Eskom	Specification	Kusile Power Station

Title: **Condensate, Feed Heating Systems Inspection and Repairs During Outages including Statutory Testing of Pressure Vessels for 5 years**

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1. Introduction

Kusile Power Station Management has taken a decision to outsource Condensate and Feed Heating systems inspections, repairs and testing of pressure vessels during outages to a suitably qualified, experienced, and well-established Contractor for 5 years on an “as and when required” basis. The initiation of this contract aims to establish comprehensive maintenance, welding, repair, inspection and testing services to ensure the optimal functioning of the power station during outage periods.

2. Supporting Clauses

2.1 Scope

This document establishes the prerequisites for a Contractor that will be stationed at Kusile Power Station, to be deployed on an as-needed basis for maintenance and outage-related tasks, with a primary focus on welding and mechanical activities pertaining to the turbine plant. The overarching objective is for the Contractor to furnish the essential maintenance and outage resources and equipment throughout the contract duration at Kusile Power Station, deploying these resources as needed.

2.1.1 Purpose

The purpose of this document is to define the Condensate and Feed Heating systems inspections, repairs and testing of pressure vessels scope of work activity requirements for Kusile Power Station. This includes details of the applicable plant areas, technical scope of work, standards, quality, requirements, specifications, terms and conditions as well as the criteria to qualify for the tender. These set of requirements are intended to allow prospective Contractors to bid on the contract in an open tender.

The station is expected to perform at 85% UCF, 10% PCLF and 5% UCLF, and the specified Condensate and Feed heating systems inspections, repairs and testing of pressure vessels, system activities and management strategy efforts must support this requirement.

It is therefore imperative that the successful and suitably qualified Contractor aligns fully to these specified scope activities and processes laid down in this document.

2.1.2 Applicability

This document is compiled for the purposes of an open tender and shall apply throughout Eskom Kusile Power Station.

2.1.3 Effective date

Document is effective upon authorization.

2.2 Normative/Informative References

2.2.1 Normative

[1]	OHS Act	Occupational Health and Safety Act 85 of 1993
[2]	PER	Pressure Equipment Regulations (GN R734),
[3]	SANS 347	Categorization and Conformity Assessment Criteria for all Pressure Equipment

[4] EN 13445 Unfired Pressure Vessels
[5] EN 13480 Metallic Industrial Piping
[6] AD 2000 AD-Merkblatter – Technical Rules for Pressure Vessels
[7] ISO 3834 Quality Requirements for Fusion Welding of Metallic Materials
[8] ISO 9001 Quality Management System
[9] ISO 14001 Environmental Management Systems
[10] ISO 45001 Occupational Health and Safety Management Systems
[11] ASME VIII Rules for Construction of Pressure Vessels (Divisions 1 to 3)
[12] ASME B31.1 Power Piping
[13] ASME B31.3 Process Piping
[14] ASME PCC-2 Repair of Pressure Equipment and Piping
[15] API 650 Welded Steel Tanks for Oil Storage
[16] MSS SP97 Integrally Reinforced Forged Branch Outlet Fittings: Socket Welding, Threaded, and Buttwelding Ends
[17] EN1514-1 Flanges and Their Joints – Dimensions of gaskets for PN-Designated Flanges
[18] EN 24032 Metric Hexagon Head Internal-Thread Fasteners
[19] EN 588 Fibre-Cement Pipes for Sewers and Drains
[20] SANS 62-1 Pipes Suitable for Threading and of Nominal Size
[21] SANS 719 Electric Welded Low Carbon Steel Pipes For Aqueous Fluids (Large Bore)
[22] SANS 14 Malleable Pipe Fittings
[23] SANS 815-2 Shoulder-Ended and Groove-Ended Pipe Systems Part 2: Groove-Ended Steel Pipes, Fittings and Couplings
[24] SANS 1123 Pipe Flanges
[25] SANS 974-1 Rubber Joint Rings (non-cellular) Part 1: Joint Rings for Use in Water Sewer and Drainage Systems
[26] DIN 976 Fully Threaded Stud Bolts
[27] BS 1640 Steel Butt-Welding Pipe Fittings for the Petroleum Industry
[28] 240-81951984 Kusile Power Station Outage Philosophy
[29] 240-106628253 Standard for Welding Requirements on Eskom Plant
[30] QM 58 Supplier Quality Management: Specification
[31] 240-56239129 High Energy Pipework Standard for Eskom Power Plants
[32] 240-5629133 High Pressure Pipework Supports Standard
[33] 240-43156827 Introduction to welding rulebook
[34] 240-89147446 Instrument Piping for Fossil and Hydro Power Plant Standard
[35] 240-123801640 Standard for Low Pressure Pipelines
[36] 240-83539994 Preservation of Power Plants during shutdowns guideline
[37] 240-86973501 Engineering drawing standard – Common Requirements
[38] 240-154283718 PER compliance manual
[39] 240-107677940 Specification Standard for High Pressure Water Jetting of Condenser and Heat Exchanger Tubes
[40] 240-150642762 Generation Plant Safety Regulations
[41] 240-53114002 Generation Engineering Change Management Procedure
[42] 240-134589068 Kusile Power Station Turbine Plant Boundary Limits
[43] KUS-20241108 Technical Evaluation Strategy

2.2.2 Informative

[1] 240 -111098236 Kusile Power Station Issue Management Work Instruction
[2] OHSACT Corrective and Preventative Action Management Work Instruction

2.3 Definitions

2.3.1 Contractor

Service provider contracted for supplying and fulfilling specific services to Eskom, Kusile Power Station.

2.3.2 Employer

Eskom, Kusile Power Station.

2.3.3 Employer Representative

Any person appointed in writing by the Employer as the delegated Employer representative in terms of the provisions.

2.3.4 Maintenance

Repair and replacement of components to ensure the reliable operation of the plant and conformance to statutory legislation. Maintenance is conducted on plant areas that has been isolated, or when a short opportunity is granted.

2.3.5 Manufacturer

Means any juristic person who has overall control and is responsible for the design, construction, commissioning, or maintenance of equipment.

2.3.6 Modification

Means any change to the original design conditions of pressure equipment, including re-rating, or the addition or removal of elements that could affect the integrity of the pressure equipment, and

1. Component replacement with different material types is deemed a modification.

2. Component replacement with different material grades or the replacement of obsolete materials can be deemed as a modification, depending on the rules and requirements of the applicable health and safety standard or in-service health and safety standards.

2.3.7 Outage

An outage is a state of an item or plant unable to perform its required function or undergoing maintenance or welding activities, during which outage scope of work is executed. An outage can either be planned or unplanned.

2.3.8 Plant

Any structure, machinery, apparatus or equipment which does not fall within the scope of the operating regulations for high voltage systems, and excludes, mobile, portable lifting equipment, domestic circuits' appliances and tools.

2.3.9 Repair

Means restoration to original standard by the application of heat, welding, or other maintenance activities specified in the scope of work. Component replacement with same material grades can be deemed as a repair where no changes to the original design are affected. The repair shall be in accordance with the rules and requirements of the applicable health and safety standards.

2.4 Abbreviation

Abbreviation	Description
AIA	Authorised Inspection Authority
ANSI	American National Standards Institute
API	American Petroleum Institute
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing Materials
BS	British Standard
CV	Curriculum Vitae
DIN	German Institute for Standardization
ECM	Engineering Change Management
ECSA	Engineering Council of South Africa
EN	European Norm
GI	Guarantee Inspection
GO	General Overhaul
HP	High Pressure
IIW	International Institute of Welding
IN	Inspections
IP	Intermediate Pressure
IR	Interim Repairs
ISO	International Standardisation Organisation
IWE	International Welding Engineer
IWT	International Welding Technologist
LP	Low Pressure
MGO	Mini General Overhaul
MSS	Manufactures Standardisation Society
NDT	Non-Destructive Testing
OEM	Original Equipment Manufacturer
PCLF	Planned Capability Loss Factor
PD	Published Document
PMI	Positive Material Identification
PPE	Personal Protective Equipment
PR Eng	Professional Engineer
Pr Tech	Professional Technologist
Pr Techni	Professional Technician
PSR	Plant Safety Regulations

PTW	Permit to Work
PWHT	Post Weld Heat Treatment
QC	Quality Control
QCP	Quality Control Procedure
QM	Quality Management
QTY	Quantity
RP	Responsible Person
RTS	Return To Service
SANS	South African National Standard
SOW	Scope of Work
UCF	Unit Capability Factor
UCLF	Unplanned Capability Loss Factor
WPQR	Welding Procedure Qualification Record
WPS	Welding Procedure Specifications

2.5 Roles and Responsibilities

2.5.1 The Employer

The responsibilities of the Employer include the following:

1. Inform and issue the Contractor with updated outage dates.
2. Issuing of cutting and engineering instructions.
3. Ensuring the SOW is issued to the Contractor on time to allow planning for the outage.
4. Measuring the performance of the Contractor against those areas which contribute to the Employer's business in order to determine continuous improvement interventions required.
5. Providing training for Plant Safety Regulations (PSR), and any other training as deemed necessary by the Employer in line with the scope requirements.
6. Determining what should be repaired on site and what should be send away for repairs.
7. Subjecting the Contractor to anytime appraisal, inspections, and stoppages on all or part of the works.
8. The Employer is committed towards the following:
    a) Retention of critical skills
    b) Continuous cost reduction
    c) Health & Environment Safety
    d) Transfer of operational experience and skills

2.5.2 The Contractor

The responsibilities of the Contractor include the following, but not limited to:

1. The Contractor shall comply with the Employer's SHEQ standards, policies and procedures.

2. The Contractor shall compile and submit improvement programmes to the Employer for approval and implementation for the enhancement of plant performance, advancing the retention of critical skills, transferring operational experience and skills, achieving cost reductions.

3. The Contractor shall be responsible of disposing waste and end-products to designated disposal sites upon approval by the Employer.

4. The Contractor shall be responsible for offsite repairs as per the Employer's instructions, processes, and systems.

5. Pressure/leak test certificate must be produced by the Contractor on completion of the pressure/leak test.

6. The Contractor shall ensure that all platforms, gratings, handrails and cat ladders removed are re-instated into original bases as per structural standards.

7. The Contractor shall take note of a contract start date that may deviate or be changed by the Employer.

8. The Contractor will execute the SOW even if it was not catered in the contract as and when required by the Employer.

9. The Contractor shall provide resources required to execute this scope and any changes to the crew and resource must be negotiated and agreed with the Employer.

10. This contract is for outage SOW and any other breakdowns that the Contractor will be required to perform outside the scope boundaries of this contract.

11. The Contractor shall ensure the integrity of plant labelling and that deficiencies with regards to KKS labelling are reported immediately. All KKS removed during repairs to be put back in the correct position.

12. The Contractor must ensure that they have Responsible Persons (RP) in terms of PSR for any work performed on plant.

13. The Contractor to provide the personnel, expertise, equipment, software resources, and tools required for the works. Required software access shall be granted to the Employer, on an as and when needed basis, following an instruction from the Employer.

14. The Contractor shall produce a final report within seven calendar days after the date of completion of the works or any date agreed on, as per Task Order.

15. Contractor vehicles to comply with Eskom Vehicle Standards and Procedures.

16. Contractor will provide on-site representation on a 24-hour basis, seven days a week if required. Shift times: 07h00 to 19h00, 19h00 to 07h00 or whichever times that will be agreed between the Contractor and Employer.

17. The Contractor must have access and make use of any project planning software such as Primavera or as agreed with the Employer for project tracking and reporting purposes.

18. The Contractor shall be responsible for submitting proposed Quality Control Procedures (QCPs), updating steps and interventions points as instructed by the Employer, compiling required data books, attaching all necessary supporting documents including Non-Destructive Testing (NDT) reports, procedures, drawings, and certificates.

19. Contractor to provide a technical (pre-outage) report of the preliminary inspection findings, damages, and repairs to be conducted before the repair and maintenance work commences. The report shall, as a minimum, include the initial condition of equipment, detailed proposed repair procedure and methods, and final report, as agreed with the Employer's Representative. The technical report shall be submitted within two days after the initial inspections are completed.

20. Contractor to compile and submit a comprehensive service (post-outage) report and submit to Turbine Engineering with seven calendar days after completion of outage, maintenance and ad-hoc activities. This shall include, as a minimum:

    a. Scope executed and not executed (with reasons).

    b. Updated drawings, if applicable.

    c. Reports of all inspections conducted.

    d. Evidence of work, repairs and inspections completed including a photo report.

    e. Further recommendations and actions required.

21. Contractor's reports are considered complete after review and acceptance by the Employer's Representative. Contractor shall ensure accepted reports are submitted to the Employer.

22. The Contractor shall compile and submit a weekly progress report on repairs, inspections, and maintenance activities to the Employer's Representative and System Engineer on a mutual agreed day of the week. The progress report shall include, as a minimum:

    a. Comparison of planned activities for the week against the actual executed work.

    b. Project plan: progress percentage of planned and actual executed work.

    c. List of reasons for not completing planned work, including risks of not achieving targets, risk mitigation, plan for recovering.

    d. Manpower, tools, equipment, and other resources utilised in the current week.

    e. Items of executed work including photos for each item.

f. Items of planned work, manpower, tools, equipment, and other resources utilised for the coming week.

g. Risks and risk mitigations for coming week planned work.

23. The Contractor is responsible for requesting a complete list and contact details of System Engineers responsible for applicable plant areas and ensuring that correspondence reaches all key personnels, including Outage Coordinators, Contract Managers, System Engineers and Maintenance Technicians and Supervisors

24. Contractor to submit welding method statements, welding procedures, qualifications to the Employer for approval before the commencement of work.

25. Contractor to provide soft goods and consumable for work to be conducted.

26. All tests or inspections done by the Contractor shall be reviewed and accepted by the Employer.

27. The Contractor is to ensure that any service rendered does not interfere with the Employer's scheduled work and should align himself with the Employer's work control management process.

28. Should the Contractor become aware of any changes to the activity schedule (programme of notifications), the Contractor may issue the Employer with a revised programme for review and approval.

29. The Contractor shall maintain high standards of housekeeping during and after the completion of work.

30. The Contractor shall provide the following complementary services to improve Plant and labour performance can be defined as follows:

a. Project management

b. Value engineering

c. Procedure and documentation writing

d. Compile and improve task list's

e. Implement approved design and modification

f. Spares management

g. Technical advice

h. Operational and production process review

i. Asset management in accordance with ISO 55001

j. Component failure analysis reporting

31. The Contractor shall submit a certificate of repair, as defined in SANS 347 and PER, after completion of each welding activity countersigned by the AIA for category II and above vessels.

2.5.3 Re-commissioning

The Contractor's responsibilities during re-commissioning include the following:

1. The Contractor shall be responsible or held liable for any defects arising from outage/operational faults after an intervention.

2. The defect liability period is 52 weeks after outage completion or as agreed in the contract.

3. The Contractor shall provide resources required for recommissioning of the plant after the works is completed in preparation for unit Return To Service (RTS).

4. The Contractor shall ensure quality related documents, data books and reports are completed including the collection of signatures as prescribed by an agreed QCP before re-commissioning and handover to operations and production.

5. The Contractor to ensure Permit to Work (PTW) is cleared and plant or equipment are safe to operate, including housekeeping.

2.5.4 Management and Reporting

The following details the responsibilities related to management and reporting:

1. The type of reports, level of detail and frequency of reporting will be mutually agreed by the Employer and the Contractor during the contract negotiation phase of this agreement. These may change from time to time on request by the Employer.

2. The Contractor to be represented at all outage-related meetings which may be daily, weekly or monthly.

3. The Contractor to be represented at all Employer safety meetings.

4. The Contractor to be represented at any ad-hoc meetings that may arise in order to address any outage planning, execution, finalisation or safety related matters.

5. Liaison meetings shall be held with the Employer's Representative or his/her delegate on an as and when required basis to discuss any technical details or concerns.

6. The Contractor shall give the Employer at least 24-hour notice on intervention points and inspections required as part of outage and maintenance activities.

2.5.5 Contractor's Management Meetings and Key People

The Contractor's roles and responsibilities regarding management meetings and key people include:

1. Before work starts on site, an inaugural meeting is held with the Contractor and the Employer, to explain in detail all requirements of the Site Regulations.

2. The Contractor is issued with a file of current Site Regulations on arrival. The file remains the property of the Employer, and the Contractor is responsible for its maintenance and updating to include new or revised regulations as issued by the Employer.

3. The Contractor must ensure that all personnel operating mobile equipment and vehicles are authorised, this includes but not limited to:

    a) Forklifts

    b) Mobile Cranes

    c) Cherry Pickers

    d) Sky Jacks

4. The Contractor shall be responsible for the regular inspections and daily equipment checks of the mobile equipment and vehicles including record keeping while on site.

5. The Contractor must ensure that all personnel performing work on the plant are authorised. This includes but not limited to:

    a) Confined space locations

    b) Working at heights

    c) Heat stress areas

    d) Scaffolding Compliance

    e) Hazardous substances

2.5.6 Communication and Correspondence

1. All correspondence includes but not limited to:

    a) Kusile Power Station

    b) Employer’s Contract number

    c) Contract description

    d) Correspondence subject matter

    e) Employer’s name and contact details

    f) Contractor’s contact details

    g) Date

2. Where appropriate the correspondence includes the Employer’s reference and is delivered as a single package or as per the agreed contract terms.

3. All communications from the Contractor are numbered sequentially with a prefix as advised by the Employer. The Employer responds in like manner. The prefix and numbering system are decided upon at the Inaugural meeting.

4. The Contractor shall communicate with the Employer by form of telephone and writing.

2.5.7 Occupational Hygiene and Safety Requirements

1. Applicable OHS requirements shall be stipulated in the SHE Specification issued for this SOW.

2. The contractor must prepare a scope specific SHE Plan in accordance with the SHE Specification.

3. The contractor shall be responsible for own occupational hygiene monitoring programme, and this must be submitted together with the SHE Plan.

4. Costing for the works must include occupational hygiene and safety costs and these must be clearly listed/itemised.

5. Proof of work force competency must be submitted with the SHE Plan.

2.5.8 Quality and Documentation Control

1. During the tender process a qualifying criterion will be defined that the Contractor must comply to.

2. Contractor shall comply to Eskom's Supplier Quality Management Specification 240-105658000.

3. The Contractor to compile a specific outage quality management plan for specific SOW that will be approved by the Employer's delegated person, usually the System Engineer.

4. The Contractor shall ensure that any witness, hold and inspection points are strictly adhered to.

5. The Contractor to ensure that all measuring and test equipment is calibrated at all times & proof thereof must be readily available.

6. All Quality References and Standards as stipulated in this document will be adhered to.

7. The Contractor to comply with the Employer's quality documentation management system and processes.

2.5.9 Project Implementation

The Contractor shall supply an outage execution plan per outage including at least the following:

1. Project or programme plan in Primavera or any project software agreed with the Employer.

2. Activities

3. Manpower plan (resource loaded)

4. Organogram

5. Skills required and associated cost per skill (e.g. artisan, site manager, etc.)

2.5.10 Manpower Requirements

1. The number of personnel required to execute the works is to be proposed by the Contractor after his/her assessment of the SOW and submitted to the Employer for approval.

2. The successful Contractor shall utilise/provide skilled and suitably qualified staff with experience in the technical aspects of this SOW and supporting teams.

3. Key staff brought onto site in connection with this SOW should be able to fluently speak, understand and write in English.

4. Proof of qualification is to be supplied on request by the Employer for specific key resources.

5. All welding personnel are to be qualified as stated in the Eskom Standard which is stipulated in the reference documents.

6. The Contractor ensures that all staff being brought to Kusile Power Station have a valid fitness certificate based on the specific plant and SOW specification.

7. Provide daily supervision of all related plant through trained and competent personnel to ensure that inspections and work activities are conducted daily during execution of the outage.

2.6 Process for Monitoring

Process will be agreed by both parties per purchase order and according to outage process control manuals and the specific outage SOW.

2.7 Related/Supporting Documents.

Not Applicable

3. Works information

3.1 Applicable Plant Area

3.1.1 Systems

The scope of the Turbine Plant includes the following systems:

1. Feedwater Storage and Dearation (LAA)
2. Feedwater Pumps (LAC)
3. High Pressure Heating (LAD)
4. Main Condensate (LC)
5. Low Pressure Heating (LCC)
6. Condensate Make-up (LCP)
7. Air Cooled Condenser (ACC)
    a. ACC Vacuum (MAJ)
    b. ACC Cleaning (SDR)
    c. ACC Steam and Condensate (MAG)
    d. Turbine Condensate Tank and Clean Drains (LCM)
    e. Weather Station (CKA)
8. Process Drains (GMM)
9. Demin Water Make-up (GHC)

3.1.2 Pressure Vessels and Tanks

Table 1 to Table 21 highlight pressure vessels, tanks, and heat exchangers that will require outage and maintenance work as per the contract. The equipment description, KKS labels, volume, design codes and standards, pressure, and temperature are provided to guide the potential Contractor in planning (for resources and manpower), pricing and tendering for the contract. The information below contains equipment details for each unit.

Table 1: Feedwater Tank

Equipment Description	Feedwater Tank Vessel
Equipment KKS Label	LAA10BB010
Volume	549 m^3
Design Standard or Code	ASME VIII Div. 1
Design Pressure	14 Bar.g
Design Temperature	200 °C
Fluid Type	Steam/Water

Table 2: High Pressure Heater 5A

Equipment Description	High Pressure Heater 5A
Equipment KKS Label	LAD51AC001
Volume	Tube Side: 5.5 m^3 Shell Side: 32 m^3
Design Standard or Code	DIN EN 13445
Design Pressure	Tube Side: 335 Bar.g Shell Side: 35 Bar.g
Design Temperature	Tube Side: 255 °C Shell Side: 280 °C
Fluid Type	Tube Side: Water Shell Side: Steam/Water

Table 3: High Pressure Heater 5B

Equipment Description	High Pressure Heater 5B
Equipment KKS Label	LAD52AC001
Volume	Tube Side: 5.5 m^3 Shell Side: 32 m^3
Design Standard or Code	DIN EN 13445
Design Pressure	Tube Side: 335 Bar.g Shell Side: 35 Bar.g
Design Temperature	Tube Side: 255 °C Shell Side: 280 °C
Fluid Type	Tube Side: Water Shell Side: Steam/Water

Table 4: High Pressure Heater 6A

Equipment Description	High Pressure Heater 6A
Equipment KKS Label	LAD61AC001
Volume	Tube Side: 5.5 m^3 Shell Side: 32 m^3
Design Standard or Code	DIN EN 13445
Design Pressure	Tube Side: 335 Bar.g Shell Side: 69 Bar.g
Design Temperature	Tube Side: 295 °C Shell Side: 300 °C
Fluid Type	Tube Side: Water Shell Side: Steam/Water

Table 5: High Pressure Heater 6B

Equipment Description	High Pressure Heater 6B
Equipment KKS Label	LAD62AC001
Volume	Tube Side: 5.5 m^3 Shell Side: 32 m^3
Design Standard or Code	DIN EN 13445
Design Pressure	Tube Side: 335 Bar.g Shell Side: 69 Bar.g
Design Temperature	Tube Side: 295 °C Shell Side: 300 °C
Fluid Type	Tube Side: Water Shell Side: Steam/Water

Table 6: Liquid Drain Flash Tank

Equipment Description	Liquid Drain Flash Tank
Equipment KKS Label	LCM20BB001
Volume	5.8 m^3
Design Standard or Code	ASME VIII Div. 1
Design Pressure	39 kPa.g (Full Vacuum)
Design Temperature	150 °C
Fluid Type	Steam/Water

Table 7: Steam Drain Flash Tank

Equipment Description	Steam Drain Flash Tank
Equipment KKS Label	LCM10BB001
Volume	6.73 m^3
Design Standard or Code	ASME VIII Div. 1
Design Pressure	39 kPa.g (Full Vacuum)
Design Temperature	520 °C
Fluid Type	Steam/Water

Table 8: Turbine Condensate Tank

Equipment Description	Turbine Condensate Tank
Equipment KKS Label	LCM30BB001
Volume	37 m^3
Design Standard or Code	ASME VIII Div. 1
Design Pressure	39 kPa.g (Full Vacuum)
Design Temperature	120 °C
Fluid Type	Steam/Water

Table 9: Air Cooled Condenser Tank

Equipment Description	Air Cooled Condenser Tank
Equipment KKS Label	MAG95BB001
Volume	206 m^3
Design Standard or Code	ASME VIII Div. 1
Design Pressure	39 kPa.g (Full Vacuum)
Design Temperature	120 °C
Fluid Type	Steam/Water

Table 10: Drain Recovery Tank

Equipment Description	Drain Recovery Tank
Equipment KKS Label	LCJ20BB001
Volume	3.6 m^3
Design Standard or Code	EN 13445
Design Pressure	3 Bar.g
Design Temperature	225 °C
Fluid Type	Steam/Water

Table 11: Turbine Exhaust Ducting A

Equipment Description	Turbine Exhaust Ducting A
Equipment KKS Label	MAG01BR001
Volume	N/A
Design Standard or Code	ASME VIII Div. 1
Design Pressure	39 kPa.g (Full Vacuum)
Design Temperature	120 °C
Fluid Type	Steam

Table 12: Turbine Exhaust Ducting B

Equipment Description	Turbine Exhaust Ducting B
Equipment KKS Label	MAG02BR001
Volume	N/A
Design Standard or Code	ASME VIII Div. 1
Design Pressure	39 kPa.g (Full Vacuum)
Design Temperature	120 °C
Fluid Type	Steam

Table 13: Air Cooled Heat Exchanger/Condenser

Equipment Description	Air Cooled Heat Exchanger/Condenser
Equipment KKS Label	MAG02BR001
Volume	2.114 m^3
Design Standard or Code	AD 2000
Design Pressure	39 kPa.g (Full Vacuum)
Design Temperature	120 °C
Fluid Type	Steam/Water

Table 14: Condensate Reserve Tank

Equipment Description	Condensate Reserve Tank
Equipment KKS Label	LCP01AC001
Volume	760.73 m^3
Design Standard or Code	API 650
Design Pressure	17 Bar.g
Design Temperature	105 °C
Fluid Type	Water/Nitrogen Blanket

Table 15: Low Pressure Heater 1

Equipment Description	Low Pressure Heater 1
Equipment KKS Label	LCC10AC001
Volume	Shell Side: 24 m^3 Tube Side: 9.42 m^3
Design Standard or Code	EN 13445
Design Pressure	Tube Side: 30 Bar.g Shell Side: 1 Bar.g
Design Temperature	Tube Side: 121 °C Shell Side: 155 °C
Fluid Type	Tube Side: Water Shell Side: Steam/Water

Table 16: Low Pressure Heater 2

Equipment Description	Low Pressure Heater 2
Equipment KKS Label	LCC20AC001
Volume	Shell Side: 16.8 m^3 Tube Side: 8.75 m^3
Design Standard or Code	EN 13445
Design Pressure	Tube Side: 30 Bar.g Shell Side: 3 Bar.g
Design Temperature	Tube Side: 144 °C Shell Side: 225 °C
Fluid Type	Tube Side: Water Shell Side: Steam/Water

Table 17: Low Pressure Heater 3

Equipment Description	Low Pressure Heater 3
Equipment KKS Label	LCC30AC001
Volume	Shell Side: 14.51 m^3 Tube Side: 8.63 m^3
Design Standard or Code	EN 13445
Design Pressure	Tube Side: 30 Bar.g Shell Side: 8 Bar.g
Design Temperature	Tube Side: 176 °C Shell Side: 295 °C
Fluid Type	Tube Side: Water Shell Side: Steam/Water

Table 18: Holding Ejector A

Equipment Description	Holding Ejector A
Equipment KKS Label	MAJ41AC001
Volume	N/A
Design Standard or Code	ASME VIII Div. 1
Design Pressure	Tube Side: 3100 Shell Side: 690
Design Temperature	Tube Side: 120 °C Shell Side: 350 °C
Fluid Type	Tube Side: Water Shell Side: Steam/Water

Table 19: Holding Ejector B

Equipment Description	Holding Ejector B
Equipment KKS Label	MAJ42AC001
Volume	N/A
Design Standard or Code	ASME VIII Div. 1
Design Pressure	Tube Side: 31 Bar.g Shell Side: 6.9 Bar.g
Design Temperature	Tube Side: 121 °C Shell Side: 350 °C
Fluid Type	Tube Side: Water/Steam Shell Side: Steam

Table 20: Turbine Gland Steam Condenser

Equipment Description	Turbine Gland Steam Condenser
Equipment KKS Label	16MAW30AC001KC01
Volume	Shell Side: 0.834 m^3 Tube Side: 1.03 m^3 (with water-box)
Design Standard or Code	ASME Section VIII, Division 1
Design Pressure	Tube Side: 30 Bar.g Shell Side: 3.1 Bar.g
Design Temperature	Tube Side: 58 °C Shell Side: 350 °C
Fluid Type	Tube Side: Water Shell Side: Air/Steam/water

3.1.3 Piping and Valves

Piping, valves, instruments, strainers, silencers, coolers, and associated equipment connected to pressure vessels, tanks, and heat exchangers may also require outage and maintenance work on an “as and when” required basis. The codes and standards used to design and manufacture piping and associated equipment are listed to allow the Contractor to allocate correct resources for fulfilling any welding and maintenance activities that may be required as part of the contract.

1. ASME B31.1 and ASME B31.3
2. ASME B Series for fittings, welds, and valves
3. ASTM/ANSI
4. EN 13480, EN1514-1, EN 24032, EN 588-1, EN 588-2
5. MSS SP97
6. SANS 62-1, SANS 719, SANS 14, SANS 815-2, SANS 1123, SANS 974-1
7. DIN 976
8. BS 1640

3.2 Outage Philosophy

An extract of the Kusile Power Station Outage Philosophy is presented on Figure 1 and Table 21 to ensure that the Contractor understands the type, intervals, and duration of each outage, per unit. At the time of writing this document, it can be said that Kusile Power Station will have 33 planned outages, encompassing 213 days, for the period of five years from the beginning of the year 2025 until the end of 2026. Table 22 provides a summary of planned outages, type, duration, and count.

Given that Kusile Power Station will have six operational units, the Contractor can use the outage philosophy to plan (for resources and manpower), price and tender for the contract related to the Condensate and LP heating, Feedwater and HP heating systems inspections, repairs, and maintenance activities during planned outages for a period of five years. The Contractor shall anticipate and plan for unplanned outages and “as and when” maintenance activities that may take place for the period of five (5) years. The duration and count for unplanned outages will be communicated by the Employer during the contract. However, the preliminary number of unplanned outages can be considered as 12 with 30 days for the execution of activities for each outage. The preliminary number of outages and duration can be view as a contingency for planning and resource allocation purposes and will be subject to change based on the requirement of the Eskom business.

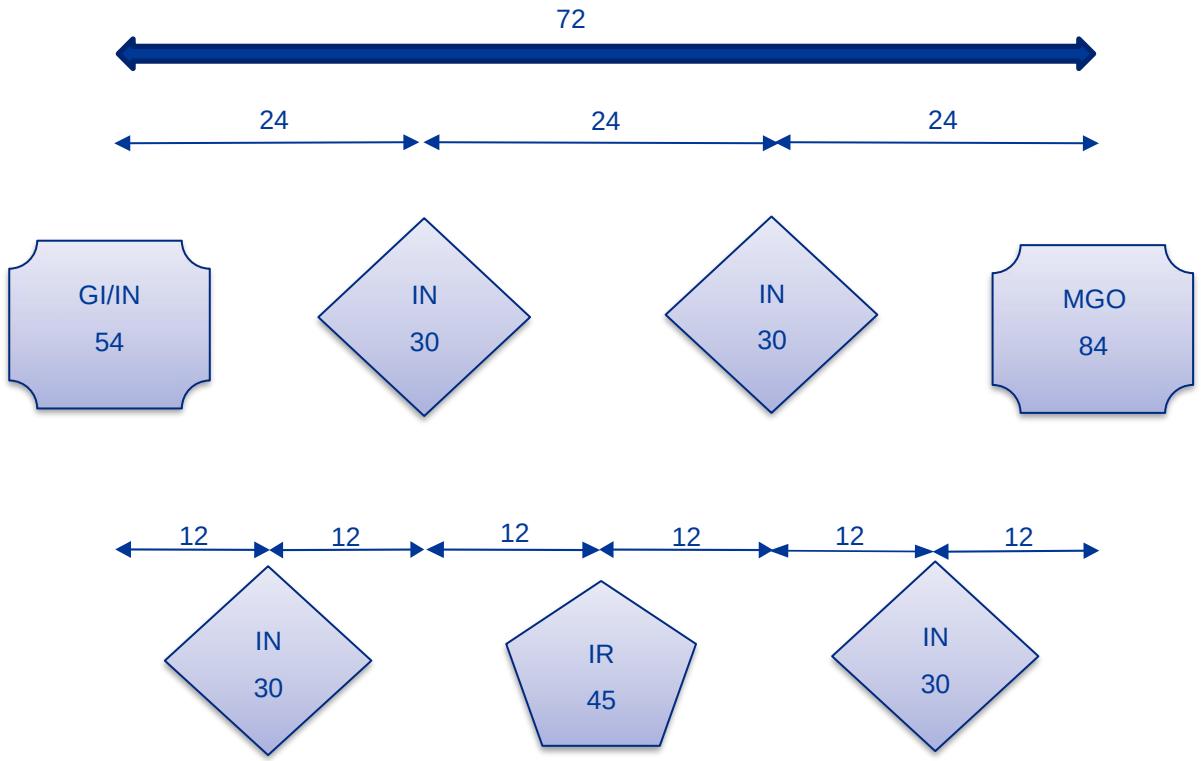

Figure 1: Kusile Outage Philosophy Interval Diagram

Table 21: Kusile Power Station Outage Philosophy Outage Intervals

Symbol	Outage type	Interval (Years)	Interval (Hours)	Duration (Days)	Main activities
◇	IN	1	8,333	30	Boiler and Draught Group inspection Mill bin inspection Absorber, Inlet & Outlet Duct, Emergency Quenching Nozzles, Mist Eliminators, OxyBlower and Reaction Tanks - Cleaning, Inspection and Refurbishment
◇	IN	2	16,666	30	Boiler and Draught Group inspection Mill bin inspection Absorber, Inlet & Outlet Duct, Emergency Quenching Nozzles, Mist Eliminators, OxyBlower and Reaction Tanks - Cleaning, Inspection and Refurbishment

	IR	3	25,000	45	LP Bypass Valves and Hydraulic packs inspection and repairs Boiler and turbine auxiliaries inspection and repairs Absorber, Inlet & Outlet Duct, Emergency Quenching Nozzles, Mist Eliminators, OxyBlower and Reaction Tanks - Cleaning, Inspection and Refurbishment
	MGO	6	50,000	84	HP and IP turbine cylinders full refurbishment LP cylinder, Valves and Hydraulic packs overhaul Boiler statutory inspections Generator stator and rotor inspections Absorber, Inlet & Outlet Duct, Emergency Quenching Nozzles, Mist Eliminators, OxyBlower and Reaction Tanks - Cleaning, Inspection and Refurbishment
	GO	12	100,000	84	HP, IP, LP Turbine cylinders and Valves overhaul Air heater element packs will be replaced every 12 years Boiler statutory inspections Absorber, Inlet & Outlet Duct, Emergency Quenching Nozzles, Mist Eliminators, OxyBlower and Reaction Tanks - Cleaning, Inspection and Refurbishment

Table 22: Kusile Power Station Planned Outage Type, Duration and Count Summary

Type	Duration (Days)	Count
GI	54	3
IN	30	18
IR	45	8
MGO	84	4
Total	213	33

3.3 Activity Workflow

The inspections, repairs and maintenance SOW will follow the below steps:

3.3.1 Need for Work

The SOW to be executed by the Contractor shall be established by an engineering instruction, approved defects list and descriptions, and outage and maintenance SOW document generated by the Employer's representative, mainly the System Engineer.

3.3.2 QCP

The QCP shall be approved by the Eskom System Engineer and Eskom Quality Control (QC) for all identified SOW. Where welding is performed, an Eskom Welding Custodian shall sign for approval. The Authorised Inspection Authority (AIA) shall approve QCPs where the category of pressure parts, vessels, piping, heat exchangers or ducts are SANS 347 CAT 2 or higher.

3.3.3 Planning

The Contractor must prepare project plans which include timelines, resource allocation and materials to ensure the identified SOW can be executed with success. The project plan is subject to the review and approval by the Employer.

3.3.4 Opportunity

If the SOW cannot be performed on-load, the Employer's Representative will request for an opportunity to conduct the inspection, repair and maintenance activities based on the Contractor's required time, material, and resource estimates.

3.3.5 Permit to Work

The Contractor's RP shall apply for a PTW, which must be cleared once the SOW has been completed. The PTW shall be relevant to and only reflect the SOW communicated by the System Engineer.

3.3.6 Record Keeping

The Contractor must collect all the required supporting documents, test reports and signatures to be included into a Databook and issue a digital copy to the System Engineer upon completion of the identified scope of work.

3.4 Contract Activities

3.4.1 PSR Training

The Contractor is required to guarantee that an adequate number of personnel are trained and qualified in accordance with the Employer's PSR, enabling proficient application and acceptance of work permits. Eskom employs a PTW system to ensure the safe execution of tasks. Thus, it is the full responsibility of the Contractor to arrange for personnel to undergo the Eskom PSR Course immediately upon tender award. Throughout the contract's duration, the Contractor must ensure that a satisfactory number of personnel remain trained and qualified in accordance with Eskom's PSR.

3.4.2 Routine Plant Inspections

The Contractor is obligated to conduct plant inspections to identify and report on any defects, abnormalities or findings that need attention on the systems list under section 3.1.1. Furthermore, annual or outage related visual inspections of the pressure vessels must be carried out according to the Original Equipment Manufacturers (OEMs) specifications, maintenance manual and system maintenance strategy. Methods statements and QCPs are to be proposed by the Contractor and agreed with the Employer's representative.

3.4.3 Perform Welding Activities

The core purpose of the contract is to perform welding activities. The Contractor will use Eskom Turbine Engineering instructions or approved defect notifications to compile QCPs, welding procedures, repair procedures, allocate welding personnel, quality controllers, inspectors, and other resources for the welding work. These must be approved, before any work is done, by Eskom System Engineer, QC, Welding Custodian. For SANS 347 category 2 and higher rated equipment, the same must be approved by the AIA. After completion of the welding work, a digital copy of the fully signed-off QCP must be submitted to Eskom Turbine Engineering.

3.4.4 Perform Mechanical Activities

The Contractor is additionally tasked with executing mechanical work, encompassing, but not restricted to:

1. Removing equipment from the plant through cutting and loosening fasteners.
2. Hydraulicly and mechanically torquing fasteners to precise torque specifications.
3. Rigging and moving heavy (ton-range) industrial equipment and piping including jacking.
4. Precision cutting and installing gaskets, including O-rings, spiral wound and ring type joint gaskets.
5. Preparing for and conducting leak/pressure tests on vessels and piping.
6. Disassembling and reinstating flanges, pipes, components (i.e. valves, strainers, etc), manholes related to pipes, tanks, heat exchangers, pressure vessels, and ducts.
7. Inspect, survey, adjust, correct, refurbish, and replace piping hanger support.
8. Heat treatment (welding and mechanical).
9. Plate Cutting and Rolling.
10. Flame and Plasma Cutting.
11. Pipe bending.
12. Thread cutting.
13. Drilling (magnetic base drill, press or hand portable).
14. Heat treatment – Post Weld Heat Treatment (PWHT) or heating to remove close fit equipment).
15. Grinding, sandblasting, and polishing metallic surfaces.
16. Mechanical cleaning of pressure vessels, tanks, heat exchangers, pipes, and ducts.
17. Internal blockage removal and flushing of pressure vessels, tanks, heat exchangers, pipes, ducts, and components.

18. Dry preservation of pressure vessels, tanks, pipes, ducts, and heat exchangers during outages.

19. Pickling and Passivation of welds, pipes, tanks, and equipment.

20. Pressure vessels, piping, equipment, tanks, heat exchangers, and tube leak repairs including tube plugging and expansions.

21. Lapping of components and valves.

22. Cleaning of walkways and removal of ash that may have settled on the junction boxes, equipment, and Control & Instrumentation (C&I) equipment throughout the plant.

23. Closing of all floor-covers and manholes following the execution work.

24. Reinstatement of KKS tags and labels.

25. Performing housekeeping before, during and after the execution of work.

3.5 Manpower and Other Resources Requirements

3.5.1 Manpower Requirements

The Contractor is required to ensure that a compliment of personnel is available for the purpose of fulfilling planned and unplanned outage work which includes inspection, repair, welding and mechanical maintenance activities. The core crew shall be on a two shift (12-hour shift) program or any agreed alternative regime to ensure a 24-hour coverage during the execution of outage and maintenance SOW and on “as and when required basis”. This manpower shall consist of the following personnel listed on Table 23.

Table 23: Labour Resources

Description of Labour	QTY (1st Shift)	QTY (2nd Shift)	Total
Site Manager	-	-	1
Site Supervisor	-	-	1
Planner	-	-	1
Storeman/Material Controller	-	-	1
Data Capturer/Site Clerk	-	-	1
Welding Coordinator	-	-	1
Safety Officer	1	1	2
Welding Inspector/QC	1	1	2
Pressure/Leak Test Technician	1	1	2
Welding Supervisor	1	1	2
Foreman – Piping and Mechanical	1	1	2
Electrician	1	1	2
Rigger	1	1	2
Overhead or Mobile Crane, Forklift, Cherry Picker, and Sky Jack Operator	1	1	2
Boiler Maker	2	2	4
Welder	2	2	4
Fitter – Mechanical	4	4	8

Fitter – Piping	4	4	8
Semi-skilled Labourer	4	4	8

In addition:

1. The qualification requirement for welders, welding coordinators, welding supervisor and welding inspectors are set out in the Standard for Welding Requirements on Eskom Plant, 240-106628253 [29].

2. Any changes to the manpower requirements or submitted crew details for tender evaluation must be communicated in writing and subject to approval by the Employer.

3. The crew may be utilised for other related tasks within the skill set of the labourers during normal working hours, as instructed by the Employer.

4. Additional resources, over and above those listed in Table 23 may be requested by the Employer in writing at any time during the contract. The Contractor must fulfil the additional manpower resource requirements by strictly adhere to the time frames, plans, motivation, skills, qualifications, and experience set out by the Employer.

5. The manpower listed in Table 23 and those additional manpower resources, requested by the Employer, must be equipped with all the required tools and equipment, training, and skills to perform work and responsibilities of the Contractor.

6. The Contractor will be obliged to present the proposed additional manpower resources and deploy such without delay to Kusile Power Station after written approval is given by the Employer.

7. The Contractor may motivate for additional manpower resources during outages or “as and when” required maintenance activities using the SOW, plan, and estimated time, as a basis. The Contractor may only deploy additional manpower resources after the request has been review and approved by the Employer or work is issued to this effect.

3.5.2 Engineering Resource Requirements

The Contractor shall have access to the engineering capabilities such as providing technical advice, engineering, and design support on an “as and when” required basis for:

1. Compiling and reviewing repair, erection, and rigging method statements in accordance with design standards.

2. Welding coordination and welding procedure specification performed by a International Welding Engineer (IWE) or International Welding Technologist (IWT) with more than five years’ experience post either IWE or IWT qualifications is acceptable, with the following requirements: IWE in line with International Institute of Welding (IIW) document IAB-252R2-14 or latest version, or IWT in line with IIW document IAB-252R2-14 or latest version. The IWE or IWT shall be registered with the Engineering Council of South Africa (ECSA) as Professional Engineer/Technologist (Pr Eng/Pr Tech).

3. Piping, component and system design modelling, calculations, finite element analysis and drawings (isometrics, Piping and Instrumentation Diagrams, general arrangements, and detail drawings) in accordance with design standards and performed by a Professional Engineer complete with more than 5 years' experience post registration with ECSA as a Pr Eng. The latest design packages that the Contractor must have and give access to the Employer's Representative may include but not limited to Solidworks, Flownex, Autodesk (AutoCAD) suite, Ansys, PV Elite, Rohr 2, HAP (Hourly Analysis Program), and CAESAR II.

4. Piping and equipment surveys performed by a Professional Technician (Pr Techni) to issue a detailed report containing all finding and recommendations.

The Employer must be supplied with completed design packs including design calculations, finite element analysis reports, pipe stress analysis reports, 3D models, isometrics, Piping and Instrumentation Diagrams, general arrangements, layouts, and detail drawings for the engineering services to be deemed complete by the Employer. The engineering work carried out by the Contractor, resultant copyrights and intellectual property shall belong to the Eskom.

3.6 Drawing Requirements

Kusile Power Station continuously updates drawings and other related documentation based on the Generation Engineering Change Management Procedure, 240-53114002 [41]. As such drawings that are created, revised, and submitted by the Contractor shall meet the minimum requirements described under the Engineering Drawing Standard – Common Requirements, 240-86973501 [37].

Repairs or "like-for-like" replacements will be done according to as-built drawings (Drawing provided by Eskom, if available). A like-for-like replacement is one where neither the material nor geometry of a replacement component differs from the originally installed component.

In cases where no drawings are available or previous as-builts are incorrect, as-built drawings will be drawn up, referenced, reviewed, and signed by the Contractor before submission to the Employer for review and approval.

3.7 Certifications

3.7.1 ISO 3834 Part 2

The Contractor must be in possession of a valid ISO 3834 Part 2 – Comprehensive certification which must be submitted as part of the tender for the following design standards and codes:

- EN 13445 Unfired Pressure Vessels
- EN 13480 Metallic Industrial Piping
- ASME VIII Rules for Construction of Pressure Vessels (Divisions 1 to 3)
- ASME B31.1 Power Piping
- ASME B31.3 Process Piping

3.7.2 ISO 9001

To keep quality standards high at Kusile Power Station, the Contractor must be ISO 9001 certified. The certification must be submitted as part of the tender and maintained throughout the duration of the contract. This requirement is aim at ensuring that the Contractor:

1. Meets the Employer's requirements, enhances performance, mitigates risks and reduces waste.

2. Demonstrates commitment to quality and improve the credibility of work output by the Contractor.

3. Has built a framework for consistent quality in providing services and executing the outage and maintenance SOW contained in this document.

3.7.3 ISO 14001

The Contractor must hold a valid ISO 14001 certificate for design, service, maintenance, manufacturing, refurbishment of power plants and related inspection activities and services, which shall be included as part of the tender submission.

3.7.4 ISO 45001

The Contractor may be required to have a current ISO 45001 or an equivalent OHSAS 18001 certification for design, service, maintenance, manufacturing, refurbishment of power plants and related inspection activities and services, that must be provided with the tender submission.

3.8 Site Establishment and Workshop Requirements

The Contractor shall establish and maintain suitable facilities at the Kusile Power Station for the duration of the contract. A proposed site layout shall be included as part of the tender submission for review by the Employer. The Contractor must ensure that the proposed site layout can be certified and attains an ISO 3834 Part 2 – Comprehensive certification for all design standards post-contract award. The Contractors facilities may include but not limited to:

1. Offices to accommodate manpower and other resources described under section 3.5. This shall include offices, meeting room, ablutions, changerooms, and kitchen/tea-room facilities.

2. Workshop and store area to house materials, spares and parts utilised in preparation, during and post outages and maintenance activities. The workshop or store must be certified following contract finalisation. Re-certification of the on-site workshop will be required after a period of three years. This responsibility lies with the Contractor. However, Eskom retains the right to conduct a surveillance audit for ISO 3834 Part 2 – Comprehensive at the Kusile Power Station based workshop six months after contract award and annually for the duration of the contract. Should the Kusile Power Station based workshop fail to possess a valid ISO 3834 Part 2 – Comprehensive certificate within six months of contract commencement, Eskom reserves the right to terminate the contract entirely.

3.9 Spares

The Contractor's roles and responsibilities regarding spares include:

1. It is the responsibility of the Contractor to supply, store and manage all the consumables required for to perform the activities detailed in this document including Personal Protective Equipment (PPE).

2. The Contractor shall supply and maintain welding, fabrication, and manufacturing equipment according to design standards including ISO 3834-2 requirements.

3. The employer will free issue material such as but not limited to piping, gaskets, bolts and nuts, flanges, plates or valves with the required material certificates, drawings and datasheets. It is the responsibility of the Contractor to keep copies of the material certificates related to the material in a filing system where it is easily accessible. The Contractor may perform non-abrasive Positive Material Identification (PMIs) to confirm the correctness of received material.

4. Under exceptional cases and with written instruction from the Employer's Representative, the Contractor will be required to procure on- and off-the-shelf materials required to fulfil outage and maintenance related SOW. The Contractor shall be required to proof acceptability of proposed materials by supplying a Contractor's preferred quotation (plus two alternative quotations), lead times, drawings, datasheets, test results and material certificates for review and approval by the same Employer's Representative that send out the instruction.

3.10 Equipment and Tooling

The Contractor is required to possess and maintain their own equipment, ensuring it adheres to the highest standards, specifically in accordance with ISO 3834-2, throughout the entire contract period. The equipment necessary for the Contractor to perform tasks can be determined based on the contract activities under section 3.4 and specifications outlined in this document.

3.11 Exclusion from SOW

1. Scaffolding and Insulation

2. Electrical and Control and Instrumentation components

3. Non-destructive testing

4. Lubrication

5. Unauthorised modifications

6. Civil Maintenance

7. Boiler feedwater pumps and booster pumps and associated components, Variable Speed Drive, gearboxes, motors, non-return valves, suction valves, and strainers.

8. Condensate extraction pumps and associated components, strainers, and Leak-off valves.

3.12 Technical Evaluation and Tender Returnables

The Contractor responding to the open-tender process will be evaluated based on submitted bid documentation and tender returnables. A successful bidder will be found and chosen in a Contractor that best meets the mandatory technical and qualitative technical evaluation criteria contained in the Technical Evaluation Strategy, Document No. KUS-20241108.

To ensure a fair and equitable technical evaluation of tenders, the Contractor must submit all documentation in accordance with this specification and requirements outlined below.

3.12.1 Returnables for Mandatory Technical Evaluation

The Contractor must submit the following mandatory tender returnables:

1. The Tenderer must submit a valid ISO 3834-2 certificate clearly indicating the following design codes in the scope of accreditation:

    - EN 13445 Unfired Pressure Vessels
    - EN 13480 Metallic Industrial Piping
    - ASME VIII Rules for Construction of Pressure Vessels
    - ASME B31.1 Power Piping or ASME B31.3 Process Piping

3.12.2 Returnables for Qualitative Evaluation

The Contractor must submit the following tender returnables for the purposes of qualitative evaluation:

1. Contractor to submit copies of certificate of repairs for previous work undertaken on SANS 347 Cat II, III, IV vessels or steam generators countersigned by the AIA. A minimum of three certificates shall be provided and not older than five years. Each submitted certificate of repair shall be accompanied by contactable details of the client and AIA. Contact details should include contact number, email, name and surname.

2. Contractor to submit qualified WPS and WPQR signed off by IWE/IWT and AIA for the following materials:

    - 15NiCuMoNb5-6-4 or WB36 (thickness up to 40 mm)
    - 10CrMoVNb9-1 up to 20 mm thickness
    - Dissimilar Material Joint for Stainless Steel (Group 8.2) to Carbon Steel (Group 1.2) up to 15 mm wall thickness

3. The Contractor to return a site and engineering activities organogram. Including Curriculum Vitae (CVs), and qualifications and accreditation of key personnel listed in section 8.2 to 8.4 of 240-106628253, Standard for Welding Requirements on Eskom Plant [29].

4. The Contractor must submit evidence of current or previously completed in-situ leak tests within the last five years. This includes procedures, calibration certificate of equipment used, completed QCPs, leak test certificates for performing leak tests on pressure vessels, heat exchangers, or tanks similar to those described in section 3.1.2 of this specification.

4. Acceptance

This document has been seen and accepted by:

Name	Designation

5. Revisions

N/A

6. Development Team

The following people were involved in the development of this document:

7. Acknowledgements