

| | | |
|---|----------------------|-------------------------------|
|  | Scope of work | Hendrina Power Station |
|---|----------------------|-------------------------------|

Title: **Repairs of 6.6kV MV circuit breakers and Vacuum contactors used at Hendrina Power Station.**

Document Identifier: **N/A**

Alternative Reference Number:

Area of Applicability: **Hendrina Power Station**

Functional Area: **Engineering**

Revision: **0**

Total Pages: **9**

Next Review Date: **AR**

Disclosure Classification: **Controlled Disclosure**

Content

Page

| | |
|---|---|
| 1. Introduction..... | 3 |
| 2. Supporting Clauses | 3 |
| 2.1 Scope..... | 3 |
| 2.1.1 Purpose..... | 3 |
| 2.1.2 Applicability | 3 |
| 2.1.3 Effective date..... | 3 |
| 2.2 Normative/Informative References | 3 |
| 2.2.1 Normative..... | 3 |
| 2.2.2 Informative..... | 3 |
| 2.3 Definitions | 4 |
| 2.4 Abbreviations | 4 |
| 2.5 Roles and Responsibilities | 4 |
| 2.6 Process for Monitoring..... | 4 |
| 2.7 Related/Supporting Documents..... | 4 |
| 3. Scope of work..... | 5 |
| 3.1 <i>Contractor</i> - Repairs Scope of Work. | 5 |
| 3.1.1 G.E.C vacuum circuit breakers. | 5 |
| 3.1.2 SACE air circuit breakers..... | 5 |
| 3.1.3 Hawker Siddeley vacuum circuit breaker | 7 |
| 3.1.4 Hawker Siddeley and Toyo Denki Vacuum contactors..... | 8 |
| 3.1.5 Merlin Gerin SF6 gas circuit breakers..... | 8 |
| 4. Acceptance..... | 8 |
| 5. Revisions..... | 9 |
| 6. Development Team | 9 |
| 7. Acknowledgements | 9 |

Figures

| | |
|--|---|
| Figure 1: Arc chute..... | 6 |
| Figure 2: Ceramic plates & Arc runners | 7 |

CONTROLLED DISCLOSURE

1. Introduction

The Hendrina power station 6.6kV circuit breakers have surpassed their design life with no notable maintenance or refurbishment. This document provides the required scope of work for a 5-year contract for the repairs of all 6.6kV circuit breakers and vacuum contactors used on MV switchgear system.

2. Supporting Clauses

2.1 Scope

The scope of this document covers a detail scope of work for a 5-year contract for the repairs of the 6.6kV circuit breakers, and detail scope of work for the repairs of 6.6kV vacuum contactors used at Hendrina power station.

2.1.1 Purpose

The main purpose of this document is to provide a technical specification for the repairs of MV circuit breakers and MV vacuum contactors used at Hendrina power station for a 5-year contract.

2.1.2 Applicability

This document shall apply throughout Eskom Hendrina power station, MV switchgear system only.

2.1.3 Effective date

The document is effective from the date of authorisation.

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] ISO 9001 Quality Management Systems

2.2.2 Informative

[1] N/A

CONTROLLED DISCLOSURE

2.3 Definitions

2.3.1 Circuit breaker: A switching device with arc quenching medium that is used to make or break an electric circuit manually and automatically, under normal and abnormal (fault) conditions.

2.3.2 Contactor: A contactor is an electromechanical switch whose function is to make or break the connection between the power supply and the load. The contactor is electrically controlled and usually powered at a much lower level than the switched circuit.

2.3.3 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.

2.4 Abbreviations

| Abbreviation | Explanation |
|--------------|-------------------------|
| AR | As Required |
| MV | Medium Voltage |
| QCP | Quality Control Plan |
| QIP | Quality Inspection Plan |
| FAT | Factory Acceptance Test |

2.5 Roles and Responsibilities

This document will be used as the scope of work that is required when repairing the MV circuit breaker and MV vacuum contactors.

MV Switchgear System Engineer : Responsible for compiling and reviewing the content requirement of this document.

Electrical Maintenance : Responsible for ensuring that the requirements of this document are utilised on retrofitting and repairs contract.

2.6 Process for Monitoring

The document shall be utilised as the main scope of work for the repairs of MV circuit breaker and vacuum contactors at Hendrina power station. All reviews shall follow the Hendrina power station main document centre procedures.

2.7 Related/Supporting Documents

None.

CONTROLLED DISCLOSURE

3. Scope of work

The scope entails repairs of MV circuit breakers and MV vacuum contactors utilised at Hendrina power station MV switchgear system shall be done in accordance with the requirements of this document; however, the supplier is treated as the expert on the subject matter.

All the works is done in accordance with SANS 62271-100, SANS 62271-1 and IEC 60059.

3.1 Contractor - Repairs Scope of Work.

Hendrina power station has different types of MV switchgears and their controlgear differs as well. The repairs must be done on MV circuit breakers as well as MV contactors as and when required. See annexure A for the list of all the MV circuit breakers and contactors utilised at Hendrina power station MV switchgear.

The scope of work includes but not limited to:

- Collect the MV controlgear (circuit breaker/ vacuum contactor) at Hendrina power station.
- Strip & assess the controlgear for damage(s), develop a QIP for the controlgear and email back the report to the *Employer* for the scope final approval.
- (FAT) routine tests in the presence of an Eskom representative and deliver the contactor at Hendrina power station. See annexure B for all the circuit breaker tests to be conducted.
- Deliver the MV circuit breaker at Hendrina power with all the circuit breaker data packs.
- All technical communications concerning the scope of work to be done via email to the *Employer*.

3.1.1 G.E.C vacuum circuit breakers.

- Clean the circuit breaker trolley/frame.
- Sand blast the trolley and repaint (fire retardant paint to be used) the trolley with the original colour of the circuit breaker.
- Replace all the worn-out parts.
- Replace vacuum bottles with the new ones and return the old bottles to *Employer*.
- Replace/Rewind the trip coil and the close coil with new ones.
- Inspect and overhaul the charging motor.
- Replace the brushes of the charging motor.
- Install the operation counter.
- Conduct circuit breaker tightness checks.
- Ensure that all arcing contacts make simultaneously. Check the loading spring for irregularities and check spring tension.

3.1.2 SACE air circuit breakers

- Clean the circuit breaker trolley/frame.

CONTROLLED DISCLOSURE

- Clean carefully the insulating parts, clean and lubricate the operating mechanism and the connection rods.
- Sand blast the trolley and repaint (fire retardant paint to be used) the trolley with the original colour of the circuit breaker.
- Replace all the worn-out parts.
- Inspect and overhaul the charging motor.
- Replace the brushes of the charging motor.
- Install the operation counter.
- Conduct circuit breaker tightness checks.
- Ensure that all arcing contacts make simultaneously. Check the loading spring for irregularities and check spring tension.
- **Inspect the Tulip contact.**

Arc chute checking:

Remove the interphase barrier and bolts fastening the arc chutes to the front insulating support (3) (fig. 2); tilt the arc-chute on pin (2) (fig. 2).

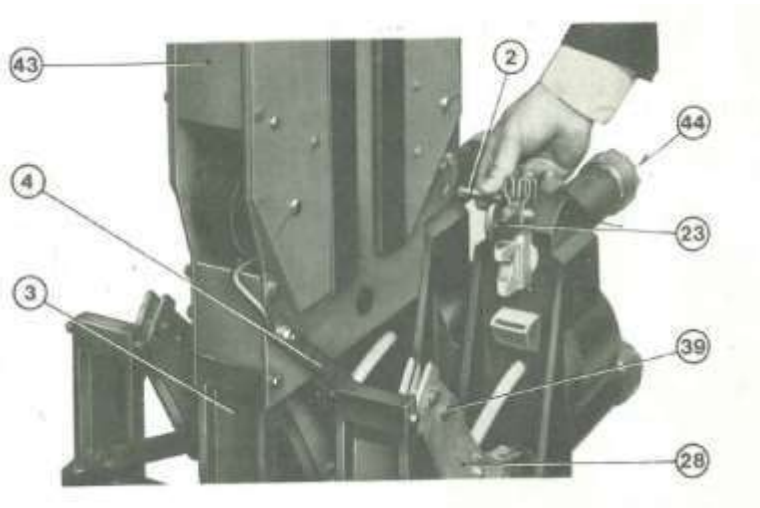


Figure 1: Arc chute

- **Ceramic plate – (21) figure 3:**
 - ✓ Check ceramic plates for breaking or cracks and replace where necessary.
 - ✓ Remove the smoke or dust deposits with dry clean rags or with dry compressed air.
 - ✓ Remove metal deposit due to arc by means of sand pate. NOTE: Do not use wire brushes, files, or emery cloth.
- **Arc runners – (22) figure 3:**
 - ✓ Remove smoke or dirt deposits with dry clean cloth.

CONTROLLED DISCLOSURE

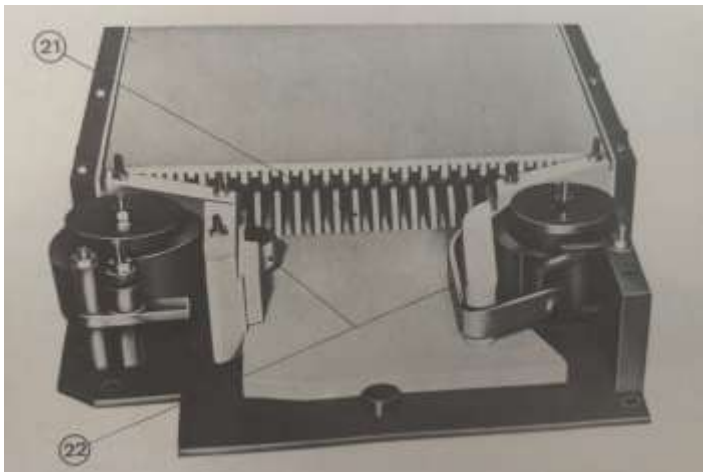


Figure 2: Ceramic plates & Arc runners

- **Arcing contacts inspection and replacement**

To inspect the arcing contacts, remove the safety barrier and tilt the arc-chutes backwards.

- ✓ Remove carbon traces due to the arc by means of clean cloth drenched with a volatile solvent.
 - ✓ Remove any pitting of contact with fine sandpaper, taking care not to alter the shape of the contacts.
 - ✓ Remove any metal traces from the insulating parts of the breaker.
 - ✓ Report to Eskom the circuit breaker with worn out contacts.
- Anti-pumping device?

3.1.3 Hawker Siddeley vacuum circuit breaker

- Clean the circuit breaker trolley/frame.
- Sand blast the trolley and repaint- fire retardant paint to be used- the trolley with the original colour of the circuit breaker.
- Replace all the worn-out parts.
- Replace vacuum bottles with the new ones and return the old bottles to *Employer*.
- Replace the operating circuit breaker mechanism including but not limited to, charging motor, closing and trip coils.
- Replace/Rewind the trip coil and the close coil with new ones.
- Conduct circuit breaker tightness checks.
- Ensure that all arcing contacts make simultaneously. Check the loading spring for irregularities and check spring tension.

CONTROLLED DISCLOSURE

3.1.4 Hawker Siddeley and Toyo Denki Vacuum contactors

- Clean the circuit breaker trolley/frame.
- Sand blast the trolley and repaint- fire retardant paint to be used- the trolley with the original colour of the circuit breaker.
- Replace all the worn-out parts.
- Replace vacuum bottles with the new ones and return the old bottles to *Employer*.
- Replace HRC fuses with new one of the same ratings and return the old fuses to *Employer*.
- Replace the operating circuit breaker mechanism including but not limited to, charging motor, closing and trip coils.
- Conduct circuit breaker tightness checks.
- Ensure that all arcing contacts make simultaneously. Check the loading spring for irregularities and check spring tension.

3.1.5 Merlin Gerin SF6 gas circuit breakers.

- Clean the circuit breaker trolley/frame.
- Sand blast the trolley and repaint (fire retardant paint to be used) the trolley with the original colour of the circuit breaker.
- Replace all the worn-out parts.
- Replace/Rewind the trip coil and the close coil with new ones.
- Inspect and overhaul the charging motor.
- Replace the brushes of the charging motor.
- Install the operation counter.
- Conduct circuit breaker tightness checks.
- Ensure that all arcing contacts make simultaneously. Check the loading spring for irregularities and check spring tension.

CONTROLLED DISCLOSURE

CONTROLLED DISCLOSURE

When downloaded from the document management system, this document is uncontrolled and the responsibility rests with the user to ensure it is in line with the authorized version on the system. No part of this document may be reproduced in any manner or form by third parties without the written consent of Eskom Holdings SOC Ltd, © copyright Eskom Holdings SOC Ltd, Reg No 2002/015527/30