

	<b>Scope of work</b>	<b>Generation</b>
---	----------------------	-------------------

Title: **Scope of work for repairing the road and sump next to the HV yard area**

Unique Identifier:

Alternative Reference Number: **N/A**

Area of Applicability: **Engineering**

Documentation Type: **Specification**

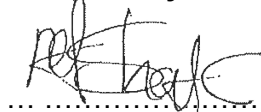
Revision: **1**

Total Pages: **16**

Next Review Date: **N/A**

Disclosure Classification: **CONTROLLED DISCLOSURE**

**Compiled by**



**TC Netshia  
System Engineer Civil**

Date: 2022/10/18 .....

**Authorised by**



**NE Hlophe  
Auxiliary Engineering  
Manager**

Date: 2022/10/18 .....

## **CONTENTS**

	<b>Page</b>
<b>1 INTRODUCTION .....</b>	<b>3</b>
<b>2 SUPPORTING CLAUSES.....</b>	<b>3</b>
2.1PURPOSE .....	3
2.2APPLICABILITY .....	3
2.3NORMATIVE/INFORMATIVE REFERENCES .....	3
2.3.1 Normative .....	3
2.3.2 Informative .....	3
2.4DEFINITIONS.....	3
2.4.1 Disclosure Classification .....	3
2.5ABBREVIATIONS.....	4
2.5.1 Roles and Responsibilities .....	4
<b>3 REQUIRED CRITERIA FOR CONTRACTOR .....</b>	<b>5</b>
<b>4 RELATED/SUPPORTING DOCUMENTS .....</b>	<b>5</b>
<b>5 SCOPE OF WORKS .....</b>	<b>5</b>
5.1DESCRIPTION OF THE <i>WORKS</i> .....	5
5.1.1 Gravel road .....	6
5.1.2 Kerbing and edge beam.....	6
5.1.3 Sump .....	6
5.1.4 Cleaning of site .....	8
5.2EMPLOYER'S DESIGN REQUIREMENTS .....	9
The following Functional Requirements must be adhered to .....	9
5.2.1 Gravel Material for the Wearing course .....	9
5.2.2 Concrete.....	10
<b>6 CONTRACTOR'S DESIGN .....</b>	<b>13</b>
<b>7 AUTHORISATION.....</b>	<b>13</b>
<b>8 REVISIONS .....</b>	<b>13</b>

### **CONTROLLED DISCLOSURE**

When downloaded from the EDMS, this document is uncontrolled and the responsibility rests with the user to ensure it is in line with the authorised version on the system.

## **1 INTRODUCTION**

Duvha Power Station is a coal fired power station located in Witbank, Mpumalanga Province. The station had a project in 2021 to replace a storm water pipe next to the HV yard area which was corroded. The storm water pipe work was successful replaced, however there is the area was not properly reinstated. Upon inspection it was found that the HV yards sump downstream of the storm water pipe was starting to corrode and will also need some repair work.

## **2 SUPPORTING CLAUSES**

### **2.1 PURPOSE**

The purpose of this project is to reinstate the surface area above the storm water pipe and repair the HV yards sump which has started to show some signs of corrosion

### **2.2 APPLICABILITY**

This document applies to Duvha Power Station.

### **2.3 NORMATIVE/INFORMATIVE REFERENCES**

Parties using this document shall apply the most recent edition of the documents listed in the following paragraphs.

#### **2.3.1 Normative**

- [1] ISO 9001 Quality Management Systems.
- [2] Construction Regulations, 2014
- [3] 32-727 - Eskom Safety, Health, Environment and Quality (SHEQ) Policy
- [4] Occupational Health and Safety Act No. 85 of 1993,
- [5] QM58 - Suppliers contract quality requirements specification
- [6] SANS 1200 - Standardized specification for civil engineering construction
- [7] SANS 1921-5, Construction and management requirements for works contracts, Part 5: Earthworks activities which are to be performed by hand

These documents are indispensable for the application of this document, i.e. documents to be used together with this document.

#### **2.3.2 Informative**

- [8] 474-58 (Rev1): Document and Records Management

## **2.4 DEFINITIONS**

### **2.4.1 Disclosure Classification**

**Controlled disclosure:** controlled disclosure to external parties (either enforced by law, or discretionary).

### **CONTROLLED DISCLOSURE**

## **2.5 ABBREVIATIONS**

<b>Abbreviation</b>	<b>Description</b>
CIDB	Construction Industry Development Board
HV	High Voltage
SE	System Engineer
SHEQ	Eskom Safety, Health, Environment and Quality
QA	Quality Assurance
QC	Quality Control
QCP	Quality Control Plan
PPE	Personal protective Equipment

### **2.5.1 Roles and Responsibilities**

#### **Project manager**

To ensure that:

- The appointed contractor execute all the work specified in the scope of work on the set timelines and allocated budget
- Monitor and ensure that all workers from contractor and Eskom have appropriate PPE whenever accessing the construction area
- All workers from contractor and Eskom involved in the project are familiar with the risk assessment, safety precautions and hazards which they will be exposed too during the implementation of the project
- The work is carried out by appropriately authorised or competent person
- Facilitate all Eskom internal process required prior execution of work and manage all project risk

#### **System Engineer (SE)**

- Responsible for the Quality Assurance

#### **Appointed Contractor**

- The contractors shall execute the work as per the specification provided.
- The supplier shall supply a method statement before any execution of work to the engineer detailing how the scope will be safely implemented
- The contractor must adhere to the condition of the contract and Eskom SHEQ requirements

### **CONTROLLED DISCLOSURE**

When downloaded from the EDMS, this document is uncontrolled and the responsibility rests with the user to ensure it is in line with the authorised version on the system.

### **3 REQUIRED CRITERIA FOR CONTRACTOR**

- The contractor must be CIDB registered and compliant to the requirements.
- The contractor must provide and have a record of having carried out civil construction works
- The contractor must have necessary technical personnel to execute the work as listed on the technical criteria.

### **4 RELATED/SUPPORTING DOCUMENTS**

None

### **5 SCOPE OF WORKS**

#### **5.1 DESCRIPTION OF THE *WORKS***

The scope of work for this project is to reinstate the area between MH1 and sumps 2 as indicated on the layout on figure 1 below. The scope will also include the repair of sump 2 which has started to corrode due to continue inflow of effluent water (corrosive) from the water treatment plant which is located up stream of the area.



**Figure 1: Site layout plan**

**The project scope is as follows**

- Repair of gravel road
- Interlocking pavement works
- Kerbing works
- Sump 2 repair works
- Cleaning of site
- Breaking of concrete wall in the south drains v-ditch
- Reinstating the 11kv cables to its original route

**CONTROLLED DISCLOSURE**

### **5.1.1 Gravel road**

The gravel road along the HV yard area was one of the services that was disturbed during the storm water repair work and need to be reinstated. The total length of the road is 140m, starting from MH1 up too sump 2 as indicated on figure 1. The first section of the road total to 60m will only require 1 layer of gravel material to be applied, and the last section of the road total to 80m will required 2 layers of gravel material to be applied.

The works entails:

- Remove the 150mm top layer on the existing road and stock pile. The material must be tested if suitable to be used for subbase layer
- In situ rip and compact sub-grade, water, spread, shape and compact to 93%Mod AASHTO to a depth of 100mm
- Construct gravel wearing course of 150mm and 300mm on the 2 section of the roads respectively, The wearing coarse should be done in layers not exceeding 150mm with material of specification show on section 5.2.1 table 1 below. Material should be from commercial sources or a certified borrow pit.

Note: There is a load of G5 material on site that the supplier will be required to utilise first before procuring additional material. The supplier will be required to provide the rate for the works inclusive and exclusive of the material

### **5.1.2 Kerbing and edge beam**

The kerbing works is required along the road and pavement island. The total perimeter of 75m required for kerbing and 75m required for edge break. Figure 7 Kerb – Long will be

- Figure 7 Kerb – Long kerbing will be used for all areas which need kerbing works
- 100 x 200 mm edge beam will be constructed in all areas which required edge beams. (25 Mpa concrete to be used for all edge beams)

### **5.1.3 Sump**

HV yard sump mostly contains contaminated water which is pumped to the station dirty water dams. The sump also collects the storm water from the storm water drains around which is regarded as contaminated storm water also pumped to the dirty water dams. The main storm water pipe that connects to the sump is a 1200 diameter concrete pipe and v-ditch channel from the cooling towers.

The sump was previously repaired and minor modification was done on the floor leading to invert level of the pipe being 300mm below the finish floor level (FFL) of the sump. This needs to be correct to avoid water constantly standing inside the storm water pipe.

**The sump works entails**

**CONTROLLED DISCLOSURE**

#### **5.1.3.1 Isolation**

In order to gain access into the sump, all streams on inflow into the sump must be isolated. Two set of isolation points will be requires, one at MH 3 and another one at the v-ditch channel. The following must be done

- Construct a concrete wall inside the MH3 of 1.3m wide by 1.3 m high to blank off the outlet pipe to the sump and 7m wide and 1.5m high blank of the v-ditch. 25mps mass concrete must be used.
- Supply a diesel pump not less than 60l/s with all fittings to pump water storm to the channel to LLD SW channel as shown in the Appendix A. NB: The pipe to be used in the MH3 isolation should be an acid resistance pump together with all fitting due to corrosive effluent medium.
- Supply a lay flat discharge pipe of not less than 220m to connect to a two diesel pumps
- Provide site supervision for all isolation works for 24 hours. This is required to prevent any over topping of water to the environment or backflow of water into the plant.
- Break and remove all isolation wall after the work has be completed

**NB:** It is the responsibility of the supplier to provide all necessary safety requirement and all the resources needed for the pump supervisory staff. This should be catered on the pricing

#### **5.1.3.2 Concrete works**

In order to fix the invert level of the sump the following must be done

- Clean the sump and remove all ash sludge, oil and acidic residues
- Cut the existing floor as shown in the appendix B to a depth of 500mm
- Excavate the to an extra depth of 700mm for foundation and extra sump depth
- Compact the insitu to stabilise the soil to compaction rate of 95% mod AASTHO and CBR value of at least 15 to enhance the bearing capacity
- Supply and install reinforcing steel as indicated in the appendix B
- Supply and install form work accordingly
- Supply and cast in concrete wall and floor of 200mm thick using 30/19mm concrete. See section 5.2.2 further concrete specification and required test
- Supply concrete grout and create benching in all corners of the sump
- Repair all corroded section of the sump wall and floor using 30mpa concrete grout
- Supply and apply acid resistance coating as per Specification acid resistant epoxy liner. See section 5.2.3 for specification

#### **CONTROLLED DISCLOSURE**

#### **5.1.4 Cleaning of site**

The site has some section where rubbles need to be cleared out and some backfilling of open trench required.

- Back fill requires is 7m x 6m x2m deep open trench. The backfilling must be done in layers not exceeding 150mm and the area
- All rubble must be clear and contained as per the Duvha waste management procedure ENVP0005.

#### **5.1.5 Breaking of concrete wall in the south drains v-ditch**

The station south drain area has a concrete wall that was constructed to blank off water from flowing to the station south oil trap plant. Part of the scope of work is to break that wall and reinstate the plant. This activity should be done last, after the sump has been repair and it has been proven that contaminated water is no longer seeping into that v-ditch channel.

- Break the existing wall (see detail of the wall on Appendix C)
- Remove all concrete rubbles and dumped as per the Duvha waste management procedure ENVP0005.
- Repair the surface area of the v-ditch where there was a wall, and bring it to smooth surface using a 30 MPa quick dry grouting from a commercial source. The specification of the grouting to be approved by the engineer before commencing
- Repair all the corroded concrete joints in the v-ditch using a 30 MPa quick dry grouting (see specification) and seal the affects joint with proprietary expansion joints (10mm) (The specification of the grouting to be approved by the engineer before commencing)

#### **5.1.6 Reinstating the 11kv cables to its original route**

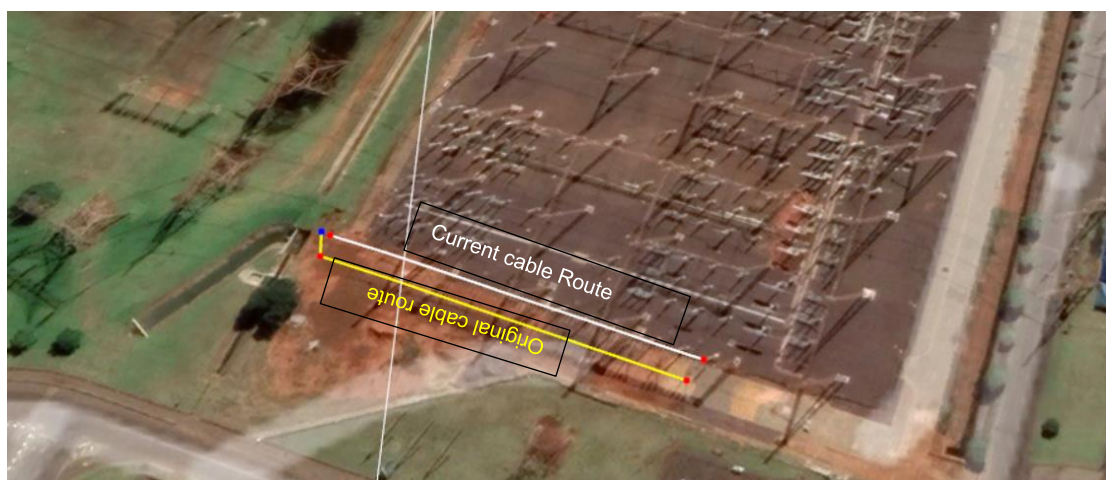
In the previous implementation phase of replacing the storm water the 11kv cable was rerouted from its original position, as it was restricting the excavation activity. The cable must now be reinstated to its original position. The supplier will only execute the earthworks part of this scope and all electrical works will be done by Eskom Electrical Maintenance Department (EMD). The scope will entail:

- A risk assessment must be conducted by all relevant Eskom stakeholders and the supplier. This must be approved by the relevant manager in line with the RA scoring criteria.
- EMD must scan the area where cable is currently position (Electrical engineering must advice the appropriate method of scanning) and provide the report showing the position of the cable (position and depth).
- EMD must isolate the cable from the substation where the cable is feed
- The supplier must be given an written instruction to start with the excavation by the PM. (PM must ensure that the all action identified in the RA prior excavation are completed by the relevant party to ensure safe working environment)

### **CONTROLLED DISCLOSURE**



- Supplier must excavate and expose the cable. Hand excavation must be utilised with special care not to damage the cable
- A trench of 1.5m depth x 0.5m wide x 120m length must be excavated on the original route as indicated on the layout plan below. The exact servitude will be confirmed on site with the Eskom engineers (Electrical and Auxiliary)
- EMD to reinstate the cable to its original route
- Supplier to backfill and the excavated trenches (current cable route and the original cable route). Backfill will be done using excavated material in layers not exceeding 150mm. Compact to 95% Mod AASTHO at 2% moisture content
- EMD to de-isolate the cable



**Figure 2: Layout Plan for cable routes**

## **5.2 EMPLOYER'S DESIGN REQUIREMENTS**

The following Functional Requirements must be adhered to

### **5.2.1 Gravel Material for the Wearing course**

The following specifications for materials for unpaved wearing courses for rural roads are stated by the TRH 20 and TRH 14 as:

Maximum size	37.5 mm
Oversize index (Io)	5 %
Shrinkage product (SP)	100 - 365 (max. of 240 preferable)
Grading coefficient (Gc)	16 - 34
PI	8 - 20
CBR := 15 at = 95 per cent Mod AASHTO compaction and OMC	

Table 1: Material specification for construction of wearing course

The following grading envelopes are suggested as a guide by the TRH 14 in Table 2 below

### **CONTROLLED DISCLOSURE**

Sieve size (mm)	Percentage passing by mass			
	Maximum size of particle (mm)			
	37,5	26,5	19,0	13,3
37,5	100	100	100	100
26,5	85-100	100	100	100
19,0	70-100	80-100	100	100
13,2	60-85	60-85	75-100	100
4,75	40-60	45-65	50-75	60-100
2,00*	25-45	30-50	35-55	45-70
0,425	15-40	15-40	18-45	25-50
0,075*	7-30	7-30	7-30	7-30

Table 2: suggested grading of gravel wearing courses

The 2.00mm and 0.075mm sieve sizes are the most important in this instance.

In the construction of the road, detail testing of in-situ material along the centreline of the existing unpaved road needs to be done. It is proposed that soil testing must be done at least 20m intervals, tests are conducted, and analysis should be done by a reputable laboratory. The pavement design, if needs be should be optimized by Engineer, once these results are available. Suitable borrow areas should be identified by the contractor or alternatively the material should be sourced from local commercial sources

### 5.2.2 Concrete

Concrete should have adequate flexural strength and good dimensional stability. The concrete should be placed, compacted and finished to acceptable dimensional tolerances and surface texture.

#### General requirements

Materials for the concrete are covered by SANS 10100-2,

#### Cement

Cement shall comply with the requirements of SANS 50197-1 of cement 42,5N or 52,5N. Superplasticiser type CHRYSO Fluid L or similar shall be used to improve workability of the concrete ONLY if necessary. Superplasticiser shall be the chloride free type.

#### Aggregates

Aggregates shall comply with the requirements of SANS 1083. In addition, the following requirements should be stated in the project specifications: coarse aggregate shall comply with the 10 % fine aggregate crushing test (10 % FACT) values, as specified in SANS 1083; the maximum nominal size of the coarse aggregate shall be the lesser of 25 % of the thickness of the slab and 37,5 mm; a coarse aggregate of size smaller than 19,0 mm shall not be used; during the work, no fine aggregate such that the fineness modulus of the aggregate varies by more than 0,20 from that on which the original mix design is based shall be used, unless the mix proportions are adjusted accordingly; and when bleeding is likely to be excessive, the use of a suitable fine blending sand, or a different sand, or a water-reducing admixture, or air-entrainment, shall be considered.

### CONTROLLED DISCLOSURE

**NOTE:** In certain conditions, additional tests might be necessary to determine the suitability of aggregates (see SANS 1083)

### **Admixtures**

Please Note: Admixtures shall ONLY be used with the approval of the Engineer. Admixtures shall be chloride free.

### **Concrete mix proportioning**

#### **General**

Ready mix concrete class 19 for blinding, 30/19 for slabs shall be used for this application. The contractor shall provide a mix design to the Engineer. No placing of concrete shall commence without the prior approval of the mix design.

#### **Proportioning**

The concrete mix should be proportioned to try and provide a smooth and as continuous an overall grading as possible. Where more than one size of coarse aggregate is used, the sizes should be chosen to avoid particle interference between the two sizes.

#### **Fresh concrete**

- The concrete should be designed to ensure adequate consistence as measured by the slump test (see SANS 5862-1). Suitable slumps are in the range of 70 mm to 120 mm depending on the equipment to be used.
- The concrete should be cohesive enough to ensure complete compaction and to avoid segregation. This can be assessed by tapping the base plate in the slump test after the slump has been determined. A cohesive mix should settle gradually without the concrete falling apart.
- The bleeding of the fresh concrete should be minimized as excessive bleeding can result in zones of weakness when trapped below aggregate particles and reinforcing steel and also interfere with finishing operations. Care shall be taken not to reduce bleeding too much as this will significantly increase the risk of plastic shrinkage cracking.
- The effect of admixtures, when used, on setting and bleeding should be assessed.
- The amount of paste on the surface after compaction should be assessed in the laboratory. Too little paste could result in difficulty in finishing the surface and disturbance of the coarse aggregate near the surface. Too much paste could result in durability problems such as dusting and crazing of the surface area.
- Concrete should be thoroughly compacted in terms of SANS 10100 /2 by using suitable concrete vibrators.
- Damp curing of the topping should start immediately after surface finishing by covering the patch with polyurethane or damp hessian. Damp curing should be maintained for at least 3 days
- The construction area is to be barricaded for at least 3 days.

#### **Finishes:**

Finishes shall be a smooth finish.

#### **Hardened concrete**

### **CONTROLLED DISCLOSURE**

The 28 d compressive strength for concrete should be 30 MPa.

### **Quality Control**

All work is carried out under the supervision of an experienced supervisor. The Contractor complies with the Employer's Quality Requirements as specified in Eskom Generation Standard QM58. All quality control documentation is submitted to the Project Manager within 7 days of Contract date. Quality Control:

- The contractor to provide a Quality Control Plan to Eskom Duvha for approval prior to construction. The contractor shall also assure that the following quality control documentation are available during construction and are submitted to ESKOM on completion.
- Ready Mix Concrete delivery note (if ready mix concrete will be used)
- QCP plan with signed off witness and hold points by Eskom's Engineer
- Slump test to be done in terms of SANS 5862-1
- Cube Testing in terms of SANS 5860, SANS 5860 – 2&3:
- Cube test samples to be taken and tested by an approved laboratory which will be agreed upon prior to execution of work
- Testing of cubes shall be done on 7 and 14 as well as 28 days.

### **Formwork**

All formwork to be provided with a smooth finish.

#### **5.2.3 Corrosion Resistant liner for Effluent sump**

The product must be able to handle the following

- Should handle Sulphuric acid & caustic
- Should handle effluent with pH of 1 up to 11
- Should be flexible to allow concrete movement without breaking or cracking
- Should be able to handle mechanical stresses, thermal shocks and abrasion.
- Should also be non-slip, non-corrosive, free-thaw resistance, antistatic, antibacterial, aesthetic and should have hygienic advantages
- Should have a life span of not less than 10 years guarantee
- An epoxy product to be used and at least 3 coats should be used and the product specification to be approved by the engineer

#### **5.2.4 Grouting specification**

The grouting must have the following:

- Compressive Strength of not less than 30Mpa
- Flexural Strength of not less than 6.0 N/mm<sup>2</sup>
- Tensile Strength of not less than 2.6 N/mm<sup>2</sup>
- Easy mixing and placing
- Rapid strength development
- Fatigue tested

**CONTROLLED DISCLOSURE**

- Good flow properties
- Free from chlorides and metallic particles
- Expansive properties
- Very high mechanical strengths.
- Not corrosive or toxic

## **6 CONTRACTOR'S DESIGN**

None

## **7 AUTHORISATION**

This document has been seen and accepted by:

<b>Name &amp; Surname</b>	<b>Designation</b>
Hlophe NE	Auxiliary Engineering Manager

## **8 REVISIONS**

<b>Date</b>	<b>Rev.</b>	<b>Compiler</b>	<b>Remarks</b>
April 2022	0	Netshia TC	Draft Document

### **CONTROLLED DISCLOSURE**

When downloaded from the EDMS, this document is uncontrolled and the responsibility rests with the user to ensure it is in line with the authorised version on the system.

## **Appendix A: Isolation**

### **CONTROLLED DISCLOSURE**

When downloaded from the EDMS, this document is uncontrolled and the responsibility rests with the user to ensure it is in line with the authorised version on the system.

Appendix B: Detail of sump works

**CONTROLLED DISCLOSURE**

When downloaded from the EDMS, this document is uncontrolled and the responsibility rests with the user to ensure it is in line with the authorised version on the system.

Appendix C: Detail of the South drain wall

**CONTROLLED DISCLOSURE**

When downloaded from the EDMS, this document is uncontrolled and the responsibility rests with the user to ensure it is in line with the authorised version on the system.