

	Specification	Generation Engineering
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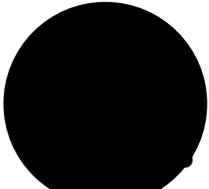
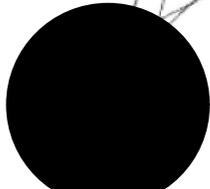
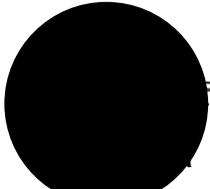
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<p>Civil engineer</p> <p>Date: 2025/05/28</p>	<p>Chief engineer</p> <p>Date: 2025/05/30</p>	<p>Auxiliary engineering manager</p> <p>Date: 2025-06-02</p>	<p>Engineering manager</p> <p>Date: 2025-06-02</p>

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1. INTRODUCTION

The ash dam is a hydraulically deposited tailings facility. All the ash water and tailings deposited to the ash dam is via the ash and sludge pipelines which terminate at the ash dam distribution box. The slurry is channelled from the distribution box to either dam 1 or dam 4. The ash from the slurry settles and water is decanted from the dams, via penstocks, to a concrete lined channel along the toe line called the solution trench. This water then enters silt traps before flowing into the Ash Water Return (AWR) Dam. Water is then pumped back to the plant from the AWR Dam for re-use in the ash hydraulic deposition process.

The approximate co-ordinates of the ash dam are as follows:

Latitude: 25°56'29.02" S

Longitude: 29°20'19.63" E

The solution trenches various panels are in disrepair and need urgent repairs and reconstruction. There has been erosion under the solution trenches which is causing the panels to collapse in, the depth of the sinkhole is extending to a depth of 4.5m below ground level. It is required that the ash dam solution trench be repaired and reconstructed in other sections to ensure safe conveyance of water without contravening environmental regulations.

2. SUPPORTING CLAUSES

2.1 SCOPE

2.1.1 Purpose

The purpose of this scope is to appoint a Contractor to execute the repairs and reconstruction of solution trenches along the perimeter of the ash dam, including the reinstatement of the damaged foundation sections which are eroded to a depth of 4.5m below ground level.

2.1.2 Applicability

This document shall be applicable to Duvha Power Station only.

2.2 NORMATIVE / INFORMATIVE REFERENCES

2.2.1 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 2001 BE3 Repair of sinkholes and subsidences in dolomite land
- [8] 03A- ENM0003 Ash Dam Operations and Maintenance Manual
- [9] ISO 14000, Environmental Management System

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[10] The National Water Act (Act 36 of 1998)

[11] 32-727 Eskom SHEQ Policy

[12] 240-100200485 The Safe Management and Use of Pesticides and Herbicides

2.2.2 Informative

[13] 03A DUV0045 Duvha Environmental Management Policy

[14] 03A ENVP0005 Environmental Waste Management Procedure

[15] 32-95, Environmental Occupational Health and Safety Incident Management procedure

2.3 DEFINITIONS

2.3.1 Disclosure Classification

Controlled Disclosure: Controlled Disclosure to external parties (either enforced by law, or discretionary).

2.4 ABBREVIATIONS

Abbreviation	Description
AWR	Ash Water Return
ISO	International Organisation for Standardisation
NWA	National Water Act
O&M	Operation and Maintenance
QCP	Quality Control Plan
SANS	South African National Standards
SHEQ	Safety Health Environment Quality
WUL	Water Use License

2.5 ROLES AND RESPONSIBILITIES

Auxiliary engineering:

- Providing quality assurance by conducting quality control during maintenance activities.
- Ensuring that the scope is executed accordingly, and all work is done as per specification.

Projects department:

- Ensuring that the contractor executes all the work within the stipulated timeline.
- Creating a plan that outlines the project scope, budget, schedule, resources, and milestones.
- Managing the project budget and ensuring that costs are within the allocated budget and addressing financial concerns that arise during the project.
- Identifying potential risks and developing mitigation measures
- Providing regular updates and handle communication between stakeholders

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- Ensuring that the contractor has site access and does induction

Appointed contractor:

- Execution of construction activities as outlined in the project scope.
- Ensuring that all work is executed in accordance with the specification while also complying to the relevant national standards.
- Adhering to health and safety regulations and maintaining a safe working environment
- Procuring and managing all the materials and resources needed for the project.
- Ensuring that construction tasks are completed on time delays are minimized.
- Accountable for the quality of work done on site.
- Adhering to their allocated budget
- Ensuring that the project complies with the environmental regulations.

2.6 PROCESS FOR MONITORING

This will follow an Eskom internal review process.

3. SCOPE OF WORK

3.1 DETAILED SCOPE

The solution trench is a concrete lined channel which collects water from the toe drains, stormwater generated off the sides of the ash dam, water decanted from the penstocks as well as seepage from the dam through toe drains and channel it into the AWR dam. The solution trench also collects all the water from the Power Station via the dirty water V-ditch channel.

The Contractor must ensure that the solution trench is kept clean from dirt, plant growth and any other items that can obstruct the free flow of water in these trenches on areas where the repairs are to be executed.

Since the solution trenches carry ash water decanted from the ash dam as well as dirty water from the power station, ash and silt slowly build up on the solution trenches concrete overtime causing scale build up. The contractor shall remove all the scaling on the solution trenches and dispose of. The scaling shall be disposed at the ash dam designated dump area before the repair works are executed to ensure that the solution trench is properly exposed for the repairs. Care should be taken to not damage the concrete when removing the scale.

3.2 SOLUTION TRENCH REPAIRS

The solution trench, a concrete lined channel, is a key component of the ash dam water management system as it captures contaminated water from seepage and directs all the decanted water from the dam to the Low-Level AWR dam. The solution trench has a total of 198 toe drains which are constantly discharging into the solution trench.

The solution trench on the eastern side of the dam also directs all the contaminated water emanating from the power station terrace as well as the coal stockyard and directs it to the Low Level AWR dam.

There are various sections of the solution trench that are in disrepair and need urgent maintenance. In addition, there are places where the foundation has been eroded and needs to be reinstated. The

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solution trench foundation has a subsoil drainage system (see figure 1 below), and it is expected that some sections might have been disturbed, and repair will be required on those section.

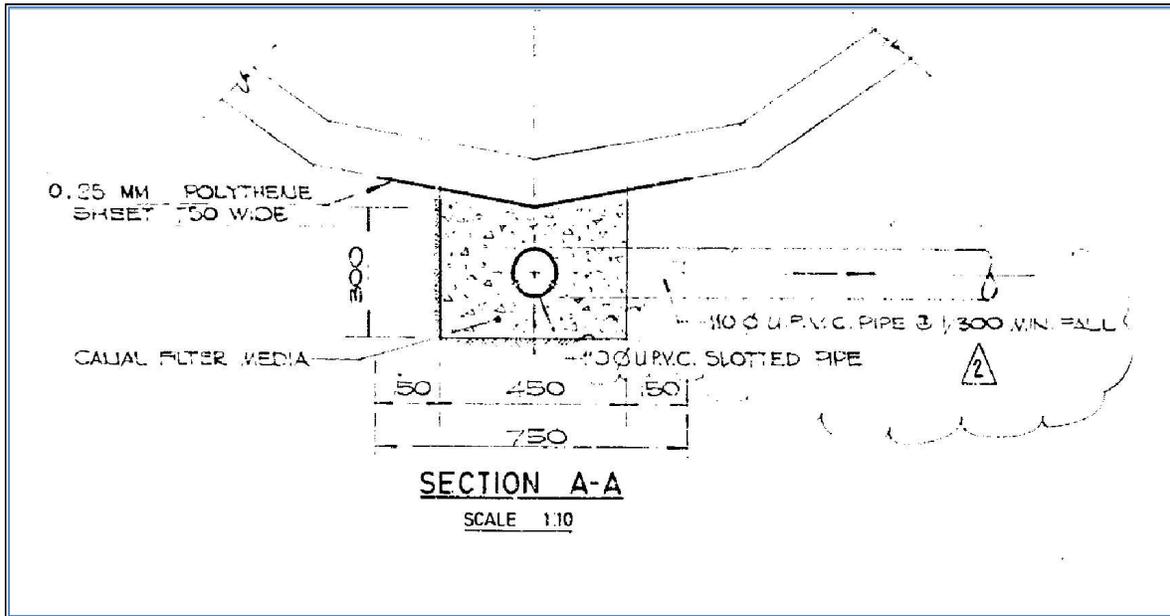


Figure 1: Subsoil drainage system (Drawing No 0.57/48854)

An inspection was conducted, and the solution trench was divided into 13 sections requiring either full reconstruction or repairs. These sections are set out visually in the illustration below in Figure 1 and discussed hereafter.



Figure 2: Ash dam solution trench repair sections

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3.2.1 SECTION 1 (DP 1 – DP 10)

This section covers the solution trench from the western side of the distribution box up to the first bend in the solution trench on the southwestern side of the ash dam. This section is in a relatively good condition with only cracks and some minor holes visible. The contractor shall do the repairs and sealing of joints on this section. The section encompasses a total length of 900 m, with 140 joints to be sealed. The material to be used shall be high strength non-shrink grouting and/or crack fillers for cracks and a concrete joint sealant.



Figure 3: Typical view of section 1 panels

3.2.2 SECTION 2 (DP 10 – DP 15)

This section covers the southwestern corner of the ash dam. This section is heavily overgrown, and some sections are clearly undermined by roots, with the concrete being lifted in some sections. The contractor shall reconstruct this section of the solution trench, including the isolations of this area during execution.

The section encompasses a total length of 360 m, with 60 joints.

3.2.3 SECTION 3 (DP 15 – DP 19)

This is a small section on the start of western side of the ash dam. The section is in good repair, only cleaning, sealing of joints and repairs of cracks are required to be executed by the contractor.

The section encompasses a total length of 350 m, with 56 joints to be sealed.

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Figure 4: Section 3 requiring cleaning, sealing and repair of joints and cracks

3.2.4 SECTION 4 (DP 19 – DP 21)

This section is similar in location to Section 3 but in a poor state with visible sections of the channel needing reconstruction. The contractor shall reconstruct this section of the solution trench.

The reconstruction of the section would require the following activities:

- a) Diversion of the water flowing in the trench to bypass the section (See isolation details on section 3.3.1).
- b) Removal of the concrete liner.
- c) Repair to the channel embankments and floor.
- d) Replacement of the concrete after the above in (c) is completed.

The section encompasses a total length of 180 m, with 40 joints.

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Figure 5: Section 4 requires a total reconstruction.

3.2.5 SECTION 5 (DP 21 – DP 27)

This section of the solution trench requires repairs. The section encompasses a total length of 420 m, with 70 joints to be sealed.



Figure 6: Section 5 requiring repairs, cleaning, sealing of cracks and joints.

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3.2.6 SECTION 6 (DP 27 – DP 30)

This section of the solution trench requires reconstruction. The Contractor shall reconstruct as it is in bad condition as shown in figure 6. The section encompasses a total length of 190 m, with 35 joints.



Figure 7: Section 6 requiring total reconstruction.

3.2.7 SECTION 7 (DP 30 – DP 38)

This section of the solution trench requires repairs. The section encompasses a total length of 250m, with 50 joints to be sealed.

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Figure 8: Section 7 requiring repairs.

3.2.8 SECTION 8 (DP 38 – DP 43)

Section 8 of the solution trench requires reconstruction. The contractor shall execute reconstruction works on this section. The section encompasses a total length of 180m, with 35 joints.



Figure 9: Section 8 requiring reconstruction.

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3.2.9 SECTION 9 (DP 43 – DP 80)

This section needs to be repaired. The contractor shall execute repair works on this section of the solution trench. The section encompasses a total length of 1 430 m, with 250 joints to be sealed.



Figure 10: Section 9 requiring repairs.

3.2.10 SECTION 10 (DP 80 – DP 87)

This section requires reconstruction. The contractor shall execute the reconstruction works required on this section. The section encompasses a total length of 120m, with 25 joints.



Figure 11: Section 10 requiring reconstruction.

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3.2.11 SECTION 11 (DP 87 – DP 135)

This section of the solution trench requires repairing. The contractor shall execute the repair works required on this section of the solution trench.

The section encompasses a total length of 2 350 m, with 390 joints to be sealed.

3.2.12 SECTION 12 (DP 135 – DP 156)

Section 12 is the section that is in the worst state of the whole solution trench. The foundation of this sections is compromised, the refusal on the Dynamic Probe Super Heavy (DPSH) test results is at 7.5m max and 0.3m minimum. The average from the tests gives the depth of 4.5m for refusal. Therefore, allowance should be made to repair the foundations using the average depth of 4.5m for the repairs. The extent of erosion extends to a depth of 4.5m below the ground level.

Excavations on this area may be necessary to remove the contaminated soil material. The excavated material shall be disposed of at the ash dam designated disposal area as advised by the employer. The contractor shall make provision for the excavated material to be loaded on the disposal trucks from excavations and be immediately disposed of at the ash dam.

The contractor shall remove and reconstruct the panels on this section of the solution trench with associated earthworks necessary to provide stable founding conditions for the new trench section. This shall be done carefully since this area is eroded and always saturated with water therefore the excavations on this area might not be stable. The fill material shall be stored in stockpiles on the road next to the solution trenches. The area where construction shall be executed adjacent to a wetland, therefore care should be taken to minimise impact on the wetland. Provision shall be made by the contractor to ensure that the excavations are stable and safe.



Figure 12: Section 12 with compromised foundations

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Figure 13: Section 12 requires total reconstruction.

The section encompasses a total length of 1 550 m, with 270 joints.

3.2.13 SECTION 13 (DP 156 – DP 164)

The contractor shall execute the repair works on this section of the solution trench. The section encompasses a total length of 740 m, with 130 joints to be sealed.

3.2.14 Summary of the solution trench findings

Section	Extent	Y Coordinates	X Coordinates	Recommended work	Length(m)
Section 1	DP1-DP10	-32932.8 to -32226	2870932 to 2870599	Repair	900
Section 2	DP10-DP15	-32226 to -32178.8	2870599 to 2870285	Reconstruct	360
Section 3	DP15-DP19	-32178.8 to -32455.4	2870285 to 2870101	Repair	350
Section 4	DP19-DP21	-32455.4 to -32595.4	2870101 to 2870014	Reconstruct	180
Section 5	DP21-DP27	-32595.4 to -32930.7	2870014 to 2869803	Repair	420
Section 6	DP27-DP30	-32930.7 to -33080.6	2869803 to 2869710	Reconstruct	190
Section 7	DP30-DP38	-33080.6 to -33285	2869710 to 2869580	Repair	250
Section 8	DP38-DP43	-33285 to -33424.6	2869580 to 2869492	Reconstruct	180

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Section 9	DP43-DP80	-33424.6 to -34550.8	2869492 to 2869430	Repair	1430
Section 10	DP80-DP87	-34550.8 to -34664.1	2869430 to 2869371	Reconstruct	120
Section 11	DP87-DP135	-34664.1 to -35027.8	2869371 to 2870797	Repair	2350
Section 12	DP135-DP156	-35027.8 to -33797.9	2870797 to 2871321	Reconstruct	1550
Section 13	DP156-DP164	-33797.9 to -33220	2871321 to 2871068	Repair	740

Table 1: Solution trench sections summary

3.3 FOUNDATION REINSTATEMENT

The inverted filter method shall be used to reinstate the foundation by rehabilitation and stabilization of the foundation area. There are zones of deep, very soft and compressible soils along section 12. To stabilise the existing subsidence, excavations along the length of the solution trench will be required. It is recommended that excavations are taken to a depth of 5.0m below ground level. The slopes should be excavated at 1v:3.75h to allow for the removal of the corrosive soils.

Rockfill or boulders (up to 500mm diameter) should be placed within the excavations and the material should be compacted by tamping with the back of the excavator bucket into the underlying very soft, compressible soils. Alternatively, a vibratory roller should be placed within the excavation and the rockfill compacted until negligible settlement is recorded.

Thereafter, rockfill up to 300mm diameter should be backfilled and compacted into the excavation trench. The rockfill to be compacted to a depth of 1.0m below ground level. A biddim blanket should be placed on top of the compacted dump rock to prevent fines clogging the dump rock.

A G6 engineering fill to be backfilled and compacted to the underside of the proposed solution trench founding depth. The G6 material to be compacted to 95% modified AASHTO density at -1% to +2% of optimum moisture content.

Where necessary repair the subsoil drainage system (using the 100dia slotted U.P.V.C pipe, canal filter media and 0.25mm polythen sheet 750 wide), see figure 1 for further details

3.4 REPAIR, SEAL AND RECONSTRUCTION

The repair method shall use Sika products or similar products to repair cracks and joints where applicable with the re-construction of sections with conventional concrete. Cracks and small holes should be cleaned and repaired with Sika MonoTop 412 or similar, as per the manufacturer's specification. All sections to be reconstructed, shall be demolished, foundation conditions re-instated, and new sections cast using conventional concrete. All joints should be sealed with SikaflexPro 3 or similar. The material to be used shall be high strength non-shrink grouting and/or crack fillers for cracks and a concrete joint sealant for all the sections to be repaired.

3.4.1 SITE AND SURFACE PREPARATION

The following activities shall be covered by the contractor under this section of the works:

- Remove the solution trench panels on all sections that need reconstruction. This shall be done carefully to avoid damaging the subsoil drainage. Provision shall be made to repair the damaged subsoil drainage system (see figure 2).

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- Backfill the areas where reconstruction is needed as per 3.3 for section 12 and use G6 material to backfill the rest of the sections where reconstruction is required in layers not greater than 150mm and compact to 95% Mod AASHTO density at -1% to +2% of optimum moisture content.
- Isolate the identified areas with compromised foundations for reconstruction to prevent water from flowing into the sections being repaired or reconstructed. The contractor shall take note of the following for isolations:
 - i. Procure, supply, and provide all necessary equipment, tools, plant, and materials to be used for isolations including but not limited to pumps, barriers, isolation material etc. The contractor is to take note that there is no power supply at the ash dam.
 - ii. Ensure that the isolation works are secure and watertight.
 - iii. The diverted water flow shall be monitored and managed to prevent flooding and ensure that construction activities are not interfered with.
 - iv. There are toe drains, or filter drains around the ash dam that discharge seepage into the solution trench. The contractor shall ensure that the toe drains are also isolated to prevent them from discharging into an isolated area.
 - v. The contractor shall supply and install equipment necessary to fully isolate the damaged sections of the solution trench. The contractor shall provide a method statement detailing how the isolations will be executed successfully.
 - vi. There are fish drains all around the ash dam which collect seepage from the embankment walls. The contractor shall divert the drains to discharge away from their work area to ensure a dry working area.
 - vii. The contractor shall take note that in some sections of the solution trench seepage is continuously flowing along the solution trench. The contractor shall propose isolations for the solution trench, toe drains, filter drains, fish drains, seepage along the solution trench as well as seepage into the excavations prior to execution. The contractor shall submit a method statement and an Environmental Management Plan (EMP) to the employer prior to execution of the works.
- The Contractor shall properly deal with isolations to ensure that the works are kept sufficiently dry for their proper execution and ensure that the collected water is discharged into the solution trench and not the environment.
- The contractor shall provide, operate, and maintain in sufficient quantity such pumping equipment, pipes and other equipment as may be necessary for isolation works.
- Remove the isolated panels on areas where reconstruction is required.
- Backfill the areas with compromised foundations as per section 3.3.
- Level and compact the ground to provide a stable base for the formwork and the channel. The contractor shall do compaction testing to ensure that the compaction requirements are achieved.
- Place damp proof course or membrane on the layer works before casting concrete.

3.4.2 REINFORCEMENT WORKS

Procure, supply, and fix mesh reinforcement Reinforcing - Ref 395. The mesh shall be placed at the middle of the slab to allow enough concrete cover for both sides of the mesh.

3.4.3 Formwork

- All formwork to be provided with a smooth finish.

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- The formwork shall be designed and constructed according to the dimensions and specifications of the trapezoidal channel as follows:
 - Bottom width: 1500mm
 - Flow depth: 1500mm
 - Side slopes: 1 vertical: 1,5 horizontal
 - Length of each panel: 6m
 - Wall thickness: 150mm

The provided dimensions shall be verified by the contractor on site, the solution trenches might vary in size in different sections of the solution trenches.

- Construct a stable and accurate formwork to achieve the specified dimensions above and shape of the trapezoidal channel.
- All exposed concrete edges to be provided with a 25 x 25 chamfer.
- Ensure the formwork can withstand the pressure of wet concrete and environmental conditions.
- Position the bottom panel first. It shall be 1.5 meters in width and 6m in length (to be verified by the contractor on site).
- Erect the side panels with the required slope 1V: 1,5H. The height of the side panels should be 1.5 meters plus the thickness of the base and sides (150 mm).
- Install formwork ties and spacers to maintain the correct spacing and alignment of the panels.
- Secure the panels together at the corners and joints using clamps and fasteners.
- Add bracing and props to support the formwork panels and prevent movement or collapse under the weight of the wet concrete.
- Use a spirit level or laser level to ensure the formwork panels are aligned, and at the correct slope for the sides.
- Ensure the top edges of the formwork panels are level to achieve a uniform top surface.
- Coat the inner surfaces of the formwork with a release agent to prevent the concrete from sticking to the formwork panels.

All required formwork panels, ties and spacers, clamps and fasteners as well as supporting prop and braces etc shall be procured and supplied by the contractor.

The formwork panels, ties, and bracings shall be removed when the concrete has cured.

The Contractor shall take note that some panels have toe drains and filter drain outlets, the formwork shall cater for the drains.

3.4.4 CONCRETE WORKS

The Contractor shall:

- Install 50mm concrete spacer blocks tied to the mesh reinforcement to ensure a minimum concrete cover is achieved.
- Procure, supply, and place 35MPa concrete with 19mm aggregates.
- Perform a slump test prior concrete placement, a slump of 100mm shall be achieved.

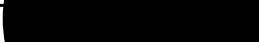
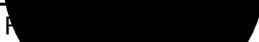
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- Take cube samples prior concrete placement for comprehensive strength test. A minimum of 6 cube samples shall be taken of which 3 shall be used for 7-days compressive strength testing and 3 shall be used for the 28-days compressive strength testing.
- A South African National Accreditation System (SANAS) accredited laboratory shall be used for testing of concrete. The proposed laboratory shall be communicated to the project manager and agreed prior to casting of concrete.
- A 7-day compressive strength shall be more 60% of the specified 28-days compressive strength.
- The concrete shall be thoroughly compacted to prevent bleeding and/or segregation.
- Use a concrete vibrator to consolidate the concrete and eliminate air pockets.
- Allow the concrete to cure and gain sufficient strength before removing the formwork.
- The sections shall have steel float finish.
- After concrete placement the concrete shall be protected during the curing period which shall be proposed by the contractor and approved by the engineer.
- All joints shall be sealed using SikaflexPro 3 or similar approved product to manufacturer's specification.
- Backfill on the sides of the concrete and rehabilitate the area after placing of concrete and when the formwork is removed.
- Concrete shall be so placed in moulds and vibrated that concrete surfaces are smooth and even and all arises are true and clean.
- Curing in accordance with the requirements of SANS 2001-CC1:2012 at ambient temperature shall start not earlier than 6 h after the concrete has been placed.
- The required 28 day-compressive strength for concrete is 35MPa.

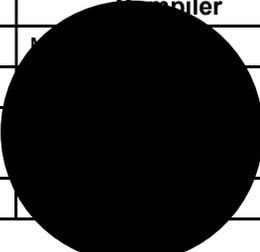
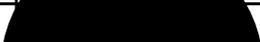
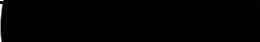
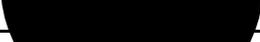
The concrete should be placed, compacted, and finished to acceptable dimensional tolerances and surface texture.

4. AUTHORISATION

This document has been seen and accepted by:

	Designation
	Senior advisor - Environmental management
 hi	Chief engineer - Civil
 A	Chief engineer - Civil

5. REVISIONS

Date	Rev.	Compiler	Remarks
December 2024	0.1		First draft for review
January 2025	1.0		Final draft for signatures
April 2025	2.0		Reviewed to add geotechnical studies recommendations
May 2025	2.0		Final report for signatures

CONTROLLED DISCLOSURE

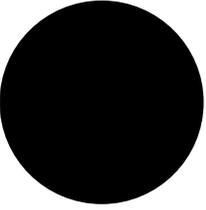
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6. DEVELOPMENT TEAM

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

-  a

7. ACKNOWLEDGEMENTS



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	Specification	Generation Engineering
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Title: **Addendum to the Technical specification for the ash dam solution trench repairs at Duvha Power Station**

Unique Identifier:

Alternative Reference Number: **N/A**

Area of Applicability: **Engineering**

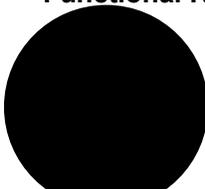
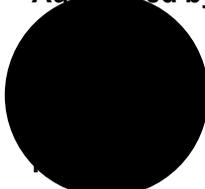
Documentation Type: **Report**

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Disclosure Classification: **CONTROLLED DISCLOSURE**

Compiled by  so Civil Engineer Date: 2026/03/27.....	Functional Responsibility  Auxiliary Engineering Manager Date: 2026/03/27.....	Authorised by  Auxiliary Engineering Manager Date: 2026/03/27.....
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1.1.1 Liner installation

A liner is required to prevent seepage of water into the ground which will cause groundwater contamination. The Contractor shall procure, supply and install the liner system, including all associated layers required to form a complete containment barrier. The Contractor shall procure and supply a Class C geomembrane liner consisting of 1.5 mm thick HDPE, approved clay material, and all pipes and fittings required for the reinstatement of the existing underdrainage system. All materials shall comply with relevant specifications and applicable standards.

The existing channel panels in sections identified for reconstruction shall be demolished, broken into manageable pieces, and disposed of at a designated disposal area as instructed by the Employer. Following demolition, the exposed in-situ soil shall be trimmed, levelled, and compacted to form a stable and uniform base suitable for liner installation.

The Contractor shall reinstate any existing underdrainage system within the prepared base, ensuring correct alignment, gradients, and functionality for effective drainage. Upon completion of the base preparation and underdrainage installation, a 300 mm thick compacted clay liner shall be constructed in two layers of 150 mm each, with each layer compacted to achieve 95% Mod AASHTO density at -1% to +2% of optimum moisture content.

A 1.5 mm thick HDPE geomembrane shall be installed above the clay liner. The Contractor shall ensure proper placement, alignment, seaming, and welding of the geomembrane in accordance with approved procedures and manufacturer specifications. The geomembrane shall be adequately anchored and terminated at the channel edges to ensure continuity and integrity of the containment system.

All works shall comply with the National Norms and Standards for Disposal of Waste to Landfill (GN R636) and any other applicable environmental legislation governing leachate containment systems. The completed liner system shall provide a continuous, impermeable barrier to prevent groundwater contamination.

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