



SFF MILNERTON TANK FARM

TANK INSPECTION WORKS

SCOPE OF WORK



Table of Contents:

EXECUTVE SUMMARY

BACKGROUND

1. PROJECT DATA

1.1. Tank technical information

1.2. Site layout

1.3. Deliverables

1.3.1. Method Statement


1.3.2. Project Schedule

1.3.3. Project HSE Plan

1.3.4. Resources

2. SCOPE OF WORKS

3. QUALITY CONTROL

	SCOPE OF WORK: TANK INSPECTION WORKS	Rev 1 25/03/2022
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EXECUTIVE SUMMARY

The Strategic Fuel Fund (SFF) wishes to appoint a Contractor to carry out Inspection Works on 4 tanks at the Milnerton Tank Farm facility, in accordance with API 653 requirements. These inspections will inform the refurbishment process that will follow the successful completion of inspection.

BACKGROUND

The Strategic Fuel Fund Association (SFF) is a Section 21 company and a subsidiary of the Central Energy Fund (CEF). It manages South Africa's strategic inventory of crude oil on behalf of the State.

SFF manages the storage facilities in the Western Cape at Saldanha Bay and Milnerton, outside Cape Town. The strategic stocks of crude oil and the land and buildings used to hold the stock are the property of the State. SFF has acted as the agent of the State in managing these assets under the guidance of ministerial directives issued by the Minister of Minerals and Energy in terms of the CEF Act.

1. PROJECT DATA

1.1. Tank technical information:

No of tanks	4	
Tank Names	CT 3; CT 12; CT 13 and CT 39	
Tank Diameter (all)	54.86m (180 ft)	
Tank Height (all)	14.63m (48 ft)	
Year of construction	1967	
Product stored	Crude oil	
Product Specific Gravity	0.918 (TBC by Client)	
Roof	External floating roof	
Floor	8mm thick annular ring, butt welded with permanent backing plates 6mm lap welded floor plates. Floor Plate material is ASTM A283 Grade C.	
Shell	6 butt welded strakes Shell plate material is ASTM A283 Grade C.	
	Strake	Plate Thickness
	S1	32mm
	S2	28mm
	S3	20mm
	S4	16mm
	S5	12mm
S6	8mm	

1.2. Site layout:



1.3. Deliverables:

The service provider, upon completion of the works, is to provide SFF with:

- **Provision of Tank Inspection Services for selected tanks as per API 653 Tank Inspection requirements.**
- **Provision of a API 653 Tank Condition report for each tank inspected.**
- **Provision of a scope of works for repairs/ refurbishment, based on the condition report for each tank, that will adhere to API 653 tank repair standards.**

Deliverables for each activity are listed under the respective activity heading. The Tenderer shall submit the following documents as deliverables for the tender, for perusal by the Client:

1.3.1. Method Statement: The method statement should clearly state how the Contractor intends to perform the prescribed work. A clear and concise method statement should be provided for each activity of the tank inspections. The method statement should detail, inter-alia, the tasks to be performed, access, equipment used, personnel involved, sequence of events, schedule, operational requirements, HAZOP procedures. The Contractor must make emphasis on the safety aspects of the methodology.

1.3.2. Project Schedule: A detailed project schedule showing the proposed sequence of activities in the form of a Gantt Chart shall be supplied. The project schedule should take advantage of accessible tanks to programme tasks such that the project duration is minimised. The schedule should include a work breakdown structure and resource schedule.

1.3.3. Project HSE Plan: A preliminary HSE plan shall be included with the submission. HSE plans shall comply with local regulations as well as SFF's safety policies.

1.3.4. Resources: The Contractor shall employ suitably qualified personnel for the execution of the work. Details of prescribed qualifications are indicated in the relevant parts of this document. In particular, Contractors shall submit:

- API 653 Inspector Certification for all personnel to be performing tank inspections
- Certified copies of calibration certificates for all inspection equipment to be used



- List of personnel to be employed on site. This list shall be the actual persons who will be employed and will be used for security screening purposes.

2. SCOPE OF WORKS

The Strategic Fuel Fund (SFF) wishes to appoint a Contractor to carry out inspection works on 4 tanks at the Milnerton Tank Farm facility, in accordance with API 653 requirements. These inspections will inform the refurbishment process that will follow the successful completion of inspection.

The overall tank inspection scope of works will encompass four activities per tank:

- Tank surface preparation
- Inspection and non-destructive evaluation
- Tank settlement survey

Upon completion of the inspection and settlement survey, the Contractor will issue a detailed condition assessment report per tank that will inform the required scope of repairs to be performed on the tank.

Note that this phase of the project does not involve any repair work.

Due to the nature of the project, tenderers are required to closely adhere to the provisions of this scope of work.

Tank Surface Preparation

Prior to commencement of internal tank inspections, the Contractor shall arrange for tank surface preparation. Surface preparation in accordance with ISO 8503 SA 2.5.

The methodology for tank cleaning shall provide details of equipment, access and spillage control measures. The preferred method of surface preparation is abrasive blasting. Alternative methods may be proposed subject to the Client's approval.

Surface preparation shall be performed on the following surfaces:

- Internal floor
- Internal shell to bottom weld
- Internal strake 1 vertical welds
- Internal strake 1 to 2 horizontal weld
- Shell nozzle welds
- External shell to bottom weld
- External strake 1 vertical welds
- External strake 1 to 2 horizontal weld and external shell nozzle welds
- Reinforcement plate to shell welds.

The Contractor shall indicate the measures to be taken for the storage and disposal of surface preparation by-products e.g. contaminated grit. This shall include proposed storage locations, methods of containment, disposal procedures, and quality control procedures.



Tank inspection, Specification and Non-Destructive Evaluation

The following are the specifications to be adhered to in accordance to API 653 Fifth Edition, November 2014:

Specifications

Acceptance Standards:

- Air Test: None
- Pen Oil: None
- MTPT: ASME Section VIII, Appendix 8 (paragraphs 8-3, 8-4, 8-5)
- RT: ASME Section VIII (paragraph UW-51(b))
- Tracer Gas: None
- UE: API Std. 650, Section 8.3.2.5
- VB: None
- VE: API Std 650, Section 8.5.1

Examiner Qualifications:

- Air Test: None
- MTPT: API Std 650, Section 8.2.3
- UE: ASNT SNT-TC-1A Level II or III. Level I personnel may be used under the supervision of Level II or Level III personnel with a written procedure in accordance with ASME Section V, Article 2.
- VB: API Std 650, Section 8.6.4
- VE: API Std 650, Section 8.5.1
- Tank Bottom Examination: Annex G of API 653

Procedure Requirements:

- Air Test: API Std 650, Section 7.3.5
- MTPT: ASME Section V
- UE: ASME Section V
- VB: API 650, Section 8.6
- VE: None
- Tank Bottom: Annex G of API 653

Tank Inspection scope of works

Due to the nature of the project, tenderers are required to closely adhere to the provisions of this scope of work

Tank Floor

1. Perform Tank Floor Mapping using MFL (Magnetic Flux Leakage) including MFL Handscan and UT Proof Up. This will determine top and bottom side corrosion of the tank floor.
2. Perform 100% Vacuum Box Testing on all the floor welds including the shell to bottom weld, annular to floor weld, all lap welded floor plates and the sump to floor weld.
3. Perform 100% Magnetic Particle Inspection on all the floor welds including the shell to bottom weld, annular to floor weld, all lap welded floor plates and the sump to floor weld.
4. Perform 100% visual inspection using the checklist found in Annex C of API 653.

Shell – Internal

1. Perform 100% Magnetic Particle Inspection on the entire strake 1 to strake 2 horizontal weld.
2. Perform 100% Magnetic Particle Inspection on all the strake 1 vertical welds.
3. Perform 100% Magnetic Particle Inspection on all the nozzle and man way welds.
4. Perform 100% visual inspection using the checklist found in Annex C of API 653. Special attention to be paid behind the floating roof seal and the current water to air interface where severe corrosion is anticipated.

Shell – External

1. Perform 100% Magnetic Particle Inspection on the entire strake 1 to strake 2 horizontal weld.
2. Perform 100% Magnetic Particle Inspection on all the strake 1 vertical welds.
3. Perform 100% Magnetic Particle Inspection on all the nozzle and man way welds including reinforcement plate to shell welds.
4. Perform 100% Magnetic Particle Inspection the entire shell to bottom weld.
5. 100% Visual inspection using the checklist found in Annex C of API 653. Special attention to be paid to the shell to bottom weld, internal condition of shell nozzles and flange faces of shell nozzles.
6. Leak test all nozzle reinforcement plates to 100 kPa, then conduct a soap air test internally and externally whilst under pressure to check for leaks.
7. Perform C Scan (using a shell crawler that has minimum 300mm coverage) on the entire strake 1 shell plates (100% Coverage).
8. Perform either 16 vertical C Scan Locations (using a shell crawler that has minimum 300mm horizontal coverage) equally spaced around the tank shell or 32 vertical B Scan Locations equally spaced around the tank shell.
9. Where pitting is identified the critical length shall be calculated in accordance with API 653 4.3.2.1 b) and evaluated accordingly.
10. Estimated corrosion rates to be calculated by API 653 inspector based on NDE carried out.
11. Estimated remaining life to be calculated by API 653 inspector based on NDE carried out.

Roof – Internal & External

1. 100% Visual inspection using the checklist found in Annex C of API 653.
2. AUT Roof Scanning - 16 Locations.
3. Leak Test Compartments. Refer to API 650 Annex C.



Resource Requirements

Recommended criteria for the tank inspection personnel and equipment are described in Table 1 and Table 2 respectively. Valid qualifications, logbooks and calibration certificates shall be supplied by the Contractor.

Table1: Test method personnel requirements

Method	Operator and Evaluator		NDE Log Book Signed	NDE Qualification
	Qualification	Experience		
Magnetic Particle Inspection	MT 2	320 Hours	Yes	Proof
Liquid Penetrant Inspection	LPT 2	280 Hours	Yes	Proof
Ultrasonic Testing – (Lamination and Flaw Detection)	UT 2	900 Hours	Yes	Proof
Ultrasonic Wall Thickness Measurement – (A-scan Only)	WT2 or UT1	120 Hours	Yes	Proof
NDT Visual Inspection	MT 2 & UT2	420 Hours	Yes	Proof
API 653 Visual Inspection	API 653	10 Years	Yes	Proof
Automated Ultrasonic Inspection	UT2 Equipment Suppliers Training Certificate	900 Hours	Yes	Proof
Magnetic Flux Leakage Inspection (MFL)	MT1, UT2 Equipment Suppliers Training Certificate	900 Hours	Yes	Proof
Magnetic Flux Leakage Inspection (MFL) (Hand scan)	MT1 & UT1 MT1, UT2 Equipment Suppliers Training Certificate	450 Hours	Yes	Proof
Bubble Leak Testing (Vacuum Box)	MT1 or WT2 or LPT1	180 Hours	Yes	N/A

Table 2: Test method equipment requirements

Equipment with Valid Calibration Certificates	Equipment on Site	Operators on Site	Evaluators on Site
Magnetic Particle Inspection	2 x Sets of Yoke	2	1
Liquid Penetrant Inspection	N/A	2	1
Ultrasonic Testing – (Lamination and Flaw Detection)	2 x Sets	2	1
Ultrasonic Wall Thickness Measurement – (A-scan Only)	2 x Sets	2	1
NDE Visual Inspection	N/A	2	1
API 653 Visual Inspection	N/A	1	1
Automated Ultrasonic Inspection	2 x Sets	2	2
Magnetic Flux Leakage Inspection (MFL)	2 x Sets	2	2
Magnetic Flux Leakage Inspection (MFL) (Hand scan)	1 x Set	1	1
Bubble Leak Testing (Vacuum Box)	1 x Set	1	1

Tank Settlement Survey

Only laser equipment is permitted with at least 2mm accuracy. Valid calibration certificates shall accompany all equipment used, with corrections considered. At least 3 sets of equipment should be deployed to be able to execute work concurrently. The tenderer is required to submit proof and references of at least 3 years or 150 tanks across the settlement criteria.

Table 3: Tank settlement survey scope

No.	Criteria/Scope	Reference/s	Technical Requirements/Variables
1	Shell Verticality ("Plumbness")	10.5.2.1	Plummet line method not permitted
2	Shell Roundness ("Ovality")	10.5.3 Table 10.2 Figure B.2	Coordinated (X, Y, Z) measurements at a minimum of 18 equally distanced locations around tank periphery (Maximum spacing of 32 ft around circumference). Deflection not permitted
3	Shell Settlement ("Differential")	B.2.2.4.e Figure B.3 B.3.2.1	Optimum cosine curve method / analysis to be used Free hand drawing method not permitted Internal and external capabilities to perform these criteria must be possible
4	Floor Settlement	Figure B.2	Maximum spacing of 10 ft across diameter diagonally More locations are recommended.
5	Edge Settlement	B.2.3 Figure B.6 Figure B.7 B.3.4 Figure B.11 Figure B.12 Figure B.13	B over R (Figure B.6) measurement alone are not sufficient to this measurement. Appropriate projection consideration (Figure B.7) must be included inclusive of the weld angle to the long weld (Figure B.11, Figure B.12, Figure B.13, B_{ew} , B_e & B_α).

	SCOPE OF WORK: TANK INSPECTION WORKS	Rev 1 25/03/2022
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3. QUALITY CONTROL

All work shall be subjected to the QA/QC requirements and procedures defined by the Code, SFF Specifications & Procedures and ISO 9000 series.