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1. INTRODUCTION

Lethabo Power Station is a large coal fired power station, located between Vereeniging and Sasolburg in the Free State, and consists of six 618MW units for a total installed capacity of 3708MW.

Lethabo burns coal with a calorific value of 15-16MJ/kg and an ash content of 42%. It is the only power station in the world running with such low-grade coal.

The valves discussed in this document are categorized as low pressure and low temperature valves. Low pressure valves are defined as valves that operate at less than 100°C and less than or equal to 2 MPa. The different types of valves, discussed in the document, are as follow: butterfly valves (sizes up to but not including 600 NB), butterfly valves (600NB and higher), rubber gate valves, gate valves, globe valves, NRV's (flap), motorized valves, float valves and control valves.

This document serves as Lethabo Power Station Technical Specification for the refurbishment of auxiliary and secondary cooling water valves. This document must be used in conjunction with the following standards:

- Standard for Low Pressure Valves (Unique Identifier: 240-105020315).
- Standard for Large Bore Resilient Seal Butterfly Valves for use as Cooling Water Isolation Valves (Unique Identifier: 240-63094243).
- Technical Evaluation Standard for the Capability Assessment of Service Providers for The Refurbishment of Valves and Fitting in Eskom Coal Fired Power Plants.

2. SUPPORTING CLAUSES

2.1 SCOPE

This specification covers the minimum requirement for the refurbishment of low-pressure valves used on the auxiliary and secondary cooling water systems at Lethabo Power Station. This specification is to ensure maximum life expectancy and reliability and consistent quality during the refurbishment of these valves. This specification also indicates which valves on the auxiliary and secondary cooling water systems will be refurbished during IR and GO outages.

2.2 PURPOSE

The purpose of this specification is to clarify Eskom's requirements for refurbishment of low-pressure valves, on the auxiliary and secondary cooling water systems, so that all the valves refurbished are of consistent quality and to ensure plant reaches end of design life.

2.3 APPLICABILITY

This document shall apply to Lethabo Power Station.

2.4 NORMATIVE/INFORMATIVE REFERENCES

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

2.4.1 Normative

- [1] ISO 9001 Quality Management Systems.
- [2] EN 1092-1/2 Flanges and their joints – Circular flanges for pipes, valves, fittings and accessories, PN designated – Part 1, Steel Flanges.
- [3] EN 10204 Metallic Products - Type of Inspection Documents.
- [4] OHSACT Occupational Health and Safety Act of 1993.
- [5] API 598 Valve Inspection and Testing.

Employer's Specifications

- [6] 240-106628253 Standard for Welding Requirements on Eskom Plant.
- [7] 240-63094243 Standard for Large Bore Resilient Seal Butterfly Valves for use as Cooling water Isolation valves.
- [8] 240-105020315 Standard for Low Pressure Valves.
- [9] 240-101712128 Standard for Internal Corrosion Protection of Water Systems, Chemical Tanks
- [10] 240-105658000 Supplier Contract Quality Management Specification (QM-58).
- [11] 240-83539994 Standard for Non-Destructive Testing (NDT) on Eskom Plant.
- [12] 240-106365693 Standard for the External Corrosion Protection of Plant, Equipment and Associated Piping with Coatings.
- [13] 240-142257054 Technical Evaluation Standard for the Capability Assessment of Service Providers for The Refurbishment of Valves and Fittings in Eskom Coal Fired Power Plants.
- [14] 240-145581571 Standard for the Identification of the Contents of Pipelines and Vessels.

Drawing and Documentation Standards

- [15] 240-76992014 Project / Plant Specific Technical Documents and Records Management Work Instruction.
- [16] 240-65459834 Project Documentation Deliverable Requirement Specification.
- [17] 240-54179170 Technical Documentation Classification and Designation Standard.
- [18] 240-66920003 Documentation Management Review and Handover Procedure for Gx Coal Projects.
- [19] 240-86973501 Engineering drawing Standard.

2.4.2 Informative

None

2.5 DEFINITIONS

Definition	Description
Approved Inspection Authority	South African organisation that is approved by regulatory authority in terms of SANS 10227.
Cladding	Galvanised thin metal plate used to cover and protect the lagging.

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Definition	Description
Contractor	A group of people and facilities (corporation, firm, enterprise, institution etc.) with an arrangement of responsibilities, authorities, and relationships. It also refers to supplier, consultant, and service provider
Customer	The word customer refers to Eskom Holdings SOC Limited (in the context hereof referred to as Eskom)
Disc/disk/obturator	Movable component of the valve whose position in the fluid flow path permits, restricts or obstructs the fluid flow
Lagging	Insulation used to prevent heat losses, such as from a pipe or pressure vessel.
Manufacturer	The word supplier refers to the Manufacturer or Contractor involved with the production and or design of the final product,
Pipework	Pipes and fittings are used for the conveyance of steam, water, gases, or other fluids.
Quality Control Plan (QCP)	A document specifying the activities to be inspected throughout the execution of the project, inclusive of test methods, procedures, and acceptance criteria. (This term is equivalent to QIP and ITP)
Refurbishment	Restoration to a sustainable usable state or as near as possible to new state (within agreed limits)
Supplier	Entity supplying the final product to the client.
Valve	A device that regulates the flow of gases, liquids, fluidized solids, and slurries by opening, closing, or partially obstructing various passageways.

2.5.1 Disclosure Classification

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

2.6 ABBREVIATIONS

Abbreviation	Description
BFPT	Boiler Feed Pump Turbine
CV	Curriculum Vitae
CW	Cooling Water
C&I	Control and Instrumentation
ECM	Engineering Change Management
EFP	Electric Feed Pump
DP	Differential Pressure
FAT	Factory Acceptance Test
HP	High Pressure
ISO	International Standard Organisation
ITP	Inspection and Test Plan
LP	Low Pressure
MS	Main Steam
MTC	Main Turbine Condenser
NB	Nominal Bore

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Abbreviation	Description
NCR	Non-conformance Report
NDT	Non-destructive Testing
NRV	Non-return-valve
OD	Outside Diameter
OEM	Original Equipment Manufacturer
PER	Pressure Equipment Regulations
PPE	Personal Protective Equipment
PTW	Permit To Work
PVC	Polyvinyl Chloride
QCP	Quality Control Plan
QM	Quality Management System
SANS	South African National Standards
SOW	Scope Of Work
SWL	Safe Working Load
RT	Radiography Testing
UCLF	Unit Capability Loss Factor
UV	Ultraviolet

2.7 ROLES AND RESPONSIBILITIES

The Lethabo Power Station procurement department shall enforce the use and inclusion of this document during the enquiry phase of any future valve maintenance, repair, or refurbishment contracts, and further ensure that the capability of each potential service provider is assessed accordingly to provide assurance and confidence that access to opportunities is based on fair and equitable principle.

Service provider and vendor assessment are conducted to ensure that valve maintenance, repair, and refurbishment operations division task to carry out valve maintenance and repair activities are adequately equipped, skilled and experienced, have undergone the required training and are proficiently capacitated to ensure that Lethabo Power Station is not unduly exposed to safety, reliability profitability risks.

2.8 PROCESS FOR MONITORING

N/A.

2.9 RELATED/SUPPORTING DOCUMENTS

N/A.

3. COMPLETE/TOTAL SCOPE OF WORK OVERVIEW

1. The scope of work consists of the minimum requirement for the refurbishment of auxiliary and secondary cooling water valves.

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2. The contractor to familiarized themselves with the P&ID's, provided by engineering. The contractor is to know the functional locations of the valves on the plant.
3. The contractor to comply with the valve list discussed in this document, for refurbishment during IR and GO outages.
4. The contractor to use this document in conjunction with the following:
 - Standard for Low Pressure Valves (Unique Identifier: 240-105020315).
 - Standard for Large Bore Resilient Seal Butterfly Valves for use as Cooling Water Isolation Valves (Unique Identifier: 240-63094243).
 - Technical Evaluation Standard for the Capability Assessment of Service Providers for The Refurbishment of Valves and Fitting in Eskom Coal Fired Power Plants.
5. Contractor to comply with Eskom colour coding:
 - Standard for the Identification of the Contents of Pipelines and Vessels (Unique Identifier: 240-145581571).

4. WORKS INFORMATION FOR REFURBISHMENT OF AUXILIARY AND SECONDARY COOLING WATER VALVES

4.1 DESCRIPTION OF THE SYSTEM

4.1.1 Main cooling water system

The primary purpose of the station cooling water (CW) is to remove the latent heat of evaporation from the station condenser to the cooling towers (atmosphere). The station cooling water system is divided into sections-East and West. The west side supplies CW to unit 1, 2, and 3, while the East side supplies cooling water to units 4, 5 and 6.

Cooling water is supplied from the six CW pumps, which are situated in the CW pumphouse. The CW pumps take suction from a centre well, which is supplied with water from the three cooling towers. The CW pumps supply the cold CW into two lines, called cold ducts, which runs half the length of the station, below ground.

After the water has passed through the condenser, water-water coolers and BFPT condenser, the now warm CW is fed into two lines, the hot ducts, which returns the hot water to the cooling towers to complete this main cooling water cycle.

4.1.2 Secondary cooling water system

Cooling water is tapped off from the two cold ducts and is joined in a common line (cold duct interconnect).

From this common line cooling water is supplied to the following items of the plant:

- Auxiliary cooling system water coolers (water-water coolers), spray water pits of Main Turbine and BFPT via CW booster pumps.
- BFPT condenser.
- BFPT mixed temperature water pit.

The common duct interconnect is fitted with hand-operated butterfly valves (1000NB, see standard 240-63094243) for isolation. A drain line with an isolating valve (150NB gate valve, see standard 240-105020315) is also installed on this interconnect.

4.1.3 Cooling water flow to the water-water coolers

This system not only supplies water to the water-water coolers, but also supplies water to the spray water pits of the main turbine and BFPT.

From the interconnector three lines tee off, two supplying each 100% secondary cooling water pump. Each pump is fitted with a butterfly isolating valve (600NB, see standard 240-63094243) on the suction line and a swing-check valve (600NB NRV) and isolating valve (600NB, see standard 240-63094243) on the discharge line. The isolating valves are hand operated.

The pumps discharge into a common line. At the highest point on this common line a vent line with an isolation valve (25NB ball valve, see standard 240-105020315). This common line is divided into three branch offs each supplying water through a strainer. Inlet and outlet butterfly valves (400NB, see standard 240-105020315) are installed on each strainer. A drain line with a hand-isolating valve (150NB globe valve) valve for each strainer discharges into a drain funnel.

4.1.4 Auxiliary cooling water system

The auxiliary cooling system is a closed circuit using demin water as a cooling medium. The advantage of this system is that the same water is continuously in circulation, also the water stays pure, rust and metal attack is eliminated.

The auxiliary cooling system consist of 3 pumps, each with 50% capacity. Two pumps are normally in service with the third pump being standby. The pump supply water into a common line from where it is distributed to the various plant auxiliaries. Each pump is equipped with a hand-isolating valve (500NB butterfly valve, see standard 240-105020315) on the suction and discharge line. Swing-check valve (500NB NRV) are also installed on the discharge lines immediately upstream of the hand isolating valve.

The return from the auxiliaries' discharges into a common return line. The warm water now passes through one of two plate type coolers (water-water cooler). Each cooler is provided with inlet and outlet hand isolating valves (500NB butterfly valve, see standard 240-105020315) Drain connections are installed on the inlet lines downstream of the isolating valves, and on the outlet line upstream of the outlet isolating valves (50NB Globe valve, see standard 240-105020315).

Vent connections are also installed on each of the outlet lines downstream of the coolers, vents are equipped with hand isolating valve (25NB globe valve, see standard 240-105020315).

Downstream of the point where the three discharge lines join each other a line tees off and allows 10% of the water to flow through two filter units. One filter will always be in service. Inlet and outlet valves (150NB gate valve, see standard 240-105020315) are installed for isolation.

4.1.5 Auxiliary cooling water flow through main turbine bearing oil coolers

The first branch-off from the common supply line supplies cooling water to the two main oil coolers installed in parallel in the main oil room. One cooler will always be in operation.

From the auxiliary cooling water range a line branches off and is equipped with a motorised "main turbine bearing oil" control valve (250NB control valve, see standard 240-105020315) and a normally open hand-isolating valve (250NB gate valve, see standard 240-105020315). This control valve regulates the amount of cooling water to the in-service cooler on a command from a temperature signal which comes from the oil leaving the cooler, and which controls the temperature between 42 and 45°C. The higher the temperature of the oil, the more cooling water will be allowed to pass through the cooler.

Upstream of the coolers the common cooling water supply line divides and proceed to the coolers. Each cooler is supplied with an inlet and outlet-isolating valve (250NB gate valve, see standard 240-

105020315). Vent connections are fitted to each outlet water box and drain connections are fitted on each inlet water box. An extra vent is installed at a point upstream of the cooler inlet valves. The drains and vents from these coolers discharge into a drain funnel. All valves (15NB,25NB,32NB globe valve, see standard 240-105020315) are hand operated.

A drain line with a hand-isolating valve (25NB globe valve, see standard 240-105020315) is also installed between the temperature regulating valve and the main isolating valve should this section of pipe need to be drained.

4.1.6 Auxiliary cooling water flow through EFP auxiliaries

The next-tap of the main supply line is a line, which supplies water via a hand-isolating valve (250NB gate valve, see standard 240-105020315) to the following:

- EFP coupling oil cooler (working oil cooler).
- EFP lubrication oil cooler.
- Motor coolers.

Before supplying the two motor air coolers, two lines branch off and supply water for:

- Pedestal cooling (40NB globe valve, see standard 240-105020315).
- Mechanical seal coolers via hand isolating valves (50NB globe valve, see standard 240-105020315).

A vent line is installed upstream of the lube oil and coupling oil coolers. These vents discharge into a funnel drain via hand-isolating valves (15NB globe valve, see standard 240-105020315).

The outlet from all the coolers discharges into a common return line. A hand-isolating valve (250NB gate valve, see standard 240-105020315) is installed on the common supply and return line) will at the same time isolate all the other coolers on this pump.

The cooling water arrangement for the second EFP is identical to those already discussed.

The pedestal and mechanical seal cooling water for the BFPT is obtained via a line which comes off a point between the cooling water lines for the two EFP's. The return discharges into a common return line.

4.1.7 Auxiliary cooling water flow through the BFPT oil coolers

Two oil coolers are installed in parallel for the BFPT to cope with the total lubricating oil flow of the BFPT, (i.e.) lubrication oil. One cooler will always be in service.

From the supply line, which supplies the EFP coolers, a line branches off and supplies water to the BFPT oil coolers via a hand-isolating valve (125NB gate valve, see standard 240-105020315) and a motorised control valve (125NB control valve, see standard 240-105020315). This control valve regulates the amount of cooling water to the in-service cooler on a command from a temperature signal which come from the oil leaving the cooler, and which controls the temperature between 38°C and 42°C. The higher the temperature of the oil, the more cooling water will be allowed to pass through the cooler. A flow-measuring orifice is installed on the common discharge line from the oil coolers.

Each cooler is supplied with an inlet and outlet-isolating valve (125NB gate valve, see standard 240-105020315). Vent connections are fitted to each inlet water box and two drains are fitted to each outlet water box. The drains and vents from these coolers discharge into a drain funnel. All valves are hand operated (15NB,32NB globe valve, see standard 240-105020315).

A drain line with a hand-isolating valve (25NB globe valve, see standard 240-105020315) is also installed between the temperature-regulating valve and the main isolating (hand) valve should this section of pipe need to be drained.

4.1.8 Auxiliary cooling water supply to main condensate pumps

The third supply from the auxiliary cooling system goes to the main condensate extraction pumps for cooling of the pump and motor bearings.

The only valves on this system are the inlet and outlet isolating valves (25NB globe valve, see standard 240-105020315). The return from this system also discharges into the common return line.

4.1.9 Auxiliary cooling water to control fluid cooler

This system, which is separate from the turbine lubrication oil system, consists of one cooler, which is sufficient to cool the total control fluid for the turbine control system.

The fourth supply from this common auxiliary cooling water main supplies water to the cooler via a hand-isolating valve (50NB gate valve, see standard 240-105020315), motorised temperature regulating valve (50NB control valve, see standard 240-105020315) and another hand isolating valve (50NB gate valve, see standard 240-105020315) upstream of the cooler.

The temperature control valve regulates the amount of cooling water to the cooler on command from a fluid temperature signal which comes from the fluid leaving the cooler and which controls the temperature between 50 - 55°C when the heater is off. The lower the temperature, the less cooling water will be allowed to pass through the cooler.

An inlet water box vent and an outlet water box drain are also installed. A drain line is also installed on the supply line and tees off between the first isolating valve and the temperature-regulating valve. All drains and vents drain into a tundish via hand-isolating valves (50NB globe valve, see standard 240-105020315).

4.1.10 Auxiliary cooling water supply to H2 and Exciter coolers

The last supply from this common line, turbine side, supplies cooling water to all the coolers associated with the alternator via a common manifold. Upstream of this supply, a line also tee's off and supplies cooling water to the 20 KV breaker cooling system.

The first tap-off supplies water to the exciter air cooler via inlet and outlet isolating valves (80NB gate valve, see standard 240-105020315).

Two drain lines are connected to the inlet and outlet lines and drain via hand isolating valves (25NB globe valve, see standard 240-105020315) in a tundish.

The second supply supplies water to the hydrogen (H2) coolers (x4).

Each cooler is supplied via an isolating valve (150NB rubber gate valve, see standard 240-105020315) and flow orifice. Outlet isolating valves are also installed.

Inlet and outlet drain lines are installed on each cooler. These drains discharge into a tundish via isolating valves (25NB globe valve, see standard 240-105020315). The outlet from the coolers discharge into a common header.

4.1.11 Auxiliary cooling water through stator coolant coolers

Two stator coolant coolers are installed in parallel to cool the stator water that circulates through the stator bars (windings).

The cooling water to the coolers is supplied by a line, which taps off a point downstream of the cooler inlet manifold. Each cooler is equipped with inlet and outlet hand-isolating valves (300NB gate valve, see standard 240-105020315). The discharge from the coolers flows back into the common return line upstream of the H2 cooler discharge manifold.

4.2 VALVE REFURBISHMENT DURING OUTAGES

4.2.1 Secondary cooling water valve replacement during outages

Table 1: Secondary cooling water valve replacement during outages

AKZ	Description:	IR	GO
VC31S001	SEC CW PMP A SUCTION ISOL V/V	X	X
VC31S002	SEC CW PMP A DISCH NRV	X	X
VC31S003	SEC CW PMP A DISCH ISOL V/V	X	X
VC32S001	SEC CW PMP B SUCTION ISOL V/V	X	X
VC32S002	SEC CW PMP B DISCH NRV	X	X
VC32S003	SEC CW PMP B DISCH ISOL V/V	X	X
VC20S001	CW COLD CROSS OVER ISOL V/V (half station shutdown)	X	X
VC20S002	CW COLD CROSS OVER ISOL V/V (half station shutdown)	X	X
VC21S002	CW HOT CROSS OVER ISOL V/V (half station shutdown)	X	X
VC21S003	CW HOT CROSS OVER ISOL V/V (half station shutdown)	X	X
VC20S003	BFPT COND CW INL ISOL V/V (half station shutdown)	X	X
VC21S001	BFPT COND CW OUTL ISOL V/V (half station shutdown)	X	X
VC33S001	CW STRAINER 1 INL ISOL V/V		X
VC33S002	CW STRAINER 1 OUTL ISOL V/V		X
VC34S001	CW STRAINER 2 INL ISOL V/V		X
VC34S002	CW STRAINER 2 OUTL ISOL V/V		X
VC35S001	CW STRAINER 3 INL ISOL V/V		X
VC35S002	CW STRAINER 3 OUTL ISOL V/V		X
VC36S001	CW WTR WTR COOLER ISOL V/V	X	X
VC36S002	CW WTR WTR COOLER ISOL V/V	X	X
VC37S001	CW WTR WTR COOLER ISOL V/V	X	X

VC37S002	CW WTR WTR COOLER ISOL V/V	X	X
VC31S004	SEC CW PMP A SUCTION DRN V/V		X
VC31S005	SEC CW PMP A DISCH DRN V/V		X
VC32S004	SEC CW PMPS DISCH PIPE VENT		X
VC32S005	SEC CW PMP B SUCTION DRN V/V		X
VC32S006	SEC CW PMP B DISCH DRN V/V		X
VC33S003	BACK WASHING PIPE ISOL V/V		X
VC34S003	BACK WASHING PIPE ISOL V/V		X
VC35S003	BACK WASHING PIPE ISOL V/V		X
VC33S004	CW STRAINER 1 DP ISOL V/V 1		X
VC33S005	CW STRAINER 1 DP ISOL V/V 2		X
VC36S003	CW WTR WTR COOLER VENT		X
VC37S003	CW WTR WTR COOLER VENT		X
VC36S004	CW WTR WTR COOLER DRN V/V		X
VC37S004	CW WTR WTR COOLER DRN V/V		X

4.2.2 Auxiliary cooling water valve replacement during outages

Table 2: Auxiliary cooling water valve replacement during outages

AKZ	Description	IR	GO
VF00S001	AUX CW WTR/WTR COOLERS MAIN INL ISOL V/V		X
VF00S003	AUX CW SAMPLING ISOL V/V		X
VF00S004	AUX CW VENT V/V		X
VF04S001	AUX CW WTR/WTR COOLER 1 INL ISOL V/V	X	X
VF04S002	AUX CW WTR/WTR COOLER 1 OUTL ISOL V/V	X	X
VF04S003	AUX CW WTR/WTR COOLER 1 SAMPLING		X
VF04S004	AUX CW WTR/WTR COOLER 1 DRN		X
VF04S005	AUX CW WTR/WTR COOLER 1 VENT		X
VF05S001	AUX CW WTR/WTR COOLER 2 INL ISOL V/V	X	X

VF05S002	AUX CW WTR/WTR COOLER 2 OUTL ISOL V/V	X	X
VF05S003	AUX CW WTR/WTR COOLER 2 SAMPLING V/V		X
VF05S004	AUX CW WTR/WTR COOLER 2 DRN		X
VF05S005	AUX CW WTR/WTR COOLER 2 VENT		X
VF06S001	AUX CW TANK OUTL ISOL V/V		X
VF06S002	AUX CW TANK STANDPIPE TOP ISOL V/V		X
VF06S003	AUX CW TANK STANDPIPE BOTTOM ISOL V/V		X
VF06S004	AUX CW TANK STANDPIPE DRN V/V		X
VF06S005	AUX CW TANK STANDPIPE VENT V/V		X
VF06S006	AUX CW TANK STANDPIPE VENT V/V		X
VF07S001	AUX CW WTR/WTR COOLER BYPASS ISOL V/V		X
VF08S001	AUX CW TANK DRN V/V		X
VF09S001	AUX CW BYPASS FILTER 1 INL ISOL V/V		X
VF09S002	AUX CW BYPASS FILTER 1 OUTL ISOL V/V		X
VF09S003	AUX CW BYPASS FILTER 2 INL ISOL V/V		X
VF09S004	AUX CW BYPASS FILTER 2 OUTL ISOL V/V		X
VF10S001	GEN H2 COOLER 1 AUX CW INL ISOL V/V		X
VF10S002	GEN H2 COOLER 1 AUX CW OUTL ISOL V/V		X
VF10S003	GEN H2 COOLER 2 AUX CW INL ISOL V/V		X
VF10S004	GEN H2 COOLER 2 AUX CW OUTL ISOL V/V		X
VF10S005	GEN H2 COOLER 3 AUX CW INL ISOL V/V		X
VF10S006	GEN H2 COOLER 3 AUX CW OUTL ISOL V/V		X
VF10S007	GEN H2 COOLER 4 AUX CW INL ISOL V/V		X
VF10S008	GEN H2 COOLER 4 AUX CW OUTL ISOL V/V		X
VF10S009	EXCITER AIR COOLER AUX CW INL ISOL V/V		X
VF10S010	EXCITER AIR COOLER AUX CW OUTL ISOL V/V		X
VF10S011	EXCITER AIR COOLER TEMP REG V/V		X
VF10S012	GEN H2 COOLER TEMP REG V/V		X

VF10S013	AUX CW VENT V/V		X
VF10S014	GEN H2 COOLER 1 INL DRN		X
VF10S015	GEN H2 COOLER 2 INL DRN		X
VF10S016	GEN H2 COOLER 3 INL DRN		X
VF10S017	GEN H2 COOLER 4 INL DRN		X
VF10S018	EXCITER AIR COOLER INL DRN V/V		X
VF10S019	H2 COOLER DRN TO DA VES ISOL V/V		X
VF10S020	H2 COOLER VENT TO DA VES ISOL V/V		X
VF10S021	AUX CW TO DEAERATION VESSEL ISOL V/V		X
VF10S022	AUX CW TO DEAERATION VESSEL ISOL V/V		X
VF10S023	AUX CW TO DEAERATION VESSEL ISOL V/V		X
VF10S024	AUX CW TO DEAERATION VESSEL ISOL V/V		X
VF10S025	AUX CW GEN COOLERS HEADER DRN		X
VF10S026	AUX CW GEN COOLERS HEADER DRN		X
VF10S027	AUX CW GEN COOLERS HEADER VENT		X
VF10S034	GEN H2 COOLER 1 OUTL DRN		X
VF10S035	GEN H2 COOLER 2 OUTL DRN		X
VF10S036	GEN H2 COOLER 3 OUTL DRN		X
VF10S037	GEN H2 COOLER 4 OUTL DRN		X
VF10S038	EXCITER AIR COOLER OUTL DRN V/V		X
VF10S039	EXCITER AUX CW VENT V/V		X
VF11S001	MAIN TURB OIL TEMP REG V/V		X
VF11S002	TURB BRG OIL COOLER 1 INL ISOL V/V		X
VF11S003	TURB BRG OIL COOLER 1 OUTL ISOL V/V		X
VF11S004	TURB BRG OIL COOLER 2 INL ISOL V/V		X
VF11S005	TURB BRG OIL COOLER 2 OUTL ISOL V/V		X
VF11S007	TURB BRG OIL TEMP REG V/V ISOL V/V		X
VF12S001	STATOR COOLANT COOLER A AUX CW INL ISOL		X

VF12S002	STATOR COOLANT COOLER A AUX CW OUTL ISOL		X
VF12S003	STATOR COOLANT COOLER B AUX CW INL ISOL		X
VF12S004	STATOR COOLANT COOLER B AUX CW OUTL ISOL		X
VF12S005	STATOR COOLANT COOLER AUX CW INL DRN		X
VF12S006	STATOR COOLANT COOLER AUX CW OUTL DRN		X
VF13S001	AUX CW RETURN PMP SUCTION ISOL V/V		X
VF13S002	AUX CW RETURN PMP DISCHARGE NRV		X
VF13S003	FLOAT V/V AUX CW RETURN PMP DISCHARGE		X
VF13S004	AUX CW RETURN PMP DISCHARGE ISOL V/V		X
VF13S005	AUX CW RETURN PMP DRN		X
VF16S001	EXTR PMP A AUX CW INL ISOL V/V		X
VF16S002	EXTR PMP B AUX CW INL ISOL V/V		X
VF16S003	EXTR PMP A AUX CW OUTL ISOL V/V		X
VF16S004	EXTR PMP B AUX CW OUTL ISOL V/V		X
VF21S001	EFP A AUX CW INL ISOL V/V		X
VF21S002	EFP A AUX CW OUTL ISOL V/V		X
VF21S003	EFP A LUB OIL COOLER AUX CW DRN		X
VF21S004	EFP A WORKING OIL COOLER AUX CW DRN		X
VF22S001	EFP B AUX CW INL ISOL V/V		X
VF22S002	EFP B AUX CW OUTL ISOL V/V		X
VF22S003	EFP B WORKING OIL COOLER AUX CW DRN		X
VF22S004	EFP B LUB OIL COOLER AUX CW DRN		X
VF23S001	BFPT OIL TEMP REG V/V		X
VF23S002	BFPT OIL COOLER 1 AUX CW INL ISOL V/V		X
VF23S003	BFPT OIL COOLER 1 AUX CW OUTL ISOL V/V		X
VF23S004	BFPT OIL COOLER 2 AUX CW INL ISOL V/V		X
VF23S005	BFPT OIL COOLER 2 AUX CW OUTL ISOL V/V		X
VF23S006	BFPT OIL COOLER 1 AUX CW VENT		X

VF23S007	BFPT OIL TEMP REG V/V AUX CW INL ISOL		X
VF23S008	BFPT OIL COOLER 1 AUX CW DRN V/V		X
VF23S009	BFPT OIL COOLER 2 AUX CW VENT V/V		X
VF23S010	BFPT OIL TEMP REG V/V AUX CW DRN		X
VF23S011	BFPT OIL COOLER 2 AUX CW DRN		X
VF23S012	BFPT AUX CW INL ISOL V/V		X
VF23S013	BFPT AUX CW OUTL ISOL V/V		X
VF31S001	EFP A AUX CW INL ISOL V/V		X
VF31S002	EFP A AUX CW OUTL ISOL V/V		X
VF31S007	EFP A NDE MECH SEAL WTR COOLER AIR REL		X
VF31S008	EFP A DE MECH SEAL WTR COOLER AIR REL		X
VF32S001	EFP B AUX CW INL ISOL V/V		X
VF32S002	EFP B AUX CW OUTL ISOL V/V		X
VF32S007	EFP B MECH SEAL NDE COOLER AIR RELEASE		X
VF32S008	EFP B MECH SEAL DE COOLER AIR RELEASE		X
VF33S001	BFPT AUX CW INL ISOL V/V		X
VF33S002	BFPT AUX CW OUTL ISOL V/V		X
VF33S007	BFPT NDE MECH SEAL WTR COOLER AIR REL		X
VF33S008	BFPT DE MECH SEAL WTR COOLER AIR RELEASE		X
VF41S001	EFP A BASEPLATE AUX CW INL ISOL V/V		X
VF41S002	EFP A BASEPLATE AUX CW OUTL ISOL V/V		X
VF42S001	EFP B BASEPLATE AUX CW INL ISOL V/V		X
VF42S002	EFP B BASEPLATE AUX CW OUTL ISOL V/V		X
VF43S001	BFPT BASEPLATE AUX CW INL ISOL V/V		X
VF43S002	BFPT BASEPLATE AUX CW OUTL ISOL V/V		X
UG70S001	AUX CW TANK DEMIN WATER INL V/V	X	X
UG70S002	AUX CW TANK INL FLOAT V/V	X	X
UG70S003	FEED WATER TANK STANDPIPE FILLING ISOL		X

UG70S004	FEED WATER TANK STANDPIPE FILLING NRV		X
VF01S001	AUX CW PMP A SUCTION ISOL V/V	X	X
VF01S002	AUX CW PMP A DISCHARGE NRV	X	X
VF01S003	AUX CW PMP A DISCHARGE ISOL V/V	X	X
VF02S001	AUX CW PMP B SUCTION ISOL V/V	X	X
VF02S002	AUX CW PMP B DISCHARGE NRV	X	X
VF02S003	AUX CW PMP B DISCHARGE ISOL V/V	X	X
VF03S001	AUX CW PMP C SUCTION ISOL V/V	X	X
VF03S002	AUX CW PMP C DISCHARGE NRV	X	X
VF03S003	AUX CW PMP C DISCHARGE ISOL V/V	X	X
VF15S001	MAIN TURB C/FLUID TEMP REG V/V ISOL V/V		X
VF15S002	MAIN TURB C/FLUID TEMP REG V/V		X
VF15S003	MAIN TURB C/FLUID COOLER AUX CW INL ISOL		X
VF15S004	MAIN TURB C/FLUID CLR AUX CW OUTL ISOL		X

4.3 SCOPE OF WORK

4.3.1 Flow measurement valves

- Calibrate flow measurement valves.

4.3.2 Butterfly valve (Ainsworth)

- Strip valve and clean components.
- Visual inspection on valve seat & retaining ring, body seat, body internal coating, shaft, and bushes.
- Line bore and install new bushes and pins if damage is found in the inspection.
- Blast clean and coat valve body internal and disk.
- Replace O-ring (natural rubber), must be a single continuous ring, not made up from glued chords.
- Replace retaining ring (use stainless steel 316 Allen cap and grub screws).
- After pressure test, all Allen cups and grub screws to be glued with lock tight to prevent loosening.
- Clean gearbox and repack with new grease (LS3 grease).
- Replace gasket (use klinger4430).
- Replace shaft lip seals.

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- Reassemble valve and pressure test to 700kPa for 5 minutes.
- Valves are to pass the pressure test with 100% sealing, no leaking tolerance accepted.
- On site leak test and directional testing will also be done.

4.3.3 Rubber gate valve (Ainsworth)

- Strip valve and clean components.
- Visual inspection on spindle, rubber gate and body internal coating.
- Replace rubber gate if required.
- Repair coating if required.
- Replace gland packing (crane water packing).
- Replace gaskets.
- Replace dome rubber O-ring, must be a single continuous ring, not made up from glued chords.

4.3.4 Gate valve (Beta)

- Strip valve and clean components.
- Visual inspection on spindle, rubber gate and body internal coating.
- Replace rubber gate if required.
- Repair coating if required.
- Replace gland packing (crane water packing or graphite).
- Replace gaskets.
- Replace dome rubber O-ring.

4.3.5 Globe valve (BOA 50)

- Strip valve and clean components.
- Visual inspection on spindle, valve seat, body seat and body internals.
- Lap and blue check valve seats.
- Replace gland packing (graphite).
- Replace body gasket (copper gasket).

4.3.6 NRV (wing-check valve/flap)

- Strip valve and clean components.
- Visual inspection on shaft & bushes, valve seat, body seat and body internal coating.
- Record shaft to bush clearances.
- Fit new bushes and line bore if required.
- Replace shaft lip seals.

- Blast clean and coat valve body internal and flap.

4.3.7 Globe valve (KSB)

- Strip valve and clean components.
- Visual inspection on spindle, valve seat, body seat and body internals.
- Lap and blue check valve seats.
- Replace gland packing - graphite packing.
- Replace body gasket (copper washer).

4.3.8 Motorised valve

- Ensure that mechanical position is properly marked.
- Stroke check valve before returning it to operation.

4.3.9 Float valve

- Strip and clean.
- Inspect rubber seat.
- Replace gland packing.
- Replace Teflon seal.

4.3.10 Control valve

- Nut and spindle inspection, check for signs of wear.
- Bearings – Inspection and replace both bearings, based on amount of visible wear.
- Cleaning and inspection of ports.
- Lapping.
- Blue Check.
- Stroke check after reassembly.

4.4 BILL OF MATERIALS

Table 3: Bill of materials

Type	COMPONENT DESCRIPTION	COMPONENT / MATERIAL SPECIFICATION	OPERATING PARAMETERS
Butterfly valve	Grease for packing	LS3	T < 60°C; P < 10 bar
	Gaskets	Klinger 4430	T < 60°C; P < 10 bar
	Grub Screws	Stainless steel 316	T < 60°C; P < 10 bar
	Allen Caps	Stainless steel 316	T < 60°C; P < 10 bar

	O-rings	Natural rubber solidly manufactured. No joint or glued cords will be accepted	T < 60°C; P < 10 bar
	Retaining rings	Stainless Steel 316	T < 60°C; P < 10 bar
	Bushes (if damaged)		T < 60°C; P < 10 bar
	Pins (if damaged)		T < 60°C; P < 10 bar
	Lock tight to clue allen caps and grub screws in position after pressure test		T < 60°C; P < 10 bar
	Pressure testing facilities	7 – 10 bar capability	T < 60°C; P < 10 bar
	Calibrated pressure gauges	7 – 10 bar capability	T < 60°C; P < 10 bar
	Shaft lip seals		T < 60°C; P < 10 bar
	Grit blasting	To surface preparation standard SA 2	T < 60°C; P < 10 bar
	Internal Coating	Epoxy coating to 200 microns	T < 60°C; P < 10 bar
	Needle bearings for worm gear shaft		T < 60°C; P < 10 bar
Gate valves	Rubber gate (if required)		T < 60°C; P < 10 bar
	O-rings	Dome rubber O-ring. Must be a single continuous ring, not made up from glued chords.	T < 60°C; P < 10 bar
	Gland packing	Crane water packing or graphite packing	T < 60°C; P < 10 bar
	Pressure test on body and seat		T < 60°C; P < 10 bar
	Calibrated pressure gauges for pressure testing		T < 60°C; P < 10 bar
	Gaskets	Klinger 4430 (only if removed from plant)	T < 60°C; P < 10 bar
	Grit blasting	To surface preparation standard SA 2	T < 60°C; P < 10 bar
	Internal Coating	Epoxy coating to 200 microns	T < 60°C; P < 10 bar
Globe valves	Gasket	Copper	T < 60°C; P < 10 bar
	Gland Packing	Graphite	T < 60°C; P < 10 bar
Swing-check valve (NRV)	Sandblasting	To surface preparation standard SA 2	T < 60°C; P < 10 bar
	Internal Coating	Epoxy coating to 200 microns	T < 60°C; P < 10 bar
	Shaft Lip Seals		T < 60°C; P < 10 bar
	Bushes		T < 60°C; P < 10 bar
	Gaskets	Klinger 4430	T < 60°C; P < 10 bar

Control valve	Gland Packing		T < 60°C; P < 10 bar
	Bearings		T < 60°C; P < 10 bar
	Teflon Seals		T < 60°C; P < 10 bar

5. ADDITIONAL INFORMATION

5.1 QUALITY

Quality standards will be in line with the national and international standards listed in: *Standard for Low Pressure Valves (Unique Identifier: 240-105020315)*. Audits will be carried out from time to time to ensure that quality standards are maintained.

5.2 QUALITY CONTROL

The *Contractor* who executes the refurbishment activity is responsible for the quality of their work. Formal quality control shall be applied as appropriate to all level 1 and 2 plants and to all critical activities on level 3 plants. The quality inspection plan must contain the minimum quality control requirements.

5.3 QUALITY INSPECTION PLANS

Quality inspection plans define the sequence of activities to be performed. The QIP must indicate all associated hold and witness points as well as the person responsible for these activities. All controlling documentation must be indicated as well as the documentation required.

5.4 LETHABO QUALITY CONTROL INSPECTORS

- Quality control inspections will be conducted on behalf of Eskom by a quality inspector from maintenance support services section.
- The quality inspector must be authorised by the Power Station Maintenance Manager in terms of LMA10002.
- The inspections will be carried out to provide an assessment of conformance to specification and quality requirements.
- These inspections do not take any responsibility away from the supervisor or artisan performing the work.

5.5 QUALITY CONTROL INSPECTOR'S RESPONSIBILITIES

- Reviewing maintenance procedures and work instructions and indicating witness and hold points.
- Verifying that specified quality requirements have been achieved by inspecting work in progress and indicating acceptance on the quality control plan.

- Ensuring that quality control plans conform to the requirements of Lethabo Power Station and that these quality control plans are completed for all valves overhauled. The quality control plan must be made available by the *Employer's* Representative prior to commencement of work for review.
- Ensuring that acceptable maintenance/refurbishment practice and all relevant codes, standards and statutory requirements are adhered to.
- The quality inspector has the authority to stop work where an inadequacy threatens the safety of plant or personnel. It is the responsibility of the person performing the activity to inform the quality inspector prior to reaching a witness or hold point. In the case of a major outage the quality inspector must be informed at least one day in advance.

5.6 QUALITY CONTROL CHECKPOINTS

- A copy of the QCP indicating all hold and witness points must be submitted with the tender documents.
- The Eskom quality inspector must be informed 24 hours in advance of any hold or witness points.
- Inspection of internals.
- NDE (Non-Destructive Testing).
- Inspection of disc and seat "blueing".
- Replacement of gaskets and pressure seals.
- Valve assembly.
- Document completed.
- Pressure test.

5.7 REQUIREMENTS ON WELDING

- Any welding to be done on the valve body must be confirmed by Eskom QC and/or Eskom Engineering.
- Any welding be done must only be done by the approved valve bodies welding supplier and the Employer must be notified before the welding is carried out (Eskom AIA involvement compulsory).
- If special processes such as welding, seat hard facing, weld overlay is carried out, the service provider provides demonstrable proof of the applicable ISO 3834, certification (Eskom AIA involvement compulsory).

5.8 REQUIREMENTS FOR BLASTING AND COATING OF VALVES

- Any contaminants such as oil should be removed.
- Blast cleaned to surface preparation grade SA2.
- Coated with epoxy type coating suitable for immersion, in accordance Eskom procedure within 12 hours of blasting.

For further coating specification refer to Standard for Large Bore Resilient Seal Butterfly Valves for use as Cooling Water Isolation Valves (Unique Identifier: 240-63094243).

5.9 REQUIREMENTS FOR CORROSION PROTECTION

All valves shall be protected against corrosion. The type of corrosion protection will be specific for the valve material, the working environment of the valve as well as the type of fluid passing through or in contact with the valve.

Non-stainless-steel valves used in cooling water systems containing raw water shall be lined internally unless otherwise specified by Eskom. (The type of lining is contract specific and will be specified during the tender stage.)

Corrosion Protection shall conform to 240-101712128 Specification for the Internal Corrosion Protection of Water Systems, Chemical Tanks and Vessels and Associated Piping with Linings.

5.10 TESTING OF VALVES

All testing must be done in accordance with the applicable valve design code (health and safety standard), certificates will be in compliance with requirements of EN10204 relevant certification. Eskom requires that the following test be carried out as a minimum, as stipulated in Standard for Low Pressure Valves (Unique Identifier: 240-105020315):

- Pressure Test.
- Fire Test.
- Hazardous application.
- Body Test.
- Seal Test.
- Testing of Elastomers.

5.11 PACKAGING, TRANSPORT AND DELIVERY

The safe, undamaged delivery of the valves is the responsibility of the supplier or the contractors responsible for the installation of the valves.

All valve components, especially the valve stem shall be securely packed with the correct packaging to prevent damage in transit. The gate, butterfly and globe valves shall be in the closed position for transportation, whereas ball and plug valves shall be in the open position. Any actuated valves shall be transported in the failsafe position. Electric actuators shall not be attached to the valves during transportation; the contractor will however be required to witness the final assembly on site.

The ends of the valves (flanged, socket welded, threaded, butt welded) shall be blanked off with the appropriate rigid materials to prevent damage to the valve trim and prevent foreign materials from entering the internals of the valves. The blanked off ends will remain blanked off until final installation. Before dispatch, flange faces of non-coated valves shall be coated with heavy grease or other suitable corrosion preventative.

All valves will be inspected upon delivery and any valve that maybe damaged or that does not comply with the stipulation of this standard will be rejected. If a damaged valve is delivered, it is the responsibility of the contractor or supplier to replace/correct the valve deficiencies, at the contractors own cost; this might entail replacement of damaged valves with an undamaged valve according to the original valve specification.

5.12 GENERAL TECHNICAL REQUIREMENTS

For all general technical requirements for low pressure valves refer to Standard for Low Pressure Valves (Unique Identifier: 240-105020315). The general technical requirements covered in the above-mentioned standard includes:

- Seals
- Indicators
- Materials
- Flanges
- Bolts, studs, nuts, washers, and threads
- Markings
- Locks
- Valve closing direction
- Handwheel

6. TECHNICAL EVALUATION CRITERIA

A weighted score-card approach is used to evaluate the technical compliance of the tenders against the specifications or ability to perform the work. Tenderers need to have a minimum weighted score of 70% overall or more to technically qualify for further evaluation.

For technical Evaluation, the principles below will apply.

Table 4: Qualitative evaluation criteria

Score	(%)	Definition
5	100	COMPLIANT <ul style="list-style-type: none"> Meet technical requirement(s) AND. No foreseen technical risk(s) in meeting technical requirements.
4	80	COMPLIANT WITH ASSOCIATED QUALIFICATIONS Meet technical requirement(s) with. <ul style="list-style-type: none"> Acceptable technical risk(s) AND/OR. Acceptable exceptions AND/OR. Acceptable conditions.
2	40	NON-COMPLIANT <ul style="list-style-type: none"> Does not meet technical requirement(s) AND/OR. Unacceptable technical risk(s) AND/OR. Unacceptable exceptions AND/OR; Unacceptable conditions.
0	0	TOTALLY DEFICIENT OR NON-RESPONSIVE
Note 1: The scoring table does not allow for scoring of 1 and 3. Note 2: Foreseen acceptable and unacceptable risk(s), exceptions and conditions shall be unambiguously defined in the relevant Tender Technical Evaluation Strategy.		

Table 5: Qualitative Criteria

Tenderers need to have a minimum weighted score of 70% overall or more to technically qualify for further evaluation

Item no	Criteria	Weight	0	2	4	5
1.	Number of maintenance related years of experience maintaining low pressure valves	30%	Nonresponsive	Unacceptable Technical Risk (Refer Table 4)	Acceptable Technical Risk (Refer Table 4)	Fully Compliant
2.	Supervisor qualification: <ul style="list-style-type: none"> Minimum apprenticeship or level 4 learnership (A copy of the supervisors' qualifications to be attached) Minimum 3 years supervisor experience 	20%	Nonresponsive	Unacceptable Technical Risk (Refer Table 4)	Acceptable Technical Risk (Refer Table 4)	Fully Compliant
3.	Safety Officer qualification: <ul style="list-style-type: none"> Minimum SAMTRAC qualification (A copy of the Safety Officer's qualification attached) 	10%	Nonresponsive	Unacceptable Technical Risk (Refer Table 4)	Acceptable Technical Risk (Refer Table 4)	Fully Compliant
4	Mechanical Artisans' qualification: <ul style="list-style-type: none"> Minimum apprenticeship or level 4 learnership (trade test certificate/red seal) Copies of all artisan's minimum qualification attached Suppliers should be able to present a minimum of 4 artisans with the qualifications 	5%	Nonresponsive	Unacceptable Technical Risk (Refer Table 4)	Acceptable Technical Risk (Refer Table 4)	Fully Compliant
5.	Qualified Quality Controller qualification: <ul style="list-style-type: none"> Proof of appointment as quality personnel Minimum apprenticeship or level 4 learnership (trade test certificate / red seal) Copies of all artisan's minimum qualification attached 	5%	Nonresponsive	Unacceptable Technical Risk (Refer Table 4)	Acceptable Technical Risk (Refer Table 4)	Fully Compliant
6	Condition of equipment relevant to repair/refurbishment of valves	15%	Nonresponsive	Unacceptable Technical Risk (Refer Table 4)	Acceptable Technical Risk (Refer Table 4)	Fully Compliant
7	Testing facilities	5%	Nonresponsive	Unacceptable Technical Risk (Refer Table 4)	Acceptable Technical Risk (Refer Table 4)	Fully Compliant
8	Quality Control execution including subcontracted works: Welding, NDT, Sandblasting, Coating	10%	Nonresponsive	Unacceptable Technical Risk (Refer Table 4)	Acceptable Technical Risk (Refer Table 4)	Fully Compliant

7. AUTHORISATION

This document has been seen and accepted by:

Name & Surname	Designation
	Corporate Consultant, Generation Engineering

8. REVISIONS

Date	Rev.	Compiler	Remarks
Oct 2023	1		First draft issued for review

9. DEVELOPMENT TEAM

10. ACKNOWLEDGEMENTS

N/A

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