



**Technical Specification**

**Hendrina Power Station**

Title: **Replacement of oil filled RMU switchgear SOW.**

Reference No: **F/ESK136**

Alternative Reference Number: **N/A**

Area of Applicability: **Hendrina Power Station**

Functional Area: **All**

Revision: **0**

Total Pages: **12**

Next Review Date: **N/A**

Disclosure Classification: **Controlled Disclosure**

Compiled by

Functional Responsibility

Authorized by

.....

.....

.....

## Content

	Page
1. Introduction.....	3
2. Supporting Clauses .....	3
2.1 Scope .....	3
2.1.1 Purpose.....	3
2.1.2 Integrated Business Improvement objectives .....	3
2.2 Normative/Informative References.....	3
2.2.1 Normative.....	3
2.2.2 Informative .....	4
2.3 Definitions.....	4
2.4 Abbreviations.....	4
2.5 Roles and Responsibilities .....	4
2.6 Process for Monitoring .....	5
2.7 Related/Supporting Documents .....	5
3. Scope of work.....	5
3.1 Employer's design.....	5
3.1.1 System Description .....	5
3.2 Parts of the works which the <i>Contractor</i> is to design .....	8
3.2.1 Electrical works .....	8
3.2.2 Civil works .....	10
3.3 Other requirements of the Contractor's design.....	11
3.4 Equipment required to be included in the works .....	11
3.5 As-built drawings, operating manuals, and maintenance schedules .....	11
4. SHEQR requirements .....	11
5. Records to be kept .....	11
6. Notes / Forms / Appendices / Annexures.....	11
7. Acceptance.....	12
8. Revisions .....	12
9. Development Team .....	12
10. Acknowledgements .....	12

**CONTROLLED DISCLOSURE**

## **1. Introduction**

The document is detailing the electrical and civil scope of work for the replacement of oil filled RMU switchgear at Hendrina power station.

Hendrina power station came into operation by the end of 1976. It is located on the N11 between Middelburg and Hendrina. The facility is situated south-west of Optimum Colliery, which historically supplied most of the coal to the power station.

## **2. Supporting Clauses**

### **2.1 Scope**

The scope of the project is about the replacement of 4 oil-filled outdoor ring main unit (RMU) MV switchgears at Hendrina power station (in Pullenshope). The scope of work comprises of:

- Site establishment
- Civil works - Earth works  
- Construction
- Cable works/ electrical installations
- Electrical testing and commissioning
- Decommissioning
- Training
- Documentation
- Handing over

#### **2.1.1 Purpose**

- The objective of this project is to replace the existing RMUs with the RMUs that are internal arc compliant (IAC).
- The objective is to have functional ring feed without electrical risks (electrical shock, arc flash exposure) to all personnel.
- The new plant must not prejudice the environment i.e. It must not pose a risk of water or air pollution/soil contamination.

#### **2.1.2 Integrated Business Improvement objectives**

Not applicable.

## **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] NEC document – ECC 3 Employer's Works Information

**CONTROLLED DISCLOSURE**

## 2.2.2 Informative

- [1] 240-56030406- Specification for the ring main unit for systems with nominal voltages from 3.3kV to 33kV.
- [2] 240-77904802 – Replacement / Installation of mini-substations, ring main units and ground mounted transformers.
- [3] 240-56030635-general information and requirements for medium-voltage cable systems.
- [4] SANS 1200 Standardised Specification for Civil Engineering Construction.

## 2.3 Definitions

**2.3.1 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.

**2.3.2 Ring main unit (outdoor):** switchgear assembly that is suitable for installation in the open air i.e., capable of withstanding wind, rain, snow, dirt deposits, condensation, ice, and frost.

## 2.4 Abbreviations

Abbreviation	Explanation
A	Ampere
IAC	Internal arc compliant
kV	Kilovolts
MPa	Megapascals
MV	Medium voltage
NEC	New engineering contract
RMU	Ring main unit
SANS	South African national standards
SHEQ	Safety health environment and quality
SOW	Scope of work
XLPE	Cross linked polyethylene cable

## 2.5 Roles and Responsibilities

Role	Responsibility
System Engineer	Responsible for compiling this document.

**CONTROLLED DISCLOSURE**

## 2.6 Process for Monitoring

Not applicable.

## 2.7 Related/Supporting Documents

Not applicable.

## 3. Scope of work

### 3.1 Employer's design

The Contractor is required to confirm the Employer's Design, taking full professional accountability and liability for the works required.

#### 3.1.1 System Description

The RMU switchgear is the source of power supply to the one of the critical plants in the outside plant (older lower and the new lower dams). It offers great flexibility of the power system in maintaining continuity of supply. There is a total of 4 RMUs, which form a ring feed network.

The ring feed network can be supplied either through 6.6kV substation board 1B or 6.6kV substation board 2B. Figure 1(this section of the drawing is taken from 0.15/686 - unit and station MV&LV electrical diagram, annexure N) below shows the network connection of the electrical plant.

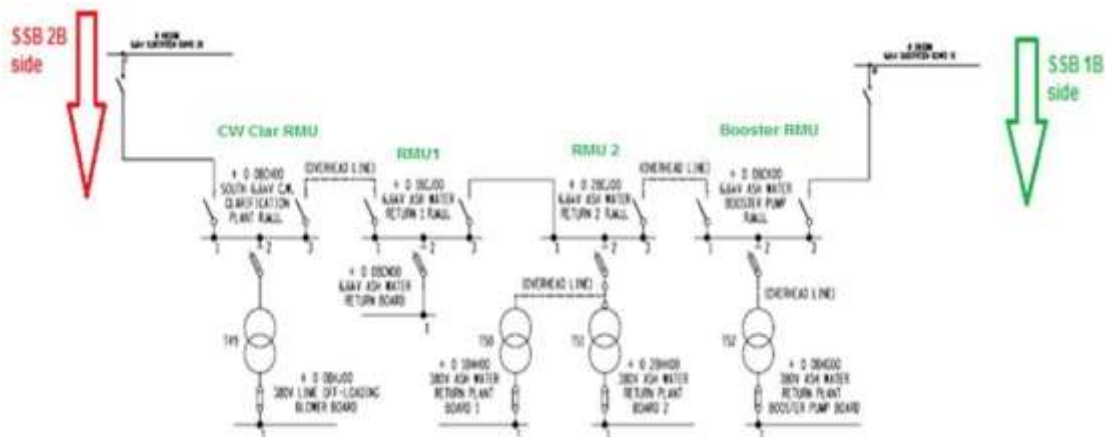


Figure 1: RMU network connection

The new ring feed network shall consist of 4X RMUs (6.6kV Ash Water Booster RMU; 6.6kV South CW Clarification RMU; 6.6kV Ash Water Return (AWR) RMU 1; 6.6kV Ash Water Return (AWR) RMU 2). They shall be supplied from the existing supply point of 6.6kV substation board 1B and/or 6.6kV substation board 2B.

**CONTROLLED DISCLOSURE**

The new RMUs shall be installed within a 5 metres radius of the existing RMU locations, and they shall still continue to supply the corresponding existing loads:

- The 6.6kV Ash Water Booster RMU located inside the station feeds the 6.6kV/380V transformer, which then supplies the 380V ash water return plant booster pump board.
- The 6.6kV South CW Clarification RMU located inside the station feeds the 6.6kV/380V transformer, which then supplies the 380V lime off-loading blower board.
- The 6.6kV Ash Water Return (AWR) RMU 1 located at the old lower dams feeds the 6.6kV ash water return board 1.
- The 6.6kV Ash Water Return (AWR) RMU 2 located at the old lower dams feeds the two 6.6kV/380V transformers which then supplies the 380V ash water return board 1 and 380V ash water return board 2.

The design for all new 4 RMU switchgears is the same and is in accordance with 240-56030406-Specification for the ring main unit for systems with nominal voltages from 3.3kV to 33kV annexure E, and SANS 1874.

The following proposed dimensions of the plinth are provided by the Employer for information.

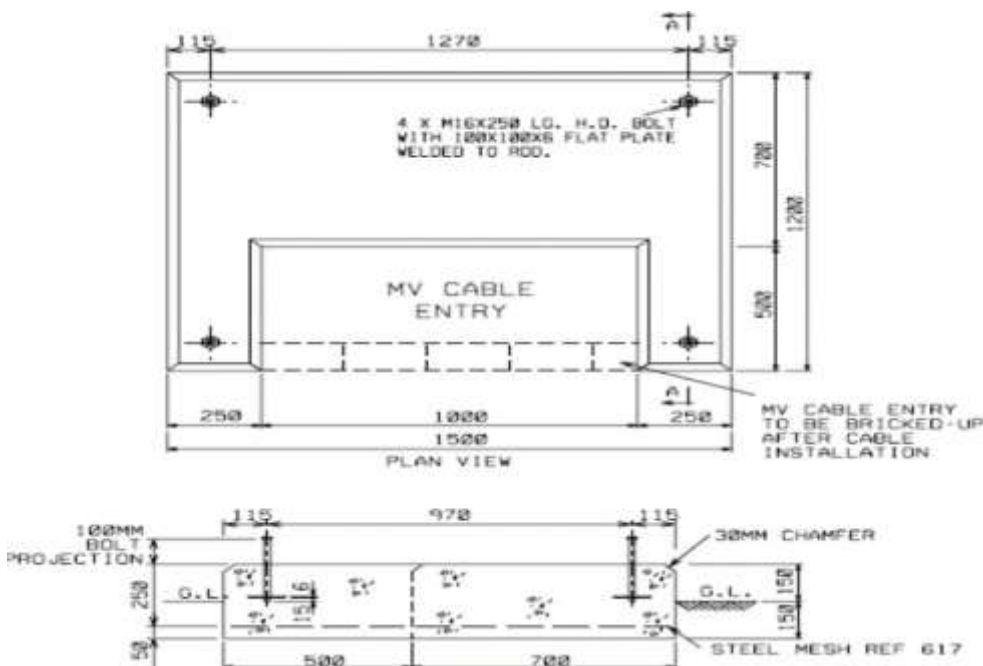


Figure 2: 11kV 3-way RMU Plinth details (Cast on site)

**CONTROLLED DISCLOSURE**

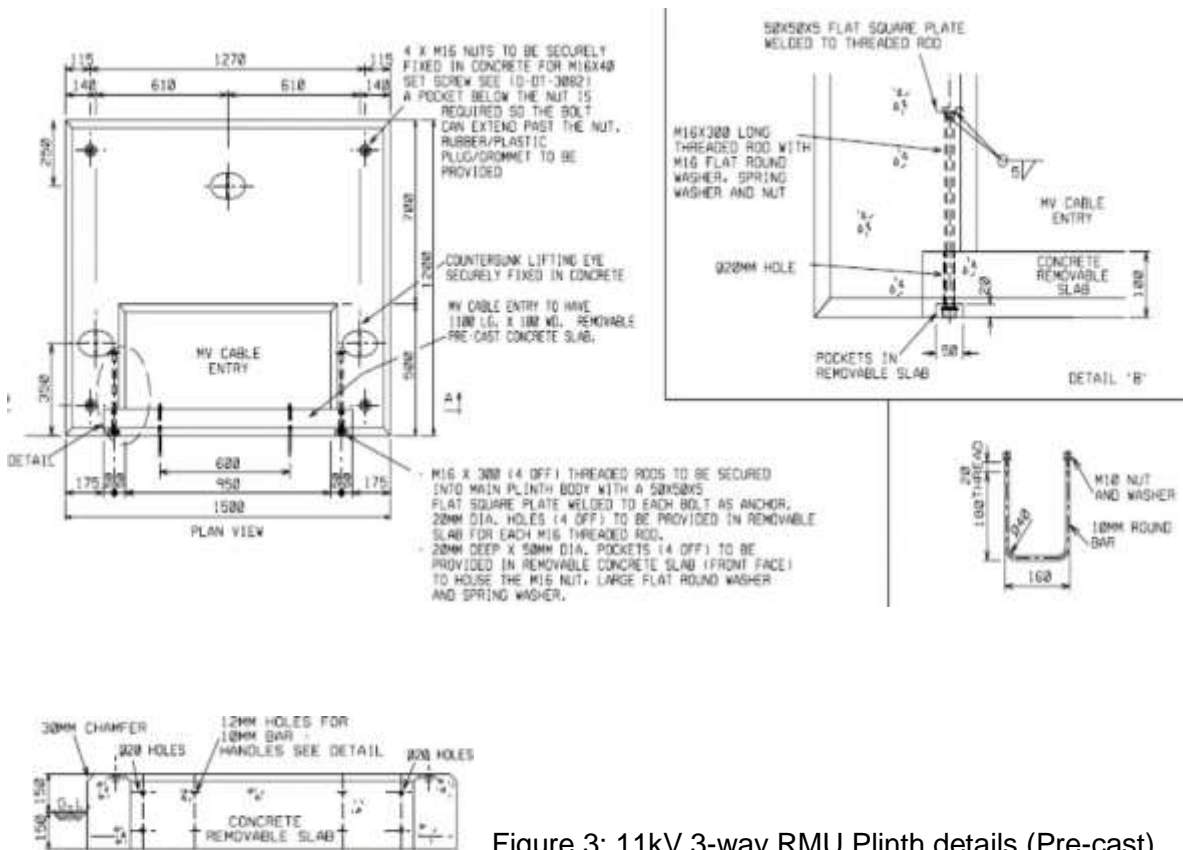


Figure 3: 11kV 3-way RMU Plinth details (Pre-cast)

**RMU layout**



Figure 4: RMU layout

**CONTROLLED DISCLOSURE**



### **3.2 Parts of the works which the *Contractor* is to design**

The Contractor adheres to 240-56030406- Specification for the ring main unit for systems with nominal voltages from 3.3kV to 33kV annexure E, and SANS 1874. In cases where the Eskom standard/task manual is silent the SANS 1874 will take precedence.

The Contractor transports the RMU switchgear from Employer stores, loads, and offloads, erects into position, installs, tests, commissions, certifies, and hands over the entire works, to ensure a fully functional RMU switchgear system.

The Contractor supplies the 6.6kV, 3-phase, 3 cores, 150mm<sup>2</sup> armoured, XLPE cable.

The Contractor shall design and build the plinths in accordance with 240-77904802 – Replacement / Installation of mini-substations, ring main units and ground mounted transformers annexure F, and Eskom buyers drawing guide D-DT-0863 annexure C.

#### **3.2.1 Electrical works**

The Contractor does the following:

1. Load, transport, offloads, erect into position, Installs, tests, commissions, certifies the new RMU switchgears, hand over the entire completed, fully functional RMU switchgear system, and decommissions the old RMU switchgears.

#### **Loading, Transportation, off-loading and Erection of Ring Main Units**

- The new 4RMU switchgear are located at the stores area on site at Hendrina Power Station.
- The loading, transportation, off-loading and erection on the base plinths, shall be in accordance with the Original Equipment Manufacture's Installation and Operations Instruction's Manual.
- In addition, the Eskom standard 240-56030635-general information and requirements for medium-voltage cable systems annexure M shall be adhered to for the *Employer's* requirements.
- *Contractor* is responsible for rigging, loading, from the *Employer's* storage facility; transporting to the specific location where the works is to be executed, offloading, and erecting of the RMUs.
- *Contractor*, upon access granted by the *Employer*, shall load each RMU from the stores area and deliver them to the location where the works is to be executed.
- Defects that are incurred during the rigging, loading, transporting, offloading, erecting remains the responsibility of the *Contractor*.
- *Contractor* transports the RMUs in accordance with 240-56030635-general information and requirements for medium-voltage cable systems annexure M, section 3.19, page46 of 66.
- *Contractor* erects the RMU on newly built plinths.

#### **Installation**

- *Contractor* shall install the RMUs as per the OEM's Installation and Operations Instruction's Manual.

**CONTROLLED DISCLOSURE**



- In addition, the Eskom task manual 240-77904802 – replacement/installation of mini-substation, ring main units and ground mounted transformers shall be adhered to for the *Employer's* requirements.
- *Contractor* shall comply to the Eskom standard, 240-56030635: General information and Requirements for Medium Voltage Cable Systems.
- *Contractor* supplies 105 metres, 6.6kV, 3-phase, 3 cores, 150mm<sup>2</sup> armoured, XLPE cable. The 105metre cable length is divided amongst 12 circuits.
- *Contractor* supplies 11 joint kits, 12 cables termination kits and 12 steel cable glands.
- The *Contractor* complies with Eskom standard, 240-56030635: General information and requirements for medium voltage cable systems, annexure M.
- **The *Contractor* shall conduct underground detection of underground services and provide a report and/or drawings with the following outputs.**
  - ✓ **Identification of the existing underground cable route.**
  - ✓ **Proposed unobstructed cable route, for the new joint (or new cable) from existing cables to the new RMUs.**
- *Contractor* digs and backfill the cable trenches in accordance with D-DT-0854 annexure D, set 8, sheet 1, revision 8. The combined distance of all trenches is approximately 110metres.
- The *Contractor* lays, terminate, joints, secure, test, connects, labels the cables in accordance with 240-77904802- Replacement/installation of mini-substations, ring main units and ground mounted transformers and 240-56030635: General information and requirements for medium voltage cable systems.
- *Contractor* shall ensure fire seal or vermin proof is installed at the RMUs cable entries.
- *Contractor* shall install earthing spikes for each RMUs and tests as per the. Eskom standard, 240-56356396 Earthing and Lightning Protection Standard.

### **Routine tests on primary circuit**

- *Contractor* shall perform all the routine tests according to IEC 62271-200.

### **Commissioning**

- The *Contractor* develops the commissioning procedure and the *Employer* reviews and approves the commissioning procedure.
- The *Contractor* commissions the plant in the presence of *Employer* representative in accordance to developed commission procedure to ensure safe and correct operation of the plant.

### **Documentation**

- The *Contractor* supplies a list of recommended spares.
- The *Contractors* provides all cabling drawings.

### **Decommissioning the existing oil filled RMUs**

- The *Contractor* dismantles, decommissions, and removes the existing oil filled RMUs to the allocated waste facility provided by the *Employer*.
- The *Contractor* complies with the Hendrina power station waste management procedure HSPPON003.

**CONTROLLED DISCLOSURE**

### **3.2.2 Civil works**

The scope of work involves the Design and Construction of 4 RMU plinths, the plinths will be located adjacent to the existing RMU's.

The *Contractor* is responsible for the following:

#### **Design**

- The *Contractor* conducts the structural design of the plinths in accordance with the specifications and standards indicated herein.
- The *Contractor* is required to submit a layout drawing with setting out coordinates of the plinth locations to the *Project Manager* for acceptance.
- The *Contractor* submits the detailed design report and drawings for acceptance before any construction can take place.

#### **Site establishment**

- Establish site offices to control and supervise construction works.

#### **Site clearance**

- Clear and grub all unwanted material along channel running length before excavations up to 150mm depth.

#### **Excavations**

All excavation works to be according to SANS 1200 standards and Engineering specifics regarding excavations and disposal of all excavated material.

- Earthworks – all earthworks to be done to engineers' specifications. Any selected material to be compacted and tested for density and moisture content.

#### **Backfilling**

- The in-situ material is compacted to 95% mod ASSHTO density of a minimum depth of 150mm.

#### **Concrete works**

- A 50mm blinding layer is applied to provide for adequate cover for reinforcement.

#### **Reinforcement**

- All reinforcement is stamped with a SANS quality assurance mark.

#### **Concrete strength**

- Use 25Mpa concrete strength for all concrete works.

#### **Formwork**

- All concrete finishes are to be smooth and desired texture. Use shutter board formwork or any type of formwork to achieve desired texture of finishing.

#### **Construction joints installation**

**CONTROLLED DISCLOSURE**

- The concrete to have silicon joints 10mm thick to join old and new cast concrete.

#### **Cube test**

- For every concrete mix delivered on site, it is required that a cube test be performed to obtain the 7-, 14- and 28-day concrete strength, and results shall be submitted to the project engineers

#### **Documentation**

- The *Contractors* provides all plinths layout drawings

### **3.3 Other requirements of the Contractor's design**

The Contractor is required to submit documents as electronic and hard copies. Both copies are delivered to the Employer's representative with a transmittal note.

### **3.4 Equipment required to be included in the works**

The Contractor:

- Provides all machinery/equipment to conduct the works, compatible with the site conditions and constraints of the project. The Employer issues no other machinery/equipment, to the Contractor, except for scaffolding.
- Provides their own resources to secure security of machinery and equipment that may be stored on site. The Employer is not liable to account for any costs related to damages or theft of machinery and equipment

### **3.5 As-built drawings, operating manuals, and maintenance schedules**

The Contractor submits the RMU documents as listed in section 3.2.1 and 3.2.2.

The Contractor submits the updated, completed, and approved RMU plinths as built drawings before date of issue of the defects certificate for the whole of the works.

## **4. SHEQR requirements**

SHEQR requirements that cover the total comprehensive approach to all potential risks includes the following legal obligation:

- Refer to section 2.3, 2.4, 2.5 of ECC3 Employer's Works Information of NEC document.

## **5. Records to be kept**

Not applicable.

## **6. Notes / Forms / Appendices / Annexures**

### **Annexures**

- **Annexure C:** Eskom buyers drawing guide D-DT-0863.
- **Annexure D:** D-DT-0854.
- **Annexure E:** 240-56030406- Specification for the ring main unit for systems with nominal voltages from 3.3kV to 33kV

**CONTROLLED DISCLOSURE**

- **Annexure F:** 240-77904802 – Replacement / Installation of mini-substations, ring main units and ground mounted transformers
- **Annexure M:** standard 240-56030635-general information and requirements for medium-voltage cable systems
- **Annexure N:** Unit and station MV&LV electrical diagram.

## **7. Acceptance**

This document has been seen and accepted by:

## **8. Acknowledgements**

- None.

**CONTROLLED DISCLOSURE**