1 Description of the *service*

1.1 Executive Overview

The Contractor shall design, supply, install, integrate, validate and commission a fully integrated, robotics-enabled automated work cell at Eskom's Rotek Transformer Oil Laboratory.

The pilot project shall automate eight (8) key transformer oil tests, integrate seamlessly with the existing Sample Manager 21.2 LIMS, and establish a validated reference model for broader enterprise deployment. The solution shall deliver measurable improvements in turnaround time, throughput, data integrity, safety and total cost of ownership.

The scope is a single turnkey delivery where the Contractor is the design authority and is accountable for end-to-end performance, including detailed laboratory layout design, supply of all hardware and software, systems integration, infrastructure upgrades, validation, training, change management and operational transition.

The following eight (8) transformer oil tests shall be automated:

Table 1: Automated Tests and Workflow

Test Name	Automation Requirement
Dissolved Gas Analysis (DGA)	Automated sample injection, analysis, and data capture
Moisture Content (Karl Fischer)	Automated sample metering, titration, and result logging
Acidity (Neutralisation Number)	Automated reagent addition, mixing, titration, and cleaning
Dielectric Strength (BDV)	Automated sample filling, voltage application, and reporting
Colour (ASTM)	Automated sample presentation to spectrophotometer
Interfacial Tension (IFT)	Automated ring or plate handling and measurement
Furanic Analysis	Automated sample injection, analysis, and data capture
Tan Delta (Dissipation Factor)	Automated sample cell filling and measurement

1.2 Employer's Objectives and Purpose of the Works

Eskom's Petroleum Sciences Laboratories currently rely on manual and partially automated workflows that constrain throughput, increase data integrity risk, and heighten operator variability. The Rotek Transformer Oil Laboratory has been selected as the pilot site to de-risk future implementation at scale.

This Scope of Work defines the end-to-end delivery requirements for the automated work cell, including hardware, software, systems integration, infrastructure upgrades, validation, training, change management, and operational transition.
The Employer's objectives are to:

1. Achieve measurable improvements in turnaround time, throughput, data integrity, safety, and total cost of ownership

2. Automate eight key transformer oil tests to eliminate manual transcription errors
3. Integrate seamlessly with the existing Sample Manager 21.2 LIMS
4. Establish a validated reference model for broader enterprise deployment
5. Achieve the quantified performance targets defined in the Key Performance Indicators below

1.3 Quantified Performance Targets (Key Performance Indicators)

The Contractor's solution shall demonstrably achieve the following minimum performance improvements against the baseline established in the As-Is process mapping. Performance shall be measured during implementation, validation, and site acceptance to confirm that the automated work cell delivers the required operational, quality, and traceability benefits.

Table 2: Quantified Performance Targets (Key Performance Indicators)

Metric	Baseline (As-Is)	Target (To-Be)	Measurement Method
Turnaround Time (TAT) – Routine	16 days average	≤ 3 days from sample receipt to report approval	LIMS audit timestamps
Turnaround Time (TAT) – Urgent	24 hours	≤ 8 hours	LIMS audit timestamps
Turnaround Time (TAT) – Emergency	Same shift	≤ 2 hours	LIMS audit timestamps
Throughput	9,690 samples/year	≥ 15,000 samples/year using the same headcount	LIMS sample count per annum
Data Entry Transcription Errors	Baseline error rate	Zero (0) routine manual keying	LIMS audit log and SAT test
Operator Hands-On Time per Sample	Baseline to be measured jointly	≥ 70% reduction	Time-motion study during SAT
Sample Tracking	No digital location visibility	100% barcode-tracked from receipt to disposal	System traceability report

1.4 Scope of the Works

The Contractor shall provide the following scope as a single turnkey provider and remain accountable for end-to-end delivery, including detailed laboratory layout design, supply, installation, integration, performance, compliance, cybersecurity readiness, SHEQ/Facilities approval support, validation, documentation and acceptance. The scope covers the complete analytical value chain from barcode-based sample receipt through automated preparation, testing, result capture, LIMS submission, reporting, storage and disposal.

The full technical requirements are set out in **Annexure A: Rotek Oil Lab Automation Technical Specification**, which is incorporated by reference and forms part of this Service Information. Annexure A includes, but is not limited to:

- Automated tests and workflow (Section 3.3.3.1 of Annexure A)
- Sample registration and barcode-driven workflow

- Robotics and sample handling
- Automated sample conditioning and homogenisation
- Instrument-to-LIMS data flow
- Integration architecture and IT/OT engagement
- LIMS integration
- Laboratory layout design and facilities approval
- Laboratory infrastructure upgrades
- Visual demonstration and 3D training simulation suite
- IT/OT infrastructure
- Change management and training
- Validation and acceptance testing
- Mandatory technical performance criteria
- Instrument list and specifications
- Robotics criteria
- C&I scope (Section 3.4 of Annexure A)
- IT/OT scope (Section 3.5 of Annexure A)
- Building upgrade (Section 3.6 of Annexure A)
- Scope exclusions and boundaries
- Deliverables
- Acceptance criteria
- Commercial and contractual conditions
- Compliance requirements
- Assumptions, exclusions and deviations
- Risk and dependency management
- Change control
- Defects, warranty and performance liability
- Construction
- Completion, testing, commissioning and correction of defects
- Plant and materials standards and workmanship
- Specifications for the works

Where there is any conflict between this Part 3 and Annexure A, **Annexure A shall prevail for technical matters**, and **this Part 3 shall prevail for contractual matters**.

1.5 Existing System

The Oil Lab is located at the Rotek facility. The existing Sample Manager 21.2 LIMS is the target integration platform for the automated work cell.

1.6 Interpretation and terminology

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The following abbreviations and definitions apply to this Service Information and are to be read together with the contract documents. Where a term is defined in the conditions of contract, that contractual meaning takes precedence unless this Service Information requires a more specific technical interpretation.

The following abbreviations are used in this Scope Document.

Abbreviation	Meaning
AFC	Approved for Construction
C&I	Control and Instrumentation
CQP	Contract Quality Plan
CRM	Certified Reference Material
CSV	Comma-Separated Values
DGA	Dissolved Gas Analysis
DMZ	Demilitarised Zone
ECM	Engineering Change Management
FAT	Factory Acceptance Testing
FDS	Functional Design Specification
GPRS	General Packet Radio Service
HMI	Human-Machine Interface
HPLC	High Performance Liquid Chromatography
HTTPS	Hypertext Transfer Protocol Secure
IEC	International Electrotechnical Commission
IFT	Interfacial Tension
IQC	Internal Quality Control
IQ/OQ/PQ	Installation Qualification / Operational Qualification / Performance Qualification
ISO	International Organisation for Standardisation
ITP	Inspection and Test Plan
LIMS	Laboratory Information Management System
MDR	Multi-disciplinary Review
MFA	Multi-Factor Authentication
MTBF	Mean Time Between Failures
NEC	New Engineering Contract
NCR	Non-Conformance Report
OBL	Outside Battery Limits
OEM	Original Equipment Manufacturer
OPC	Open Platform Communications
OT	Operational Technology
PLC	Programmable Logic Controller
QCP	Quality Control Plan
RAC	Registered Asbestos Contractor
RFID	Radio Frequency Identification
RSD	Relative Standard Deviation
SANAS	South African National Accreditation System
SANS	South African National Standards
SAT	Site Acceptance Testing

2 Management strategy and start up.

2.1 The *Contractor*'s plan for the *service*

The Contractor shall provide a comprehensive scope execution plan which complies with the requirements of this Service Information.

The Contractor's plan shall be submitted for acceptance within two (2) weeks of the Contract Date in accordance with core clause 21.1. The plan shall be a single integrated programme that incorporates all the work to be performed, including that of his Subcontractors. The interfaces between Subcontractors as well as the interfaces between Subcontractors and the Contractor shall be clearly identified.

The Contractor's plan shall take into consideration and address the following requirements:

Table 1: Contractor's Plan Components

No.	Component	Description
2.1.1	Site Inspections	Conduct physical inspections of the Employer's selected sites (Rotek Oil Lab facility) to inform the Contractor of the site-specific requirements for the design of the automated work cell.
2.1.2	Location Determination	Determine the appropriate location at the selected sites for the installation of the automated work cell to ensure effective measuring, monitoring, and operational efficiency.
2.1.3	System Design	Design an automated work cell with the requirements specified in Section 2.1.3 below.
2.1.4	Design Review	Design review requirements and approval of the final design as per Eskom Design Review Procedure (240-53113685).
2.1.5	Documentation	Submit installation, commissioning, operating and maintenance manuals and procedures for the automated work cell.
2.1.6	Factory Acceptance Testing	Facilitate acceptance testing of the automated work cell prototype at the Contractor's premises.
2.1.7	Training Proposal (Practical)	Submit a training proposal for practical training to be approved by the Employer.
2.1.8	Supply of Equipment	Supply four (4) automated work cell systems complete with all accessories and material required, as per the approved design.
2.1.9	Quality Documentation	Provide the quality control plan and inspection test plan for all activities of this scope.
2.1.10	Installation and Commissioning	Install and commission the automated work cell systems at the Employer's selected sites.
2.1.11	Practical Training	Provide practical training to the Employer as part of the installation and commissioning works.
2.1.12	Training Proposal (Theoretical)	Submit a training proposal for theoretical training to be approved by the Employer.
2.1.13	Theoretical Training	Provide theoretical training to the Employer once commissioning of all sites has been completed.
2.1.14	Technical Support	Provide technical support to the Employer on an as-and-when required basis.
2.1.15	Knowledge Transfer	Participate in knowledge transfer workshops on request from the Employer, on an as-and-when required basis.

2.1.2 Site Inspections

The Contractor shall conduct physical inspections of the Employer's selected sites provided in this Service Information. This will inform the Contractor of the site-specific requirements for the design of the automated work cell.

The site inspections shall include, but not be limited to:

- Verification of available space and layout constraints
- Identification of existing services and utilities
- Assessment of environmental conditions
- Verification of access routes and logistics requirements
- Identification of SHEQ hazards and risks

2.1.2 Location Determination

The Contractor shall determine the appropriate location at the selected sites for the installation of the automated work cell to ensure effective measuring and monitoring.

2.1.3 System Design Requirements

The Contractor shall design an automated work cell with the following requirements:

2.1.3.3 Web-Based Data Acquisition System

The Contractor shall integrate the GIC and magnetic field data into a web-based data acquisition system that can be accessed on-site and remotely, with the following specific requirements:

Requirement	Description
Interface	Hypertext transfer protocol secure (HTTPS) enabled web-based interface to navigate, view, download and interrogate the data using Microsoft Excel or comma-separated values (CSV) file formats without any encryptions.
Browser Support	Support common web browsers (Microsoft Edge, Mozilla Firefox, Google Chrome, Safari) on a personal computer or mobile device (cell phone, tablet, etc.).
SMS Notifications	Direct SMS notifications from the system shall always be available and operational to multiple end users. Notifications must include the GIC level in Amperes per monitored transformer. The Employer (multiple end users) must be able to specify and enter the limits of the GIC level in Amperes in the system.
Manual Download	Capability to manually download data from the system via a universal serial bus (USB) port, using Microsoft Excel or CSV file formats without any encryptions.
Data Storage	Minimum data storage period (data availability for download) of 2 years.
Data Display	Data display as data points, graphs or any user-friendly method, allowing data interrogation on both the web-based interface and exported data files.

2.1.3.4 Communication Medium

The automated work cell communication medium shall be general packet radio service (GPRS) or any latest mobile communication technology.

2.1.3.5 Enclosure and Protection

The automated work cell shall be enclosed to protect its functionality and operation against environmental elements. An ingress protection (IP) rating of 56 will be accepted, as a minimum.

2.1.3.6 Seismic Requirements

The automated work cell design shall be able to withstand seismic conditions at a minimum of 0.3g.

2.1.3.7 Expected Life Span

The expected life span of the automated work cell shall be at least 15 years.

2.1.3.8 Completeness

All components and accessories required for the successful operation of work under the scope of this project, either specified in detail or not, shall be supplied, installed and commissioned by the Contractor as necessary.

The automated work cell shall be complete with all the equipment and material necessary for the safe, reliable operation and maintenance of the system.

Any equipment and/or function of the automated work cell not specified herein shall be designed and supplied as required by the overall design of the system.

2.1.4 Design Review Requirements

Design review requirements and approval of the final design shall be in accordance with the Eskom Design Review Procedure (240-53113685).

The Contractor shall present the design to the Employer for technical review along with all relevant drawings. A design review is a planned exercise to ensure that there is a common understanding of the applicable standards and specification requirements, and to provide an opportunity to scrutinize the design to ensure the requirements meet the Employer's requirements.

During this meeting, the comments of the Employer on the design will be reviewed and discussed in detail to finalize the design. The Contractor's installation and commissioning methodology will be reviewed as part of the design review.

The design shall be accepted by the Project Manager for approval.

2.1.5 Documentation Submission

The Contractor shall submit installation, commissioning, operating and maintenance manuals and procedures for the automated work cell for all sites.

2.1.6 Factory Acceptance Testing

The Contractor shall facilitate acceptance testing of the automated work cell prototype at the Contractor's premises.

Factory Acceptance Testing (FAT) Requirements:

- All safety functions shall be demonstrated during FAT.
- Testing shall verify the initiating device or condition, logic response, safety I/O, diagnostics, safe state, equipment response, alarm/indication, reset and prevention of automatic restart.
- FAT records shall identify the safety function tested, test method, expected result, actual result, witness/approval status, defects and closure evidence.
- Safety-related changes arising from testing shall be controlled, documented and verified before acceptance.

2.1.7 Training Proposal (Practical)

The Contractor shall submit a training proposal for practical training which will be approved by the Employer.

As a minimum, the training proposal shall address the following requirements:

Requirement	Description
Number of Participants	10
Requirements	This should be carried out as part of the installation and commissioning of the automated work cell at all sites and shall be based on the training proposal submitted by the Contractor.
Training Location	Each of the selected Eskom sites where the automated work cell will be installed.
Training Duration	Based on installation and commissioning duration per site, as proposed by the Contractor.
Training Modules	Installation, commissioning, operation, maintenance, software operation and troubleshooting, web-based application operation and troubleshooting, download and analysis of results, safety aspects.
Programme per Training Intervention	Proposal to be submitted by the Contractor.
Certification	Issuing certificates of attendance to all participants.

2.1.8 Supply of Equipment

The Contractor shall supply automated work cell systems complete with all accessories and material required, as per the approved design.

2.1.9 Quality Documentation

The Contractor provides the quality control plan and inspection test plan for all activities of this scope.

Quality Documentation Requirements:

- Supplier Quality Management Specification (240-105658000)
- Contract Quality Plan (CQP)
- Quality Control Plan (QCP)/Inspection and Test Plan (ITP)
- Method Statements
- Non-Conformance Reports (NCRs)
- Calibration certificates for all testing equipment
- Material certificates and test reports

2.1.10 Installation and Commissioning

The Contractor shall install and commission the automated work cell systems at the Employer's selected sites.

2.1.11 Practical Training

The Contractor shall provide practical training to the Employer as part of the installation and commissioning works at the selected sites.

2.1.12 Training Proposal (Theoretical)

The Contractor shall submit a training proposal for theoretical training which will be approved by the Employer.

As a minimum, the training proposal shall address the following requirements:

Table 4: Theoretical Training Requirements

Requirement	Description
Number of Participants	20
Requirements	Classroom training. Complete training manuals to be provided covering all training modules to be presented.
Training Duration	Suppliers to declare duration of training based on contractor's training proposal.
Training Modules	Installation, commissioning, operation, maintenance, software operation and troubleshooting, web-based application operation and troubleshooting, download and analysis of results, safety aspects. Aspects covering geomagnetic disturbances (GMDs) and geomagnetically induced current (GIC) theory shall be limited as there is sufficient publicly available literature on the topic. The training content of the training modules shall be approved by the Employer.
Program	Based on contractor's training proposal.
Certification	Issue certificates of attendance to all participants.

2.1.13 Theoretical Training

The Contractor shall provide theoretical training to the Employer once commissioning of all the sites has been completed.

2.1.14 Technical Support

The Contractor shall provide technical support to the Employer on an as-and-when required basis.

2.1.15 Knowledge Transfer

The Contractor may be required to participate in knowledge transfer workshops on request from the Employer, on an as-and-when required basis.

2.1.16 General Requirements

The following general requirements shall apply:

Table 5: General Requirements

Requirement	Description
Completeness	All components and accessories required for the completion and successful operation of the Work covered under the scope of this project, either specified in detail or not, shall be supplied by the Contractor as necessary.
Reliability	The automated work cell shall be complete with all the equipment and material necessary for the safe, reliable operation and maintenance of the system.
Design Completeness	Any equipment and/or function of the automated work cell not specified herein shall be designed and supplied as required by the overall design of the system.
Transportation	The Contractor shall provide transportation of all equipment and accessories required as part of the work to the relevant sites.
Storage	The Contractor shall provide suitable storage of all equipment during installation and commissioning activities.
Documentation	Provide all the required documentation pertaining to the automated work cell.

Table 6: Contractor's Plan Deliverables Summary

No.	Deliverable	Timing
1	Project kick-off and safety file clearance	Within 1 week of Contract Date
2	Contractor's inspection of Employer's selected sites	Within 2 weeks of Contract Date
3	Interim design of automated work cell	Within 4 weeks of Contract Date
4	Employer's review of interim design	Within 2 weeks of submission
5	Final design of automated work cell, including installation, commissioning, operating and maintenance procedures and manuals	Within 6 weeks of Contract Date
6	Employer's review of final design	Within 2 weeks of submission
7	Contractor procures material and equipment	Within 8 weeks of final design approval
8	Acceptance testing of prototype at Contractor's premises	Within 4 weeks of procurement completion
9	Submission of practical training proposal	Within 4 weeks of procurement completion
10	Supply, installation, commissioning, site acceptance testing and practical training at sites	To be confirmed
11	Theoretical training	After commissioning of all sites

2.2 Management meetings

Meetings will be held between the Employer, the Contractor and any other co-opted members. The Contractor will be represented at each meeting by appropriate members of its staff. All meetings will be chaired by the Project Manager.

The venue for these meetings will be as determined by the Project Manager. The Project Manager will prepare and issue the minutes of these meetings.

All meetings shall be recorded using minutes or a register prepared and circulated by the person who convened the meeting. Such minutes or register shall not be used for the purpose of confirming actions or instructions under the contract as these shall be done separately by the person identified in the conditions of contract to carry out such actions or instructions.

A summary of the planned meetings is provided in Table 2.

2.2.1 Kick Off Meeting

Kick-off meeting will be held within 1 week after the award of the contract. This meeting will cover Project implementation, the Scope of work, and Schedule. This will give the Contractor an opportunity to discuss all matters related to carrying out their responsibilities.

2.2.2 Progress Meetings

Weekly progress meetings will be held covering progress to date on the execution of the scope of works, and all associated risks, risk impact and risk mitigation.

2.2.3 Design Review Meetings

The Contractor shall present the Design to the Employer for technical review along with all relevant drawings.
A design review in a planned exercise is envisaged to ensure that there is a common understanding of the applicable standards and specification requirements, and to provide an opportunity to scrutinize the design to ensure the requirements meet the Employer's requirements.

During this meeting, the comments of the Employer on the design will be reviewed and discussed in detail to finalize the design for the RTM system. The Contractor's installation and commissioning methodology will reviewed as part of the design review.

The design shall be accepted by the Project Manager for approval.

2.2.4 Ad-hoc Meetings

Ad-hoc meetings to discuss any matters related to the execution of the scope of work on an as-and-when required basis upon request from the Employer or the Contractor.

2.2.5 Meetings of a Specialist Nature

Meetings of a specialist nature may be convened as specified elsewhere in this Works Information or if not so specified by persons and at times and locations to suit the Parties, the nature and the progress of the works. Records of these meetings shall be submitted to the Project Manager by the person convening the meeting within five days of the meeting.

Table 7: Planned Meetings

Title and purpose	Approximate time & interval	Location	Attendance by:
Kick off meeting: Covering Project implementation, the Scope of work, Schedule and Safety File Requirements. This will give The *Contractor* an opportunity to discuss all matters related to carrying out their responsibilities.	Once-off, shortly after award of the contract. Date, time and duration to be confirmed upon award of contract.	Eskom Research, Testing & Development Offices, Lower Germiston Road, Rosherville,	*Employer*, *Supervisor*, *Contractor* and others as determined by the *Project Manager*.
Design review meetings: Technical review of the *Contractor's* RTM system design, and installation and commissioning methodology	Frequency, date and time to be confirmed during kick-off meeting.	Remotely via Microsoft Teams or in-person at Eskom Research, Testing & Development.	*Employer*, *Supervisor*, *Contractor* and others as determined by the *Project Manager*.
Progress meetings: Covering progress to date on the execution of the scope of works, and all associated risks, risk impact and risk mitigation.	Weekly. Day, time and duration to be confirmed and agreed upon at kick off meeting.	Remotely via Microsoft Teams or in-person at Eskom Research, Testing & Development.	*Employer*, *Supervisor*, *Contractor* and others as determined by the *Project Manager*.

Adhoc meetings	As-and-when required. Date, time and duration to be confirmed.	Remotely via Microsoft Teams or in-person at Eskom Research, Testing & Development	*Employer*, *Supervisor*, *Contractor* and others as determined by the *Project Manager*.
Meetings of Specialist Nature	As-and-when required. Date, time and duration to be confirmed.	Remotely via Microsoft Teams or in-person at Eskom Research, Testing & Development	*Employer*, *Supervisor*, *Contractor* and others as determined by the *Project Manager*.