Eskom	Scope of Work	Kusile Power Station

Title: **Kusile Power Station Dams Concrete and High-Density Polyethylene Liner Repairs**

Document Identifier:	**KUS-20250719**
AlternativeReference Number:	**N/A**
Area of Applicability:	**Kusile Power Station**
Functional Area:	**Engineering**
Revision:	**1**
Total Pages:	**11**
Next Review Date:	**August 2028**
Disclosure Classification:	**Controlled Disclosure**

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Date: 13/11/2025	Date: 13/11/2025	Date: 14.11.2025	Date: 14/11/2025

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1. Introduction

To prevent contamination to the underlying soil, the Station's Raw Water Reservoir (RWR) and pollution control dams (PCD) were designed and constructed as fully contained structures. The reservoir and dams are fully lined with a double liner and a leakage detection system. A suitably qualified Contractor is required to repair the underlying high-density polyethylene (HDPE) liner and associated concrete structures, at the Station's raw water reservoir and dams, as and when required.

2. Supporting Clauses

2.1 Scope

2.1.1 Purpose

The purpose of this document is to detail the scope of the repairs that may be required on the underlying high-density polyethylene (HDPE) liner and associated concrete structures on the Station's raw water reservoir and pollution control dams.

2.1.2 Applicability

This document shall apply to Kusile Power Station only.

2.1.3 Effective Date

This document will be effective from the date of its authorisation.

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] SANS 5863 Concrete tests - Compressive strength of hardened concrete

[2] SANS 10409 Design, Selection and Installation of Geomembranes

2.2.2 Informative

[3] 203-770 Kusile Power Station Specification for Structural Concrete

[4] 203-16098 Concrete Mix Designs

2.3 Definitions

2.3.1 Contractor

Service provider contracted to provide a specific service to Eskom, Kusile Power Station.

2.3.2 Coupon Cutter

Equipment designed to create a uniform coupon blank incorporating the welded seam to enable seal viability and strength testing.

2.3.3 Employer

Eskom, Eskom Kusile Power Station or representative

2.3.4 Gypsum

Mineralogically identical to natural gypsum, FGD gypsum, or synthetic gypsum, is produced from gas captured within emission control systems at coal fired electric utilities.

2.3.5 Proctor Compaction Test

The Proctor Compaction Test establishes the maximum unit weight that a particular type of soil can be compacted to using a controlled force at an optimum water content.

To add more applicable definitions

2.4 Abbreviations

Abbreviation	Explanation
ADDD	Ash Dump Dirty Dam
CSY	Coal Stockyard
CSY ST	Coal Stockyard Settling Tank
FGD	Flue Gas Desulfurization
HDPE	High-Density Polyethylene
HRD	Holding Recycling Dam
ITP	Inspection, Testing Plan
J	Joule
PCD	Pollution Control Dam
QCP	Quality Control Procedure
RWR	Raw Water Reservoir
SDD	Station Dirty Dam
SDD ST	Station Dirty Dam Settling Tank

2.5 Roles And Responsibilities

2.5.1 Contractor

a) Executes the defined scope according to contractual agreements
b) Submits all relevant and necessary documentation requested by the Employer once works are completed

2.5.2 Employer

a) Review and approves the Contractor's reports, method statement, Quality Control Procedures (QCP) and Inspection Test Plans (ITP)
b) Is present for all applicable points of the ITP and QCP

2.6 Process For Monitoring

This scope of works will be revised on a yearly basis or when necessary.

2.7 Related/Supporting Documents

Not applicable.

3. Concrete And HDPE Liner Repairs

3.1 Plant Description

3.1.1 Ash Dump Dirty Dam

The Ash Dump Dirty Dams (ADDD) are two HDPE lined, holding dams that are used as a collection point for the polluted storm water from the ash dump before it is pumped to the SDD. The ADDD is designed to store the run-off from a once in fifty-year storm event from the active ash dump surface area and the three-year rehabilitation zone. Compartment 1 of the ADDD can store a volume of 120,050 m^3 and compartment 2 stores 125,145 m^3. The maximum height of both compartments is 5.8m.

Each compartment has a deepened concrete lined well compartment for reserve storage of irrigation and dust control water for the ash dump. The wells are concrete lined to allow front-end loader access for cleaning. Ramps are provided for access to the concrete lined well.

The ADDD can be accessed from the ramp on the western side of the ADDD pump station. At the crest, a 5m wide access road does a loop around the perimeter of the structure. This provides access to both maintenance access ramps.

3.1.2 Holding/Recycle Dam

The Holding Recycle Dams (HRD) are two HDPE lined, holding dams that are the final storage point for the Station's clarified storm water and wash-down water. Each compartment of the HRD stores a volume of 34,046 m^3 with a height of 5.7m. Spillway overflow is provided by two pipes from each compartment. Overflow from the HRD is sent back to the SDD via the CSY ST.

The dam floors are sloped to the southern end to facilitate drainage and cleaning. The southern end of each compartment has a deepened well compartment for storage of settled products. The wells are concrete lined to allow front-end loader access for cleaning. Ramps are provided for access to the concrete lined wells.

3.1.3 Station Dirty Dam

The Station Dirty Dams (SDD) are two lined, temporary holding dams that act as a collection point for all polluted storm water and wash-down water, before it is pumped to the HRD. Each compartment of the SDD stores a volume of 90,980 m^3 with a height of 7m.

The SDD will receive inflows from two sources, the CSY ST and the SDD ST.

The dam floors are sloped to the southern end to facilitate drainage and cleaning. The southern end of each compartment has a deepened well compartment for storage of settled products. The wells are concrete lined to allow front-end loader access for cleaning. A ramp is provided for access to the concrete lined well.

The SDD can be accessed from the ramp on the south-eastern corner of the dam. At the crest, a 5m wide access road does a loop around the perimeter of the structure. This provides access to both maintenance access ramps.

3.1.4 Coal Stockyard Settling Tanks

There are two settling tank compartments at the Coal Stockyard Settling Tank (CSY ST). Each compartment is 144.8 m long with a maximum depth of 5.6m. Each compartment has a capacity of 11,707 m^3 at overflow weir, full supply level (FSL). The 200mm thick concrete tank floors, over the liner system, slope slightly to the southern end to facilitate emptying and cleaning. Each compartment is fitted with a series of under and over-flow weirs to still the water flow.

The CSY ST receives inflows from the Coal Stockyard (CSY), emergency ash dump, limestone stockyard, and the degrit sumps. Clarified water leaving the CSY ST will travel via gravity pipeline to the SDD. A concrete lined ramp is provided to allow front-end loader and personnel access to each of the two compartments for cleaning.

3.1.5 Station Dirty Dams Settling Tanks

There are two settling tank compartments at the Station Dirty Dam Settling Tank (SDD ST). Each compartment is 144.8 m long with a maximum depth of 5.6m. Each compartment has a capacity of 11,707 m^3 at overflow weir, full supply level. The 200mm thick concrete tank floors, over the liner system, slope slightly to the northern end to facilitate emptying and cleaning. Each compartment is fitted with a series of under and over-flow weirs to still the water flow.

The SDD ST receives inflows from the station terrace area. Clarified water leaving the SDD ST travels via gravity pipeline to the SDD. A concrete lined ramp is provided to allow front-end loader and personnel access to each of the two compartments for cleaning.

3.1.6 Raw Water Reservoir

The Raw Water Reservoir comprises two compartments lined with a double layer HDPE liner with a drainage layer and a leakage detection system. The reservoir has a gross storage capacity at FSL of 679,315 m^3 for both compartments at a maximum depth of 12.3m. The reservoir receives raw water from the Kendal raw water pipeline.

3.2 Inspections

Each PCD and settling tank compartment is emptied at least once a year for inspection, cleaning and repairs to the HDPE and concrete liner as well as other components within the dam basins. It is unlikely that the raw water reservoir will be emptied regularly, however some defects may occur on higher levels of the reservoir or might become evident as water levels drop.

3.3 Components

3.3.1 Liner System

The dams were constructed on earthworks, free from loose angular particles and vegetative matter, compacted to 96% Standard Proctor. Bidim geo-textile was placed on the finished grade, as a protective measure for the liner system.

Two continuous 1.5 mm mono-textured HDPE geo-membrane liners were placed as the secondary liner with a cuspated drainage layer in between to facilitate leakage drainage to the leakage detection sumps. A 110 mm OD slotted corrugated HDPE collector pipe is installed along the inside toe on the south end of the dam to collect any flow from the drainage layer and convey it to the leakage detection sumps.

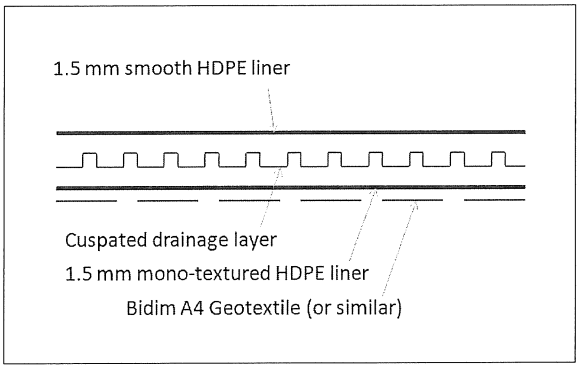

Figure 1: Schematic illustration of the liner system

The liner is HDPE flexible geomembrane which is anchored in a perimeter anchor trench. The liner should sit flat on the surface of the earthworks in a slightly tensioned state, with no obvious excess tension or slack in any areas. The liner is regularly inspected for any signs of damage. Any condition that may affect the integrity of the dam's liner is recorded and reported.

3.3.2 Reinforced Concrete Liner

The low end of the pollution control dams, including the access ramp, are concrete lined to accommodate heavy equipment loads and to protect the liner from damage during cleaning and maintenance activities. The concrete section is 250mm thick. The concrete slab is cast directly on top of the plastic liner during construction with construction joints throughout to facilitate construction.

3.3.3 Anchor Trenches

The geo-membrane liner and geo-fabric are secured on the embankment crests in anchor trenches. Anchor trenches are excavated trenches along the perimeter of the dam where the liner is anchored to hold it securely in place. The HDPE liner is laid across the dam slope and into the anchor trench, with enough material embedded to prevent pull-out. These trenches play a vital role in stabilizing and securing the liner to prevent it from moving, slipping, or lifting due to water pressure, wind, or other environmental forces.

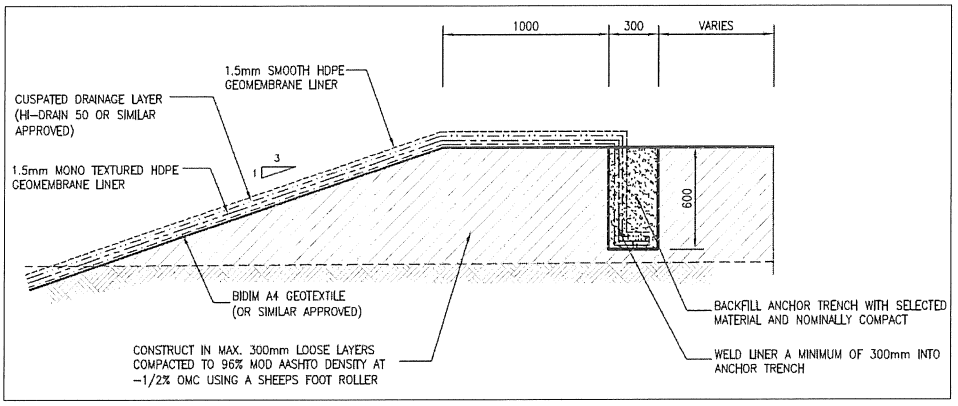

Figure 2: Anchor trenches

3.4 Repairs

3.4.1 Reinforced Concrete Repairs

Prior to any repairs being done, the Contractor shall submit a report to the Employer indicating the location and size of the concrete repairs required. The Contractor may continue with the repairs only after agreed on by the Employer.

The Contractor shall request the relevant concrete mix design, reinforced concrete slab or trench drawing. Repairs must be done as per the design specifications. The Contractor receives, and keeps a record of the test certificates for each assignment of concrete, covering all the requirements of SANS 5863 [1], for inspection by the Engineer. The test certificates must be submitted to the Employer upon completion of the repairs.

3.4.2 Liner Repairs

Prior to any repairs being done, the Contractor shall submit a report to the Employer indicating the location and size of the patch required for the liner repairs. The Contractor may continue with the repairs only after agreed on by the Employer. The Contractor must be able to weld patches, for larger liner repairs, and extrusion welds for areas where the liner is punctured. The Contractor must keep a record of all on site tests, material data sheets and equipment certification, covering all requirements of SANS 10409 [2]. All relevant documentation must be submitted to the Employer upon completion of the repairs.

3.5 Waste Removal

The Contractor is responsible for rubble removal from the work site. Kusile Power Station has a waste storage facility that the Contractor may use to dispose of their rubble.

The contractor must provide at least one front end loader with a minimum $3m^3$ bucket as well as a 35T articulated dump truck (ADT).

3.6 Competency

Technicians performing seaming operations shall be suitably trained in the operation of the specific seaming equipment being used and shall demonstrate their competence by successfully welding trial seams in accordance with SANS 10409 [5].

3.7 Risk Assessments

Working on a wet HDPE liner introduces unique safety risks due to the liner's slippery surface and the possibility of water intrusion. Here are some safety considerations that a contractor must address:

a) Slip and Fall Prevention
b) Personal protective equipment (e.g. Personal Flotation Devices)
c) Rescue and Emergency Equipment:
d) Safety training:

3.8 Quality Control Procedures

The Contractor must compile the construction, installation method statement, quality control (QC) and quality assurance (QA) documents and submit to the Employer for review. The Employer will provide representation for items indicated in the QCP and ITP.

4. Acceptance

This document has been seen and accepted by:

Full Name and Surname	Designation
Phetheni Mhlongo	Senior Advisor Technical Support
Lovemore Lukhele	Senior Supervisor Technician Mechanical Maintenance
Xolie Langa	Snr Technician Maintenance

5. Revisions

Date	Rev.	Compiler	Remarks
August 2025	1	K Kgaladi	New document

6. Development Team

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

a. Keoagile Kgaladi, System Engineer

7. Acknowledgements