

	Specification	Medupi Power Station
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Title: **Medupi Power Station Scope of Work for Maintenance, Calibration and Spares Supply of Inlet and Outlet Oxygen Analysers on Boiler Gas Air heaters**

Document Identifier: **241-20221028**

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Area of Applicability: **Medupi Power Station**



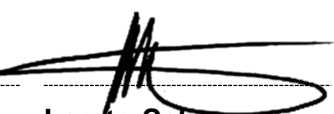
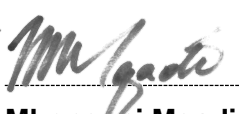
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Content	Page
1. Introduction.....	4
2. Supporting Clauses	4
2.1 Scope.....	4
2.1.1 Purpose.....	4
2.1.2 Applicability	4
2.1.3 Effective date.....	4
2.2 Normative/Informative References	4
2.2.1 Normative.....	5
2.2.2 Informative.....	5
2.3 Definitions	6
2.4 Abbreviations	7
2.5 Roles and Responsibilities	8
2.5.1 <i>Employer</i>	8
2.5.2 <i>Contractor</i>	8
3. Document Content.....	8
3.1 General	8
3.1.1 Adherence to Eskom General Policies & Standards	8
3.1.2 Quality Standard.....	8
3.1.3 Document Control.....	9
3.1.4 Contractual Meetings.....	9
3.1.5 Correspondence.....	9
3.1.6 Legal Requirements	9
3.1.7 Task Order	10
3.2 Manpower	10
3.2.1 Competent Personnel.....	10
3.3 Callout Services	10
3.4 Calibrations	10
3.4.1 Calibration Approval	10
3.4.2 Calibration Test Equipment	11
3.4.3 Calibration Test Gases	11
3.4.4 Calibration Procedures	11
3.4.5 Calibration Certificates	11
3.4.6 Calibration Gas Specifications.....	12
3.4.7 Service of Medupi Power Station Oxygen Analysers on Boiler Gas Air heaters...	12
3.4.8 Spares.....	12
3.5 Specific Requirements.....	13
3.6 Equipment and Tools.....	14
3.7 Site Services Provided by the <i>Employer</i>	14
3.8 Site Facilities	14
3.9 Services Provided by the <i>Contractor</i>	14

3.10 Transport.....	14
3.10.1 Vehicle transport to and from the <i>Employer's</i> Premises.....	14
3.11 Scope of Work Information	15
3.11.1 Plant Areas to Be Covered	15
3.11.2 Maintenance and Calibration of Oxygen Analysers.....	15
3.11.3 Spares Management	16
3.11.4 Work Preparation and Work Management	17
3.11.5 Plant and Material.....	17
3.11.6 Continuous Improvement.....	17
3.11.7 Management and Reporting	17
3.12 Safety.....	18
4. Acceptance.....	18
5. Revisions.....	18
6. Development Team	19
7. Acknowledgements	19
8. Appendix	19
8.1 Appendix A : Bill of Materials / Oxygen Analysers Spares List.....	20

1. Introduction

Medupi Power Station is a coal fired power station located in Lephalale, Limpopo Province, South Africa. The station consists of six 800 MW units which supplies a total of 4800 MW. Medupi Power Station main steam generation boilers from Unit 1 to 6 are equipped with oxygen analysers located on the flue gas side of the inlet and outlet of the gas air heater. They serve the purpose of measuring the oxygen concentration at the economizer exit as required by the Fossil Fuel Fired Regulations. The analysers are critical in monitoring the quality and efficiency of combustion in the furnace. As such, these are expected to have high accuracy and availability during the operation of the Boiler to produce steam. The measurement is critical because with comparison to stoichiometric air, it is possible to achieve efficient combustion.

2. Supporting Clauses

2.1 Scope

This document describes the detail of the applicable requirements, scope of work, specifications, terms & conditions as well as the criteria necessary for the Medupi Power Station Scope of Work for Maintenance, Calibration and Spares Supply of Inlet and Outlet Oxygen Analysers on Boiler Gas Air heaters to ensure compliance to Eskom Standards.

2.1.1 Purpose

The purpose of this document is to define the URS on which the service contract will be established between the *Employer* and the *Contractor*. Medupi Power Station is expected to perform at 92% UCF, 6% PCLF and 2% UCLF, and the specified services rendered to the *Employer* will support this requirement. It is therefore imperative that the successful and suitably qualified *Contractor* aligns their organisation fully to these specified scope activities and processes laid down in this document.

2.1.2 Applicability

This document sets out the detailed User Scope of Work requirements necessary for the maintenance of oxygen analysers installed at the inlet and outlet of the boiler gas air heaters in Medupi Power Station.

2.1.3 Effective date

The effective date of this document is as per the date and signature of the authoriser, as indicated on the cover page of this document.

2.2 Normative/Informative References

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

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2.2.1 Normative

- [1]. ISO 9001 Quality Management Systems.
- [2]. 240 - 97020108 Rev 5 Medupi Maintenance Contracts User Requirement Specification (URS).
- [3]. NEC 3 Term Service Short Contract.
- [4]. ISBN 0-9638650-0-5 - Calibration: Philosophy in Practice
- [5]. SANS 17025 General requirements for the competence of testing and calibration laboratories
- [6]. OPS 6501 Calibration Standard for Process Measurement Instruments
- [7]. 32-1034 Eskom procure and supply management procedure.
- [8]. 32-1033 Eskom Procurement and Supply Chain Management Policy
- [9]. SABS Quality Standards
- [10]. National Key Point Act no 102 of 1980.
- [11]. Eskom Plant Safety Regulations (PSR) - GGR 0992.
- [12]. Occupational Health and Safety Act No. 83 of 1993.
- [13]. BS 5750 for Quality Management.
- [14]. 240-62196227 Eskom Lifesaving Rules.
- [15]. 32-520 Occupational Health and Safety Risk Assessment Procedure.
- [16]. 32-95 Environmental, Occupational Health and Safety Incident Management Procedure.

2.2.2 Informative

- [1]. Act No 85 Occupational Health and Safety Act & Regulations.
- [2]. 240-46554063: Safety Health Environmental and Quality Policy.
- [3]. 240-78787829 Medupi Power Station Coal Plant Operating and Control Philosophy.
- [4]. 240-87607698 Coal Quantity and Quality Accounting Standard for Thermal Efficiency Determination.
- [5] 240-103826026 Medupi Power Station Operating Technical Specification

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2.3 Definitions

Term	Description
Ad hoc	A solution designed for a specific problem or task, non-generalizable, and not intended to be able to be adapted to other purposes
<i>Contractor</i>	Service provider contracted for supply specific service to Eskom Medupi Power Station.
Controlled Disclosure	Controlled disclosure to external parties (either enforced by law, or discretionary.
Corrective Maintenance	The process of restoring plant and equipment which have failed or deteriorated to a state which renders it unable to meet the acceptance criteria required for its application.
<i>Employer</i>	Eskom or Eskom Medupi power station representative appointed in writing.
In-service Inspection	All inspection and testing conducted on plant and equipment at regular intervals and prescribed by regulatory and statutory codes or other types of specification throughout its service life.
Inspection	Activities, which by means of examination, observation or measurement, determine the conformance of material, parts, components etc, to predetermined specifications and quality requirements.
Maintenance	A combination of all technical, administrative and managerial actions during the life cycle of an item intended to retain it in, or restore it to, a condition in which it can perform the required function.
Maintenance Philosophy	The principal approach decided upon for performing maintenance, such as pro-active or reactive maintenance.
Maintenance Plan	A plan that details the maintenance that needs to be done on a specific plant item or component and the frequency and quality requirements for that maintenance.
Maintenance Schedule	The timing of the Maintenance Plan information stipulating when in the calendar year, work needs to be done.
Maintenance Strategy	The type of maintenance selected for specific plant and equipment, such as time or condition-based maintenance, corrective or preventative maintenance.

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Parties	The <i>Employer</i> and the <i>Contractor</i>
Preventive Maintenance	Planned time or schedule-based maintenance carried out with the explicit objective of preventing functional failures and is directed towards maintaining the physical condition of the plant or equipment. It includes scheduled overhauls and scheduled replacement of worn-out parts or failure prone components.
Service Manager	The <i>Employer's</i> representative regarding the contract agreement.
Task Order	The Service Manager's instruction to be carried out as a task.

2.4 Abbreviations

Abbreviation	Explanation
C&I	Control and Instrumentation.
SHE	Safety Health and Environmental
SHEQ	Safety Health Environmental and Quality
H&S	Health and Safety
KPA	Key Performance Area
KPI	Key Performance Indicator
MSDS	Material Safety Data Sheet
NEC3	New Engineering Contract
OEM	Original Equipment Manufacturer.
PDF	Portable Document Format
QCP	Quality Control Plan.
SANAS	South African National Accreditation System
SOW	Scope of Work.
TSSC	Term Service Short Contract
URS	User Requirement Specification
V1	Re-Order Point for Non-Repairable Material (Normal)
VB	Manual Re-Order Point Planning (RF)
PD	Order On Request (As and When required)
RF	Refurbishment of items

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2.5 Roles and Responsibilities

2.5.1 Employer

Manage the Medupi Power Station Scope of Work for Maintenance, Calibration and Spares Supply of Inlet and Outlet Oxygen Analysers on Boiler Gas Air heaters contract in terms of NEC3 Term Service Contract's procedures and guidelines in terms of the URS specified in *Section 2.2.1[2]*

2.5.2 Contractor

Provide a supply, maintain and calibration service to the *Employer* in accordance with 241-20221028 Medupi Power Station Medupi Power Station Scope of Work for Maintenance, Calibration and Spares Supply of Inlet and Outlet Oxygen Analysers on Boiler Gas Air heaters SOW.

Ensure that quality workmanship is delivered by means of providing quality control plans for the execution of the works and providing hold points for the *Employer* to sign off acceptance of the works being executed.

Obey any instruction which is in accordance with the contract and is given to the *Contractor* by the Service Manager.

Acts in accordance with the Health, Safety and Environmental requirements as stated in 240 - 97020108 Rev 5 Medupi Maintenance Contracts User Requirement Specification (URS).

3. Document Content

3.1 General

3.1.1 Adherence to Eskom General Policies & Standards

The Employees of the *Contractor* shall comply with Eskom's policies and site regulations. The 240 - 97020108 Medupi Maintenance Contracts User Requirement Specification Rev. 5 aims to normalise contract agreements and as such should be used as the point of departure on which this service contract will be based.

3.1.2 Quality Standard

The *Contractor* shall provide a complete Quality Assurance plan in accordance with the requirements of ISO 9001: 2010 – Quality Management to the *Employer* for approval. This plan must ensure an integrated quality service as part of the contract.

Execution of all quality related activities, including inspection and test plans compilation and execution, stores material quality inspections and all quality-related record keeping is part of the *Contractor's* scope of work.

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Workmanship shall always be of a grade accepted as the best practice of the trade involved and as stipulated in written standards of recognised organisations or institutes of the respective trades, except as exceeded or qualified by the specifications. The *Employer* shall determine the acceptability of workmanship.

3.1.3 Document Control

All contractual communication between the *Employer* and *Contractor* shall be in written format accompanied by an official letterhead and signed by the authorised Parties.

All attached documentation shall be in the format of Microsoft Word / Excel and / or Power Point.

All contractual communication letterheads and attached documentation shall be electronically mailed as per PDF format.

3.1.4 Contractual Meetings

The *Contractor* shall be required to adhere to and take part in the following meetings being held by the Service Manager and / or person delegated in writing to do so:

- Safety File meeting.
- Contractual start up meeting.
- Ad hoc meetings.

3.1.5 Correspondence

All verbal and non – verbal communication between the *Employer* and *Contractor* which this contract requires shall be communicated in a form which can be read, copied and recorded. All correspondence between the Parties shall be in written format and exchanged by means of electronic mail service.

The rules of NEC3; Term Service Short Contract will set out the requirement for both Parties.

3.1.6 Legal Requirements

The *Employer* shall provide a representative to sign limited access register (LAR) and witness the maintenance and/or calibration activity.

The *Contractor* shall use the required calibration gas cylinder product from the laboratory that is SANAS accredited. The *Contractor* shall produce proof of gas certificate before they can commence with the calibration of the oxygen analysers specified in the SOW.

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In an event where calibrations of the Oxygen Analysers are not possible, the *Contractor* should perform a calibration verification by means of using SANAS accredited test equipment to prove the correctness of the verification being executed. As a result, a calibration verification certificate should be provided for each, and every verification being executed accompanied with the SANAS accredited calibration certificate of the specific test equipment used for the verification. In addition, each specific Calibration Verification Certificate being provided should be linked to the specific SANAS Accredited calibration certificate on their respective documents by means of endorsing serial numbers on both the SANAS Accredited calibration certificate and the Calibration Verification Certificate for traceability.

3.1.7 Task Order

The *Contractor* shall by no means carry out any maintenance and/or calibration services in terms of the SOW without the approval, without an official Task Order being supplied by the *Employer* to the *Contractor*.

3.2 Manpower

3.2.1 Competent Personnel

The *Contractor* shall make use of competent personnel which has been fully trained and authorised to provide the Maintenance, Calibration and Spares Supply of Inlet and Outlet Oxygen Analysers on Boiler Gas Air heaters as stipulated in the SOW under *Section 3.11*.

The *Contractor* shall supply the *Employer* with valid documentation as proof regarding the competency of their personnel.

The *Contractor* shall supply the *Employer* with the relevant documentation, criminal records and/or police clearance of their personnel AND undergo safety induction before they can gain access in the Eskom Medupi premises.

3.3 Callout Services

The *Contractor* shall provide a service technician that is qualified and have adequate expertise to manage the plant area issues on and as when required basis when requested by the *Employer*.

The *Contractor's* response time to a callout shall be within 48 hours from the time that the *Contractor* is notified of the plant concern until the *Contractor* reports to the *Employer* on site.

3.4 Calibrations

3.4.1 Calibration Approval

The *Contractor* shall supply the *Employer* with proof of an OEM approved certificate authorizing that the *Service Provider* is competent to perform calibration on the specific calibration services specified in *Section 3.11* on the Medupi Power Station Scope of Work for Maintenance, Calibration and Spares Supply of Inlet and Outlet Oxygen Analysers on Boiler Gas Air heaters contract SOW.

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3.4.2 Calibration Test Equipment

The *Contractor* shall only make use of approved test equipment for calibrations, and which is of higher accuracy than the equipment to be calibrated.

3.4.3 Calibration Test Gases

The *Contractor* shall only use SANAS Accredited test gasses required to execute the calibrations of Inlet and Outlet Oxygen Analysers on Boiler Gas Air heaters and mentioned under legal requirements in *Section 3.1.6*.

The *Contractor* shall supply the *Employer* with a Certificate of Analysis, for each test gas, liquid and/or sample being used in calibrating the associated Analysers specified in *Section 3.10* at the premises of the *Employer*.

The certificate shall indicate the MSDS content of each test gas, liquid and/or sample with the percentage of test gas content and/or any supporting information to justify the calibration results.

3.4.4 Calibration Procedures

The *Contractor* shall supply the *Employer* with the approved calibration procedures or method statements used for the calibrations related to the Medupi Power Station Scope of Work for Maintenance, Calibration and Spares Supply of Inlet and Outlet Oxygen Analysers on Boiler Gas Air heaters contract SOW.

The *Contractor* shall notify the *Employer* of any revision changes of these approved calibration procedures and supply the latest release.

3.4.5 Calibration Certificates

The *Contractor* shall only use and supply approved SANAS Accredited calibration certificates for each equipment calibration service. In the event where an approved calibration certificate cannot be supplied, refer to the legal requirements in *Section 3.1.6*.

The calibration certificates shall be recorded in writing and carry the initials, surname and signature of the *Contractor's* employee who carries out the equipment calibration service and the date of calibration. The calibration certificates should also be accompanied with serial numbers of each equipment being calibrated for ease of traceability and records.

The calibration certificates shall record the "as found" and "as left" values, including the error and error tolerance of each equipment being calibrated specified in *Section 3.11*.

Test equipment which operates outside the acceptable error tolerances shall be recorded in the calibration certificate.

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3.4.6 Calibration Gas Specifications

The following specifications are to be used or as close as possible to the value being provided.

- Zero gas – 2%
- Span Gas – 18% or above

3.4.7 Service of Medupi Power Station Oxygen Analysers on Boiler Gas Air heaters

The *Contractor* shall upon request through the task order, service the analysers on site or offsite at their premises. In cases offsite, the *Employer* shall arrange for a spare to be availed for continued production. A record shall be availed for condition and serial number of the item being serviced offsite. Specialist services shall also be provided by the *Contractor* as and when required in case of more advanced challenges.

3.4.8 Spares

The contractor shall supply the following but not limited to, on as and when required basis. See appendix for detailed information.

For Ametek Thermox Analysers:

- Cell Lead Kits
- Filters
 - 5 micron
 - 5 micron with shield
 - 20 micron SS
- Complete probe
 - 900mm (36 inch)
 - 1800 mm (72 inch)
- Inner Probes
 - 900mm (36 inch)
 - 1800 mm (72 inch)
- Heater Assemblies
- Thermocouple Assemblies
- Connector kit
- Display PCB
- Electronics Assembly
- Insulating tube
- Miscellaneous components
- O-rings

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- In-situ Cell
- Ceramic washers
- Power supply PCB
- Gasket

For Yokogawa ZR202G

- Complete Probe
- Contact
- Sensor
- Metal O-ring
- Filter
- Dust filter
- Heater Unit
- U-pipe
- Cell assembly
- Thermocouple assembly

3.5 Specific Requirements

A compact oxygen analyzer that comes as probe and display integrated on one unit.

The oxygen probe must come with dust filter fitted on it.

The oxygen probe must come with a dust guard protector fitted on the tip to prevent dust settling on the cell.

For the Yokogawa equipment, the O₂ analyzer must come with the stainless-steel spool piece flanged DN100 (PN6/PN10 316L)

Display range of 0 – 100 vol% O₂

Output signal of 4 – 20mA

Tolerance of $\pm 1\%$ maximum value of set range

List of spares to maintain the system.

The system annual average availability of 100 % is required during the course of the life of the system and a daily reliability > 90%

Probe head to be IP65 protected.

The system should come with operating and maintenance manuals.

The system's installation should be similar to the current installation.

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3.6 Equipment and Tools

The *Contractor* shall supply their own tools, electrical equipment and approved calibration test gas that might be required when providing the spares supply, maintenance and calibration services to the *Employer*.

The *Contractor* shall provide a comprehensive list of all tools and electrical equipment to be used for the calibration service before entering the premises of the *Employer*.

All tools and electrical equipment shall be checked for compliance purposes before commencement of work and during the period of contract by the *Employer*.

3.7 Site Services Provided by the *Employer*

The *Employer* shall support the *Contractor* with site access and plant availability or any associated communication or arrangements that enables the contractor to execute the tasks required in relation to the contract.

3.8 Site Facilities

Refer to document 240-97020108 Medupi Power Station Maintenance Contracts User Requirement Specification.

3.9 Services Provided by the *Contractor*

The *Contractor* shall be required to provide a Supply, Maintain and Calibration service in terms of 241-20221028 Medupi Power Station Medupi Power Station Scope of Work for Maintenance, Calibration and Spares Supply of Inlet and Outlet Oxygen Analysers on Boiler Gas Air heaters for the duration of the contract period.

Refer to document 240-97020108 Medupi Power Station Maintenance Contracts User Requirement Specification.

3.10 Transport

3.10.1 Vehicle transport to and from the *Employer's* Premises

The *Contractor* shall be responsible to provide means of transport to get employees, spares and tools onto and out from the *Employer's* premises.

The *Contractor* shall ensure that all employees who are authorised to drive a motor vehicle / specialised vehicle and have the required authorisation to do so.

The *Contractor* shall supply the *Employer* with the required legal authorisation as proof of compliance.

The *Contractor* shall be responsible for the safe keeping and transportation of Oxygen Analysers and associated spare parts in an event where the calibration and/or maintenance activities cannot be executed at the *Employer's* Premises.

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3.11 Scope of Work Information

3.11.1 Plant Areas to Be Covered

The *Contractor* shall be responsible for Maintenance, Calibration and Spares Supply of Inlet and Outlet Oxygen Analysers on Boiler Gas Air heaters at Medupi Power Station.

The *Contractor* shall also be responsible for implementing and adhering to good housekeeping practices in plant areas and any other facility allocated to the *Contractor* in terms of their maintenance and/or calibrations responsibilities of the Oxygen Analysers instrumentation installed on the Inlet and Outlet of Unit Boiler Gas Air heaters.

The *Contractor* shall also be responsible to execute calibration and/or maintenance activities of Oxygen analyser instrumentation off the *Employer's* Premises in an event where these activities cannot be executed on site. In such a case, full approval shall be provided by the responsible senior supervisor responsible and cannot leave the plant operations in abnormal state without the prior approved Out of Normal or simulation if required.

The following plant areas shall form part of the Services covering the Spares Supply, Maintenance and Calibration Services:

- a) Units 1 & 6 C&I Workshops
- b) Units 1 - 6 Boiler plant
- c) *Contractor* Workshop

3.11.2 Maintenance and Calibration of Oxygen Analysers

Maintenance and Calibration services as per 241-20221028 Medupi Power Station Scope of Work for Maintenance, Calibration and Spares Supply of Inlet and Outlet Oxygen Analysers on Boiler Gas Air heaters. The *Contractor* will also be expected to keep inspection reports and calibration certificates for work done on these analysers. Condition reports may also be requested at times.

Refer to *Appendix A* for the detailed spares list of the Oxygen Analysers and its associated spares parts. The supply of spare parts is not limited to the spares list in Appendix A only, therefore the *Contractor* should be aware and ensure that spares can be supplied under this agreement on an **“as and when required”** basis provided that the *Employer* provides the detailed specifications of spare parts required to maintain and calibrate the Oxygen Analysers at Medupi Power Station.

IMPORTANT:

The spares supply, maintenance and calibration of oxygen analysers will be applicable on an “as and when required” basis and the Contractor needs to ensure the availability of spares are managed efficiently and a minimum quantity of spares are readily available off the shelf due to long lead times for sourcing of spares. In this manner it will prevent delays and/or negative influence on the Employer's obligations to support continuous load of Electricity Supply to South Africa.

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The following inspections and calibrations shall be performed by the *Contractor* on a ONE yearly frequency and on an “as and when required” basis where necessary, which will be communicated from the *Employer* to the *Contractor*.

3.11.2.1 Ametek Thermox Oxygen Analysers

- a) Inspect and calibrate the analyser.
- b) Inspect and replace wearable components where necessary.
- c) Provide service report with recommendations.
- d) Refurbish and/or replace with a new heater, temperature measurement or any other damaged component.
- e) Provide SANAS Accredited calibration gas certificate, endorsed with its serial number and expiry date of each gas cylinder.
- f) Provide calibration verification certificates endorsed with the SANAS accredited calibration gas certificate for traceability. Each calibration verification certificate should be endorsed also with the KKS number, serial number and description of the analyser probe AND the serial number and expiry date of each gas cylinder.

3.11.2.2 Yokogawa Oxygen Analysers

- a) Inspect and calibrate the analyser.
- b) Inspect and replace wearable components where necessary.
- c) Provide service report with recommendations.
- d) Refurbish and/or replace with a new heater, temperature measurement or any other damaged component.
- e) Provide SANAS Accredited calibration gas certificate, endorsed with its serial number and expiry date of each gas cylinder.
- f) Provide calibration verification certificates endorsed with the SANAS accredited calibration gas certificate for traceability. Each calibration verification certificate should be endorsed also with the KKS number, serial number and description of the analyser probe AND the serial number and expiry date of each gas cylinder.

3.11.3 Spares Management

The *Contractor* shall advise after every calibration which spares are needed for replacement or servicing to ensure the integrity and the health operation of the specified oxygen analysers. The sourcing and making of the spares available required to refurbish the oxygen analysers will be planned and managed by the *Contractor* until the execution phase has been completed and acceptance signed off by the *Employer*. The *Contractor* shall supply spares based on the findings and recommendations recorded in their service reports issued to the *Employer*.

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3.11.4 Work Preparation and Work Management

The *Contractor* shall ensure that the Occupational Health and Safety Act are always adhered to and partner with *Employer* to create and maintain a safety culture of striving towards “Zero Harm” and report any unsafe conditions and/or actions.

The *Contractor* shall ensure the LAR procedure is always followed, maintain healthy work relations and communication with the Unit Controller.

The *Contractor* shall ensure the risk assessments are done and documented for each activity.

The *Contractor* shall be responsible to maintain their Safety File and keep it always up to date and always attend SHEQ meetings.

Safe working procedures or temporary working procedures shall be available and used for each job.

The staff shall perform Job Observations on the required frequencies.

All supporting documentation required to complete work shall be managed, referenced, and filed for future reference by the *Contractor* for example test results, certificates, reports, drawings, etc.

3.11.5 Plant and Material

The *Contractor* shall be expected to make recommendations regarding to the inventory strategies to ensure that the correct spares are available in the Medupi Power Station Materials Management Warehouse.

3.11.6 Continuous Improvement

The *Contractor* shall implement a program of continuous improvement to optimise plant performance and reduce system and equipment failures.

The *Contractor* shall be responsible for participating in root cause failure investigations required by the *Employer*.

The *Contractor* shall participate in improvement programs pertaining to plant equipment.

3.11.7 Management and Reporting

The *Contractor* shall be responsible for implementing a performance management system consistent with the *Employer's* supplier management requirement.

The *Contractor* shall be responsible to do assessments on all the plant equipment inspections specified in the SOW, provide a detailed service report with findings and recommendations on each activity.

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3.12 Safety

- a) The purpose of this *section* is to provide clear and unambiguous Health & Safety specifications to enable the *Contractor* to make provision for and comply with Health & Safety requirements - both in terms of relevant legislation and *Employers'* requirements, as well as any additional or site-specific H&S requirements.
- b) This *section* promotes legal compliance as well as a health and safety culture amongst those working in *Employers'* Generation projects.
- c) Health and Safety requirements that the Consultant shall comply with includes *Employers'* Rules where compliance is required for the following:
- Employers'* SHE Policy (32-94)
 - Employers'* Cardinal Rules (32-421)
 - Employers'* Incident Management procedure (32-95)
 - Vehicle and Driver Safety Management procedure (32-93)
 - Medical Surveillance Procedure (32-282)
 - Site Specific SHE Policies and Procedures
- d) The above-mentioned procedures / documents shall be made available to the *Contractor* in preparation of his/her health and safety management compliance to the *Employers'* requirements.
- e) The provided detailed costing for Health and Safety includes:
- Based on the overall scope of work / service to be performed
 - Compulsory demonstration of an adequate health and safety management system that the *Contractor* has a documented health and safety management system – provide proof.
 - Approved Safety file

4. Acceptance

This document has been seen and accepted by:

Name	Designation
Lerato Sehume	C&I Maintenance Manager
Cornelius Mulaudzi	C&I Senior Technical Supervisor
Nare Senama	C&I Senior Technical Supervisor
Tankiso Mpebe	C&I Senior Technical Supervisor
Tumelo Chauke	C&I Senior Technical Supervisor
Lebo Pebane	Material Management Manager
Chuene Boshomane	Material Management Planner

5. Revisions

Date	Rev.	Compiler	Remarks
November 2024	1	Thys Britz	First revision

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6. Development Team

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

Name	Designation
Andrew Lekganyane	C&I Engineer
Thys Britz	C&I Senior Technical Supervisor

7. Acknowledgements

Not Applicable.

8. Appendix

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8.1 Appendix A : Bill of Materials / Oxygen Analysers Spares List

Material	Material short description	Material full description	Material Type	Unit of Measure	Max	Required Quantity	Lab Code
679890	ANALYZER:WDG1200;4-20 MA	ANALYZER: TYPE: WDG1200; RANGE: 4-20 MA; POWER SOURCE: 230VAC 50HZ V AC; APPLICATION: GAH INLET AND OUTLET; SPECIFICATION: INNER PROBES ONLY: LENGTH: 36 INCH AND 72 INCH; BOTH LENGTHS NEEDS TO BE SUPPLIED BY THE VENDOR ON REQUEST FROM THE EMPLOYER; VENDORS ARE RESPONSIBLE FOR ENSURING THAT THEY ARE PERFORMING AGAINST THE CORRECT DRAWING REVISION NUMBER (IF APPLICABLE).	PD	EA	24	120	BAH
690344	ASSY:ELECTRONIC;INDUSTRIAL 02 ANALYSER	ASSEMBLY: TYPE: ELECTRONIC; APPLICATION: INDUSTRIAL 02 ANALYSER; SPECIFICATION: AMETEK THERMOX WDG; OEM P/N: 12097JE; ASSEMBLY TYPE: ELECTRONIC ASSEMBLY; SPECIFICATION: AMETEK THERMOX WDG-1200/1210/INSITU; PART NO 12097JE	V1	EA	30	150	C&I
690358	CELL:ZIRCONIUM OXIDE CELL;230 VAC	CELL: TYPE: ZIRCONIUM OXIDE CELL; POTENTIAL: 230 VAC; RANGE: 0-20.9 PCT OXYGEN CONCENTRATION; MOUNT: SCREW INTO OXYGEN ANALYSERS PROBE; OEM P/N: 71785SE; AMETEK THERMOX WDG OXYGEN MEASURING CELL (SENSOR) INSITU	V1	EA	36	180	C&I

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Maintenance, Calibration and Spares Supply
of Inlet and Outlet Oxygen Analysers on Boiler
Gas Air heaters**

Unique Identifier: **241-20221028**

Revision: **1**

Page: **Page 21 of 25**

690405	POWER SUPPLY:I/P 240 VAC;100 - 240 VAC;4	POWER SUPPLY: INPUT: 240 VAC; OUTPUT VOLTAGE: 100 - 240 VAC; OUTPUT CURRENT: 4 A; APPLICATION: INDUSTRIAL OXYGEN ANALYSER; MOUNTING: MOUNTED ONTO O2 ANALYSER; OEM P/N: 80586SE; POWER SUPPLY TYPE: PCB POWER SUPPLY; OUTPUT VOLTAGE: 100-240 VAC AMETEK THERMOX WDG - 1200/1210/INSITU, PART NO: 80586SE; CURRENT RATING: 4 A PEAK; POWER 250W	V1	EA	30	150	C&I
690407	PROBE:INDUSTRIAL OXYGEN;LG 36 IN;36 IN	PROBE: TYPE: INDUSTRIAL OXYGEN; LENGTH: 36 IN; CABLE LENGTH: 36 IN; MATERIAL: SS 310; OEM P/N: 71922SE; PROBE TYPE: COMPLETE SET; LENGTH: 36 INCH; PCT; MATERIAL AMETEK THERMOX WDG - 1200/1210/INSITU PROBE: 71922SE; INDUSTRIAL PROBE; MATERIAL: 310 STAINLESS STEEL; CASE MATERIAL; POWDER-COATED ALUMINIUM ; WEIGHT: 11.5KG	V1	EA	30	150	C&I
690424	KIT:AMETEK THERMOX WDG	KIT: TYPE: AMETEK THERMOX WDG; APPLICATION: INDUSTRIAL O2 ANALYSER REPLACEMENT KIT; SPECIFICATION: AMETEK THERMOX WDG; OEM P/N: 25818J; KIT TYPE: CONNECTOR KIT; SPECIFICATION : AMATEK THERMOX WDG - 1200/1210/INSITU/; PART NO: 25818J; CONNECTOR KIT (INCLUDES 2 CONNECTORS)	V1	EA	30	150	C&I
690440	DISPLAY:INDUSTRIAL OXYGEN LED	DISPLAY: TYPE: INDUSTRIAL OXYGEN LED; OEM P/N: 80585SE; DISPLAY TYPE: DIGITAL PCB: AMETEK THERMOX WDG - 1200/1210/INSITU; PART NO: 80585SE; INDUSTRIAL OXYGEN ANALYSER PCB DISPLAY	V1	EA	30	150	C&I

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of Inlet and Outlet Oxygen Analysers on Boiler
Gas Air heaters**

Unique Identifier: **241-20221028**

Revision: **1**

Page: **Page 22 of 25**

690442	PROBE:INDUSTRIAL OXYGEN PROBE;LG 72 IN	PROBE: TYPE: INDUSTRIAL OXYGEN PROBE; LENGTH: 72 IN; CABLE LENGTH: 72 IN; MATERIAL: 310 STAINLESS STEEL; OEM P/N: 71923SE; PROBE TYPE: COMPLETE SET; LENGTH: 72 INCHES; PCT; CABLE LENGTH 72 INCHES; MATERIAL: AMETEK THERMOX WDG - 1200/1210/INSITU; PART NO: 71923SE; INDUSTRIAL OXYGEN PROBE	V1	EA	30	150	C&I
DCF to be completed	GAS MIXT:NITROGEN/OXYGEN 20.9 PCT;10 L; CYLINDER	GAS, MIXTURES: TYPE: NITROGEN/OXYGEN; CONTAINER CAPACITY: 10 L; CONTAINER TYPE: CYLINDER; CONCENTRATION: N 81/O2 20,9 PCT; PHYSICAL FORM: GAS; TEST GAS; BALANCE NITROGEN; N2; MATERIAL SAFETY DATA SHEET WITH ENVIRONMENT INFORMATION IN THE 16 POINT FORMAT TO BE PROVIDED WITH EVERY DELIVERY AS REQUIRED BY THE OCCUPATION HEALTH AND SAFETY ACT	V1	EA	350	1750	C&I
DCF to be completed	GAS MIXT:NITROGEN/OXYGEN 1 PCT;10 L; CYLINDER	GAS, MIXTURES: TYPE: NITROGEN/OXYGEN; CONTAINER CAPACITY: 10 L; CONTAINER TYPE: CYL; CONCENTRATION: N 98/O2 1 PCT; TEST GAS, BALANCE NITROGEN, N2; MATERIAL SAFETY DATA SHEETS WITH ENVIRONMENTAL INFORMATION IN THE 16 POINT FORMAT TO BE PROVIDED WITH EVERY DELIVERY AS REQUIRED BY THE OCCUPATIONAL HEALTH AND SAFETY ACT	V1	EA	350	1750	C&I

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**Medupi Power Station Scope of Work for
Maintenance, Calibration and Spares Supply
of Inlet and Outlet Oxygen Analysers on Boiler
Gas Air heaters**

Unique Identifier: **241-20221028**

Revision: **1**

Page: **Page 23 of 25**

DCF to be completed	PROBE:INDUSTRIAL OXYGEN;LG 1M	PROBE: TYPE: INDUSTRIAL OXYGEN ZR202G; LENGTH: 1 METRE; RANGE: 0-25% O2; MATERIAL: SUS316 (JIS); OEM P/N: ZR202G-100-S-G-N-C-T-M-E-A/F2; PROBE TYPE: INDUSTRIAL YOKOGAWA ZIRCONIA OXIDE OXYGEN ANALYSER WITH DUST GUARD PROTECTOR AND FILTER FITTED ON THE TIP; FILTER TYPE: MESH WIRE; PROBE MATERIAL: STAINLESS STEEL; CASE MATERIAL: ALUMINIUM ALLOY; PROCESS CONNECTION: DIN PN10-DN100-A; MOUNT: FLANGE TO STRAIGHT SPOOL PIECE; ELECTRICAL CONNECTION: M20 X 1,5MM; VOLTAGE: 100-240VAC; FREQUENCY: 48-62 HZ; POWER: 250W; CURRENT: 4A; CURRENT OUTPUT: 4-20MA	V1	EA	12	60	C&I
DCF to be completed	SPOOL PIPE:STRAIGHT SPOOL PIECE; DN100 PN10	SPOOL, PIPE: TYPE: SPOOL PIECE STRAIGHT; NOMINAL PIPE SIZE: DN100 PN10; CONNECTION TYPE: DN100 PN6/10 STRAIGHT; DIAMETER: 110MM; MATERIAL: STAINLESS STEEL 316L; FLANGE MATERIAL STAINLESS STEEL; SPECIFICATION: STRAIGHT SPOOL PIECE USED TO CONNECT THE YOKOGAWA OXYGEN ANALYSER TO THE FLANGE ON THE FLUEGAS DUCTING; SUPPL P/N: DIN PN10-DN100-A (EQ.)	PD	EA	10	50	C&I

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Maintenance, Calibration and Spares Supply
of Inlet and Outlet Oxygen Analysers on Boiler
Gas Air heaters**

Unique Identifier: **241-20221028**

Revision: **1**

Page: **Page 24 of 25**

DCF to be completed	PROBE:INDUSTRIAL OXYGEN PROBE;LG 2M	PROBE: TYPE: INDUSTRIAL OXYGEN ZR202G; LENGTH: 2 METRE; RANGE: 0-25% O2; MATERIAL: SUS316 (JIS); OEM P/N: ZR202G-200-S-G-N-C-T-M-E-A/F2; PROBE TYPE: INDUSTRIAL YOKOGAWA ZIRCONIA OXIDE OXYGEN ANALYSER WITH DUST GUARD PROTECTOR AND FILTER FITTED ON THE TIP; FILTER TYPE: MESH WIRE; PROBE MATERIAL: STAINLESS STEEL; CASE MATERIAL: ALUMINIUM ALLOY; PROCESS CONNECTION: DIN PN10-DN100-A; MOUNT: FLANGE TO STRAIGHT SPOOL PIECE; ELECTRICAL CONNECTION: M20 X 1,5MM; VOLTAGE: 100-240VAC; FREQUENCY: 48-62 HZ; POWER: 250W; CURRENT: 4A; CURRENT OUTPUT: 4-20MA	V1	EA	12	60	C&I
DCF to be completed	AMETEK Mesh filter; 20 Micron SS	TYPE: MESH FILTER; STAINLESS STEEL CONNECTOR; 20 MICRONS MESH; RANGE: 0-20,9 PCT OXYGEN CONCENTRATION; MOUNT: STAINLESS STEEL CONNECTOR INTO OXYGEN ANALYSERS PROBE; OEM P/N: 72346SE; AMETEK THERMOX WDG INSITU	V1	EA	10	50	C&I
DCF to be completed	Ceramic filter; 5 Micron	TYPE: CERAMIC FILTER; CERAMIC COATING WITH 5 MICRONS AND A STAINLESS STEEL CONNECTOR; RANGE 0-20,9 PCT OXYGEN CONCENTRATION; MOUNT: CONNECTOR INTO OXYGEN ANALYSERS PROBE; OEM P/N: 71895SE; AMETEK THERMOX WDG INSITU	V1	EA	10	50	C&I

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**Medupi Power Station Scope of Work for
Maintenance, Calibration and Spares Supply
of Inlet and Outlet Oxygen Analysers on Boiler
Gas Air heaters**

Unique Identifier: **241-20221028**

Revision: **1**

Page: **Page 25 of 25**

DCF to be completed	Ceramic filter Deflector	SHIELD: TYPE: CERAMIC; RANGE: 5 MICRONS; MOUNT: SCREW INTO OXYGEN ANALYSERS PROBE; OEM P/N:7186SH; AMETEK THERMOX WDG INSITU	V1	EA	10	50	C&I
DCF to be completed	AMETEK Mullite Insulating tube	CERAMIC: TYPE: MULLITE TUBE, RANGE: 5 MICRONS WITH SHIELD; MOUNT:FIT INTO OXYGEN ANALYSERS PROBE; OEM P/N: 310792LM; AMETEK THERMOX WDG OXYGEN MEASURING FILTER WITH SHIELD	V1	EA	10	50	C&I
DCF to be completed	AMETEK FILTER GUARDS	TYPE: FILTER GUARDS; STAINLESS STEEL CONNECTORS; RANGE: 0-20,9 PCT OXYGEN CONCENTRATION; MOUNT: CLAMP INTO QXYGEN ANALYSERS PROBE; OEM P/N: 19010GM; AMETEK THERMOX WDG INSITU	V1	EA	10	50	C&I

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