

	Standard	Technology
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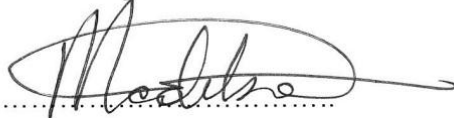
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1. INTRODUCTION

2. SUPPORTING CLAUSES

2.1 SCOPE

2.1.1 Purpose

To ensure formalise the standard for work to be carried out for power transformer maintenance

2.1.2 Applicability

This procedure shall apply to power transformers, applicable to all power stations in Generation. It defines duties to be carried out by power station staff and specialists.

2.2 NORMATIVE/INFORMATIVE REFERENCES

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

2.2.1 Normative

- [1] 36-255 -.Standard Procedure To Be Followed After Receiving A Buchholz Alarm
- [2] 36-729 - Standard For Commissioning Of Power Transformers
- [3] 32-406 — Mineral Insulating Oils (Uninhibited And Inhibited) Part 1: Purchase, Management, Maintenance And Testing
- [4] 36-740 - Sampling And Testing Of Mineral Insulating Oil For Power Transformers Within Generation Division

2.2.2 Informative

None

2.3 DEFINITIONS

Definition	Description
Authorised	A person who is trained & have been proved competent to carry out transformer maintenance in terms of this standard
Breathers	A breather is a device fitted to the transformer filled with a drying agent (like silica gel) to absorb moisture from the air flowing through it
Buchholz relay	A protective device, fitted to a transformer or reactor, that is activated by the release of gas in the insulating oil during internal fault conditions
Bushing	Component mounted to the transformer which transfers the internal electrical connection to the outside of the transformer
Conservator tank	Oil expansion tank fitted to a transformer to allow for oil expansion during temperature variations

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Definition	Description
Cooling system	Sets of fans & pumps used to cool down the transformer insulating oil
Diverter	The diverter is a switch which part of an on load tap changer used to do the switching from one tap to the other
Oil leak	Any visible sign of oil weeping or sweating will be regarded as a leak
Oil leak	Any visible sign of oil "weeping" or "sweating" or oil not in the transformer or in a suitable container will be regarded as a leak
Power transformer	A power transformer for the purpose of this standard, is a transformer which is at ground level, oil filled with a rating of 1MVA or higher

2.3.1 Classification

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

2.4 ABBREVIATIONS

None

2.5 ROLES AND RESPONSIBILITIES

None

2.6 PROCESS FOR MONITORING

None

2.7 RELATED/SUPPORTING DOCUMENTS

None

3. STANDARD FOR THE MAINTENANCE OF POWER TRANSFORMERS

3.1 RESPONSIBILITIES

3.1.1 Power Station Manager is responsible to ensure that:

- Ensuring that transformer maintenance is carried out in accordance with this standard.
- Ensuring that all maintenance is carried out against an approved check list which will form part of the maintenance records.
- Ensuring that defects are rectified and condition monitoring is carried out in accordance with this standard.
- Ensuring that actions carried out in terms of 4.1 above are adequately recorded in the transformer case history in SAP

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3.1.2 Group Managers is responsible to ensure that:

- Station personnel is trained and authorised to perform their duties to meet the requirements.
- Review training material to be in line with the Generation Policy and Standard.
- Safety "Procedure is in place and reviewed so, that it is in line with the Generation Policy and Standard and applied at all times.

The person carrying out routine maintenance inspection shall be responsible for reporting all defects and conditions affecting safety and reliability by loading a notification into the SAP system

3.2 PROCEDURE

The inspections and maintenance stipulated below must be carried out at the time intervals as specified. They may be carried out by first line maintenance personnel i.e. a qualified artisan who is authorized and who has received transformer maintenance training. The relevant readings and defects / notifications must be recorded in the maintenance case history into the SAP system.

Routine inspections & maintenance**3.2.1 Conservator tank**

	Inspection	Action	Frequency
1	Check conservator oil	Oil level to be verified in conjunction with the transformer top oil temperature. Note that sufficient space should be allowed for oil expansion especially when the conservator is fitted with an air cell	Monthly
2	No oil leaks present on tank piping or Buchholz relay	Report leaks to supervisor and load a notification into the SAP system	Monthly
3	Gauge glass to be intact, clean and max/min levels clearly	Report defects to supervisor and load a notification into the SAP system	Monthly
4	Check tap changer conservator as in items 1 & 3	Report defects to supervisor and load a notification into the SAP	Monthly

3.2.2 Breathers

	Inspection	Action	Frequency
1	Drying agent not to be more than 30% discoloured from bottom.	Note: Different type drying agents discolours differently when absorbing moisture, confirm with engineering on discolouring and site specific procedure.	Monthly
2	Drying not to be discoloured from sides & top	Indicates leaking canister, replace breather canister.	Monthly
3	Inspect oil bath at bottom of breather.	Replace or top-up as required to ensure oil bath is filled to the correct oil level.	Monthly
4	Inspect general condition of breather canister	Repair / replace if required.	Monthly

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5	Drying agent not to be contaminated with oil	Replace if contaminated.	Monthly
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3.2.3 Bushings & Insulators

	Inspection	Action	Frequency
1	Check gauge level indicators to be clearly visible	If not or glasses faded, load a notification into the SAP system	Monthly
2	Check the bushing oil level using binoculars	Record incorrect or suspect level to supervisor immediately	Monthly
3	Check bushing for visible signs of sweating or weeping	Record any leaks, sweating or weeping to supervisor immediately	Monthly
4	Check porcelain bushings for cracks or chips	Report any defects to supervisor immediately	Monthly
5	If applicable, check if bushings are correctly greased	Report top supervisor and load a notification into the SAP system	Monthly

Note: All bushing services and repairs must be done by an authorized specialist

3.2.4 Main Tank

	Inspection	Action	Frequency
1	Inspect main tank for oil leaks, weeping or sweating.	Report to supervisor immediately, action will depend on severity of the leak	Monthly
2	Check for corrosion & rust	Load notification into the SAP system	Monthly
3	Check transformer connections to earth straps to be in a good condition	Report any defect immediately to supervisor	Monthly

3.2.5 Cooling System

	Inspection	Action	Frequency
1	Ensure pumps & fans are working, including spare banks	Report any defect immediately to supervisor	Monthly
2	Check cooler fins to be clear from any debris	Report any defect immediately to supervisor and load a notification into the SAP system	Monthly
3	Feel if there is even heat distribution between the cooler units	Report any differences immediately to supervisor and load a notification into the SAP system	Monthly
4	Feel if the fan air flow direction is away from the transformer	Report any differences immediately to supervisor and load a notification into the SAP system	Monthly
5	Check cooling system for oil leaks	Report to supervisor immediately, action will depend on severity of the leak	Monthly

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6	Check oil flow indicators to be operational	Report any defects immediately to supervisor and load a notification into the SAP system	Monthly
7	High pressure water clean radiator cooler fins	Load history into the SAP system	2 yearly

3.2.6 Tap

	Inspection	Action	Frequency
1	Check mechanism box to be clean & dust free	Report any defects immediately to supervisor and load a notification into the SAP system	Monthly
2	Tap changer mech. box heater to be operational	Report any defects immediately to supervisor and load a notification into the SAP system	Monthly
3	If fitted, the valve between the main tank & selector tank to be open	Open valve if closed	Monthly
4	Record number of tap operations	Record in SAP maintenance history	Monthly
5	Check for any oil leaks, sweating or weeping.	Report to supervisor immediately, action will depend on severity of the leak	Monthly
6	Diverter switches to be serviced and oil replaced	Report any defects immediately to supervisor. Note this is to be done by a tap changer specialist	2 yearly
7	Tap changer continuity test to be performed after diverter switch service	Report any abnormalities to supervisor, issue test certificate	2 yearly
8	Off load tap changers to be manually tapped through all tap positions at least 2 times & returned to original tap & Locked	Report any abnormalities to supervisor and record operation in the SAP History	2 yearly

3.2.7 Marshalling kiosks & Junction boxes

	Inspection	Action	Frequency
1	Visually inspect instrumentation relays, contactors, fuses & wiring for obvious damage & hot	Report any defects immediately to supervisor and load a notification into the SAP system	Monthly
2	Ensure panel heaters are functioning	Report any defects immediately to supervisor and load a notification into the SAP system	Monthly
3	Ensure door seals intact, windows clear, door locking operative & earth connected	Report any defects immediately to supervisor and load a notification into the SAP system	Monthly
4	Visually inspect panel for any debris, dust, dirt or moisture.	Report any abnormalities immediately to supervisor and load a notification into the SAP system to clean panel at first possible opportunity	Monthly

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5	Visually inspect all JBs for any debris, dirt, dust, moisture, hot connections or moisture	Report any abnormalities immediately to supervisor and load a notification into the SAP system	Monthly
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3.2.8 General

	Inspection	Action	Frequency
1	Visually check surge arresters for physical damage or excessive pollution	Report any abnormalities to supervisor immediately and load history into SAP system.	Monthly
2	Physical check surge arrester earth connections to be intact	Report any abnormalities to supervisor immediately and load	Monthly
3	Clean surge arresters and apply grease if applicable	Report any abnormalities to supervisor immediately and load history into SAP system	2 yearly
4	Ensure that transformer diagram plate is secured	Secure if required	Monthly
5	Ensure transformer PCB sticker is visible and easy to read	Report any defect to supervisor and environmental officer immediately, load notification into SAP system	Monthly
6	Fire protection pipe work valves, nozzles & rupturing bulbs to be in the correct & in good condition	Report any defects to supervisor immediately.	Monthly
7	Test fire sprinkler system to be operational	Report any defects to supervisor immediately.	2 yearly
8	Check transformer oil catchment area to be clean from debris, crack sealing done & drains open	Report any defects to supervisor & environmental officer immediately	Monthly
9	Listen for any excessive noise or vibration around the transformer	Report any abnormalities to supervisor immediately and load history into SAP system	Monthly

3.2.9 Instrumentation

	Inspection	Action	Frequency
1	Calibrate oil temperature (DTI) & winding temperature (WTI) instrument.	Issue test certificates	2 yearly
	Verify OTI & WTI alarm & trip settings to be correct	Issue test certificates	2 yearly
2	Test & calibrate if required the diverter changer pressure switch	Issue test certificates	2 yearly
3	Check transformer online gas analyser to be operational and for oil leaks present	Report any defect to supervisor immediately, and load notification into SAP system	Monthly

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4	Verify all trip & alarm signals from transformer to protection panel	Report any correct any defect to supervisor immediately	2 yearly
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3.2.10 Condition monitoring

	Inspection	Action	Frequency
1	Oil sampling & analysis	To be done according to document no. 36-740	As specified
2	Perform Infra Red scan on transformer, HV connections, coolers, main tank,	Report any abnormalities to supervisor immediately and load history into SAP system and issue report to transformer system engineer	3 monthly or after maintenance
3	Perform all activities as required by the "Transformer hand condition monitoring guideline"	Record all items required and load data in the SAP history system	2 weekly
4	Tan Delta test transformer active part (Insurance requirement)	Report any abnormalities to supervisor immediately and load history into SAP system. Issue test results to system engineer	5 yearly
5	Perform Tan Delta testing on bushings fitted with test points	Report any abnormalities to supervisor immediately and load history into SAP system. Issue test results to system engineer	2 yearly
6	Inspect bushing test pin earth connection for proper contact any sign of corrosion	Report any abnormalities to supervisor immediately , action to be taken before transformer is energised	2 yearly

3.3 RECORDS

- Normal maintenance records shall be kept by the Power Station on the SAP system.
- All test reports shall be submitted to the transformer system engineer.

4. AUTHORISATION

This document has been seen and accepted by:

Name	Designation
	Document Approved by TDAC ROD 16 July 2013
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5. REVISIONS

Date	Rev.	Compiler	Remarks
November 2012	0.1	E.J. Mbokodo	Draft Document for review created from 36-348
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6. DEVELOPMENT TEAM

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- E.J. Mbokodo
- G.M. Mungwe
- L.P. Jordaan

7. ACKNOWLEDGEMENTS

- None

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