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|-----------------------------------------------------------------------------------------|--------------------------------|-------------------|

Title: **Grootvlei Specification for Refurbishment of Metal Seated Butterfly valve for use as CWIsolation valve on main Condenser Isolation valves (T1 and T2 valves)**

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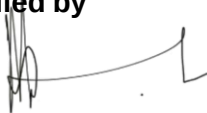
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## **1. INTRODUCTION**

Grootvlei Power Station has encountered operational challenges pertaining to condenser tube leakages, primarily attributable to the lack of isolations. Presently, both Unit 1 and Unit 3 are in operation while running with condenser tube leaks stemming from the ingress of the main cooling water through the main condenser. The existing predicament is further worsened by the inability to promptly address the condenser tube leak issues, owing to the absence of adequate isolation measures for the primary cooling water system.

The root cause analysis of these isolation deficiencies reveals it is due to the malfunctioning of the main condenser isolation valves (T1s and T2s). These valves have failed to execute their isolation functions effectively. A detailed inspection of these valves' has revealed a state of deterioration in their valve seats, thus necessitating a full refurbishment. Addressing these isolation issues will be imperative in restoring the operational efficiency and reliability of the Grootvlei Power Station's condenser systems.

This document serves as the Grootvlei specification for the refurbishment of five (5) off main condenser 1350NB Metal Seated Butterfly valves, for the main condenser cooling water isolation valves. These valves shall be electrically operated by an electrical actuator and gearbox. The actuator and gearbox will be free issued by the Employer, for testing purpose.

## **2. SUPPORTING CLAUSES**

### **2.1 Scope**

This specification covers the minimum requirements for the refurbishment, and modifications as detailed in this document. Refurbishment will be done in a workshop in South Africa.

#### **2.1.1 Grootvlei valves**

This technical specification outlines the refurbishment requirements for five (5) off valves located at Grootvlei Power Station, necessitated by issues related to isolation of the condenser. The valves were removed from Unit 2 and unit 4. Visual assessments have revealed significant deterioration in the laminated disc seats and body seals of the valve, prompting the imperative for refurbishment.

In adherence to the stipulated tender requirements, the Employer will facilitate a site visit to Grootvlei Power Station. This site visit shall provide the chosen contractor with the opportunity to conduct inspection of the valve. During this assessment, attention should be given to the identification of any requisite coating repairs that may be essential for optimal valve performance.

The selected contractor shall be responsible for organizing the collection of the valve from Grootvlei Power Station and their subsequent conveyance to the contractor's designated repair facility. It is important to note that the provision of craneage equipment necessary for loading the valves onto the transport vehicle is the sole responsibility of the contractor.

A conclusive hydrostatic test shall be executed upon the fully assembled valves. This hydrostatic test, aimed at the valve body, involves the partial opening of the valve disc to subject the entire valve body to hydraulic pressure. In the event that the valve body successfully withstands the prescribed pressure during this examination, the valve disc shall then be closed, initiating a subsequent seat leakage test. Once the seat leakage test proves successful, the final procedural steps involve configuring the gearbox to its end stop position, adjusting the actuator's torque settings, and configuring the limit switch to the closed position.

### **Controlled Disclosure**

## **2.2 Purpose**

The purpose of this document is to provide requirements for scope of work for the refurbishment of five (5) off triple offset Metal Seated butterfly valves for the Main Condenser inlet and outlet isolation valves, also known as the T1 and T2 valves complete with the existing Gearboxes suitable for existing Auma actuator on site as per Table 1.

## **2.3 Applicability**

This document shall apply to Grootvlei 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 85 of 1993
- [5] API 598 Valve Inspection and Testing

### **Employer's Specifications**

- [6] 240-63154109 Standard for Large Bore Metal Seated Butterfly Valves for use as Cooling water Isolation valves Rev 3
- [7] 240-101712128 Standard for Internal Corrosion Protection of Water Systems, Chemical Tanks
- [8] 240-105658000 Supplier Contract Quality Management Specification (QM-58)
- [9] 240-83539994 Standard for Non-Destructive Testing (NDT) on Eskom Plant Rev 3
- [10][10] 240-106365693 Standard for the External Corrosion Protection of Plant, Equipment and Associated Piping with Coatings

### **Drawing and Documentation Standards**

- [11] 240-76992014 Project / Plant Specific Technical Documents and Records Management Work Instruction
- [12] 240-65459834 Project Documentation Deliverable Requirement Specification
- [13] 240-54179170 Technical Documentation Classification and Designation Standard
- [14] 240-66920003 Documentation Management Review and Handover Procedure for Gx Coal Projects
- [15] 240-86973501 Engineering drawing Standard

### **2.4.2 Informative**

None

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## 2.5 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)                  |

### 2.5.1 Disclosure Classification

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

## 2.6 Abbreviations

| Abbreviation | Description              |
|--------------|--------------------------|
| CW           | Cooling Water            |
| FAT          | Factory Acceptance Test  |
| ITP          | Inspection and Test Plan |
| MTC          | Main Turbine Condenser   |
| NB           | Nominal Bore             |
| NDT          | Non-destructive Testing  |
| OD           | Outside Diameter         |
| QCP          | Quality Control Plan     |
| UV           | Ultraviolet              |

## 2.7 Roles And Responsibilities

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

## 2.8 Process For Monitoring

N/A.

## 2.9 Related/Supporting Documents

N/A.

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### 3. COMPLETE/TOTAL SCOPE OF WORK OVERVIEW

The scope of work consists of the minimum requirements for the refurbishment of the triple offset Metal Seated butterfly valves complete with free issued gearboxes and actuator from the Employer.

The *Contractor* shall review the CW chemistry analysis in Annexure 1 and ensure the valve material selected is suitable for this chemistry regime and operating temperature.

The flange rims to be marked Condenser side and duct side as per section 8.

### 4. WORKS INFORMATION FOR REFURBISHMENT OF THE METAL SEATED BUTTERFLY VALVE FOR USE AS CW ISOLATION VALVE ON MAIN CONDENSER COOLING WATER ISOLATION.

#### 4.1 Valve Information

After Contract award the *Contractor* shall visit Grootvlei sites to identify the respective valves to be transported to the repair facility.

Table 1 below are provided the technical details of the valves to be refurbished for tendering purposes.

Table 1: Main Condenser in and outlet 1350 NB isolation valves

|                                     |                                                                             |
|-------------------------------------|-----------------------------------------------------------------------------|
| Model                               | Triple offset, double flanged valve                                         |
| Nominal bore                        | 1350NB                                                                      |
| Face to face (approximately)        | 360mm                                                                       |
| Pressure rating                     | 300 kPa                                                                     |
| Flange drilling Table               | 32 Holes 1530PCD (8 holes drilled 35mm and 4 tapped M30)                    |
| Flange drilling PCD (approximately) | 1530 mm                                                                     |
| Operation                           | Actuator Model: 14.1 – F14<br>(Employer to supply the Gearbox and Actuator) |

### 5. ESKOM STANDARDS OMISSIONS AND ADDITIONS

Eskom document 240-63154109 Standard for Large Bore Metal Seated Butterfly Valves for use as Cooling water Isolation valves Rev 3 will be adhered to. Specific sections are not applicable and is referenced below.

The *Contractor* takes note of the following amendments to the Standard 240-63154109 Rev 3 mentioned above:

#### 5.1 Applicable To The Valve

- Figures 1 **does not** apply – Typical illustrated of Triple Off-set Metal seated valve
- Wording “large bore” to be substituted with 1350NB throughout the specification.
- The entire Section 3.1 **does not** apply – Valve body

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**Grootvlei Specification for Refurbishment of the Metal Seated Butterfly valve for use as Condenser CW Isolation valve T1 and T2.**

|                    |                |
|--------------------|----------------|
| Unique Identifier: | GVLEG 0359     |
| Revision:          | <b>2</b>       |
|                    | <b>8 of 12</b> |

- Section 3.3 **does not** apply – Discs
- Section 3.4 **does not** apply – Spindles
- Sections 6.1, 6.2, 6.3 and 6.4 **does not** apply
- Section 7.2 **does not** apply – Hydraulic Actuation
- The entire section 8 **does not** apply – Mechanical lock-out facility or accident prevention system
- Section 16.2 **does not** apply – In-situ repair

Where 240-63154109 Rev 3 allows different options, the *Contractor* must clearly indicate which option is included in the tender.

**Annexure 1** contains a typical water chemistry regime from Grootvlei CW system.

Maximum system operating pressure is 220kPa. 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 240-63154109 REV 3**

### **6.1 Gearbox**

The valve will be fitted with a gearbox provided by the employer before pressure testing. The stops on the gearbox will be set during the seat/seal leakage test. On successful pressure test, the stops will be sealed to prevent tempering. Valve will close on torque, but end stops on gearboxes are to be set as back-up in the event that torque switches fail.

### **6.2 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 always provided to the gearbox to prevent any damage to the gearbox. The palette/crate will be marked to prevent accidental lifting or rigging of the valve at the gearbox

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## 7. VALVE SEALING DIAGRAMS FOR MARKING PRESSURE SIDE



Figure 1: Condenser duct valve arrangement indicating the anticipated orientation of valves

## 8. AUTHORISATION

This document has been seen and accepted by:

| Name & Surname | Designation                                  |
|----------------|----------------------------------------------|
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| S. Erasmus     | Chief Technologist, Generation Engineering   |
| V. Dlamini     | Turbine Engineering Manger                   |
| T. Montja      | Engineering Manager                          |

## 9. REVISIONS

| Date           | Rev. | Compiler   | Remarks                                                                        |
|----------------|------|------------|--------------------------------------------------------------------------------|
| March 2023     | 1    | M. Khumalo | Original Document                                                              |
| September 2025 | 2    | M. Khumalo | Revision updated by separating the technical evaluation from the scope of work |

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## 10. DEVELOPMENT TEAM

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

## 11. ACKNOWLEDGEMENTS

Herman van Niekerk, Snr Consultant: Generation.

## 12. ANNEXURES

Table 8: Water Chemistry analysis

| Description                                      | Units 1-4     |                                                                                                                          |               |
|--------------------------------------------------|---------------|--------------------------------------------------------------------------------------------------------------------------|---------------|
|                                                  | min           | max                                                                                                                      | average       |
| CCPP (CaCO <sub>3</sub> Precipitation Potential) | 10            | 45 mg.kg-1 as CaCO <sub>3</sub>                                                                                          | 41            |
| Calcium Hardness as CaCO <sub>3</sub> (mg/l)     | 200           | 500 mg.kg-1                                                                                                              | 207           |
| Chemical oxygen demand (COD)                     | Not specified | < 200 mg.kg-1                                                                                                            | Not measuring |
| Chloride (mg/l)                                  | Not specified | < 400 mg.kg-1 as Cl                                                                                                      | 250           |
| Cycles of concentrations                         |               |                                                                                                                          |               |
| Electrical conductivity @ 25°C µS/m              | Not specified | < 4000 uS.cm-1                                                                                                           | 2500          |
| M Alkalinity                                     | 80 mg.kg-1    | 160 mg.kg-1 as CaCO <sub>3</sub>                                                                                         | 140           |
| Mg Hardness as CaCO <sub>3</sub> (mg/l)          | Not specified | Mg <sup>2+</sup> to be <160mg.kg-1 as CaCO <sub>3</sub>                                                                  | 126           |
| Nitrate (NO <sub>3</sub> ) as N (mg/l)           | Not specified | Not specified, Measured as mg.kg-1 N                                                                                     | 7.07          |
| P Alkalinity                                     | Not specified | < 7,5 mg.kg-1 as CaCO <sub>3</sub>                                                                                       | 5.2           |
| pH @ 25 °C                                       | 8.1           | 8.6 @ 25 °C                                                                                                              | 8.45          |
| Potassium (mg/l)                                 | Not specified | Not specified, Measured as mg.kg-1 as K                                                                                  | 32            |
| SiO <sub>2</sub> (mg/l)                          | Not specified | < 150 mg.kg-1 as SiO <sub>2</sub> . While also taking cognisance of Mg X SiO <sub>2</sub> limitation of less than 25 000 | 101           |
| SO <sub>4</sub> (mg/l)                           | Not           | <1000 mg.kg-1                                                                                                            | 980           |

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|                                            |               |                                                                                 |       |
|--------------------------------------------|---------------|---------------------------------------------------------------------------------|-------|
|                                            | specified     |                                                                                 |       |
| Sodium (mg/l)                              | Not specified | <500 mg.kg-1                                                                    | 97    |
| Total Hardness as CaCO <sub>3</sub> (mg/l) |               | We control permanent hardness that should be < 400 mg.kg-1 as CaCO <sub>3</sub> | 350   |
| Total suspended solids                     | Not specified | Not specified                                                                   | 70.36 |
| Turbidity (NTU)                            | No limit      | 100                                                                             | 78    |

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