Eskom	Technical Specification	Technology

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CONTENTS

1. INTRODUCTION

This document provides the technical specifications for supply and installation new secondary cooling pipes system for Kriel Power Station. The replacement of the pipes for unit 1 to 6.

2. SUPPORTING CLAUSES

2.1 SCOPE

This document covers the applicable work to be done, as well as the requirements and specifications regarding the work.

2.1.1 Purpose

The purpose of this document is to provide the *Contractor* with all the relevant details required to perform the work as defined in the scope.

2.1.2 Applicability

Kriel Power Station.

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

Regulatory and Statutory

[1] OHSACT Occupational Health and Safety Act of 1993

[2] SANS 347 Categorization and Conformity Assessment Criteria for All Pressure Equipment

Codes and Standards

[3] EN 13480 2017: Metal Industrial Piping

[4] ISO 9001 2015: Quality Management Systems

[5] ISO 3834-2 2005: Quality requirements for fusion welding of metallic materials

Eskom Documents

[6] 240-86973501: Engineering Drawing Standard – Common Requirements

[7] 240-84513751: Material Specification and Certification Guideline for Power Generation Plant

[8] 240-56239129: High Energy Pipework Standard for Eskom Power Plants

[9] 240-106628253: Standard for Welding Requirements on Eskom Plant

[10] 240-83540088-Requirements for Non-Destructive Testing (NDT) on Eskom Plant Standard

[11] 240-56364545-Structural Design and Engineering Standard

[12] 36-681-Eskom-Generation Plant Safety Regulations

[13] 240-106365693-Standard for External Corrosion Protection

2.3 DEFINITIONS

Term	Description
Secondary cooling	Auxiliary cooling system for turbine and boiler plant with demineralized water as medium

2.4 DISCLOSURE CLASSIFICATION

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

2.5 ABBREVIATIONS

Abbreviation	Description
ASME	American Society of Mechanical Engineers
BS	British Standard
CW	Cooling water
EN	European Norm
GA	General Arrangement
GO	General Overhaul
NDE or NDT	Non-Destructive Examination/Testing
PER	Pressure Equipment Regulations
P&ID	Piping and Instrumentation Diagram
PMA	Particular Material Appraisal
PQR	Procedure Qualification Record
QCP	Quality Control Plan
SANAS	South African National Accreditation System
SHEQ	Safety, Health, Environment and Quality
WPS	Welding Procedure Specification
WPQR	Welding Procedure Qualification Record
WQR	Welder Qualification Record

2.6 ROLES AND RESPONSIBILITIES

The following roles and responsibilities apply:

Person	Responsibility
Engineering	Clarification of scope if required. Quality inspections for technical adherenc Final acceptance, sign-off and approval
AIA	Authorised inspection authority as per SANS 10227/SANS 347 or a person accredited internationally according to IAF or ILAC
Site QC	Quality inspections

3. BACKGROUND

Inspection of the secondary cooling supply and return pipes to boiler and turbine auxiliaries are badly corroded with excessive leaks in the plant. Demineralized water losses caused by leaks are high resulting with both financial losses and unplanned load losses due to poor cooling. The replacement of the pipes is necessary to restore plant reliability and thermal efficiency.

4. SCOPE OF WORK

Part A

The work is to do one-on-one replacement of Secondary Auxiliary (Demineralized water) Cooling System pipework from the trenches to boiler mills and ID fans secondary cooling to reduce losses of demineralized water. Note the pipework includes to and from Circulating pump cooling, ID Fans, 18 kV cooling system, mills, all fans cooling pipes in the boiler, EFP cooling and BFPT cooling pipes. System Operating Pressure 1000 kPa, and Temp 60 deg.C. The work scope is as follows:

a) The scope to cover all areas as per attached isometric drawings, the drawings is for illustration purposes only.

b) As-built drawing of the pipework to be supplied for each unit. Drawing to be approved for construction before fabrication and as built drawing to

c) New pipes made of carbon A106 steel material schedule 80.

d) Pipes to be fabricated as per site dimensions taken, see (b)

e) Pipes to be hot dipped galvanized with a protective layer internally.

f) Hot galvanized steel pipe zinc layer thickness to be 35µm or more, with the thickest layer up to 650µm.

g) The external part of the pipes to be coated with a brilliant green epoxy coating. Green colour for association purposes.

h) 100 percent visual inspection on all welds

i) 60% MPI on all welds, requirements on point 7 of the scope to be followed.

a) Install new pipes in the plant with new supports as per BS EN 13480 requirements. Torgue setting of each bolt and nut to comply with En 13480

j) Provision to be made for pumping out water in the trenches to access the pipes.

k) All new pipes in the trenches to be elevated or installed above water level in the trenches.

l) Provide QCP for the work

m) Re-commission the entire refurbished Plant.

n) Working pressure and temperature for design purposes is 10 bar and 60 degrees respectively.

o) Welding of steel pipelines shall only be carried out by welders who are competent

p) All fittings to be based on BS EN 13480, SANS 347 and PER specifications compliance

q) QC Packages which includes: Drawings, NDE Testing, Pressure Testing to design pressure and a Certificate of Manufacture, signed off by the AIA must be provided.

Part B

HP clean supply and return auxiliary cooling water pipes from strainers to oil coolers, stator coolers, Slip ring coolers, BFPT gland steam condenser and hydrogen coolers. System Operating Pressure 400 kPa, and Temp 60 deg.C

b) Disassemble the pipes by loosening the connecting flanges

c) Insert the HP lance with a rotating nozzle and HP clean the entire length of the pipes

d) Longest pipe length is 6 meters, the cleaning hose to cover the pipe length

e) The contractor will optimise the cleaning pressure & traveling speed of the nozzle such that 90%+ of the scale is removed.

f) Inspect the internal coating and patch repair damaged areas. Blast and re-line the pipes as per Standard for the Internal Corrosion Protection of Water Systems, Chemical Tanks and Vessels and Associated Piping with Linings - 240-101712128

g) Inspection report with endoscope inspection of pipes after stage d-e to be compiled and singed by engineer for every unit.

h) Should some pipes be worn out on inspection, replace pipes with coating f. Carbon steel material to be used, schedule 80.

i) All the vent pipes from the coolers to the tundish to be replaced with galvanised pipes.

j) Inspection to be done on all the hangers and supports of the pipework, defective hangers to be replaced.

k) Assemble the pipes once cleaning is completed with new gaskets and new bolts. Torgue setting of each bolt and nut to comply with En 13480

l) Commission the plant

General mechanical Scope

The primary instructions to the service provider include but not limited to: Repair, replacement, welding, component re-instatement and general mechanical components/fittings refurbishment as stipulated on the sub instructions below. Note additional scope for general mechanical may arise on any plant in the turbine or boiler, the contractor is expected to execute the scope as required.

Part C

Commissioning strainers, CW H2 coolers main and bypass strainer, CW oil cooler main and bypass strainer, Primary cooling main and bypass strainer, secondary cooling strainers.

a) Strip the spool piece if available

b) Cover spool piece openings with FME covers, when there's no work being done on the openings.

c) Clean all the studs, bolts, nuts and washers.

d) Inspect all studs, bolts and washers. Replace damaged bolts, studs, nuts and washers with new. Eskom to supply new studs, bolts, nuts and washers

e) Install commissioning strainer.

f) Wait for flushing to complete.

g) Remove commissioning strainer after flushing.

h) Open covers for all the strainers and clean them.

i) Do cleanliness Inspections. (FME)

j) Install new gasket. Eskom to supply new gasket.

k) Install spool piece back and/or covers back (Note: apply the correct toque range on the bolts).

Part D

Primary/Secondary CW heat exchangers

a) Strip the heat exchanger bolts for access.

b) Record the tightening dimensions before disassembly

c) Drain out media completely and make sure that no media and pressure is remaining from the both chambers. Remove plates when system is drained.

d) Use solvent to clean the plates, all the scale on the plates to be removed. Note that solvent should be compatible with cleaning stainless steel 316 material.

e) Use dye-penetrant to check if there is any defects on the plates, defects found to be discussed with the client before the plates are rejected.

f) Use solvent on the market to wipe away any adhesive remaining in the heat transfer plate's gasket groove. Remove dirt, dust, which is stuck on the heat transfer plate's gasket groove.

g) Uniformly apply the specified adhesive to heat transfer plate's gasket groove. Adhesion work should be done at a well-ventilated location. Work in improperly vented room is prohibited. Gaskets to be replaced with 166 off R106 flow gaskets, 2 off R106 end gasket, 16 off R106 NBR port ring and 8 off gasket glue. Supplier to be have sufficient gaskets and glue before outage for all the plates.

h) Grease the tightening bolt and assemble the heat exchanger.

i) Tests Before Commissioning Operation

j) Provide vending on both side of the PHE to facilitate the removal of air from the system.

k) Confirm that the tightening length is correct.

l) Tightening length on the Assembly Drawing may differ from actual length. Refer the tightening length taken before the dissembling.

m) Confirm that all nuts for tightening bolt are not loose.

n) Fill up with water for both hot and cold side. Confirm all air is out and liquid will flow out of the vent.

o) There is no leak between the heat transfer plates, piping connections, or other locations.

p) Do cleanliness inspections. (FME).

q) Replace damaged plates. Eskom to supply new heat exchanger plates.

r) Change the damaged plate gaskets. Eskom to supply new gasket.

s) Install the plates back.

t) Tighten all the bolts. (Note: apply the correct toque range on the bolts).

u) Pressurize hot and cold side independently and/or both sides at the same time. Actual test pressure shall be 450 kPa for 20 minutes. Leaking plates to be removed or leaks on the gaskets to be tightened.

Part E : Heat Exchanger doors and covers

Condenser CW access doors and steam space access door, Oil coolers, GSC (Main turbine and BFPT) and stator.

a) Open 8 off MT condenser doors

b) Open 4 off BFPT condenser doors

c) Open 8 off MT and BFPT oil coolers waterbox covers

d) Open 4 off stator coolers waterbox covers

e) Open 4 off GSC covers

f) Cover door openings with FME covers, when there's no work being done on the door opening

g) Clean all the studs, bolts, nuts and washers.

h) Inspect all studs, bolts, nuts and washers. Replace damaged bolts, studs and washers with new. Eskom to supply new studs, bolts, nuts and washers.

i) Remove old gasket and/or O ring.

j) Clean the door seal faces.

k) Clean O ring groves

l) Issue repair instruction to contractor for the damaged door sealing face.

m) Await the CW water box and steam space internal work to be done.

n) Fill condenser with demin water in the steam space and conduct leak test, plug all leaking tubes and update the tubenest completion. Allow 48 hour soaking before checking for leaks

o) Conduct pressure test on all the oil coolers, 4 off at 4 bars for 2 hours. Plug all leaking tubes with rubber plugs. Update tubenest for completion.

p) Conduct pressure test on all the stator cooler at 6 bars for 2 hours. Plug all leaking tubes with rubber plugs. Update tubenest for completion

q) Conduct leak test on all the main turbine GSC by filling steam side with water. Plug all leaking tubes with rubber plugs. Update tubenest for completion. Allow 24-hour soaking before checking for leaks.

r) Install new gasket and/or O ring.

s) Do cleanliness inspection in the waterboxes, and also the steam space of the condensers including the hotwell. (FME)

t) Close all doors and covers. (Note: apply the correct toque range on the bolts).

Part F: DA vessels

a) Open DA A and B covers

b) Clean the vessels and all pipe inlet and outlets.

c) Close with plastic for FME

d) Wait for all the scopes to be conducted by all stakeholders.

e) Conduct FME inspections

f) Close the doors with new gaskets, and new bolts

Part G: Stator System

Man Strainer

a) Ensure strainer isolated by checking that inlet and outlet valves are shut.

b) Open filter cover by removing all the top bolts.

c) Care must be taken not to break the vent line on the filter top cover

d) Clean the magnet cover on top of the filter element with clean water.

e) Clean the filter element with clean demin water, use brush wire were possible to remove stubborn stuck material

f) Check that the filter element is not damaged, replace damaged elements

g) Check the filter housing, inspect for any form of damages such as corrosion, erosion, etc.

h) Repair any damages in the filter housing

i) Clean the suction and the discharge lines of the strainer using HP cleaning, including the vent line of the strainer

j) HP clean the differential pressure transmission impulse line of the strainer

k) Change the gasket

l) Assemble component once complete and box up.

De-ionizers and Cat-ion and Anion

a) Open cation and anion vessels

b) Check that the vent line is free of obstruction. Clean the line where necessary.

c) Communicate with chemical services for the following:

- Replace the mixed beds resin inside the vessels.

d) Clean the filter element at the base of the vessels.

e) Check and clean outlet and inlet of the vessels.

f) Reinstall components on completion.

Part H – Main Turbine and BFPT oil system

- Install commissioning strainers before HP cleaning.
- HP clean lube oil return lines.
- Remove commissioning strainers and all the debris after oil flushing.
- High pressure clean the lube oil return lines (backward facing rotating nozzle for the main line and forward facing nozzles for the lines from the bearings). The main line must be done after the lines from the bearings. This must be done before cleaning the MOT and BFPT tanks.
- Open, clean and inspect oil tank.
- Internal visual inspection by the System Engineer.
- Blast clean the tank and coat.
- Flush the power oil and control oil pipework.
- Conduct FME on completion of all other activities from other stakeholders and box up
- Use new bolts and gaskets to close.

Part I – CPP vessels / Make up tank / WAE tank

a) Open the CPP A, B and C vessels covers

b) Open the make tank covers

c) Clean the all the tanks, vessels and ensure no debris

d) Remove and HP clean return and supply lines on the make up and WAE tank at 300 bars with a rotating lance.

e) Close with plastic until all stakeholders have completed other activities

f) Install new gasket and/or O ring.

g) Do cleanliness inspection in the waterboxes, and also the steam space of the condensers including the hotwell. (FME)

h) Close all doors and covers. (Note: apply the correct toque range on the bolts).

Part J

Quick start Air Ejector

a) Open the QSAE flanges

b) Remove the nozzle and hand over to repair contractor, once clean and/or weld repaired reinstall back

Part K

Chest and Extraction Line Drains

a) Cut turbine chest and extraction line drain lines

i. HP casing drain to FB (MSV74 & MSV75) +- 6 cuts (no line number available) NB50

ii. HP valve drain to FB x 2 lines (MSV77) +- 5 cuts (no line number available) NB25

iii. IP valve drain to FB x 2 lines (BSV136) +- 5 cuts (no line number available) NB25

iv. CRH PA NRV to FB x 2 lines (MSV73) +- 8 cuts (line 1945) NB25

v. HPH 7 disturbance drain to ADV x 2 lines (BSV132) +- 5 cuts (line 1944) NB25

vi. Extraction 6 to HPH 6 drain to FB +- 8 cuts (no line number available in fact line is not shown on any drawing) NB25

vii. HPH 6 disturbance drain to FB x (BSV118) +- 5 cuts (line 1942) NB25

viii. Extraction 5 to BFPT drain to FB x 2 lines (BSV104 & BSV109) +- 8 cuts (line 1922 & 1923) NB25

ix. Extraction 5 to DA drain to FB x 2 lines (BSV104 & BSV106) +- 5 cuts (line 1922 & 1928) NB25

x. Extraction 4 to LPH4 drain to FB (BSV102) +- 4 cuts (line 1921) NB25

b) Clearway must be established from the main pipe to pneumatic/ hand valve, from pneumatic valve/ hand valve to FB/ ADV. (the stub to the main line must also to clear).

c) Spark test the lines and valves before welding to determine the material

d) Prep the pipe work

e) Weld the lines according to an approved welding procedure

f) MPI and X - ray the welds

g) Open, inspect (all components) and refurbish (including blue check) all drain valves and their actuators as per attached list. Cut out and replace valves that cannot be refurbished.

h) All ferminited valves must be replaced

i) Re-commission the system

Part L

Hood Spray System

a) Access Permit to Work in Condenser Steam Space, erect necessary scaffolding.

b) Remove all nozzles and clean them. Ensure free flow of water and no debris/foreign objects on the nozzle bore.

c) Any damaged / blocked sprayers to be replaced with new.

d) Disassemble the hood spray water pipework including manifolds on the front, rear, top and bottom of the LPs. Pipes to be cleaned using HP water jet. Maximum pressure of 300 bars.

e) Remove the hood spray strainer and clean all debris on both the strainer and strainer housing.

f) Re-assemble the pipework, install the strainer, install all nozzles (18 off per section; LP 1 front, LP 1 rear, LP 2 front and LP2 rear)

g) To ensure adequate support on the system, all supports to be surveyed. Loose supports to be re-tightened and defective supports to be replaced.

Part M

Turbine spray nozzles and flushing

a) LP bypass spray water cooling piping: From first fixed support upstream from the LP bypass spray water regulating valve to dumping device nozzles

b) Disassemble pipework and clean it using HP water jet at 300 bars. To be executed on four off spray water supply pipes. Assemble on completion

c) Remove and clean all nozzles (16 off)

d) Re-install nozzles on completion and tig weld them extra reinforcement.

e) Check and replace all missing nozzles on the make up lines and flashbox

f) Conduct make up nozzle spray test

g) Observe spray pattern and replace all missing and broken nozzles. Blocked nozzles to be unblocked and cleaned.

h) Commissioning Pre-Checks

i) Ensure no debris in the condenser steam space floor. Clean and remove all debris on completion of all work activities in the condenser and the LPs.

j) Condenser hotwell to be cleaned of all debris

k) CEP Suction lines to be cleaned of all debris

l) Install the CEP commissioning strainers.

m) On completion of all other work scopes on the condensate system, flushing of the system to commence as per commissioning procedure. At this stage it is recommended to open the “hoods (rupturing diaphragms is better)” on the LPs to inspect the spray pattern of the nozzles. (Blocked sprayers to be attended to before boxing up)

n) Remove the commissioning strainers and hood spray strainers on every end cycle of flushing and clean the strainers.

o) Flushing to be repeated until no debris is visible on the strainers on inspection (End of flushing Hold point).

p) Re install the hood spray strainers on completion and remove the commissioning strainers.

Part N

Boiler access doors

- Open all the access doors as required by scope
- Await mechanical work and inspections to be finished by contractor.
- Remove the old gasket.
- Clean the boiler doors sealing faces.
- Do inspections on the boiler doors sealing faces.
- Repair the boiler doors sealing faces.
- Install new gasket as per engineering spec. Eskom to supply new gasket.
- Do cleanliness inspections. (FME)
- Close the boiler access doors.

Part O

Boiler Inspection Ports

- Open all inspection doors as required by scope.
- Clean out all debris and ensure that the doors work properly.
- Remove the old and damaged hinges and replace them with new ones.
- Clean the boiler inspection doors sealing faces.
- Carry out repairs the boiler inspection doors sealing faces.
- Carry out cleanliness (housekeeping) inspections.
- Close all boiler inspection ports upon completion of all works.

Part P

Blow down vessel

- Open blow down vessel door.
- Cover door openings with FME covers, when there's no work being done on the door opening.
- Clean all the studs, bolts, nuts and washers.
- Inspect all studs, bolts and washers. Replace damaged bolts, studs, nuts and washers with new. Eskom to supply new studs, bolts, nuts and washers.
- Remove old gasket.
- Clean the door seal faces.
- Issue repair instruction to contractor for damaged door sealing face
- Await the vessel internal work to be done.
- Insert new gasket. Eskom to supply new gasket
- Do cleanliness inspection. (FME)
- Close blow down vessel door. (Note: apply the correct toque range on the bolts).

5. BILL OF MATERIALS FOR PART A OF THE SCOPE PER UNIT. (ALL PIPES TO BE GALVANIZED)

DESCRIPTION1	Size, mm	Length or number	Unit of Measure
PIPE SCH STD SMLS STL A106B	75	650	m
PIPE SCH STD SMLS STL A106B	100	200	m
PIPE SCH STD SMLS STL A106B	150	60	m
PIPE SCH STD SMLS STL A106B	200	220	m
PIPE SCH STD SMLS STL A106B	250	90	m
PIPE SCH STD SMLS STL A106B	25	30	m
PIPE SCH 80 SMLS STL A106B	50	168	m
PIPE SCH STD SMLS STL A106B	18.75	25	m
PIPE SCH 80 SMLS STL A106B	37.5	144	m
PIPE SCH 80 SMLS STL A106B	6.25	25	m
PIPE SCH STD SMLS STL A106B	12.5	25	m
PIPE SCH STD SMLS STL A106B	87.5	40	m
PIPE SCH STD SMLS STL A106B	62.5	87	m
ELL 90 DEG LR SCH STD STL A234 WPB	37.5	45	ea
ELL 45 DEG LR SCH STD STL A234 WPB	37.5	25	ea
ELL 90 DEG LR SCH STD STL A234 WPB	100	25	ea
ELL 90 DEG LR SCH STD STL A234 WPB	62.5	25	ea
ELL 90 DEG LR SCH STD STL A234 WPB	75	90	ea
ELL 90 DEG LR SCH STD STL A234 WPB	25	20	ea
ELL 90 DEG LR SCH STD STL A234 WPB	50	20	ea
ELL 90 DEG LR SCH STD STL A234 WPB	50	30	ea
ELL 90 DEG LR SCH STD STL A234 WPB	37.5	20	ea
ELL 90 DEG LR SCH STD STL A234 WPB	150	20	ea
ELL 90 DEG LR SCH STD STL A234 WPB	250	30	ea
ELL 90 DEG LR SCH STD STL A234 WPB	200	20	ea
ELL 45 DEG LR SCH STD STL A234 WPB	250	25	ea
ELL 45 DEG LR SCH STD STL A234 WPB	200	10	ea
ELL 90 DEG LR SCH STD STL A234 WPB	200	20	ea
ELL 45 DEG LR SCH STD STL A234 WPB	75	20	ea
ELL 45 DEG LR SCH STD STL A234 WPB	87.5	10	ea

ELL 45 DEG LR SCH STD STL A234 WPB	100	10	ea
REDUCER ECC SCH STD STL A234 WPB	150 X 100	10	ea
REDUCER ECC SCH STD STL A234 WPB	100 X 50	10	ea
REDUCER ECC SCH STD STL A234 WPB	200 x 100	10	ea
REDUCER ECC SCH STD STL A234 WPB	150 X 62.5	10	ea
REDUCER CONC SCH STD STL A234 WPB	250 X 200	10	ea
REDUCER CONC SCH STD STL A234 WPB	200 X 150	15	ea
REDUCER CONC SCH STD STL A234 WPB	50 X 25	10	ea
REDUCER CONC SCH STD STL A234 WPB	75 X 50	10	ea
REDUCER CONC SCH STD STL A234 WPB	75 X 62.5	10	ea
REDUCER CONC SCH STD STL A234 WPB	75 X 37.5	10	ea
REDUCER CONC SCH STD STL A234 WPB	50 X 37.5	10	ea
REDUCER CONC SCH STD STL A234 WPB	62.5 X 50	10	ea
REDUCER CONC SCH STD STL A234 WPB	37.5 X 25	10	ea
EQUAL TEE PIECE SCH STD STL A234 WPB	150	10	ea
EQUAL TEE PIECE SCH STD STL A234 WPB	250	10	ea
EQUAL TEE PIECE SCH STD STL A234 WPB	200	20	ea
EQUAL TEE PIECE SCH STD STL A234 WPB	100	30	ea
EQUAL TEE PIECE SCH STD STL A234 WPB	75	10	ea
EQUAL TEE PIECE SCH STD STL A234 WPB	25	10	ea
EQUAL TEE PIECE SCH STD STL A234 WPB	50	10	ea
EQUAL TEE PIECE SCH STD STL A234 WPB	62.5	10	ea
REDUCING TEE PIECE SCH STD STL A234 WPB	87.5 X 75	10	ea
REDUCING TEE PIECE SCH STD STL A234 WPB	100 X 87.5	10	ea
REDUCING TEE PIECE SCH STD STL A234 WPB	75 X 50	10	ea
REDUCING TEE PIECE SCH STD STL A234 WPB	150 X 100	10	ea
REDUCING TEE PIECE SCH STD STL A234 WPB	250 X 200	10	ea
REDUCING TEE PIECE SCH STD STL A234 WPB	200 X 150	10	ea

REDUCING TEE PIECE SCH STD STL A234 WPB	50 X 37.5	10	ea
REDUCING TEE PIECE SCH STD STL A234 WPB	50 X 37.5	10	ea
HALF COUPLING CL 3000 THRD	12.5	10	ea
HALF COUPLING CL 3000 THRD	18.75	10	ea
PLUG THRD	18.75	10	ea
PLUG THRD	12.5	10	ea
BLIND FLG CL 150 RF A101	100	12	ea
SPACER PALTE	250	10	ea
SPACER PALTE	200	10	ea
SPACER PALTE	100	10	ea
FLG TYPE 2	37.5	10	ea
FLG WN CL 150 RF A102	12.5	10	ea
FLG WN CL 300 RF A103	25	10	ea
FLG WN CL 150 RF A104	75	130	ea
FLG SO CL 150 RF A105	100	129	ea
FLG SO CL 150 RF A105	150	42	ea
FLG SO CL 150 RF A105	200	159	ea
FLG SO CL 150 RF A105	250	150	ea
FLG SO CL 150 RF A105	50	90	ea
FLG SO CL 150 RF A105	75	170	ea
FLG SO CL 150 RF A105	37.5	75	ea
FLG SO CL 150 RF A105	62.5	33	ea
FLG SO CL 150 RF A105	18.75	10	ea
Accessories (Bolts, Gaskets, Supports, Welding consumables)	Lot		

6. BILL OF MATERIALS FOR PART B OF THE SCOPE PER UNIT

50 NB	**Replacement sizes**	**Unit**	**Cleaning sizes**
Supply Carbon steel A106B S40 SMLS pipe	60	m	
Welding of flanges per pipe, 1501} SO RF105 150NB T1600/3	6	each	
Welding of a T-peace	6	each	
Welding of a SR SAC) bend	8	each	
Installation of pipes	24	m	

Supply of pipe made of hot dipped galvanised mild steel	24	m	
Accessories	1	Sum	1
Removal for HP cleaning and installation		m	160
125 NB	**Replacement**	**Unit**	**Cleaning**
Supply Carbon steel A106B S40 SMLS pipe	24	m	
Welding of flanges per pipe, 1501} SO RF105 150NB T1600/3	6	each	
Welding of a T-peace	6	each	
Welding of a SR SAC) bend	8	each	
Installation of pipes	24	m	
Supply of pipe made of hot dipped galvanised mild steel	24	m	
Accessories	1	Sum	1
Removal for HP cleaning and installation		m	60
150 NB			
Supply Carbon steel A106B SOO SMLS Pipe.	80	m	
Welding of flanges per pipe, 1500 SO RF105 150NB T1600/3.	6	each	
Weldin of a T-peece	6	each	
Welding of a SR S4() bend	4.8	each	
Installation of pipes	80	m	
Supply of pipe made of hot dipped galvanised mild steel	80	m	
Accessories	1	Sum	1
Removal for HP cleaning and installation		m	200
200 NB			
Supply Carbon steel A106B SAO SMLS pipe	60	m	
Welding of flanges per pipe, 1501/ SO RF105 150NB T1600/3.	12	each	

Welding of a T-peace	4.8	each	
Welding of a SR S40 bend	4.8	each	
Installation of pipes	60	m	
Supply of pipe made of hot dipped galvanised mild steel	60	m	
Accessories	1	Sum	1
Removal for HP cleaning and installation		m	150
Total			
250 NB			
Supply Carbon steel A106B SCIO SML9 pipe.	40	m	
Welding of flanges per pipe, 150/1 SQ RF105 150NB T1600/3.	16.8	each	
Welding of a T-piece	4	each	
Welding of a SR SCIO bend	12	each	
Installation of pipes	40	m	
Supply of pipe made of hot dipped galvanised mild steel	40	m	
Accessories	1	Sum	1
Removal for HP cleaning and installation		m	100
300 NB			
Supply Carbon steel A106B S40 SMI_S pipe.	80	m	
Welding of flanges per pipe, 1501/ SO RF105 150NB T1600/3.	20	each	
Welding of a T-peace	7.2	each	
Welding of a SR S40 bend	6.4	each	
Installation of pipes	80	m	

Accessories	1	Sum	1
Removal for HP cleaning and installation		m	200
350 NB			
Supply Carbon steel A106B S40 SMI_S pipe.	60	m	
Welding of flanges per pipe, 1501/ SO RF105 150NB T1600/3.	8.8	each	
Welding of a T-peace	6.4	each	
Welding of a SR S40 bend	4	each	
Installation of pipes	60	m	
Accessories	1	Sum	1
Removal for HP cleaning and installation		m	150
400 NB			
Supply Carbon steel A106B S40 SMI_S pipe.	60	m	
Welding of flanges per pipe, 1501/ SO RF105 150NB T1600/3.	20	each	
Welding of a T-peace	4.8	each	
Welding of a SR S40 bend	4.8	each	
Installation of pipes	60	m	
Accessories	1	Sum	1
Removal for HP cleaning and installation		m	150
450 NB			
Supply Carbon steel A106B S40 SMI_S pipe.	60	m	
Welding of flanges per pipe, 1501/ SO RF105 150NB T1600/3.	20	each	
Welding of a T-peace	4.8	each	

Welding of a SR S40 bend	4.8	each	
Installation of pipes	60	m	
Accessories	1	Sum	1
Removal for HP cleaning and installation		m	150
500 NB			
Supply Carbon steel A106B S40 SMI_S pipe.	20	m	
Welding of flanges per pipe, 1501/ SO RF105 150NB T1600/3.	8.8	each	
Welding of a T-peace	1.2	each	
Welding of a SR S40 bend	1.6	each	
Installation of pipes	28	m	
Accessories	1	Sum	1
Removal for HP cleaning and installation		m	50
800 NB			
Supply Carbon steel A106B S40 SMI_S pipe.	24	m	
Welding of flanges per pipe, 1501/ SO RF105 150NB T1600/3.	8.8	each	
Welding of a T-peace	1.2	each	
Welding of a SR S40 bend	1.6	each	
Installation of pipes	60	m	
Accessories	1	Sum	1
Removal for HP cleaning and installation		m	40

6.1 GENERAL REQUIREMENTS

1. The *Contractor* is responsible for the supply, manufacture and installation of all items in the following sections of this document (hereafter referred to as “the Works”) according to the applicable codes and standards and the requirements in this document.

2. Removal of lagging and cladding to accommodate the works and for inspections as required shall be done by the *Employer* upon request from *Contractor*. The *Contractor* is to request the removal of the lagging 5 days in advance of any planned work. The Employer will also provide scaffolding if requested 5 days in advance by the *Contractor*.
3. Provision of site craneage, lifting equipment, etc. required for the *Works* are by the *Contractor*.
4. Provision of all embedded anchor bolts, sleeves, anchors and other miscellaneous embedded parts required for the installation of all plant and structural steel work, including if necessary setting templates required for the placement of anchor bolts/embedment are by the *Contractor*.
5. All on-site NDE (during manufacturing) shall be the responsibility of the *Contractor* and must comply with the requirements as indicated in section 9.
6. Unless otherwise stated (for example, items that are to be relocated), the *Contractor* is responsible for the removal of all items and material that are redundant (items that are removed) as part of the *Works*. These are removed from the plant area and are laid down on site at a location to be indicated. The exact scope of all items to be removed shall be a joint decision between the *Contractor and Employer*.

7. None of the old cooling water piping removed from the plant can be reused.
8. Where the material specification of any part that hot work is to be done on is unknown (or doubt exists in the opinion of the *Employer* or the AIA), a Hardness test and a Wet Chemical analysis or OES test must be done at a SANAS approved laboratory to verify the material specification.
9. All flanged connections loosened as part of the works shall be fitted with new gaskets. Bolts to be used must be torqued to 60% of the yield strength. All bolts to be torqued (not flogged) in the “star” sequence in increments as sound engineering practice dictates. All bolts and nuts to be lubricated. After final tightening of the bolt at least two threads shall protrude behind the nut.
10. The *Contractor’s* scope is limited to the mechanical design, supply and installation pipes excluding valves, all required valves to be installed contractor appointed by Outage. The connecting flanges are expected to match existing valves. This remains the responsibility of the pipe installer.
11. The pipes dimensions and geometry are to be like for like except where there is difficulty to interconnect. The contractor, through written notification shall notify the Employer Engineer of the changes for approval before making changes.
12. The *Contractor* is responsible for the stability of the entire structure and all temporary structural elements during all the erection stages.
13. The *Contractor* is required to supply all bolts, washers, nuts etc. for the steelwork.
14. The *Contractor* is responsible for commissioning of the plant before unit light up. All defects to be repaired before hand over. A box up certificate to be signed only after this process.

6.1.1 Responsibility for Design

1. The *Contractor* takes full professional accountability and liability for all designs done by the *Contractor*.
2. The *Contractor* is responsible for the design of all temporary works required for the execution of the works.
3. The *Contractor* submits the following to the *Project Manager*:
    - Detailed structural design report signed by a Professional Civil Engineer/Technologist which includes:
        - Survey drawings, design criteria/parameters, specifications and standards that were used, loadings, assumptions, calculations and results including detailed design calculations, design models, sources of information and any record of other information associated with the completed works. All calculation files and analysis/design models are also submitted in native electronic format together with the design report.
    - Construction Specifications for the *works*
4. The *Contractor* is mandated in terms of Construction Regulations 2014: Duties of Designer, 6(1) g to fulfil the duties described therein. Any risk associated with the *Contractor's* design is to be highlighted to the *Employer* together with mitigation measures. The *Contractor* is responsible for construction monitoring at the level required to certify that the *works* have been constructed in accordance with the *Contractor's* design.

The electrical connection between the new junction box and the switchgear is the responsibility of the *Employer*

6.1.2 Earthing and Lightning Protection

1. All equipment shall be earthed to the station earth mat.
2. The earthing installations shall comply with the Employer specification **Error! Reference source not found.**

6.2 CONTROL & INSTRUMENTATION WORK TO BE DONE

6.2.1 High Level Scoping Requirements

- Where there is existing instrumentation tapping point, the contractor to ensure the instrumentation is installed back on the new pipework.

7. SAFETY REQUIREMENTS

The *Contractor* shall comply with the latest revision of the Eskom Generation Plant Safety Regulations [12], site specific procedures and stipulations of the OHS Act [1].

8. WELDING REQUIREMENTS

The following requirements are applicable for all welding (site and workshop):

1. Welding procedure qualification for welds shall be in accordance with the appropriate welding standard incorporated into the relevant design and construction code. Combination or mixing of different codes shall not be permitted.
2. A WPS supported by a valid WPQR/PQR shall be required for all welding work on Eskom plant. The WPQR/PQR shall be approved by a registered IWE or IWT.
3. Mechanical tests conducted during welding procedure qualifications shall be performed at an accredited mechanical test laboratory conforming to the requirements of ISO/IEC 17025
4. Welding and testing (destructive and non-destructive) of the test pieces shall be witnessed by an AIA or Notified Body.
5. The equipment to be welded are classified as Eskom level 1 plant, the *Contractor* responsible for the welding must be ISO 3834-2 [5] certified
6. Welders and welding operators shall be qualified in accordance with the requirements of the latest applicable construction code or engineering specification relevant to the plant. Welders working on Eskom Levels One and Two Plant shall have at least one an International Tube/Plate/Fillet Welder qualification for the specific welding process being used
7. Geometry specific Weld Procedure Specification (WPS's) are required, supported by the relevant PQR
8. The weld repair rate shall be tracked on a daily basis and reported to Eskom
9. The requirements of the Eskom welding Standard shall apply to all local (South Africa) manufacturing. (240-106628253: Standard for Welding Requirements on Eskom Plant)

9. NDE REQUIREMENTS

The following requirements are applicable for all testing (site and local workshop):

1. NDE shall only be performed by an Eskom approved NDE company.
2. All NDE shall be in line with requirements as stipulated in Requirements for Non-Destructive Testing (NDT) on Eskom Plant Standard [10].
3. All international manufacturing shall follow the relevant design code

10. MATERIAL REQUIREMENTS

1. The *Contractor* is responsible for supply of all materials. This includes, but is not limited to pipes, plates, forgings, valves, any structural steel that is used, any consumables required, gaskets as well as bolts and nuts.
2. All high pressure/ high temperature pipework used shall be procured according to 240-56239129: High Energy Pipework Standard for Eskom Power Plants and shall be traceable to the certificate.
3. All other pressure boundary materials to be supplied with 3.1 material certification in accordance with BS EN 10204:2004.
4. Structural steel is not allowed for pressure boundary containment uses.
5. Where a material is specified in this document, the material supplied shall be in accordance with the specification. If the *Contractor* intends to use similar or equivalent materials the *Contractor* must apply in writing to the *Employer* for permission.

11. QUALITY REQUIREMENTS

1. No work is to be done without a QCP that is approved by the *Employer*. A QCP must be submitted to the *Employer* for the *Works* 14 days before that part of the work is to commence.
2. QCP's and related documentation shall be subject to comment and approval by the *Employer's* Quality Control personnel as well as Engineering. QCP's used for installation shall make provision for signatures for interventions by at least the *Contractor's* QC Representative, the *Employer's* QC Representative, the *Employer's* Engineering Department and the site AIA representative.
3. Each QCP shall have a page for proof signatures, so that any signature can be traced to the individual who has endorsed any activity on QCP.
4. Intervention points shall be signed as the work progresses and no back-dating shall be allowed.
5. Notification for hold and witness points shall be in writing and shall be done at least 24 hours in advance.
6. The following minimum hold points must be included for the *Employer's* Quality Control Department:
    - Approval of QCP
    - Review material certificates
    - Review of weld related documentation such as WPS, PQR and welders qualifications
    - Review of Visual Inspection, Pressure Testing and NDT Reports
    - Final Sign off and Acceptance
    - Final Data book Review

12. DRAWING REQUIREMENTS

1. The *Contractor* shall provide all drawings for new equipment and systems installed. Where work is done on existing systems, the *Contractor* shall recreate all isometric drawings, increasing the revision number by 1 for the final version. The layout and details of the new drawings shall be exactly the same as on the old drawings, except for the areas which have been worked upon.
2. In cases where original drawings are not sufficiently clear, the *Contractor* shall take physical measurements or make reasonable assumptions, stating them clearly. These shall be subject to the *Employer's* acceptance.
3. All Drawings to be provided shall be in accordance with the Engineering Drawing Standard – Common Requirement [6]
4. After the *Works* have been completed, detailed "As-built" line isometric drawings must be provided by the *Contractor*. The "As-built" line isometric drawings are subject to the *Employer's* Engineering representative's comments and approval.
5. All isometric drawings shall indicate all the new installation/modified parts as well as the interfacing existing pipework (and components) as depicted in the relevant GA Drawings. The *Contractor* shall communicate with the system engineer in determining which isometric drawings apply.

6. All equipment/pipelines/systems shall be identified on the drawings by their correct AKZ code number. Where the AKZ code is uncertain, the *Contractor* shall consult the relevant System Engineer for assistance. Where new equipment is installed, the *Employer* shall provide AKZ code numbers.
7. Isometric drawings shall contain the following as a minimum:
    - Description of pipework and components with AKZ number
    - Layout of the pipework
    - Bill of materials (BOM) for all components traceable to the layout. BOM should include size, schedule, pressure rating or class (valve), material exact code and grade to be stated, quantity etc.
    - Design and operating pressures as well as temperatures
    - Indication of orientation on site normally done by means of a “North Arrow”
    - Design code
8. To aid in the production of the drawings, the *Contractor* may request copies of P&ID’s and the equipment’s original drawings from the *Employer’s* Library. The availability of current plant drawings cannot however be guaranteed.
9. The following general requirements apply to all drawings:
    - Space shall be provided for Employer approvals, as well as AIA approvals (where it is applicable or AIA required)
    - All drawing revisions must be provided as paper copies in original (as per Engineering Drawing Standard – Common Requirement [6], but in all cases, at least A3 size) as well as provided in .pdf format and original CAD formats (DGN/DWG).

13. DOCUMENTATION REQUIREMENTS

1. All documents supplied by the *Contractor* shall be subject to Eskom’s approval. Documents such as QCP’s, Method Statements and other documents impacting the work must be approved by the *Employer* at least 14 working days prior to commencement of the *Works*.
2. Each revision of a document or drawing shall be accompanied with a list of the comments made by the *Employer* on the previous revision if applicable and the response/corrective action taken by the *Contractor*. Changes shall be recorded in a revision table contained in each drawing/document. Any additions/subtractions/corrections made to documents by the *Contractor* which is not in response to a previous review comment shall further be noted on the list of responses with reasons for the change.
3. Documents and drawings shall indicate the *Employer’s* drawing number as allocated by the *Employer*. The *Contractor* may have his own document or drawing number on the document or drawing for internal use. In the final revision of all documents and drawings, the *Employer’s* number shall be used throughout when referencing other drawings/documents.
4. All equipment/pipelines/systems shall be identified in the documents by their correct AKZ code number. Where the AKZ code is uncertain, the *Contractor* shall consult the relevant System Engineer for assistance. Where AKZ code numbers
5. The Contractor shall compile a complete data book for all work done containing the following as a minimum if applicable:
    - Scope of work

- All Design calculations
- Approved QCP / ITP
- Inspection reports and Procedures
- As built drawings
- NDE Reports, Procedures and Technicians' qualifications
- Material summary that gives full traceability between components used, drawings and material certificates
- Pressure test certificates including calibration certificates
- Welding Procedure Qualification Record (WPQR)
- Welding Procedure Specification (WPS)
- Welder qualification record (WQR)
- Coating and galvanizing test reports
- All NCR/CAR's and corrective actions
-

14. PRESSURE TEST REQUIREMENTS

Pressure test or leak test to be conducted as per the scope of work.

15. CONFIGURATION MANAGEMENT AND DOCUMENT MANAGEMENT

Transmittal letters shall be provided with each document submittal. The transmittal letter shall include the *Contractor's* drawing number, revision number, and title for each drawing attached. Each drawing title shall be unique and shall be descriptive of the specific drawing content.

16. EVALUATIONS

16.1 TEHCNICAL EVALUATION TEAM (TET) MEMBERS

Mershan Reddy

Ishfaaq Ramathula

Gontse Mathibedi

Feyane Tivane

17. AUTHORISATION

This document has been seen and accepted by:

Name	Designation
Thembelani Ndlumbini	Turbine Engineering Manager
Pretty Sithole	Senior advisor
Rofhiwa Nelwamondo	Engineering Manager
Thapelo Masokoane	Outage Execution Manager
Gontse Mathibedi	Senior Engineer
Ishfaaq Ramathula	System Engineer
Mershan Reddy	Senior advisor
Feyane Tivane	System Engineer
Nomava Jafta	Outage Manager

18. REVISIONS

Date	Rev.	Compiler	Remarks
Oct 2023	1	Gontse Mathibedi	New document

19. DEVELOPMENT TEAM

G Mathibedi