



## Scope of Work – Substation Engineering

Technology

Title: **POSEIDON TEMPORARY  
EMERGENCY 40MVA 220/66KV  
TRANSFORMER  
CIVIL SCOPE OF WORK**

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## 1. INTRODUCTION

The Poseidon 40MVA 220/66kV Transformer 11 failed the HV Bushings Tan Delta test in January 2018. No spare bushings were available as a replacement; therefore the Grid then made the decision to switch this unit out. To manufacture new bushings takes eight months lead time from placing the purchase order.

The situation posed a risk of a possible failure of the remaining Poseidon 80MVA 220/66kV Transformer 13, which is the only feed onto the 66kV busbar. This loss would have resulted in 28MVA unserved power for a very long duration, in the order of thirty days. For this reason, the grid had planned to temporarily place an Emergency Spare Transformer 40MVA 132/66kV between the 132kV and 66kV busbars to supply the Poseidon 66kV load, should Transformer 13 also fail. This additional measure or additional contingency was deemed to be necessary from the grid as the 66kV busbar feeds a municipality (Aberdeen) load that sustains a sewerage plant, which carries a risk of solidification and an ensuing environmental disaster, in the event of loss of power. Further, 5330 customers would be without supply under this Eskom N-2 contingency.

The transformation connection will be achieved via an existing wood-pole bypass, located between the 132kV and 66kV yard, which was originally built at 220kV for the purpose of emergency line-to-feeder re-configurations on the 220kV busbar. It is noted the designs for the proposed solution were completed and detailed in design report Pos18P15-SE-D87 rev1. However the design solution did not materialise and Transformer 11 has since been restored.

This is due to the high cost associated with the solution since this transformer installation may never be used if the above-mentioned contingency of Transformer 13 failure does not materialise in the period that Transformer 11 is switched out. It was also indicated by the Grid that once Transformer 11 bushings are restored, and the transformer re-commissioned, then the emergency transformer installation will be dismantled, and the emergency spare transformer will be returned to its former storage facility.

Therefore, the change in scope from the previous proposed solution only requires a storage plinth to host a spare Transformer 220/66kV 80MVA instead of a 132/66kV 40MVA, the spare transformer will not be operated on the storage plinth but when required will be moved to the position of the failed transformer as a replacement.

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The high-level scope of work:

- Construction of a Transformer Plinth suitable for a 220/66kV 40MVA unit,
- Inclusion of all associated civil works related to the above-mentioned Plinth (Runway, bund wall & connection to emergency oil trap system).

## 2. REFERENCES

- [1] (240-55922824) - Substation Layout Design Guideline
- [2] (240-109644476) - Standard for Implementation of Substation Layouts for Transmission Substations
- [3] South African Grid Code
- [4] Occupational Health and Safety Act (OHS Act) 85 of 1993
- [5] (32-1205) - Eskom Maintenance Management Policy
- [6] (TST41-794) - Substation and Facility Maintenance
- [7] (240-43008621) - Eskom Generation and Wires Operating policy
- [8] (32-727) - Eskom Safety, Health, Environment and Quality policy
- [9] (32-846) - Operating Regulations for High Voltage Systems
- [10] (SANS 1200) – General Civil
- [11] (IEEE 80) - Guide for Safety in AC Substation Grounding
- [12] (TSP41-1009) - Standard for Labelling Outdoor High Voltage Equipment within Eskom Transmission Substations
- [13] (240-101940513) - Earth Electrode Resistance Measurement standard
- [14] (240-84854974) – Continuity Measurement of Substation Earth Grid Systems
- [15] (240-606480018) - Terms of Reference for Design Review Teams presiding over Power Delivery Infrastructure Designs in Eskom
- [16] (240-109589380) - Direct Lightning Stroke Protection of Substations
- [17] (240-82736997) - Stringing, Cabling, Earthing & Erection Specification for Transmission Substations
- [18] (240-1001183119) - Standard for Fences in Eskom Transmission Stations
- [19] (240-108982466) - Standard for HV Yard Stone in Eskom Substations
- [20] (TST41-877) - Transmission Substations Design Earthing Standard
- [21] (240-139282493) – Security Lighting for Eskom applications

## 3. SCOPE OF WORK

Designs and construction are in accordance to [1] – [21]. All construction is to be carried out in accordance with Eskom's Safety, Health and Environmental Specification. Construction will be

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done in close proximity to other electrical equipment energized at 66kV, therefore all necessary safety procedures must be strictly adhered to. Design working clearances will ensure that the design is safe to construct and operate.

The Civil Scope of Work involves the following design aspects:

- Removal and replacement of yard stone;
- Excavations;
- Fitting of rebar;
- Casting of a new foundation and plinth,
- Installation of equipment steelwork,
- Earthing of equipment, and
- Fencing for storage plinth area.

### **3.1 YARD STONE AND EXCAVATIONS**

- Yard stone in areas which have not met the minimum requirement of 100mm should be topped up to a minimum of 100mm.
- Yard stone in the area of construction should be removed and stockpiled.
- Cast new/modify foundations in accordance with bay layout drawings, 0.37/5588.
- Yard stone can be replaced once foundations have been completed. Contractor to ensure that the yard stone has not been contaminated with soil or weeds.
- Excavations must be performed on terrace for foundations as per layout drawings, 0.37/5588.

### **3.2 REBAR & CASTING OF FOUNDATIONS**

- All concrete shall be supplied by the Contractor. Designs to align with soil conditions.
- Concrete work to be in accordance with SANS 1200.
- No concrete to be poured where the air temperature will drop below 4°C in 8 hours after pouring of concrete; unless a suitable approved additive is added to the concrete mix.

### **3.3 INSTALLATION OF STEELWORK**

- Install equipment steel supports and caps as per layouts, 0.37/5588.

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### 3.4 FENCING FOR STORAGE PLINTH AREA

- Fencing to be done in accordance with drawing 0.37/5588.
- New 1m gate to be installed for access to storage area.
- Earthing to be connected every 10m.
- 2 New 3m removable panel to be installed with removable post.

### 4. AUTHORISATION

This document has been seen and accepted by:

Name	Designation	Signature
Abdullah Kaka	Senior Engineer – Substation Engineering	
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### 5. REVISIONS

Date	Rev.	Compiler/s	Remarks
19/01/2022	1	B. Hajee	First Issue

### 6. DEVELOPMENTAL TEAM

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

- Bilal Hajee

### 7. ACKNOWLEDGEMENTS

N/A

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