

Comment: Yes.

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

Comment: Awareness and practical training.

A.6.3 State designations of personnel that will require training.

Comment: All departments listed in 4 shall be trained.

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

Comment: n/a

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).

Comment: No comment.

A.6.6 Was Technical Training Section consulted regarding module development process?

Comment: No.

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

Comment: Operating Unit – Technology Forum and Change Control meetings.

A.7 Special tools, equipment, software

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

Comment: n/a

A.7.2 Are stock numbers available for the new equipment?

Comment: n/a

A.7.3 What will be the cost of these special tools, equipment, software?

Comment: No cost.

A.8 Finances

A.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: No cost.

Impact assessment completed by:

Name: Ajith Persadh

Designation: Senior Technologist

Annex B – Switchgear inspection sheet for storage

Normative

SWITCHGEAR INSPECTION SHEET FOR STORAGE

Serial number				
Order number				
SAP number				
Make				
Type				
Single phase or three phase				
Fault level (kA rating)				
Creepage				
Auxiliary voltage (DC)				
Number of crates per breaker				

Question	Y/N	Comments	Y/N	Comments	Y/N	Comments	Y/N	Comments
1. Are the circuit-breakers and operating mechanisms packaged in wooden transportation crates?								
2. Is the packaging clearly marked to indicate what it contains?								
3. Are the units stored in their original packaging?								
4. Is the packaging fit for purpose and suitable for long-term storage?								
5. Are all units are clearly labelled?								

Question	Y/N	Comments	Y/N	Comments	Y/N	Comments	Y/N	Comments
6. Is the crate labelled as a spares unit?								
7. Is the crate labelled as a project unit?								
8. Are the breaker poles stored in an approved storage environment?								
9. Is the mechanism stored indoors?								
10. Has the plastic covering, around the circuit-breakers and operating mechanisms been removed?								
11. Is the breaker visually in a good condition?								
12. If damage is discovered or suspected, has it been reported to Quality Management?								
13. Are there any missing parts?								
14. In the case of damage and/or missing parts, has this been reported to the Quality Management Department?								
15. In the case of damage and/or missing parts, has an NCR been issued?								
16. Are the breaker poles stored indoors?								
17. Are the breaker poles stored outdoors?								
18. Is there a tarpaulin cover, covering the breaker, if it is stored outdoors?								
19. Is the tarpaulin cover installed correctly so as to allow for drainage and ventilation?								
20. Are the crates in a good condition?								
21. Are the crates stacked correctly?								

Question	Y/N	Comments	Y/N	Comments	Y/N	Comments	Y/N	Comments
22. Are the crates stored above ground level?								
23. Are the sets of crates per breaker labelled correctly (e.g. 1 of 3, 2 of 3 and 3 of 3)?								
24. Is a mechanism heater connected to a power supply?								
25. Is the mechanism heater working?								
26. Are the breaker poles stored in a horizontal position?								
27. Is/are the breaker crate/s easily accessible at all times?								
28. Are critical maintenance spares stored separately from project units?								
29. Are critical maintenance spares bays and project unit bays segregated and clearly demarcated?								
30. Are nonconforming units clearly marked and segregated?								
31. Is stock rotation done? That is, first-in first-out.								

Inspected by (name)	Signature	Date

Annex C – Switchgear inspection sheet for transport and handling

Normative

SWITCHGEAR INSPECTION SHEET FOR TRANSPORT AND HANDLING

Serial number				
Order number				
SAP number				
Make				
Type				
Single phase or three phase				
Fault level (kA rating)				
Creepage				
Auxiliary voltage (DC)				
Number of crates per breaker				

Question	Y/N	Comments	Y/N	Comments	Y/N	Comments	Y/N	Comments
1. Transport								
1.1 Is the transport contractor Eskom approved?								
1.2 Does the transport vehicle have the necessary approved lifting and securing methods?								
1.3 Does the transport vehicle appear to be sound?								
1.4 Is the transport vehicle appropriate for delivering the specific equipment?								

Question	Y/N	Comments	Y/N	Comments	Y/N	Comments	Y/N	Comments
2. Loading								
2.1 Does the delivery documentation correspond with the order number and do the specified quantities tie up?								
2.2 Are all breaker crate serial numbers correct?								
2.3 Are forklift lifting points provided on the packaging, where applicable? These points shall be braced as though it were a lifting pallet (for mechanical support during lifting activities).								
2.4 Have all safety regulations been complied with whilst loading?								
2.5 Are the circuit-breakers and operating mechanisms packaged in wooden transportation crates?								
2.6 Are complete units packed and despatched with matching serial numbers? That is, are crates per breaker labelled correctly (e.g.1 of 3, 2 of 3 and 3 of 3)?								
2.7 Are the crates stacked correctly?								
2.8 Is there any damage to packaging?								
2.9 Is there any damage to equipment?								
2.10 Are there any abnormalities?								
2.11 Has the equipment been adequately secured?								

Question	Y/N	Comments	Y/N	Comments	Y/N	Comments	Y/N	Comments
3. Offloading								
3.1 Does the delivery documentation correspond with the order number and do the specified quantities tie up?								
3.2 Do the serial numbers tie up with the delivery documentation?								
3.3 Have shock indicators/detectors operated?								
3.4 If shock indicators/detectors have operated, has the Quality Management department been notified?								
3.5 Are there any discrepancies with regard to the packaging? That is, compared to the check sheet completed when it was loaded?								
3.6 Have all safety regulations been complied with whilst offloading?								
3.7 Have complete units with matching serial numbers been offloaded? That is, are crates per breaker labelled correctly (e.g.1 of 3, 2 of 3 and 3 of 3)?								
3.8 Were the crates stacked correctly?								
3.9 Is there any damage to packaging?								
3.10 Is there any damage to equipment?								
3.11 Are there any abnormalities?								

Inspected by (name)	Signature	Date