

**Scope of Work – Substation Engineering****Technology**

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– Remaining Scope of Work

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Compiled by

p.p A. Maneli

Senzo Duma
Design Engineer
Substation Engineering
Date: 14 - 06 - 2022

Checked by

Dawie Naude
Senior Advisor
Substation Engineering
Date: 14-6-2022

Authorised by

Andile Maneli
Middle Manager
Substation Engineering
Date: 14 - 06 - 2022

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1. INTRODUCTION

The Watershed Strengthening project was established due to the fact that the network was struggling with the growth in the area. The substation is located closed to Lichtenburg approximately 5km on the R505. Grid Planning had proposed the installation of a new transformer as well as extending the existing 132kV yard and upgrading the busbar to tubular. Initially the project was split into phase 1 and phase 2 in order to be able to commission the HV yards at least get the transformer operational when phase 1 scope of work (SOW) was completed. However, phase 1 scope of work was not completed due to the contract expiring which prompted the Project Manager to back on open tender market to complete the remaining SOW as well phase 2. The remaining SOW will include the following items to be completed and commissioned:

- Main column and medium equipment foundations
- Drainage system
- Medium support structures.
- Earthing, including earth mat.
- Decommissioning of existing bays.
- Trenches and trench covers
- Concrete Gutter
- Yardstone
- HV Safety Fence
- Busbar support foundations and structures.
- Manholes and Manholes covers
- Oil dam outlet
- Buildings
- Floodlighting
- Access Road

Please see section 3 below for the detailed breakdown as well the revised drawings which is a guideline of what currently exists on site.

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2. REFERENCES

- [1] (240-55922824) - Substation Layout Design Guideline
- [2] South African Grid Code
- [3] Occupational Health and Safety Act (OHS Act) 85 of 1993
- [4] (32-1205) - Eskom Maintenance Management Policy
- [5] (TST41-794) - Substation and Facility Maintenance
- [6] (32-727) - Eskom Safety, Health, Environment and Quality policy
- [7] O(32-846) - Operating Regulations for High Voltage Systems
- [8] T(SANS 10400-XA) - The application of the National Building Regulations
- [9] (SANS 204) - Energy efficiency in buildings
- [10] (SANS 1200) - Standardized Specification for Civil Engineering Construction

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3. SCOPE OF WORK

Note that this document must be used in conjunction with the design drawings (see item 2.1) as well as all specifications, procedures, guidelines and standards mentioned therein. Work will be performed in a live substation, and therefore all necessary safety procedures and precautions must be adhered to.

The civil engineering scope of work for this project includes the following:

3.1 Remaining Scope of Work

The following list includes the consolidated scope of work for building in all substations mentioned above see table below:

Items	Remaining Scope of Work
➤ Main column and medium equipment foundations	Construction of the following columns: <ul style="list-style-type: none">• C96 to C101.• C84 to C89.• Please refer to the Foundation, Trench and Earthmat (FTE) drawing 0.18-14129-13
➤ Drainage system	<ul style="list-style-type: none">• The drainage system was incompleted. The terrace was constructed on a depression therefore the drainage system consist of interlinked perforated concrete lined gutter.• For details see updated drawing 0.18-32131
➤ Medium support structures.	<ul style="list-style-type: none">• Lattice steel support structures must be assembled and erected• See bay layouts for drawing number
➤ Earthing, including earth mat.	<ul style="list-style-type: none">• Installation of earth from the man earth mat to the fences (HV fence and perimeter fence).• Installation of earth from earth mat to buildings
➤ Access Road	<ul style="list-style-type: none">• The existing access road is required to be upgrade.• Please refer to drawing 0.18-32141 sht 1-3

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➤ Decommissioning of existing bays	132kV feeder 12, 13, Cap bank 31. Transformer 2, Transformer 4 Bays: <ul style="list-style-type: none"> • ALL these bays needs to be constructed. (Phase 2) • Existing Bays needs to be decommissioned. • Please refer to the Foundation, Trench and Earthmat drawing 0.18-14129-13
• Trenches and trench covers	<ul style="list-style-type: none"> • Supply and installation of cable trench covers. • Please refer to the Foundation, Trench and Earthmat drawing 0.18-14129-13 • Please also refer to precast detail 0.54/390 sht 17a
➤ Concrete Gutter	<ul style="list-style-type: none"> • The concrete lined gutters form part of the drainage system. • For details see updated drawing 0.18-32131
➤ Yardstone	<ul style="list-style-type: none"> • Yardstone is required to have 100mm thickness • Stone size is specified to be 19-23mm.
➤ HV Safety Fence	<ul style="list-style-type: none"> • The HV yard safety fence is required to be supplied and installed including gates and removal panels. • Please see detail 0.54-4963 sht 1-4
➤ Busbar support foundations and structures.	<ul style="list-style-type: none"> • Please refer to the updated FTE drawing 0.18-14129-13
➤ Manholes and Manholes covers	<ul style="list-style-type: none"> • Please refer to DTL. 0.54-390 sht 1-4
➤ Oil dam outlet	<ul style="list-style-type: none"> • The oil dam was completed but when it's operational it won't be able to disperse stormwater or it will run back into the the dam because the outlet wasn't constructed. • Refer to the fire protection drawing for details.
➤ Buildings	<ul style="list-style-type: none"> • The consumable store, cladged store, workshop and access control buildings are all incomplete. • See scope of work – Point 4 - 11

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<p>➤ Floodlighting</p>	<ul style="list-style-type: none">• It has been complete for phase 1 and is required in phase 2.
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4. BUILDINGS

4.1 CONTROL BUILDING

Exterior

- Paving – seal the gap between the paving and the building and or kerb
 - If the gap is larger than 10mm – mortar fill.
 - If the gap is smaller than 10mm – Exterior expandable acrylic joint filler.
- The exposed concrete raft foundation must be cleaned and made good with Sika cementitious mortar repair. The finished look must be a smooth square aesthetical clean concrete grey.
 - Height H.V yard side = 150mm
 - Height Road side = 400mm
- Clean all brickwork
- Seal and make good all openings in wall of aircon or pipe entries.
- Clean gutters and downpipes
- Paint Fascia – one coat and similar colour
- Install a 100mm pvc drainage pipe to the stormwater manhole from the cable trench entrance.
- Door D5
 - Steps – Make good with Sika cementitious mortar repair. The finished look must be a smooth square aesthetical clean concrete grey.
 - Painted as per the finishes schedule
 - Add dust seals as per the door schedule
- The cable entrance duct on the road side to be completed. Only the walls is done with no cover slab.
- Ramp at main entrance door –
 - close the sump
 - Seal the expansion joints with Exterior expandable acrylic joint filler
- All wall expansion joints – rake out fibre board and fill with Exterior expandable acrylic joint filler brown Sika Sikaflex 11FC
- Install glass to the porch windows
- Roof:
 - Check ridges and waterproofing by specialist
 - Check and repair the water leak to the battery room. (road side)

Battery room

- Drainage channel grid does not fit – 2m length at basin side.
- Emergency eyewash – place eyewash on opposite side to have more space to the battery bank.
- Maintenance sink pvc outlet – extend the pipe to drain into channel.
- Door frame –
 - clean paint and varnish
 - Repair the wall against the frame at the bottom of the frame.
- Walls – repair and make good the flaking paint and paint with acid resistant paint as specified.

- Close roof area above walls marked as firewalls with 4mm nutec board and drywall lightweight steel tracks as the frame. All gaps must be sealed with foam filler.
- Drainage channel to the outside according to detail – make good on outside.
- Repair and make good between the wall, cornice and ceiling.
- Make good the ceiling above the door area.

Porch

- Fit glass to the windows
- Fit expansion joint filler

Control room

- Door D3 to porch – make good the fixing of the ironmongery to the door.

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- Replace the skirting with 19 x 76 meranti hardwood skirting. Sand and paint with clear polyurethane varnish.
 - Door D1 –
 - main entrance door. Paint as specified.
 - Apply door seals as specified to make door airtight.
 - The top lock chain according as specified in the door ironmongery.
 - The expansion joint in the wall must be opened up to fit acrylic joint filler. Repair cracks and Paint 500mm on either side.

4.2 Storage yard

- Paving is not completed. Paving – seal the gap between the paving and the building and or kerb
 - If the gap is larger than 10mm – mortar fill.
 - If the gap is smaller than 10mm – Exterior expandable acrylic joint filler.

4.3 Cladded store

- Complete the concrete apron.
- Complete the floor slab
- Complete the steel structure and cladding. Only the brickwork is done.

4.4 Consumable store

- The exposed concrete raft foundation must be cleaned and made good with Sika cementitious mortar repair. The finished look must be a smooth square aesthetical clean concrete grey.
- Complete the brick walls and make good.
- Apply the final screed and floor finish to the raft foundation floor.
- Fit roof with waterproofing as specified.
- Fit door complete as specified.

4.5 Workshop

- The exposed concrete raft foundation must be cleaned and made good with Sika cementitious mortar repair. The finished look must be a smooth square aesthetical clean concrete grey.
- Entrance door:
 - Door is clashing with the floor.
 - Fit ironmongery.
 - Complete ceiling and paint
 - Install windows
 - Install crawl beam.
 - Repair floor cracks and apply screed and epoxy as specified.
 - Complete store area
 - Complete all finishes as detailed and specified.

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4.6 ACCESS CONTROL BUILDING

Exterior

- Complete parts of the foundation ring beam and slabs.
- The exposed concrete raft foundation must be cleaned and made good with Sika cementitious mortar repair. The finished look must be a smooth square aesthetical clean concrete grey.
- Cut joints and fill with Exterior expandable acrylic joint filler brown Sika Sikaflex 11FC
- Install the roof fascia's and paint as specified
- Window plaster bands to be painted as specified.
- Window frames to be cleaned.
- Porch concrete roof
 - edge steel I-beam to be painted as specified.
 - Concrete repair to soffit of slab. No sand cement mixture.
 - Waterproofing by specialist.
 - Complete downpipe.
- Complete plumbing on the outside.
- Install burglar bars to the toilet windows as specified.
- Make good facebrick wall and plumbing pipes.

Interior

- Tile skirting:
 - Make good top of tile skirting – paint black
 - Clean and make good.
- Clean floor tiles – was wiped with oil.
- Remove elec. Conduit & isolator at basin.
- Replace worktop
- Clean overpainted paint marks on various components .
- Clean door frame of panel room and toilet
- Kitchen floor unit to be cleaned and sealed at wall.
- Ablution:
 - Complete sanitaryware as specified
 - Clean tiles
 - Add burglar bars
 - Add lockers and safe as specified

5. FLOODLIGHTING

- Supply and install one 24m mast OLM09 including steelwork, foundation, cables, electrical equipment, and luminaires as specified on the drawings.
- Supply and install one 24m mast foundation, relocate one 24m mast OLM10 to new position shown on drawings. Connect existing supply cable.

6. SECURITY LIGHTING

- Supply and install 2 poles and luminaires for the entrance gate area.
- Supply and install new armoured cable inside security lighting pole from MCB to luminaire.

7. CONTROL BUILDING ELECTRICAL INSTALLATION

- Investigate and repair emergency lighting
- Investigate and repair air conditioning installation

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- Supply and install isolator for the extraction fan in the battery room
 - Supply and install 8 diffusers in the battery room ceiling.
 - Supply and install isolator and speed control for the pressurization fan in the control room.
 - Powder coat extractor fan support.
 - Supply and install Oil dam pump supply cable, Distribution Board and isolator
 - Complete legend card according to drawing
 - Repair holes where piping goes through holes of air conditioners
 - Replace the drain pump pipe saddles with Masterbat saddles
 - Supply and install air conditioner trunking between outdoor and indoor units and on the outside wall.
 - Remove conduit and wiring from battery room roof void, replace with armoured cabling.
 - Investigate and repair emergency cutoff switch of battery room.
 - Repair battery room luminaire.
 - Supply and install beige powder coated trunking from DB1 to roof void.
 - Clean all light switches, power points and isolators.

8. ACCESS CONTROL BUILDING ELECTRICAL INSTALLATION

- Supply and install the luminaires according to the drawing.
- Supply and install 2 air conditioning units.
- Supply and install 2 isolators for the air conditioners
- Install the supplied DB8 including equipment.
- Connect the installed supply cable to DB8.
- Supply and install supply cable to DB8B.
- Supply and install Blower motor supply cable and power point.

9. WORKSHOP ELECTRICAL INSTALLATION

- Supply and install DB5
- Supply and install luminaires according to the drawing, ensuring the luminaires are on the correct phases and specified.

10. CLADDED STORE ELECTRICAL INSTALLATION

- Supply and install DB4 including Supply cable from workshop DB5 and equipment in DB4.
- Supply and install electrical equipment within the store, power points, light switch, and luminaires.

11. CONSUMABLE STORE ELECTRICAL INSTALLATION

- Supply and install isolator including Supply cable from workshop DB5.
- Supply and install electrical equipment within the store light switch, and luminaires.

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12. LIST OF DRAWINGS

<u>Drawing Title</u>	<u>Drawing Number</u>
STATION ELECTRIC	0.18/14097
KEY PLAN	0.18/14128
FOUNDATION, TRENCH AND EARTHMAT	0.18/14129 SHEET 0
FOUNDATION, TRENCH AND EARTHMAT	0.18/14129 SHEET 2
STEELWORK MARKING PLAN	0.18/14130 SHEET 0
STEELWORK MARKING PLAN	0.18/14130 SHEET 2
BAY LAYOUTS	0.18/14126
DRAINAGE LAYOUT	0.18/32131
132KV TUBULAR LAYOUT	0.18/32216
DEMOLISHING DETAIL	0.18/32147
FENCES LAYOUT	0.18/32144
ACCESS AND TERRACE ROADS LAYOUT AND DETAILS	0.18/32141 SHT 1
ACCESS AND TERRACE ROADS LONGITUDINAL SECTIONS	0.18/32141 SHT 2
T-JUNCTION ENTRANCE	
TERRACE LAYOUT	0.18/32140
CONTROL BUILDING	0.18/32130
ACCESS CONTROL BUILDING PLAN	0.18/32133 sht. 1
ACCESS CONTROL BUILDING GENERAL ARRANGEMENT	0.18/32133 sht. 2
CLADDED STORE PLAN	0.18/32148 sht. 4
CLADDED STORE FOUNDATIONS	0.18/32148 sht.5
CLADDED STORE BUILDING STEEL	0.54/5588 sht. 1-3
CONSUMABLE STORE BUILDING	0.18/32137
WORKSHOP BUILDING	0.18/32136
ACCESS CONTROL BUILDING	0.18/32133
STORAGE YARD LAYOUT	0.18/32146
FLOODLIGHTING	0.18-19158 SHT1-3
CONTROL BUILDING ELECTRICAL INSTALLATION	0.18-32134 SHT 1-6
SECURITY LIGHTING	0.18-32135 SHT 1-2
ACCESS CONTROL BUILDING ELECTRICAL	0.18-32135 SHT 3
WORKSHOP ELECTRICAL	0.18-32136
CLADDED STORE ELECTRICAL	0.18-32137
CONSUMABLE STORE ELECTRICAL	0.18-32138

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