







## SPECIFICATION FOR TANK GAUGE SYSTEM

### HP02-00-IN-SPC-0003



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## 1.0 INTRODUCTION

### 1.1 Purpose of Document

#### 1.1.1 General

This engineering specification document defines the minimum technical and functional requirements for the design, manufacturing, supply, installation, inspection, testing (FAT and pre-commissioning), documentation and delivery of the Tank Gauging System installed at HAI PHONG 2 Project. Tank Gauging System shall engineered and constructed in accordance with this Technical Specification. Any confliction between this technical specification and contract; A deviation list shall specify in writing and get approval by OWNER/CONTRACTOR.

The Tank Gauging System offered shall have minimum of 25 years design life.

#### 1.1.2 Responsibility

VENDOR of Instrument Tank Gauging system shall be responsible for supply whole system ensuring that all the field instrument equipment and components supplied are mounted, fixed, installed, configured, testing and commissioning correctly so that the whole equipment and system will operate smoothly fit to design, reliable and meet all the technical specification requirements. Necessary maintenance requirements if any to support during guarantee period shall be inform and agree by the CONTRACTOR prior to purchase order.

VENDOR shall provide all necessary details documentation/drawings and material specifications to CONTRACTOR for review and approval as required to enable guarantee responsibilities to be confirm.

## 1.2 Definition and Abbreviations



### 1.2.1 Definition

Definitions used in this document are describe below:



|                |  |
|----------------|--|
| PROJECT        | HAI PHONG 2 PROJECT  |
| OWNER          | The Branch of Top Solvent (Vietnam) Limited Liability Company – Hai Phong Terminal |
| EPC CONTRACTOR | PTSC Thanh Hoa Technical Services Company  |

### 1.2.2 Abbreviation

|     |                                  |
|-----|----------------------------------|
| A/D | Analogue to Digital (conversion) |
| DEP | Design and Engineering Practice  |

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|       |  |
|-------|--|
| DCS   | Distributed Control System               |
| FAT   | Factory Acceptance Test                  |
| DD    | Detail Engineering Design                |
| FCU   | Field <b>Communication</b> Units         |
| HSE   | Health, Safety, and Environment          |
| I/O   | Input / Output                           |
| SCADA | Supervisor Control And Data Acquisition  |
| IFAT  | Integrated Factory Acceptant Test        |
| IOM   | Installation, Operation, and Maintenance |
| IS    | Intrinsically Safe                       |
| ITP   | Inspection and Test Plan                 |
| LFS   | Landfall Station                         |
| MR    | Material Requisition                     |
| MTTR  | Mean Time to Repair                      |
| NTP   | Network Time Protocol                    |
| P&ID  | Piping and Instrument Diagram            |
| PC    | Personal Computer                        |
| QA/QC | Quality Assurance / Quality Control      |
| RTD   | Resistance Temperature Detector          |
| SAT   | Site Acceptance Test                     |
| TGS   | Tank Gauging System                      |
| UPS   | Uninterruptible Power Supply             |
| VDRL  | Vendor Data Requirements List            |
| VDU   | Visual Display Unit                      |

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### 1.3 Applicable Code and Standards

#### 1.3.1 Industrial Standards

|                   |  |
|-------------------|--|
| API MPMS ch. 1    | Manual of Petroleum Measurement Standards Chapter 1 - Vocabulary   |
| API MPMS ch. 3.La | Standard Practice for Manual Gauging of Petroleum and Petroleum Products in Stationary Tanks                                     |
| API MPMS ch. 3.IB | Standard Practice for Level Measurement of Liquid Hydrocarbons in Stationary Tanks by Automatic Tank Gauging                     |
| API MPMS ch. 3.3  | Standard Practice for Level Measurement of Liquid Hydrocarbons in Stationary Pressurized Storage Tanks by Automatic Tank Gauging |
| API MPMS ch. 3.6  | Standard Practice for Level Measurement of Liquid Hydrocarbons in Stationary Pressurized Storage Tanks by Automatic Tank Gauging |
| API MPMS ch. 7.4  | Static Temperature Determination Using Fixed Automatic Tank Thermometer  |
| IEC -60079        | Electrical apparatus for explosive gas atmospheres   |
| IEC -61000        | Electromagnetic Compatibility (Applicable Sections )   |
| EN -50081-2       | Emission, Industrial Environments  |
| IEC -60529        | Degree of Protection provided by Enclosures  |



#### 1.3.2 Local and International Regulation

All equipment and component related project shall comply with the relevant Local and International Regulation recommendations.

#### 1.3.3 Conflicts and Order of Precedence

In case of conflicts among the regulations, codes, standards and other documents referenced. The following shall apply as priority order:

- Local Government Legislation
- Project Datasheets
- Project Specifications
- Industry Standards
- CONTRACTOR Codes and Working Standards

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All equipment, systems, hardware and software supplied shall meet the contract-specified requirements and the manufacturers' published specifications. In the event of conflict, the more stringent shall govern unless mutually agreed, otherwise, by OWNER and CONTRACTOR as final.

## 2.0 GENERAL INFORMATION AND REQUIREMENTS

### 2.1 Language and Units of Measurements

The content, references, attachments and any supplementary information related project for all engineering documents shall be in English.

Units of measurement for all project-engineering documents shall be in the System International (SI).

### 2.2 System Environment / Site Condition Criteria

The instrumentation system shall be design suitable for the site climatic conditions; all the process duty, services and the storage tank dimensions as well as functions, operating and installation requirements shall comply with the requirements of this technical specification

The Tank Gauging System will be installed at HAI PHONG Terminal Project and suitable for the site conditions as follow:

- Ambient Air Temperature: Min: 5<sup>o</sup> C, Max: 45<sup>o</sup> C
- Relative Humidity: 85% -95% (maximum)

## 3.0 TECHNICAL SPECIFICATION REQUIREMENTS

### 3.1 General

The equipment and components supplied shall be suitable for continuous operation under normal operating conditions i.e. windage on tank roofs, thermal circulation etc.

The instrument design shall integrated unit or module construction particularly for electronic components, to enable plug in module replacement. Electronic parts shall be hermetically sealed solid-state modules.



The instrumentation shall constructed to permit maintenance without removal from the tank and shall hermetically sealed.

### 3.2 Electrical Requirements

Housings for tank-mounted equipment shall be a minimum rating of IP66. Equipment located indoors shall have a minimum rating of IP42.

Power failure shall not cause loss of calibration. Upon restoration of power, all units shall return to normal conditions.

Equipment connected to the system, normally located in areas classified as hazardous, shall connected to the non-hazardous part of the system via approved interfacing equipment.

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The preferred method of hazardous area protection is intrinsically safe.

Tank mounted equipment shall be suitable for the hazardous area as Zone 1, IIB Temperature class T4.

The cable entries shall be NPT type. Certified plugs shall plug the cable entries, Copper Nickel plated material.

### 3.2.1 Electromagnetic Capability (EMC)

The System shall fully comply with all applicable sections of the International Electro technical Commission (IEC) Standard and, in particular, compliance with IEC 61000-4 parts 1 to 6 as follows:

- Part 1 - General Introduction
- Part 2 - Electrostatic Discharge Requirements
- Part 3 - Immunity to Radiated Electromagnetic Field
- Part 4 - Immunity against Fast Transients/Burst
- Part 5 - Surge Immunity Requirements
- Part 6 - Immunity to Conductive Radio Frequency Disturbances.

### 3.2.2 Power Supply

The power supply for Tank Gauging System shall be derived from Distribution Panel which connect to Uninterruptible Power Supplies (UPS)

The rating of voltage shall be 230VAC/ 50 Hz

Where possible field equipment devices connected to the system and operating at 24 volts DC shall power by the TGS with all necessary protection of the field circuits.

## 3.3 Standard Hardware and Software

The TGS system shall comprise standard hardware and software configured to meet the stated requirements.



## 3.4 Tank Instrument

### 3.4.1 Radar Level Transmitter

The tank gauging system used to measure level of Solvent storage tanks for custody transfer purpose. The accuracy of Radar Level Transmitter shall be  $\pm 0.5\text{mm}$  as per API MSPS chapter 3.1B requirements.

The Radar Level Transmitter shall be state-of-the-art technology, the optimum solution for Custody Level Measurements. Selection of the appropriate system shall be determined by VENDOR to ensure that TGS system chosen satisfy all performance guarantees.

Enclosure shall be 316 SS material, explosion proof type. The enclosure shall painted as per VENDOR standards.

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The Radar Level Transmitter shall directly mounted to the tank stilling well by flange. Flange rating & sizing and material shall be as per Mechanical Tank Datasheet. Flange connection and material should comply with piping material specification as minimum requirements. The stilling well shall fabricated by Tank Supplier. VENDOR shall provide stilling well detail drawing which suitable for Radar Level Transmitter installation, operation and easy for Tank supplier fabrication.

VENDOR shall choose wetted parts material suitable with the process operating conditions. The material shall be at least 316SS or comply with piping material specification as minimum requirements. The wetted part type and shape shall selected by VENDOR to gain the best accuracy of Radar Level Transmitter.

The Radar Level Transmitter shall supported for HART or Foundation Fieldbus. The Average Temperature transmitter shall connected with Radar Level Transmitter to transmit Temperature data via two wires signal and HART or Foundation Fieldbus. The level and temperature data shall sent from Radar Level Transmitter to Tank Hub located at Tank farm.

The Radar Level Transmitter shall supplied 13-15VDC supply from Tank Hub.

### 3.4.2 Local Indicator

TGS shall provide with a local indicator in Tank Hub, which will display the tank level measurement and temperature via a 16-digit LCD indicator normally located at grade level to the tank or sphere for easy reading and observation. The local indicator shall certified for use in designated hazardous area classification location. The display shall also show tank service, identity number and measurement units.

Level measurement units shall normally be millimeters in increments of 0.1mm. The operation of the local indicator shall be independent with service status of remote data link connected instruments.

The local indicator shall be user configurable in Metric or Imperial units.

The local indicator shall get data from Radar level transmitter via two wires signal and HART or Foundation Fieldbus.

Local Indicator shall have 316 SS material enclosure, Ingress Protection IP 66.



### 3.4.3 Temperature System

Averaging temperature elements shall be of PT100 type (RTD). The RTD element shall comply with IEC-60751 and have a resistance of 100 ohms at 0 degree C and a fundamental interval of 38 ohms. They shall be of the grade of accuracy appropriate to the application. The accuracy of temperature shall be +/- 0.1° C.

Averaging temperature elements shall include a specified number or RTD elements of graduated lengths housed in a common flexible metal thermo-well.

The distance between the individual elements shall not exceed 2 meters. The immersed materials shall be 316SS or better.

The multipoint temperature RTD shall wired directly into the Radar Tank Level Transmitter and the temperature values shall transmitted to the Field Communication Unit for Tank data calculation.

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Temperature Transmitter shall be directly mounted on the stilling well of tank by 2" x 150 # RF Flange; The Flange material shall be 316SS and comply with piping material specification as minimum requirements.

Tank Supplier shall fabricate the stilling well. VENDOR shall provide the detail drawings for stilling well for Tank supplier fabrication.

An anchor shall provide by Tank supplier to fix the position of Temperature transmitter. VENDOR shall provide mounting device to fix temperature element with this anchor.

#### 3.4.4 Tank Hub

TGS shall provide with a Tank Hub located at grade level to the tank. Tank Hub, which will display the tank level measurement and temperature via a 16-digit LCD indicator.

Tank Hub handles communication between the field devices and the control room.

The Tank Hub communicates with Radar Level Transmitter and Temperature via the Foundation Fieldbus and/or TRL/2 bus.

The Tank Hub shall supplied from 230VAC/50Hz Power supply from UPS distribution board via a field Power Junction Box.

Housing: Polyurethane-coated die-cast aluminum

### 3.5 System Interfacing

#### 3.5.1 Field Interface

A rack mounted version Field **Communication** Units (**FCU**) located in Instrument Control Room shall be available.

The **FCU** shall be able to interface with Radar Level Transmitter for Tank Level and Temperature. This communication method between Radar Level transmitter and **FCU** shall be standard protocol.

The **FCU** shall hold strapping tables for a number of tanks and produce follow calculations:

- Level
- Actual volume
- Volume to standard conditions as per API standard.
- Average temperature of Solvent tank.



The **FCU** shall hold data for tank contents, tank identity and status.

The **FCU** shall have facilities for remote configuration either from a hand held terminal or the remote PC.

The **FCU** shall be able to store all data for up to 30 days following power loss.

**FCU** shall connected by a suitable communication link to the PC specified by VENDOR

The **FCU** shall supplied from 230VAC/50 Hz Power supply from UPS distribution board.

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### 3.5.2 System Communication Requirements

TGS system shall support serial communication with using industry standard links such as RS-232, RS-422 and RS-485 and OPC Server. VENDOR standard system communication requirement have to similar to the communication protocol of the existing ATG system.

### 3.5.3 System Interfacing with SCADA

The TGS system will serially interface with the SCADA via communication interfacing for below data:

- Level
- Actual volume
- Volume to standard conditions as per API standard.
- Average temperature of Solvent tank.

Inventory and Product Flow Data Processing will performed in the SCADA.

The Tank Gauging System shall connected to SCADA in the control room for the monitoring of key data and alarms status information. A level alarm will configured by SCADA based on Level data from Tank Gauging System.

The metering systems and tank gauging systems at the Control room will compared to provide an integrity monitoring system.

## 3.6 PCs

The existing Computer shall be used for Hai Phong 2.

Software functions shall be modified as required to integrate new devices of the Hai Phong 2 Project.

## 3.7 System Data Storage Requirements

The system shall have a real time and historical data collection facility to support system trends, logs and reports as required.

The data storage system shall be fully redundant and sized sufficiently to cope with all historical data collection requirement. VENDOR shall provide detailed characteristics along with the offer.

It shall also be possible to transfer data to removable media for long-term storage and/or archiving.



## 3.8 System Wiring Requirements

All wiring inside cabinets shall run in dedicated plastic ducts or wire ways, or neatly loomed and secured with plastic spiral wrapping or tie-wraps and anchors.

All discrete wiring shall be single core with sufficient current carrying capacity. A minimum core size of 0.5mm shall use unless otherwise stated.

Wire ways/ducting shall route to provide sufficient segregation between AC and DC wiring and will be able to accommodate 30% more wiring.

System card bins shall interconnected with plug and socket type system cables or ribbon type cables and edge connectors. The sockets and both ends of the cables shall labeled with the Origin and destination tags.

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### 3.9 Lightning Protection

Lightning protection for instruments shall be in accordance with Document:

- **HP02-00-EL-SPC-0001** General Electrical Specification.
- **HP02-00-IN-SPC-0001** General Specification for Instrument.

### 4.0 TANK DATA

The detail tank technical specification, Tank data sheets, Tank drawings shall described in the reference documents and drawings.

- **HP02-00-IN-DAS-0004** Datasheets for Tank Gauging System
- **HP02-00-IN-BDD-0001** Control Architecture System Block Diagram

### 5.0 SCOPE DEFINITION

The complete TGS Control System shall strictly comply with this project's technical specifications and in accordance with the referenced project specifications/ standards.

#### 5.1 Scope of TGS Supplier



##### 5.1.1 Scope of Work and Services

The TGS Control System VENDOR needs to include the following in the scope of services:

VENDOR shall responsible for design, engineering fabrication, testing, documentation, and delivery a completed of Tank Gauging System. VENDOR shall furnish all components and ancillary equipment necessary to complete the Tank Gauging System ready for operation safety and smoothly. In general, VENDOR's scope of work for the equipment, materials and systems specified shall include, but not limited to the following:

- Project Management
- Engineering Design
- Software License purchase and registration
- Programming including strap table configuration
- Fabrication and Painting
- Interfaces to other systems if any
- FAT and works inspection
- Support Site Installation and termination
- SAT included Calibration, Commissioning and documentation
- Training
- Start-up and Commissioning spares and special tools
- Recommended spares for two (2) year operation

In addition, not limited to the following:

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- Prepare TGS architecture and configuration details (based on project requirements with all hardware identified) and submit for CONTRACTOR review. All drawings & documents shall be prepared using only the preferred software specified in the Material Requisition.
- Submit all documentation as per project requirements.
- Submit all required data in given project format for configuring serial link to SCADA (MODBUS address list etc.).
- Developing / configuring all software as required meeting these specification requirements in TGS PC/ workstation.
- Perform system FAT to comply with all project requirements including integration with TGS PC, TGS System Server and TGS workstation.
- Participate in an integrated test IFAT (serial link to SCADA) at SCADA VENDOR works if required by CONTRACTOR. VENDOR shall provide same hardware that will be used on site, for integrated test at SCADA works. If this is impractical, a PC or similar may be used to test the links and validate the serial interface mapping. TGS System VENDOR is responsible to provide all inputs to SCADA VENDOR for establishing the communication and testing with SCADA.
- Participate in SAT including interface with SCADA.
- Training at site for two trainees for two days duration for owner' personnel.
- Submitting and obtaining all required approvals for Custody transfer applications as per local regulations/ as defined in the Material Requisition.
- VENDOR is required to submit guarantee statement in writing for the Quality, reliability, safety and smooth operation of the complete Tank Gauging System.

### 5.1.2 Scope of Supply

**TGS system shall be used to the existing TGS system comply with the project specification & other statutory requirements.**

VENDOR's scope shall include:

- Two (2) set of Rada level transmitter
- Two (2) set Tank side monitor
- Two (2) set of Multi-spot Temperature element
- One (1) set of FCU if required
- **Two (2) set of Tank Hub**
- One (1) lot of network communication equipment consists of Interfacing equipment, cables, fiber optic cable if any, fiber optic converters if required, firewall and all accessories (including for interface to other control system if requirements).
- Other relevant accessories to be specify by VENDOR.
- **Any item not described or expressly set forth herein, but necessary to complete the work to the true intent and meaning of the specifications, shall be furnished by Vendor without extra cost.**

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In addition, not limited to the following:

- All Hardware as specified in this specification & Document/Drawing attached here with
- All required software (with appropriate no. of licenses), fully configured in each of the TGS PC / Engineering Workstation.
- All required hardware and software for communication link for data transfer from SCADA to TGS workstation / PC.
- All required Power isolators near Tank for isolating the individual Tank Level Transmitters.
- USB / Printer cables between TGS PC / workstation and TGS printer.
- Cables between TGS PC / workstation and TGS cabinet layout.
- Spare parts for commissioning and consumables.
- Exclusions from scope of supply:
  - Interconnecting cables from TGS Field instruments to the TGS system panel in the control room
  - Interconnecting cables from SCADA to TGS interface.
  - Interconnecting cables from Radar level transmitters via two wires signal and HART protocol communication to local indicator

All interconnection cables mentioned above shall supplied and installed by CONTRACTOR; VENDOR to responsible to specify technical specification of TGS cables.

## 5.2 Out of Scope of TGS Supplier

- External power and control cable
- Installation

## 6.0 MODIFICATION IN EXISTING SYSTEM



Vendor shall verify and reconfirm spares and space availability for new additional equipment, instruments or equipment during engineering detailed design and get prior approval from “OWNER/CLIENT” before using the existing spare.

The following description is provided as a guideline to get an overview scope of work modification to the existing system. It is the responsibility of “VENDOR” to ensure all components, hardware, software and services are included to complete the required work modification.

### 6.1 Scope of Work Modification

The vendor shall do all following activities (but not limited to) for the work modifications identified in this document and other related modification documents as follows:

- 1) To develop all necessary design drawings/documents as VDRL and modifications strategies and provide them for “OWNER /CLIENT” approval.
- 2) Generate specifications for new instruments and all related components and accessories if required and provide for “OWNER /CLIENT” approval.

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- 3) To Procure and install the new Instrument and necessary accessories related wherever identified.
- 4) Do necessary additions and software work modifications in configurations (like change range setting, new signals added, unit change etc.) and logic programmable as well as, graphic modifications and other additional work required in the existing systems.
- 5) Reconnect existing and install necessary cabling and wiring for all the modifications identified in this document and new cablings, where applicable.
- 6) To Procure and install cabling, and accessories if the existing cabling for instruments being installed is not in good condition.
- 7) To Procure and install necessary cabling and wiring for all the modifications identified in this document and other related modification documents. This includes field cabling, wiring inside Cabinets, Power Distribution Boards and other cabinets related.
- 8) Do a loop and interlock and all function checking related to the system.
- 9) Proceed with all testing requirements related to engineering design practice.

The vendor is required to contact other System Vendor (if any) to provide the interfacing list and/or other information related to the Vendor's scope of work for smooth operation and modification.

## **7.0 INSPECTION AND FACTORY ACCEPTANCE TEST**

### **7.1 Factory Acceptance Test**

The Package Equipment shall subject to Inspection and Factory Acceptance Test (FAT) by VENDOR and witnessed by CONTRACTOR. VENDOR shall notify CONTRACTOR ten (10) working days prior to any FAT. CONTRACTOR shall have reserve to perform inspection of the equipment during manufacture at any time. The FAT procedure shall be prepared by the VENDOR and submitted (6 weeks prior FAT) to CONTRACTOR for review and approval. The following activities (but not limited to) shall be done during FAT.



To prove that equipment package is operable in accordance with specification and meets safe operation. This is including alarm set checking and test, functionality of operation button, shutdown simulation, serial interface testing, etc.

To check that all interfacing with other package has fabricated, provided and installed according to the documentation. This is including utility supply, 100% hardware input/output simulation, 100% addressing simulation of serial data interface. The FAT procedure shall clearly address how the serial interface with SCADA will tested.

### **7.2 Site Acceptance Test**

OWNER/CONTRACTOR will do the site installation with assistance from the VENDOR (as required); however, the VENDOR at site shall carry out final pre-commissioning.

The Site Acceptance Test (SAT) Procedure will derived mostly from the FAT and prepared by VENDOR. The Site Acceptance Test will demonstrate proper installation of system, the functionality of all hardware, field inputs/outputs, configuration and serial data links. Site Acceptance Test will witness and sign off by VENDOR and CONTRACTOR.

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## 8.0 PRESERVATION

VENDOR shall provide his standard procedure for "Preservation of Equipment" during the various stages of the project for approval by CONTRACTOR. The procedure will cover:

- Export Preparation
- Preservation prior to installation whilst at held in fabrication yard warehouse (or other). De-preservation prior to final Commissioning

## 9.0 PACKING AND SHIPPING

Vendor shall be solely responsible for the adequacy of the preparation of the Tank Gauging System for shipment.

Shipping crates shall constructed to protect all items against damage during shipment.

All spare parts will clearly marked as "Spare Parts", and shall shipped at the same time as the equipment. Packing lists shall furnished so that the parts can handled without uncrating.

## 10.0 NAMEPLATES

Field Instruments shall identified using a 316 stainless steel plate engraved with tag number and equipment description.

Tag plates shall attached with stainless steel bolts, screws, rivets or wire, whichever is more practical. Where a tag plate is not practical, the identification shall stamped on the unit.

The instruments nameplate, permanently affixed with drive screws, shall be stainless steel and shall show the following information:

- Tag number
- Manufacturer's name or trademark
- Serial number, model number
- Range
- Power supply
- Electrical certification



## 11.0 PAINTING AND COATING

Painting and Protective coatings for Equipment shall applied as per required Document attached here with.

## 12.0 SPARE PARTS

VENDOR shall guarantee that spare parts shall be available for a period of ten (10) years from the final acceptance of the plant.

Two types of spare parts identified:

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a) Installation spares

b) Operational and maintenance spares for 2 year operation

Installation spares are normal spares recommended by VENDOR and required for construction, pre-commissioning and commissioning of the plant.

Operational spare parts for maintenance are required for 2 years operation.

The VENDOR shall provide a spare parts list/record for 2 years operation.

### 13.0 DOCUMENTATION

VENDOR shall submit all documentation as per the Material Technical Requisition.

### 14.0 QUALITY ASSURANCE

VENDOR shall demonstrate evidence of quality assurance (QA) in accordance with ISO requirements in all aspects of the VENDOR's current design and manufacturing practices.

### 15.0 WARRANTY

The VENDOR at no cost shall promptly rectify any defects within the warranty period.

If the VENDOR fails to respond in a timely manner following notification by the CONTRACTOR, the CONTRACTOR may arrange for repairs carried out and all costs associated with the work shall passed to VENDOR absorption.