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on Large Power Transformers
Standard**

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1. INTRODUCTION

The amount of work on and handling of power transformers within Generation will increase dramatically over the next few years. This is due to the fact that nearly 50 % of the fleet will be replaced with new transformers or rewound/refurbished. In addition oil will be processed on current installed transformers, to extend their useful life.

Incorrect installation and oil handling can have detrimental effects on the life expectancy of installed and the successful return to service of transformers. Considering the costs which can amounts to tens of millions of rands per unit, and consequential production losses, it is pertinent that Generation implement a process whereby sound execution of works can be assured.

The aim of this policy is to define a control process whereby the various parts of the on-site works are reviewed to ensure works takes place in accordance with established Generation procedures, standards, specifications, policies and the OEM Manuals.

2. SUPPORTING CLAUSES

2.1 SCOPE

A Quality Control (QC) Review system has been developed to ensure compliance to Generation procedures, standards, specifications, policies and OEM Manuals. The QC Review system consists of an approved Generation Review team; visit Power Stations ensuring that Power Transformer works is performed in accordance to Generation approved Quality Assurance documentation and systems.

Two review processes are followed, namely:

- First Review: Verifying that the quality control plans prepared are in accordance to the requirements specified in this policy and its supporting documentation. Ensure that sufficient hold and witness points are planned to capture critical activities, that the PQP check list is sufficient, that adequate trained competent and skilled staff will be used, and that the scope of work, testing and inspections planned are adequate.

NOTE: Critical work on the transformer may only commence once the review process is completed, all the actions for the review has been address, the PQPs have been completed and Lead Reviewer has closed out the review by signature.

- Second Review: Verifying that all the PQP processes were followed, all the relevant tests and inspections have been carried out, all the test and inspection results have been analysed, a review of the test result analysis, carry out spot checks on key issues on the transformer.

NOTE: A hold point is placed on the energising of the transformer until the 2nd review process have been completed, all the key outstanding issues have been closed out, and the Lead Reviewer indicate that it is safe to energise by issuing the signed review check sheet.

2.1.2 Purpose

The objective of this policy is to mitigate the potential risks involved in performing transportation and on site works on Large Power Transformers at generation power stations.

2.1.3 Applicability

This policy is applicable to:

- All Generation's Power Transformers (All Generator Transformers, Unit Transformers and Station Transformers) at power stations
- When installing new, rewound, refurbished or used large power transformers

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- When dropping the oil below the active part and
- When polishing or processing the oil on installed large power transformers.
- When performing major works in the tap changer.

2.2 NORMATIVE/INFORMATIVE REFERENCES

2.2.1 Normative

None

2.2.2 Informative

- [1] 240-56356472: Clean conditions for power transformer outage within generation
- [2] 240-56227520: Specification for new transformer oil.
- [3] 240-56361382: Transformer hand condition monitoring guideline
- [4] GGG0942: Guideline on LTPH for transformers
- [5] GGS0949: Standard for commissioning and recommissioning of power transformers
- [6] 240-56358900: Sampling and testing of oil for power transformers within generation
- [7] 240-56178825: Generation policy on the control of road transportation and site movement of large electrical equipment
- [8] 240-56178825: Requirements for the transportation and site movement of large electrical equipment
- [9] ESKASABT0: Oil spill rehabilitation and clean-up
- [10] TRMASAAI3: Maintenance of oil filled strategic spare transformers and reactors at the stores and on site
- [11] ESKPVABK3: Transport of transformer insulating oil ESKASAAI7: Storage of HV transformer bushings
- [12] ESKASAAI7: Storage of HV transformer bushings
- [13] ESKASAAI2: Management of polychlorinated biphenyls (PCB)
- [14] GGG0734: Considerations for the preparation of oil management plan and oil spill contingency plans for generation group
- [15] GTD Web Site: from the Eskom Intranet Home page > Generation > Head Office > Technology Department > Care Programme > Transformer Care > Transformer Handling.
- [16] Transformer Health Care manual.

2.3 DEFINITIONS

Definition	Description
Active Part:	Transformer windings, core, tap-changer and harnessing
Critical Work:	Installation of a new, used, refurbished, or rewound transformer or any activity where the oil level is dropped below the conservator tank bottom
Delegate:	Is someone appointed in writing by the Corporate Consultant Power Electrical to resume responsibilities of the Corporate Consultant as refer to in this document

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Definition	Description
GTD intranet site on transformer handling:	Eskom Home page > Generation > Head Office > Technology Department > Care Programme > Transformer Care > Transformer Handling)
Lead reviewer:	A person that's been delegated in writing by the Corporate Consultant Power Electrical to lead and/or appoint a review team
Oil Handling and Processing:	Oil Purification, Oil Circulation by means of external pump, Oil Regeneration, Oil Top-Ups and refilling.
Power Transformers:	for the purpose of this document, it refers to generator transformers, Unit transformers and station transformers
Review System	A System based on documents, structured methodologies and components examining records, reports and personal competency
Review Team:	Team , which comprise of a Leader and other approved experts with direct experience applicable to Transformer Works
Works:	All physical activities performed on a Power Transformer limited to Oil Handling and Processing, Repairs on active part, Installation and Commissioning

2.3.1 Disclosure Classification

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

2.4 ABBREVIATIONS

Abbreviation	Description
GTD:	Generation Technology Department
OEM:	Original equipment manufacture
PCB:	Polychlorinated biphenyls
PQP:	Process quality plan

2.5 ROLES AND RESPONSIBILITIES

None

2.6 PROCESS FOR MONITORING

None

2.7 RELATED/SUPPORTING DOCUMENTS

This document can be accessed electronically via the Eskom Intranet and the FTR system. It can also be retrieved on GTD Web Site: from the Eskom Intranet Home page > Generation > Generation Technology & Assurance > Generation Technology Department > Care Programme> transformer care > transformer handling.

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3. CONTROL OF WORKS PERFORMED ON LARGE POWER TRANSFORMERS STANDARD

3.1 POLICY

Eskom Generation will take all the necessary steps to ensure that the risk of handling Large Power Transformers on site is kept to the lowest practical limit, by implementing the best known quality process and follow the OEM manual instruction when installing or carrying out critical work.

3.2 STRATEGY

The above policy is achieved by:

- a. Ensuring that an appropriate quality control plan is drawn up for the works. Examples of such quality plans can be found on the Generation Technology Department Intranet site on Transformer handling. (Eskom Home page > Generation > Head Office > Technology Department > Care Programme > Transformer Care > Transformer Handling).
- b. Ensure that critical work on transformers is reported to Generation Technology Department as indicated on the GTD web site
- c. GTD will appoint a Lead Reviewer and Review Team that must carry out a review of the quality control plans before work commences on the transformer.
- d. The Lead Reviewer ensures that the quality plans are reviewed and checked, that all the items as per the check list on the GTD web site are assessed and ticked off. The Lead Reviewer obtains signatures from each of the review team members and also sign off the first review process.
- e. Ensure that work does not commence unless the review team has reviewed and signed off agreeing to proceed.
- f. Ensure that the quality control plan is followed.
- g. Ensure that special approved method and procedure is required for movement of the transformer during the installation process on site (station must ensure that there is PQP in place with a hold point(s) for the above). Authorised rigger has to be present during the movement of the transformer.
- h. Ensure that maintenance records and inspection tests are available for the equipment used for moving the transformer.
- i. Ensure that the Lead Reviewer is informed on time of the 2nd review such that a second review is done.
- j. At the 2nd review, the Lead Reviewer that the team review all the completed quality documentation, test certificates, and material certificates. The Leader obtains the signatures of the review team members and signs off agreeing to the transformer to be energised.
- k. Ensure that the transformer is not energised unless clearance is obtained from the 2nd review, Lead Reviewer, by signature, before energising the transformer.
- l. Adhere to 240-56358900 latest revision and SANS 555 before acceptance of oil:
 - On site before filling up or topping the transformer
 - Before energizing the transformer

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3.3 METHODOLOGY FOR QUALITY CONTROL REVIEW

3.3.1 Critical Work

When critical work is performed on a large power transformer, the Corporate Consultant Power Electrical or delegate must be informed by the relevant Power Station Manager. Appointment of the Review Team and Lead Reviewer will be done in writing by the Corporate Consultant Power Electrical or delegate

Note that a list of possible personnel and their relevant contact information can be obtained from the GTD intranet site on oil handling. The Lead Reviewer will liaise in contact with the site Transformer System Engineer, Project Manager and Project Engineer for the transformer works review.

The Review Team uses the following method to access the works:

- Review of written material
- Interviews with personnel (Transformer System Engineer etc...)
- Direct observation of performance, status and on-site activities
- Plant inspection (as appropriate)

These will be done in accordance to the check list presented in the GTD web site on transformer handling.

3.3.2 Responsibilities

3.3.2.1 Power Station Manager

The relevant Power Station Manager (PSM) appoints a project manager and project engineer for the execution of the works.

The relevant PSM ensures that the initial quality control plans are drawn up in accordance to the requirements defined in this policy document, tailored to the specific type and make of transformer as well as to the type of work to be performed.

The relevant PSM further ensures that GTD is informed on time of any critical work and request that reviews are carried out.

The relevant PSM ensures that the works are carried out in accordance to the reviewed quality control plans.

The relevant PSM ensures that the Lead Reviewer is informed in good time and invites the Lead Reviewer to carry out the 2nd review. The PSM ensures that the transformer is not energised before the 2nd review is completed and closed out by the Lead Reviewer.

The Power Station is responsible to ensure that the quality control plans are in accordance to the Eskom policy and standards reflected in this document and to the OEM manual requirements.

3.3.2.2 Generation Technology Manager

The Generation Technology Manager appoints the Lead Reviewer in writing plus at least one Review Team Member and keeps record of the reviews done.

3.3.2.3 Appointed Lead Reviewer

The appointed Lead Reviewer ensures that the reviews are carried out on time. Before starting with the review, the Lead Reviewer discusses the review check list with the team members and the station staff, ensuring that the list is relevant and considers any necessary alterations or additions that need to be

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made to adapt it to the specific type and make of transformer as well as the type of work being carried out. The Lead Reviewer may co-opt additional members on the team for either assistance or development purposes.

The Lead Reviewer ensures that all the relevant signatures are obtained on the review sheet from the team members, project engineer, the project manager and himself for each of the reviews. Once the signatures are in place, he / she hands over a copy of the signed review check list to the appropriate station person and gives his/her agreement for the work to commence / transformer to be energised for the first and second reviews respectively. He / she ensures that the original review check sheet is placed in the GTD file.

The Lead Reviewer ensures that the results of all the inspection and test reports are checked and that is safe to energise the transformer.

3.3.2.4 Review Team Member

Each of the review team members are jointly responsible to ensure that the quality control plans are in accordance to the Eskom policy and standards reflected in this document and to the OEM manual requirements and has been followed. Review the results of all the inspection and test reports and ensure that is safe to energise the transformer.

3.3.3 Quality

Quality program must be implements as per the example given on the GTD Web Site. Please note that prior to oil filling of a transformer, the independent type test results certificate, Dielectric strength, Moisture, interfacial tension, Acidity, PCB must be available and the result must comply with the Generation oil specification GGS 1026 latest revision.

3.3.4 Records

It is the responsibility of the Lead Reviewer to ensure that the original Appendix 1 review check sheet is signed and is placed in the Transformer Quality Control Review File for review 1 and 2.

The Review check sheet is still under development, as the review exercise is done at the stations, the check sheets will be updated accordingly. The Review check sheet (Appendix 1) can be obtained at: GTD Web Site: from the Eskom Intranet Home page > Generation > Head Office > Technology Department > Care Programme > Transformer Care > Transformer Handling.

4. AUTHORISATION

This document has been seen and accepted by:

Name & Surname	Designation
	This Document has been approved by TDAC ROD 13 February 2013

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5. REVISIONS

Date	Rev.	Compiler	Remarks
November 2012	0	E.J. Mbokodo	Draft document for Review created from GGPP 1344
May 2013	1	E.J. Mbokodo	Final Document for Publication

6. DEVELOPMENT TEAM

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

- None

7. ACKNOWLEDGEMENTS

- None

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