

ESKOM WATERWAY SYSTEM Standby Welding

Eskom Peaking Generation

October 2025



INTRODUCTION

Water is conveyed to the turbines through waterways which are tunnels designed to operate under high pressure

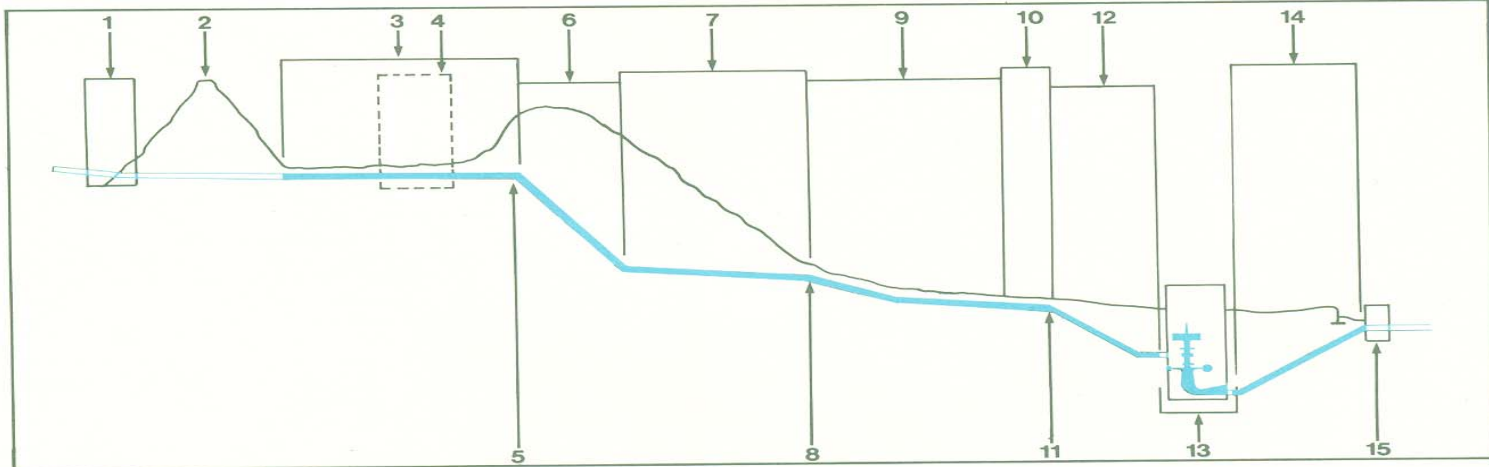
Palmiet Pumped Storage Scheme (PPSS) is a steel lined waterway and Drakensberg and Ingula Pumped Storage Scheme (DPSS & IPSS) consists of a combination of Carbon Steel and concrete lined.

Penstock	Pumped Storage		
	Palmiet	Drakensberg	Ingula
Length (m) Steel lined	1356.1	522.6	1081
Length (m) Concrete lined		3116.4	1934
Diameter (m)	6.2	5.5	6.6
Thickness (mm) Steel lined	23 - 33	23 - 33	38 - 40
Thickness (mm) Concrete lined		500 - 1575	500 - 700
Power Station Commissioning (year)	1988	1982	2016

WATERWAY - PLAN AND SECTION

Algemene uitleg van Palmiet-pompopgaarskema

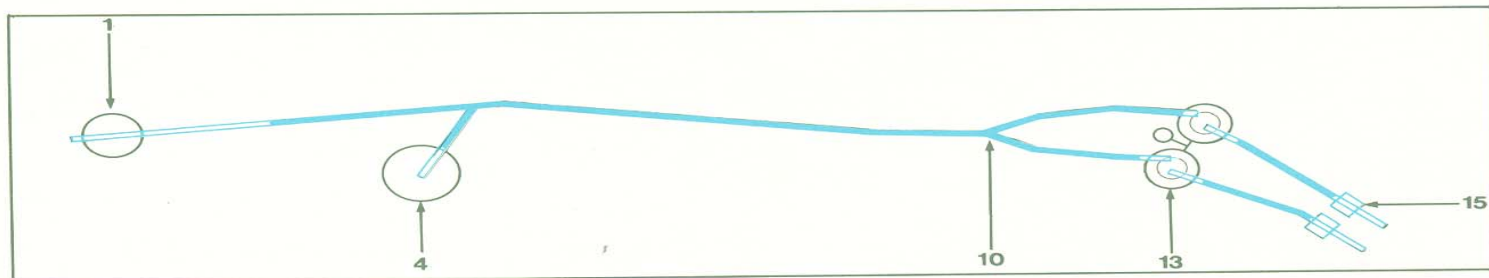
Lengtedeursnee



General layout of Palmiet Pumped Storage Scheme

Longitudinal section

Plan



1. Aanlooptoring
2. Rockviewdam
3. Toevoertunnel
4. Stutenk
5. Portaal
6. Skuins skag
7. Druktonnel
8. Portaal

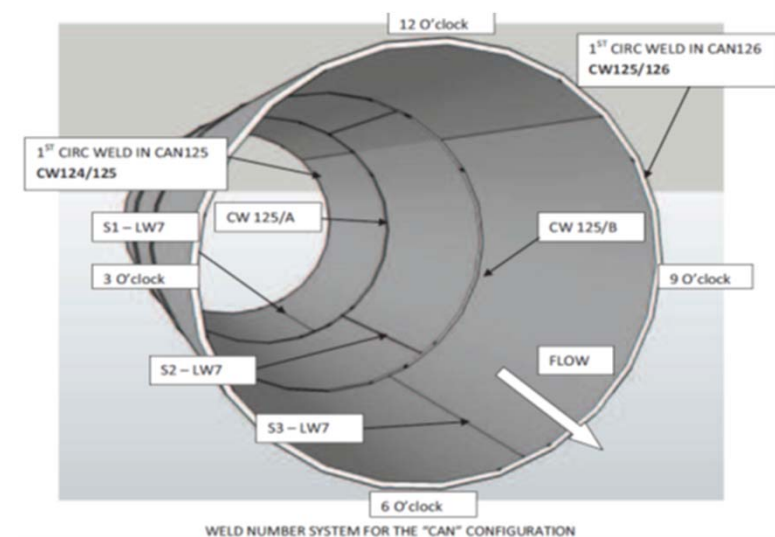
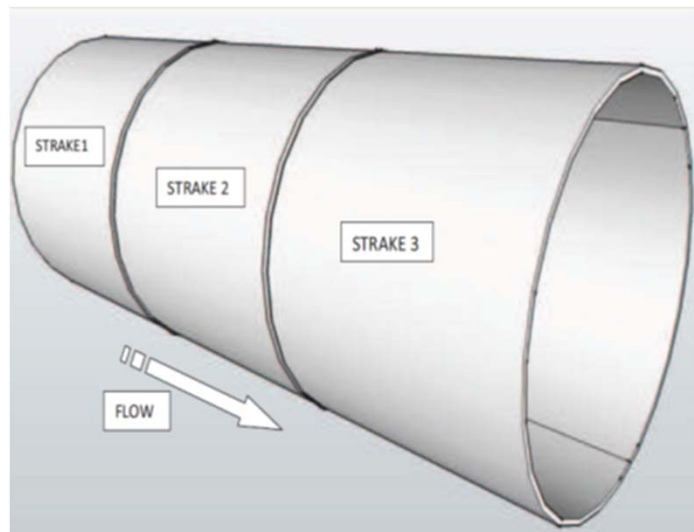
9. Dryfleiding
10. Vertakking
11. Portale
12. Dryfleidingskagte
13. Masjienskagte
14. Afvoerskagte
15. Afvoertorings

1. Headrace tower
2. Rockview dam wall
3. Headrace tunnel
4. Surge tank
5. Portal
6. Inclined shaft
7. Pressure tunnel
8. Portal

9. Penstock
10. Bifurcation
11. Portals
12. Penstock shafts
13. Machine shafts
14. Tailrace tunnels
15. Tailrace towers

WATERWAY COMPONENTS

- Lining consists of a series of steel cans welded together
- Each can is made up of 3 strakes
- Strakes are welded together with longitudinal welds
- Strakes are welded to each other with circumferential welds forming cans



INSPECTION PHILOSOPHY

An Inspection Philosophy is in place to check the welds in the waterway over the life of the station

The inspection philosophy and requirements to ensure integrity is as follows:

Station	Visual Inspection	Inspection Period		
		High Stressed Section	Low Stressed Section	Bifurcation
Drakensberg	10 Years	10 Years	10 Years	10 Years
Palmiet	36 Months	15 Years	20 Years	8 Years
Ingula	7 Years	7 Years	7 Years	7 Years

Inspection and repairs to the corrosion protective coating is also an important aspect

FREQUENCY OF INSPECTIONS

- A station outage is required to perform inspections and repairs

Peaking Outage Philosophy			
Waterways - Inspection frequency and durations			
Station	Drakensberg	Palmiet	Ingula
Outage Frequency	10 Yearly	3 Yearly	7 Yearly
Outage Duration	45 Days	28 Day	45 Days
Activity			
Dewater	3	3	10
Site Activities-Open M/H, construct coffer dams, install pumps, scaffolding/platforms. Divert seepage water.	5		2
Inspection/repairs of waterways (Steel & conc. Lining, NDE Testing)	10		10
Weld Repair	10	10	10
Close M/H, Remove dams, pumps, scaffolding	2	3	1
Rewater	8		10
Commissioning	5	2	2

WELDS

All these longitudinal and circumferential welds are monitored and tested by non destructive examinations to ensure integrity of the welds

The following inspections are carried out:

- Ultrasonic
- Magnetic particle

In the event of a major defect detected a weld repair will be required.

Scope of work



The *Contractor* ensures that the following weldment repair technical specifications are met as a minimum:

- The *Contractor* must comply with ISO 3834-2 – all work performed is on Eskom Level 1 Classified Plant.
- All Welding works are to comply with Welding Requirements on Eskom Plant (240-106628253), BS EN standards and/or
- ASME standards where required.

The *Contractor* notes the following plant specifications and ensures all welding services considers the below:

- Weld Joint Type: Butt
- Parent metal:

➤ **Ingula**

- Penstock Steel Liner = S690QL

➤ **Palmiet**

- Penstock Steel Liner = ROQ TUF AD690

➤ **Drakensberg**

- Penstock Steel Liner sections
 - ROQ TUF C.550 (ASTM 537 cl.2 MODIFIED)
 - AE 690 (ASTM 517 Gr. M)
 - AD 690 (ASTM 517 Gr. J)
- Thicknesses of pipe range between 3mm and 70mm.
- Welding processes limited to Gas Tungsten Arc Welding (GTAW) and Shielded Metal Arc Welding (SMAW).
- The system design and operating pressure for Drakensberg and Ingula PS is 7.22MPa and for Palmiet PS is 5.39MPa
- The working medium is water.
- The pipes are coated with COPON EP 2300.
- NDT Acceptance level, according to BS EN ISO 5817 Level B.
- Related to High Strength Low Alloy material (HSLA) and Quenched and Tempered (Q&T) steels, refer to the Eskom Welding Requirements on Eskom Plant (240-106628253), with regards to delayed inspection as well as additional requirements in terms of pre-heating and bakeout heat treatment required.

Platforms have been designed and manufactured for inspection purposes

The platforms have been manufactured with emphasis on the following:

- A lightweight structure
- Quick assembly (inside the waterway tunnels)
- Movable to maximize time
- Platform components to enter through a 700mm diameter manhole

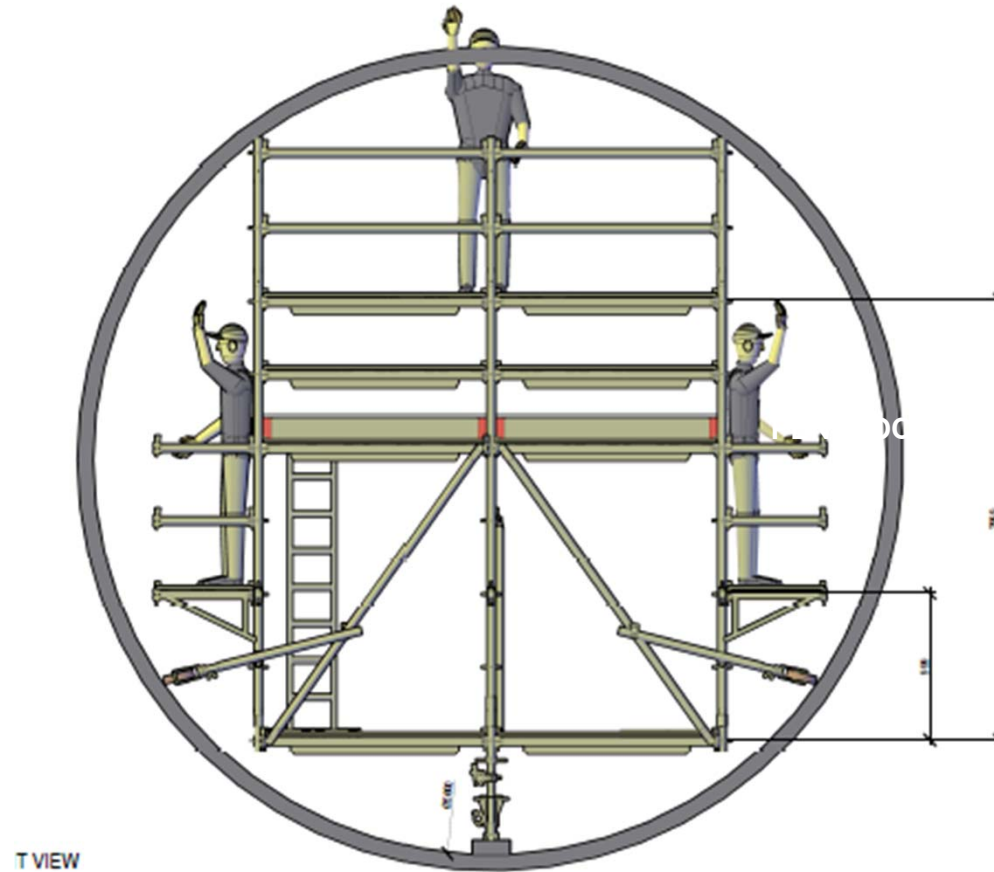
INSPECTION PLATFORMS (CONT.)

- **Palmiet Scaffolding**



INSPECTION PLATFORMS (CONT.)

Drakensberg Scaffolding



- The inspections, operations and use of the platforms in the waterway will be managed by others if or when required to conduct weld repairs.
- Welding repairs will be done after confirmation from the NDT as to whether it is required.
- The final welding procedure will be defined if a major defect is found by the NDT.

Thank you