Eskom	Technical specification	Generation

Title:	**Kriel Specification for Procurement of Resilient Seal Butterfly valve for use as CW Isolation valve on BFPT cooling water system and main Auxiliary cooling isolation valves**	Unique Identifier:	**240-163425778**
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LIST OF TABLES

1. INTRODUCTION

Kriel Power Station is situated approximately 10 kilometres from the town of Kriel in Mpumalanga. Access to the station is by road.

The Power Station comprises of 6 x 500 MW turbo-generator boiler units. Each turbo-generator includes an HP, IP and LP turbine, which exhausts to a surface condenser.

This document serves as the Kriel specification for the procurement of 12 off BFPT condenser 500NB and 12 off main auxiliary cooling 800NB concentric Resilient Seal butterfly valves, for main Auxiliary cooling inlet and outlet isolation valves. These valves shall be manual operated, i.e. hand-wheels together with reduction gearboxes are included.

2. SUPPORTING CLAUSES

2.1 SCOPE

This specification covers the minimum requirements for the design, manufacture, inspection, testing and supply of the **locally manufactured** 12 off BFPT condenser 500NB isolation and 12 off Main Auxiliary cooling 800 NB isolation concentric Resilient Seal butterfly valves for Kriel Power Station. These valves are manually operated.

2.1.1 Purpose

The purpose of this document is to provide requirements for scope of work for the design and manufacturing of 12 – off, BFPT condenser 500NB isolation and 12-off, main auxiliary cooling 800NB isolation concentric Resilient Seal butterfly valves, for the main Auxiliary cooling inlet and outlet isolation valves.

2.1.2 Applicability

This document shall apply to 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

[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 Rev 3

[8] 240-101712128 Standard for Internal Corrosion Protection of Water Systems, Chemical Tanks

[9] 240-105658000 Supplier Contract Quality Management Specification (QM-58)

[10] 240-83539994 Standard for Non-Destructive Testing (NDT) on Eskom Plant Rev 3

[11] 240-106365693 Standard for the External Corrosion Protection of Plant, Equipment and Associated Piping with Coatings

Drawing and Documentation Standards

[12] 240-76992014 Project / Plant Specific Technical Documents and Records Management Work Instruction

[13] 240-65459834 Project Documentation Deliverable Requirement Specification

[14] 240-54179170 Technical Documentation Classification and Designation Standard

[15] 240-66920003 Documentation Management Review and Handover Procedure for Gx Coal Projects

[16] 240-86973501 Engineering drawing Standard

2.2.2 Informative

None

2.3 DEFINITIONS

Definition	Description
Pipework	Pipes and fittings are used for the conveyance of steam, water, gases or other fluids.
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
Valve	A device that regulates the flow of gases, liquids, fluidized solids and slurries by opening, closing or partially obstructing various passageways.
Manufacturer	The word supplier refers to the Manufacturer or Contractor involved with the production and or design of the final product,
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)

2.3.1 Disclosure Classification

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

Public Domain: Published in any public forum without constraints (either enforced by law, or discretionary).

2.4 ABBREVIATIONS

Abbreviation	Description
Aux	Auxiliary

Abbreviation	Description
BFPT	Boiler Feed Pump Turbine
CW	Cooling Water
C&I	Control and Instrumentation
ECM	Engineering Change Management
FAT	Factory Acceptance Test
ITP	Inspection and Test Plan
MTC	Main Turbine Condenser
NB	Nominal Bore
NCR	Non-conformance Report
NDT	Non-destructive Testing
OD	Outside Diameter
PVC	Polyvinyl Chloride
QCP	Quality Control Plan
RT	Radiography Testing
UV	Ultraviolet

2.5 ROLES AND RESPONSIBILITIES

- GX Engineering - Design, Design Review, Scope of work, Inspections
- Kriel Turbine Engineering – Initiator of project, Acceptance of design and modifications, site engineering function, Design, Design Review, Scope of work, ECM process, Inspections

2.6 PROCESS FOR MONITORING

N/A

2.7 RELATED/SUPPORTING DOCUMENTS

N/A

3. COMPLETE/TOTAL SCOPE OF WORK OVERVIEW

1. The scope of work consists of the minimum requirements for the design, manufacture, inspection, testing and supply of valves with integrated gearboxes and hand wheels as a single unit
    - The valves shall have the exact same face to face length as well as flange drilling schedule as currently installed
    - Gearbox and hand wheel orientation shall be exactly same as the current installed, preferable a local manufactured quadrant and worm gear gearbox to be used.
2. The *Contractor* shall review the CW chemistry analysis in Annexure A and ensure the valve material selected is suitable for this chemistry regime and operating temperature.

4. WORKS INFORMATION FOR PROCUREMENT OF RESILIENT SEAL BUTTERFLYVALVE FOR USE AS CW ISOLATION VALVE ON BFPT CONDENSER AND MAIN AUXILIARY COOLING ISOLATION.

4.1 CURRENT EQUIPMENT INFORMATION

4.1.1 Description of the System

The CW auxiliary system is supplied from the main cooling water system to the units. Each unit is equipped with the two 800mm auxiliary cooling butterfly isolating valves on both the supply and return side which ties off the main CW system, i.e. four 800 mm auxiliary cooling butterfly isolating valves per unit.

The BFPT condenser CW system taps off from the auxiliary cooling system which is equipped with two 500mm BFPT condenser butterfly isolating valves used on both the supply and return lines of the condenser, i.e. four 500 mm condenser butterfly isolating valves per unit.

Table 1 and Table 2 below highlight the installed BFPT condenser and Main aux cooling isolation valves

4.2 VALVE INFORMATION

After Contract award the *Contractor* shall visit the site and confirm all dimensions on units 1-3 provided in the tables below. It is the *Contractors* responsibility that the valves are fully compatible with the pipe flanges on site and face-to face dimensions. The details in tables 1 and 2 below are provided for tendering purposes.

Table 1: BFPT condenser in and outlet 500NB isolation valves (4 off per unit)

Model	Concentric, double flanged rubber lined valve
Nominal bore	500NB
Face to face (approximately)	229mm
Pressure rating	600 kPa
Internal body lining	EPDM Liner / Nitrile
Flange drilling PCD (approximately)	625 mm
Flange bolts	M22, 20 off
Operation	Manually operated quarter turn gearbox
Local gearbox manufacturer	*Contractor* to advise

Table 2: Main Aux cooling in and outlet 800NB isolation valves (4 off per unit)

Model	Concentric, double flanged rubber lined valve
Nominal bore	800mm
Face to face (approximately)	Narrow face to face **not as per** EN 558 = 230mm
Pressure rating	600 kPa

Internal body lining	EPDM Liner / Nitrile
Flange drilling PCD (approximately)	960 mm
Flange bolts	M30, 24 off
Operation	Manually operated quarter turn gearbox
Local gearbox manufacturer	*Contractor* to advise

5. ESKOM STANDARDS OMISSIONS AND ADDITIONS

Eskom document 240-63094243 Rev 3 Standard for Large Bore Resilient Seal Butterfly Valves for use as Cooling Water Isolation Valves latest revision will be adhered to in full with respect to concentric double flange valve designs.

The *Contractor* take note of the following amendments to the Standard 240-63094243 Rev 3 mentioned above:

- Figure 2 and 3 **does not** apply
- Wording “large bore” to be substituted with 500NB and 800NB throughout the specification.
- All references to double offset does not apply
- Section 3.2 **does not** apply
- The entire Section 3.3 **does not** apply
- Section 3.4 **does not** apply
- Section 4.8.1 **does not** apply (pin to disc connection)
- Complete Section 4.8.2 **does not** apply (pin to disc connection)
- Disc to spindle design in accordance with 4.8.3
- Should the internal liner form the primary seal of the spindle to disc and shaft bore, section 4.9.1 **does not** apply
- Valves will be fully bi-directional
- Section 4.10.2 only concentric designs as per figure 15 applies
- Section 4.10.3 **does not** apply
- Section 4.10.4.1-2 **does not** apply
- Section 5: Fabricated bodies and / or discs **will not** be allowed
- Section 5 discs will be Stainless steel 304, or 316. ASTM Codes: either CF3M, CF8M, CF3 or CF8 in accordance to ASTM A743. EN Codes: EN 10213 GX2CrNi19-11 (1.4309) or EN 10213 GX5CrNiMo19-11 (1.4409). Disc materials such as SG iron disc or carbon steel discs will not be allowed, even if coated.
- Section 5 seal ring and Seal retainer ring **are not** applicable
- Section 5: Lined body references are applicable
- Section 5: Internal fasteners **are not** applicable
- Section 5: External fasteners for gearbox can be carbon steel / mild steel.
- Section 7.3 **does not** apply

- Section 8.1 refers to the use of “Scotch Yoke” type design for gearboxes, these will not be acceptable
- Section 8.1 - no electrical actuators are required - but gearbox still to be furnished with ISO 5211 platform for future adaption to Electrical actuation.
- Section 8.2 **does not** apply
- Section 9 **does not** apply
- Section 11 only references to external coating apply.
- Section 14: Please see additional requirements in section 6.3 below.
- Section 16.1 does not apply and is replaced with the tender returnable requirements in section 7 below.
- The whole of Section 17 does not apply
- Section 18 does not apply and is replaced with section 6 below.

Where 240-63094243 Rev 3 allows different options, the *Contractor* must clearly indicate which option is included in the tender.

This scope includes for valve, gearbox and hand wheel as a single unit. The valves will be exact same face to face as currently installed and same flange drilling as currently fitted as tabled in Table 1 and Table 2 which are to the be verified by the *Contractor*.

Annexure A

A contains a typical water chemistry regime from Kriel CW system.

It is the *Contractor’s* responsibility to review the analysis and ensure that the valve material selection is suitable for this chemistry and operating temperature range from 0ºC up to 60ºC.

Maximum system operating pressure is 250kPa. Seal tightness test to be done based on a maximum seal shut off of 400kPa. However design pressure for pressure bearing items (body and disc) will be 600kPa.

6. ADDITIONAL INFORMATION TO SPECIFICATION 240-63094243 REV 3

6.1 . GEARBOX

In addition to the requirements of Section 8.1 as detailed in document 240-63094243 Rev 3, the following will apply. The gearbox to valve spindle connection will be such that whilst the gearbox is fitted to the valve, no dis-engagement of gearbox to valve can occur. This leads to say that NO removable output sleeve will be fitted between valve shaft and gearbox output segment. The keyway will be machined directly into the one piece gearbox output segment. Reason for disallowing the output sleeve is that failure / removal of the bolts securing the output sleeve to the gearbox segment will lead to the valve being able to free swing as the self-locking feature has thus been removed. The keyway will be in line with the disc position to serve as an indication of the disc position relative to the body.

6.2 UNI-DIRECTIONAL VALVES

The valve will be Bi-directional.

6.3 PACKAGING

Valves will be supplied adequately packaged or crated so that no damage can occur during transport or off-loading by means of a forklift or slings and overhead cranes. Special care should be taken with coated areas.

Each valve will be individually wrapped in a durable protective packaging such as a re-enforced PVC or re-enforced Nylon wrapping.

The wrapping will be sealed to prevent environmental conditions such as rain or dust to settle on the valve sealing faces. Furthermore the wrapping will be UV resistant as these valves are normally not stored under roof.

Both the up and downstream flange will be covered with a solid cover (plywood or galvanised sheeting) before the wrapping is applied.

The valve will be inspected at the *Contractor's* works before it is transported to the Power Station to the acceptance of the *Employer*, this to be included on QCP as an *Employer's* hold point.

As the gearbox is to remain on the valve during transport, the transport crate/palette will be such that adequate support is provided at all times to the gearbox to prevent any damage to the gearbox. The palette/crate will be marked so as to prevent accidental lifting or rigging of the valve at the gearbox

7. TENDER RETURNABLES

For an equitable technical evaluation of the tenders the Contractor must provide all documentation as per the requirements below. **All tender returnables given below must be provided**.

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.

Failure to provide all the required technical tender returnables as detailed in this section, i.e. Sections 7.1 and 7.2, will render the tender to be non-responsive, and thus tender will be rejected.

In event that the company trade name changed since 2015 a brief history of company name change to be included to indicate that the same facility manufactured since 2015 (or earlier)

7.1 MANDATORY RETURNABLES

The Contractor shall complete table 3 below to provide two (2) verifiable references for locally (South African) manufacturing of concentric or double offset resilient seated butterfly valves ≥ 500mm since 2015.[1]

Note that the Employer may contact the references, in particular if the reference is not Eskom, thus it is the Contractor's responsibility to ensure that the contact telephone numbers is up to date. In addition, note that it is important that the table is to be completed, i.e. all empty cells to be populated.

Table 3: References of valves as per above requirements

No	Description	Reference 1	Reference 2
1	Description of valve[2]		
2	Nominal diameter of valve (mm)[2]		
3	Confirm that the reference valve was manufactured and		

	assembled in South Africa (Yes/No)[2]		
4	Purchaser/Client company name		
5	Contact name		
6	Contact telephone number		
7	Year of Manufacture[2]		
8	In the case where the reference valves, as stated in line No 3 above, were manufactured in South Africa by a sub-contractor, state the name of the sub-contractor or Original Equipment Manufacturer who manufactured the reference valves[3]		

Notes:

1. Copies of past Purchase orders will not be accepted as design & manufacture experience. Since this is a gatekeeper, the number of references will not be taken into account, i.e. tenders with more than two references will not be ranked any higher than a tender with only two references.
2. Concentric or double offset resilient seated butterfly valves ≥ 500mm for water application with diameters of ≥ 500mm manufactured since 2015 will be accepted as valid references.
3. In cases where the valve manufacturer is a sub-contractor to the *Contractor* who submit the tender to the *Employer*, the name of the valve manufacturer to be provided as part of the tender. If this information is not provided the reference will not be accepted. In the case where the valve manufacturer submit the tender directly to Eskom, the response in line No 8 above is N/A.

7.2 TENDER RETURABLES FOR QUALITATIVE EVALUATION

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

7.2.1 The Contractor shall complete column 3 in the Table 4 and Table 5 below as part of the tender:

Table 4: Basic technical information of the BFPT condenser cooling inlet and outlet 500NB isolation valves offered in the tender

Item	**Employer's requirements where applicable**	**Contractor to complete this column as part of the tender**
Face to face dimension (mm)	229	
Flange drilling PCD (mm)	625	
Number of flange bolt holes	20 off M22	
Material of Construction for body and disc	Section 5, Table 1 of 240-63094243 Rev 3	
Gearbox details (contractor to specify manufacturer)	-	
Internal body lining	EPDM Liner / Nitrile	

Table 5: Basic technical information of the main Aux cooling inlet and outlet 800NB isolation valves offered in the tender

Item	**Employer's requirements where applicable**	**Contractor to complete this column as part of the tender**
Face to face dimension (mm)	230	
Flange drilling PCD (mm)	960	
Number of flange bolt holes	24 off M30	
Material of Construction for body and disc	Section 5, Table 1 of 240-63094243 Rev 3	

Gearbox details (contractor to specify manufacturer)	-	
Internal body lining	EPDM Liner / Nitrile	

7.2.2 The Contractor shall provide the list of deviations or exclusions to the specification as detailed in this document and in 240-63094243 Rev 3. If none a specific and clear statement to be included in the tender stating that the Contractor has no deviations or exclusions.

7.2.3 The Contractor shall provide the Quality control plan that indicate all activities during manufacture including coating activities.

7.2.4 The Contractor shall provide preliminary external coating procedure inclusive of material data sheet of product offered

8. TENDER EVALUATION CRITERIA

For technical Evaluation, the principles below will apply.

Table 6: Qualitative evaluation criteria

Score	(%)	Definition
5	100	**COMPLIANT** • 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; • Acceptable technical risk(s) AND/OR; • Acceptable exceptions AND/OR; • Acceptable conditions.
2	40	**NON-COMPLIANT** • 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 7: Mandatory requirements

Criteria	Yes / No
Proof of experience in manufacturing of concentric or double offset resilient Seated butterfly valves ≥ 500mm since 2015. Reference list to have verifiable contact details	

Failure to provide the details above will render the tender to be non-responsive, and thus tender will be rejected

Table 8: 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.	Exclusions and deviations to the specification	40%	Non responsive	Unacceptable Technical Risk (Refer Table 10)	Acceptable Technical Risk (Refer Table 9)	Fully Compliant
2	Basic compliance as per Table 4 and Table 5	40%	Non responsive	Unacceptable Technical Risk (Refer Table 10)	Acceptable Technical Risk (Refer Table 9)	Fully Compliant
3	Typical QCP (both for coating and manufacturing)	10%	No QCP	Very high level and not detailed QCP	Some minor Omissions	Detailed QCP for both mechanical and coating
4	Preliminary external Coating procedure (Inclusive of material data sheet of product offered)	10 %	No procedure	More than two deviances to specification	Minor deviance but acceptable risk	Comply with requirements

9. FORESEEN ACCEPTABLE / UNACCEPTABLE QUALIFICATIONS

9.1 RISKS

Table 9 Acceptable Technical Risks

Risk	Description
1.	Shorter Face to face but spacer / adaptor offered
2.	Alternative materials offered - but suitable / superior to specification requirements

Table 10: Unacceptable Technical Risks

Risk	Description
1.	Inferior material
2.	Disc to shaft pinned arrangement
3.	Gearbox of Scotch yoke design.
4.	Loose or bonded liner - non vulcanised.
5.	Manual lever operated and no gearbox offered
6.	Discs are not one piece design
7.	Two verifiable references as requested in section 7.1 either not provided or could not be verified by the *Employer.*
8.	Valve not locally manufactured in South Africa

10. AUTHORISATION

This document has been seen and accepted by:

Name & Surname	Designation
Francois du Preez	Corporate Consultant, Generation Engineering
Senamile Nzama	Engineer, Generation Engineering
Herman Van Niekerk	Senior Consultant, Generation Engineering
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11. REVISIONS

Date	Rev.	Compiler	Remarks
June 2021	0.1	G Mathibedi	First draft issued for review
July 2021	1	G Mathibedi	To include lesson learned from Majuba and for authorisation
November 2022	2	S Nzama	Incorporating lesson learned from the tender evaluation

12. DEVELOPMENT TEAM

The following people were involved in the development of this document as per Section 10.

13. ACKNOWLEDGEMENTS

None

14. ANNEXURES

Annexure A

Table 11 Water Chemistry analysis

Description	North side*	South side*
CCPP ($CaCO_3$ Precipitation Potential)	45.75	33.17
Calcium Hardness as $CaCO_3$ (mg/l)	199.61	306.00
Chemical oxygen demand (COD)	126.00	89.83
Chloride (mg/l)	189.33	151.90
Cycles of concentrations	24.90	21.26
Electrical conductivity @ 25°C µS/m	2470.67	2499.21
Fluorine (mg/l)	2.89	2.26
M Alkalinity	163.85	134.92
Mg Hardness as $CaCO_3$ (mg/l)	392.58	331.74
NH_4 (mg/l)	4.14	2.15
Nitrate (NO_3) as N (mg/l)	5.82	4.68
P Alkalinity	10.20	4.10
pH @ 25 °C	8.62	8.39
Potassium (mg/l)	81.63	67.04
SiO_2 (mg/l)	18.80	11.80
SO_4 (mg/l)	753.02	795.50
Sodium (mg/l)	288.39	258.82
Total Hardness as $CaCO_3$ (mg/l)	592.19	638.68
Total suspended solids	32.04	-
Turbidity (NTU)	20.67	22.92

*Average data(10/01/2020 - 10/03/2020)