	<p align="center"><b>QUALITY MANAGEMENT SYSTEM</b></p> <p align="center"><b>SCOPE OF WORK</b></p>	<p>Form No: SAM DO 00001 T</p> <p>Revision No: 02</p> <p>Effective Date: November 2022</p>
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**SCOPE OF WORK FOR:**

**PROVISION OF NON-DESTRUCTIVE TESTING FOR VARIOUS RAND WATER PROJECTS FOR THE DURATION OF 60 MONTHS**


**RFP Number: RW 10403094/25 : PACKAGE A, PACKAGE B,PACKAGE C,PACKAGE D and PACKAGE E**

**DATE: 9 December 2024**

**PROJECT MANAGER: LORRAINE HUHLWANE**

**TEAM MEMBERS**

Name	Discipline
Lorraine Huhlwane	Project Manager
Chandisaita Tumbare -Sanele Mkhize	Design Office
Nthabiseng Sibisi	Metallurgy
Mandy Malindi	Safety


	<p style="text-align: center;"><b>QUALITY MANAGEMENT SYSTEM</b></p> <p style="text-align: center;"><b>SCOPE OF WORK</b></p>	<p>Form No: SAM DO 00001 T</p> <p>Revision No: 02</p> <p>Effective Date: November 2022</p>
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## 1 SCOPE OF WORK

### 1.1 Provision of Non-Destructive Testing

- 1.1.1 The Service Provider shall supply equipment to conduct the following test on pipes and other welded structure
- I. Liquid penetration or dye-penetrant testing (LPT),
  - II. Ultrasonic testing (UT),
  - III. Magnetic Particle testing (MPT), Phased Array Ultrasonic testing (PAUT),
  - IV. Eddy Current testing (EC),
  - V. Electromagnetic testing (ET),
  - VI. Radiographic testing (RT),
  - VII. Acoustic Emission testing (AET)
  - VIII. Wall Thickness tests
- 1.1.2 The Service Provider shall supply equipment to conduct the following specialised test on pipes and other welded structure as requested
- I. Leak detection using CCTV,
  - II. Guided Wave,
  - III. Ultrasonic test,
  - IV. Infrared and Laser tests.
- 1.1.3 The Service Provider shall set-up NDT equipment (include quality control checks, consumables, etc).
- 1.1.4 The Service Provider shall Perform tests and record findings.
- 1.1.5 The service provider to employ registered Inspectors of Pressurised Equipment (IPE) and Competent Persons (CP) to execute the required tasks. The Association also handles any complaints raised against AIAs in the performing of their duties.
- 1.1.6 The Service Provider shall supply qualified and skilled resources to perform the tests and inspections to assure the quality of works.
- The following resources must be supplied

Resources	Minimum Qualification	Experience
Supervisor/Team Leader	Mechanical Engineering Degree/related Engineering Qualification / NDT Diploma and NDT Level 2 from a recognized institution	5-10 years' experience
NDT Level 3	NDT Level 3 (any of the following methods MP, UT, RT) from a recognized institution	10 years' experience
Magnetic Particle Technician	MPT Level 2 qualification /NDT Diploma from a recognized institution	5 years' experience
Ultrasonic Technician	UT Level 2 qualification /NDT Diploma from a recognized institution	5 years' experience
UTWT Technician	WTT Level 2 from a recognized institution	5 years' experience
NDT Technician Assistant	NDT Level 1 from a recognized institution	3 years' Experience
UT/MPT/RT Assistants	UT/MPT/RT Level 1 from a recognized institution	3 years' Experience
Radiation Protection Officer	RT Level 2 from a recognized institution & RPO certificate	5 years' experience
Darkroom technician	Matric and Radiography Qualification	3 years' Experience
Data Capturer	Administration qualification	5 years' Experience in administration
Safety Officer	Safety Qualification, SAMTRAC/NOSA certificate / Safety Management Diploma from a recognized institution	5 years' Experience in safety Management
Barrier Watcher	Matric and related training	3 years' experience
Junior Welding Inspector	Welding Inspection Level 1 from a recognized institution	5 Years' experience
Welding Inspector	Welding Inspection Level 2 from a recognized institution	5 Years' experience
Coating Inspector	Coating inspection Level 1 from a recognized institution	5 Years' experience
Pressure Vessel /Equipment Inspector	Accreditation and registration as PEI SANAS accreditation	10 years' experience

	<p align="center"><b>QUALITY MANAGEMENT SYSTEM</b></p> <p align="center"><b>SCOPE OF WORK</b></p>	<p>Form No: SAM DO 00001 T</p> <p>Revision No: 02</p> <p>Effective Date: November 2022</p>
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Metallurgist /Material Engineer	Metallurgy /Material qualification from a recognized institution	5 years' experience with Degree or 10 years' experience with Diploma Registration with ECSA ( Minimum registration as Candidate
Civil Technician	NDip Civil Engineering qualification from a recognized institution	5 years' experience with Diploma or 10 years' experience without diploma Registration with ECSA ( Minimum registration as Candidate
Process Automation Technician or	NDip Process Engineering qualification from a recognized institution	5 years' experience with Diploma or 10 years' experience without diploma Registration with ECSA ( Minimum registration as Candidate
Mechanical Inspector /Technician	NDip Mechanical Engineering qualification from a recognized institution	5 years' experience with Diploma or 10 years' experience without diploma Registration with ECSA ( Minimum registration as Candidate
Building /structural Technician	NDip Building /Structural Engineering qualification from a recognized institution	5 years' experience with Diploma or 10 years' experience without diploma Registration with ECSA ( Minimum registration as Candidate
Quality Management System Auditor /Officers	Quality Management /Operation Management qualification from a recognized institution	5 years' experience in Quality System Auditing Registration with SAATCA as a candidate

**The service provider to supply the welding Inspector responsible to conduct the following duties:**

A Welding Inspector must ensure all the welding and associated actions are carried out per the specification and any applicable procedures. In addition to working in the field and completing their examination of welding projects, inspectors spend time compiling the reports in an office setting. The majority of inspectors work on a full-time basis, primarily during business workdays.

A Welding Inspector must:

- Observe all relevant actions related to weld quality throughout production.
- Record or log all production inspection points relevant to quality, including a final report showing all identified imperfections.
- Compare all recorded information with the acceptance criteria and any other relevant clauses in the applied application standard.

	<p style="text-align: center;"><b>QUALITY MANAGEMENT SYSTEM</b></p> <p style="text-align: center;"><b>SCOPE OF WORK</b></p>	<p>Form No: SAM DO 00001 T</p> <p>Revision No: 02</p> <p>Effective Date: November 2022</p>
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**Pre-welding procedures include**

**Preparation:**

- Familiarization with relevant documents
- Application standard/code - for visual acceptance requirements
- Drawings - item details and positions/tolerances, etc.
- Quality Control Procedures - for activities such as material handling, documentation control, storage, and the issue of welding consumables.
- Quality Plan/Inspection and Test Plan/Inspection Checklist - details of inspection requirements, inspection procedures, and records required

**During welding, the welding inspector shall monitor:**

- Suitability of the weather conditions
- Compliance with the Welding process(es) used
- Selection of the correct welding techniques
- Selection of the suitable welding consumables
- Selection of the appropriate welding parameters
- Carrying out inter-run dressing

**After welding is completed, the inspector shall carry out the following procedures:**

**Weld identification**

- Identified/numbered as required
- It is marked with the welder's identity

**Visual inspection**

- Ensure weld is suitable for all NDT
- Visually inspect and sentence to code requirements

**Dimensional survey**

- Ensure dimensions comply with code/drawing

**Other NDT**

- Ensure all NDT is completed and reports available

**Repairs**

- Monitor repairs to ensure compliance with procedure PWHT
- Monitor for compliance with the procedure
- Check chart records confirm procedure compliance

**Pressure/load test**

- Ensure test equipment is suitably calibrated

	<p style="text-align: center;"><b>QUALITY MANAGEMENT SYSTEM</b></p> <p style="text-align: center;"><b>SCOPE OF WORK</b></p>	<p>Form No: SAM DO 00001 T</p> <p>Revision No: 02</p> <p>Effective Date: November 2022</p>
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- Monitor to ensure compliance with the procedure
- Ensure all records are available

#### **Documentation**


- Ensure any modifications are on as-built drawings
- Ensure all required documents are available
- Collate/file documents for manufacturing records
- Sign all documentation and forward it to the QC department

#### **Resume**

- Check all documentation
- Check all consumables
- Check materials, dimensions, and condition
- Preheating, method, and temperature
- Check fit and set-up
- Ensure no undue stress is applied to the joint
- Check welding equipment
- Check amperage, voltage, polarity
- Ensure the correct technique, run sequence
- Check runout lengths, time-lapses
- Cleaning between passes
- Interpass temperatures
- Consumable control
- Maintenance of records and reports
- Post cleaning
- Visual inspection of completed welded joint
- Check weld contour and width
- PWHT
- Dimensional accuracy
- Weld reports
- Tie up with NDT
- Monitor any repairs

- 1.1.7 The service provider to supply the Level 2 technicians responsible to conduct the Specified Non-Destructive Testing methods, all test shall be conducted by the Level 2 and assisted by a Level 1

Note: When conducting the tests, the following resources must always be available onsite

	<p style="text-align: center;"><b>QUALITY MANAGEMENT SYSTEM</b></p> <p style="text-align: center;"><b>SCOPE OF WORK</b></p>	<p>Form No: SAM DO 00001 T</p> <p>Revision No: 02</p> <p>Effective Date: November 2022</p>
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- a) 1X Level 2
- b) 1X Level 1(Assistant)
- c) 1X Supervisor
- d) RPO where Radiography is conducted
- e) Safety Officer


1.1.8 The service provider to supply the specified technicians (Resources) to conduct the Civil, Mechanical, Automation, Building, Material, components (i.e. Valves and pumps) and pressure vessel tests and inspection as required

1.1.9 The service provider **shall appoint in writing, a responsible NDT Level 3**, who remains accountable for the integrity of the tests /inspections.

- This appointment can be a person nominated from an outside agency if required.
- If the primary responsible NDT Level 3 is not certified in all NDT methods, a secondary NDT Level 3 shall be appointed to cover the requirements of those methods. However, the primary NDT Level 3 will remain accountable for all NDT work.
- The Service Provider shall ensure that permanent or sub-contracted NDT personnel have the required experience for the scope of work to be carried out. The main contractor NDT SP's Level 3 will be responsible for authorising the subcontracted individual based on the main contractor's written practice requirements.
- The NDT Service Provider shall issue an authorisation for each employee, specifying the extent of certification and the extent of the duties that can be performed following the authorization process in the SP written practice. The authorisation shall document the procedures each employee is authorised to execute and the area to which each employee is limited to.
- The NDT service provider's authorisation of an employee or sub-contractor is limited by the individual's certification. The NDT SP shall maintain a database (spreadsheet, list, etc.) of its employees which specifies the employee's certification status. The database shall include details such as type of certification, certification validity, vision test validity, and limitations, if any.

1.1.10 **The qualified NDT level 3 Technician shall be responsible**


- a) Develop standard operating "best" practices for NDT systems.
- b) Interpret codes, standards, specifications, procedures, designating the particular NDT methods and procedures to be used.
- c) Develop, qualify, and approve NDT procedures and associated techniques related to UT/RT.
- d) Review customer specifications to ensure NDT process / equipment capabilities are met.
- e) Provide interpretation of NDT results in terms of existing codes, standards, and specifications.

	<p style="text-align: center;"><b>QUALITY MANAGEMENT SYSTEM</b></p> <p style="text-align: center;"><b>SCOPE OF WORK</b></p>	<p>Form No: SAM DO 00001 T</p> <p>Revision No: 02</p> <p>Effective Date: November 2022</p>
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- f) Establish NDT operating setups and acceptance criteria.
- g) Ensuring that equipment and consumables functions in compliance with code requirements
- h) Provides direction and necessary training to NDT personnel.
- i) Responsible for radiation safety program including interpreting local, state, and federal code requirements.
- j) Lead initiatives on new NDT installations, equipment, and testing methods.
- k) Monitor and conduct acceptance testing with employees on the shop floor.
- l) Develop NDT auditing plans for compliance with NDT written practices.
- m) Represent company regarding NDT issues during customer audits and field inspect.
- n) Tests/Inspection reports sign off.

**1.1.11 The service provider to provide a supervisor/team leader to perform the following duties**

- a) NDT Supervisor is responsible for managing a team of technicians in facilitating the analysis techniques in terms of Non-destructive testing.
- b) Oversees technicians, testing methods and processes.
- c) Cross check and ensure that test results submitted are accurate and reliable.
- d) Supervise and coordinates work performed by the team is appropriate to ensure that work targets are met in timely schedule in accordance with applicable standards and contract specification.
- e) Communicate any problem areas in a timely manner.
- f) Periodic review and updates of all NDT general and specific procedures to cope up with current NDT standards and recommended practices.
- g) Ensure that personnel, whether in-house or subcontracted, is qualified, i.e., has sufficient knowledge, skill and the physical abilities to perform the inspection.
- h) The supervisor should be available during all inspections.
- i) Interacting with the project team to ensure compliance with code and client requirements.
- j) Establishes an inspection 'chain of command' to enable status updates and summaries of results to be produced.
- k) Responsible for documentation processes and for establishing, reviewing and validating inspection techniques and related documents to ensure that the detection capability and probability of detection is within an acceptable range. Documents relating to personnel qualification and certification, equipment verification, reporting structure and archiving, should be controlled via a process established.
- l) Ensuring that equipment and consumables functions in compliance with code requirements.

	<p style="text-align: center;"><b>QUALITY MANAGEMENT SYSTEM</b></p> <p style="text-align: center;"><b>SCOPE OF WORK</b></p>	<p>Form No: SAM DO 00001 T</p> <p>Revision No: 02</p> <p>Effective Date: November 2022</p>
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- m) Creation, or facilitate the creation of the quality environment in which NDT can be performed; and ensure that the requirements of the client and that of the governing codes are met.
- n) Represent company regarding NDT issues during customer audits and field inspect.
- o) Monitor performance of technicians as appropriate and accept full responsibility for all the test results submitted to inspection engineers.


1.1.12 The service provider to supply the Quality Management Auditors to conduct projects audits to ensure compliance.

1.1.13 The Service Provider shall supply a Databook on completion of the work which contains the following:

- i. Full report on defects and repairs report
- ii. Test reports /certificates

1.1.14 The Service Provider to submit the following documentation prior to Non Destructive methods testing execution

- a. A list of all applicable procedures stating the procedure title, number and revision applicable to all the NDT systems.
- b. A list of all NDT personnel to be used for conducting inspections.
- c. SP NDT Level 3 appointment and acceptance letter(s) indicating whether the SP NDT Level 3 is appointed as primary or secondary.
- d. NDT Level 3(s) certifications with valid NDT Level 2 meeting the requirements of ISO9712.
- e. Appointed SP NDT Level 3 eye tests.
- f. NDT Level 1 and 2 technicians' certifications according to ISO9712 for the personnel listed in the letter above.
- g. Appointments/company authorizations for the NDT Level 1 and Level 2 technicians.
- h. Eye tests for the NDT Level 1 and Level 2 technicians.
- i. Appointments and authorizations for the RPO & ARPO.
- j. Written Practice.
- k. Procedures for MT, PT, UT, RT and all other applicable NDT procedures.
- l. Applicable techniques sheets related to SOW (equipment and component).
- m. Complete NDT Equipment list.

	<p style="text-align: center;"><b>QUALITY MANAGEMENT SYSTEM</b></p> <p style="text-align: center;"><b>SCOPE OF WORK</b></p>	<p>Form No: SAM DO 00001 T</p> <p>Revision No: 02</p> <p>Effective Date: November 2022</p>
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n. Calibration certificates of all equipment.

1.1.15 The contractor shall provide the fully Movable Dark Room for processing the films, including processing equipment.

## **2 SAFETY, HEALTH AND ENVIRONMENT**

**2.1.1** The contractor shall Prepare and submit the Health and Safety File (hard and soft copies) prior to execution

2.1.2 The contractor shall submit the

2.1.3 The contractor shall provide a Storage facility for equipment & consumables

2.1.4 The contractor shall provide and manage the Hygiene Facility

2.1.5 The contractor shall manage the hazardous waste and provide the hazardous waste bin

2.1.6 The contractor shall barricade the area in operation

2.1.7 The contractor shall provide the safety signages

2.1.8 The contractor shall provide Personal Protective Equipment (PPE)

2.1.9 The contractor shall provide the employee wellness program

2.1.10 The contractor to make Provision and Management of Pandemic

## **3 QUALITY ASSURANCE**

### **3.1.1 Quality Management Plan**

The contractor shall develop, implement, and maintain a formal quality management system that conforms to the latest ISO 9001 standard or any applicable standard of quality management system (latest applicable revision) and in accordance with the requirements of this specification.


Such a formal system shall consist of the appropriate documentation such as a quality manual, quality plans, work procedures, work instructions, method statements, workflow documentation, etc. This requirement constitutes the most basic quality management system requirements.

### **3.1.2 Quality Control Plan/Inspection and Test Plan**

The contractor shall submit the Quality Control Plan within 14 days prior to the commencement of work, for review and approval by Rand Water.

### **3.1.3 Document Management**

a) The contractor shall ensure that all documents are accessible and readily available.

	<p style="text-align: center;"><b>QUALITY MANAGEMENT SYSTEM</b></p> <p style="text-align: center;"><b>SCOPE OF WORK</b></p>	<p>Form No: SAM DO 00001 T</p> <p>Revision No: 02</p> <p>Effective Date: November 2022</p>
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b) Documents to be managed not limited to the following: Method Statements, Tests and Inspection plans as well as Drawings.

c) Any changes to the working documents must be recorded.

#### 3.1.4 **Record Management**

a) The contractor shall control and manage the project information not limited to: Test results, daily diaries, method statements, Non-conformances, concessions, drawings, Training records, etc.

b) All documented information should form part of the data pack to be submitted on project completion. Rand Water requires 3 copies i.e., 1 hard copy and 2 soft copies.

#### 3.1.5 **RESOURCE MANAGEMENT**

##### **People**

Contractor shall provide qualified and skilled resources needed to monitor the quality of works as requested.

##### **Materials, products, and services**

The contractor shall ensure that all materials used conform to the specifications and the material certificates must be kept for record.

##### **Equipment**

The contractor shall supply all the equipment/instruments required in the Contract documents to perform the specified quality inspection services.


The supplied equipment/instruments shall be calibrated by the SANAS accredited bodies, and the calibration certificate shall be kept for the duration of the project.

#### 3.1.6 **Training**

The contractor shall provide training to personnel who perform activities that affect quality of works.

a) All personnel who perform quality activities shall have their training needs identified and documented. The required training shall be implemented in accordance with the company's training management and competency control procedures. All the training certificates shall meet the SETA requirements in terms of having the unit standard completed and the accreditation number of the service providers.

b) The personnel required to perform special processes shall be certified competent through a certificate of competency in accordance with the company's internal training management and competency control procedures or an external certification body (for example, NDT) through an accredited service provider as per Skills Education Training Authorities (SETA) requirements.

	<p style="text-align: center;"><b>QUALITY MANAGEMENT SYSTEM</b></p> <p style="text-align: center;"><b>SCOPE OF WORK</b></p>	<p>Form No: SAM DO 00001 T</p> <p>Revision No: 02</p> <p>Effective Date: November 2022</p>
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- c) The contractor to submit the welder's qualification record (WQR), welding procedure specifications (WPS), and procedures qualification records (PQR) for review and acceptance prior to commencing with welding activities. Records to be kept and handed over on completion of the project.

#### 3.1.7 Quality Audits

- a) The contractor shall conduct independent quality audits annually during the contract duration, and the contractor shall provide all resources to support these activities.
- b) Quality audits and related quality performance reviews shall be carried out by trained, and experienced personnel.
- c) Rand Water reserves the right to oversee the contractor's s audit programmes by participating in selected audits as an observer and by assessing the contractor during key work stages.

## 4 PROJECT OBJECTIVES

- a) Inspection and testing in a reliable, safe, and cost-effective manner without the need to shut operations down, lose income or damage any of the equipment.
- b) Detect, identify and/or measure the presence of anything that could damage a component, such as corrosion or cracks.

## 5 DELIVERABLES

### DELIVERABLES BY THE CONTRACTOR


The service provider shall be responsible for the following pertinent deliverables in terms of this scope of work, bill of quantities, applicable standard specifications, applicable system requirements, industry standards, technical specifications and the contract document:

- Non-Destructive Test of the welded Structure as per the request
- Provision of required quality management technicians
- Factory Acceptance Testing (FAT) of Pumps, Valves, and other components
- Testing and Inspection reports
- Lesson Learnt report
- Data pack at handover

## 6 PROJECT CONSTRAINTS

The following are the constraints for the project:

- a) Fatigue caused by human error.

	<p style="text-align: center;"><b>QUALITY MANAGEMENT SYSTEM</b></p> <p style="text-align: center;"><b>SCOPE OF WORK</b></p>	<p>Form No: SAM DO 00001 T</p> <p>Revision No: 02</p> <p>Effective Date: November 2022</p>
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- b) Flaws caused by incorrect technique or setup in how the weld was created.
- c) Environmental damage to the weld (i.e., temperature extremes, the presence of moisture, or the use of incompatible metals).
- d) Availability of NDT Level 3 (Scarcity which might lead to sharing of resources).