PETROBRAS	**TECHNICAL SPECIFICATION**	Nr: **I-ET-3010.1Y-5133-661-P4X-001**	
	CLIENT: BÚZIOS		**SHEET:** 1 **of** 20
	JOB : HIGH CAPACITY FPSO		
	AREA: BÚZIOS		
SRGE	**TITLE:** **DIESEL OIL PURIFIER (SC-5133501A/B)**		INTERNAL
			ESUP

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REV.	DESCRIPTION AND/OR REVISED SHEETS
0	ORIGINAL ISSUE
A	REVISED WHERE INDICATED
B	REVISED TO INCLUDE THE HAZOP RECOMMENDATION RH-009 OF THE HAZOP REPORT I-RL-3010.1Y-5400-98X-P4X-001.

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1. INTRODUCTION

1.1. OBJECTIVE

The purpose of this technical specification is to describe the minimum requirements for the design, manufacturing, assembly, supply, installation, commissioning, and tests of DIESEL OIL PURIFIER (SC-5133501A/B) in conformance with relevant regulations and High Capacity FPSO design documentation.

The purpose of DIESEL OIL PURIFIER (SC-5133501A/B) is to purify the diesel oil received by FPSO from the supply vessels using the centrifugal principle to remove solid particles and diluted water mixed in the received fuel for the proper use by consumers on Hull and Process Plant.

1.2. DEFINITIONS

PACKAGE: It is defined as an assembly of equipment supplied interconnected, tested and ready to operate, requiring only the available utilities from the Unit for the Package operation.

PACKAGER: It is defined as the responsible for project, assembly, construction, fabrication, testing and furnishing of the Package.

DIESEL OIL PURIFIER (SC-5133501A/B) the package name.

OWNER: Petrobras.

All definitions are found on I-ET-3010.00-1200-940-P4X-002 – GENERAL TECHNICAL TERMS.

1.3. ABBREVIATIONS

CS Classification Society

FAT Factory Acceptance Tests

FPSO Floating Production Storage and Offloading Unit

SOS Supervisory and Operation System

SOS-HMI…… Human Machine Interface of SOS

2. NORMATIVE REFERENCES

2.1. INTERNATIONAL CODES, RECOMMENDED PRACTICES AND STANDARDS

The equipment will be designed and manufactured in accordance with the following codes and standards, if not mentioned otherwise.

- ANSI American National Standards Institute

- API American Petroleum Institute
- ASME American Society Of Mechanical Engineers
- ASME B 31.1 Process Piping
- BGV German Safety Regulations
- DIN German National Standard Code
- EN European Standards
- ISO International Standard Organization
- IMO – International Maritime Organization
- VDE / IEC German National Electric Standard Codes / International Electric Codes.
- IEC 61892, INMETRO Resolution 179, May 18th 2010 and INMETRO resolution 89, February 23rd 2012
- Classification Society defined for the Hull scope.

2.2. BRAZILIAN CODES AND STANDARDS

- NR – Brazilian Federal Government Regulatory Norms (Normas Regulamentadoras NRs)
- NORMAM-01 – Normas da Autoridade Marítima para Embarcações Empregadas na Navegação em Mar Aberto.

2.3. CLASS APPROVAL AND CERTIFICATION

The PACKAGE shall be designed, manufactured and tested according to the design reference documents, normative requirements and in accordance with the latest editions of Classification Society Rules, Regulations and Standards.

3. REFERENCE DOCUMENTS

REF DOC NUMBER	REF DOC NAME
GENERAL	
I-DE-3010.1Y-5400-94A-P4X-001	AREA CLASSIFICATION – GENERAL
I-ET-3000.00-0000-940-P4X-002	SYMBOLS FOR PRODUCTION UNITS DESIGN
I-ET-3000.00-1200-940-P4X-001	TAGGING PROCEDURE FOR PRODUCTION UNITS DESIGN
I-ET-3010.00-1200-940-P4X-002	GENERAL TECHNICAL TERMS

I-RL-3010.1Y-1200-940-P4X-001	GENERAL SPECIFICATION FOR AVAILABLE UTILITIES
I-ET-3A36.00-1000-941-PPC-001	METOCEAN DATA
CONSTRUCTION	
I-ET-3010.00-1200-955-P4X-001	WELDING
I-ET-3010.00-1000-970-P4X-002	REQUIREMENTS FOR NDT
I-ET-3010.00-1200-955-P4X-002	REQUIREMENTS FOR WELDING INSPECTION
I-ET-3010.00-0000-970-P4X-001	REQUIREMENTS FOR PROCEDURES AND PERSONNEL QUALIFICATION AND CERTIFICATION
HULL SYSTEMS	
I-DE-3010.1Y-5133-944-P4X-003	DIESEL OIL PURIFIER AND SERVICE SYSTEM
I-DE-3010.1Y-5133-944-P4X-004	DIESEL OIL STORAGE SYSTEM
I-DE-3010.1Y-5115-944-P4X-003	FRESH, HOT AND POTABLE WATER SYSTEM DISTRIBUTION
I-DE-3010.1Y-6124-944-P4X-001	HULL SERVICE AND INSTRUMENT AIR DISTRIBUTION
I-FD-3010.1Y-5133-661-P4X-001	DIESEL OIL PURIFIER (SC-5133501 A/B)
I-MD-3010.1Y-1200-940-P4X-027	DESCRIPTIVE MEMORANDUM - HULL SYSTEMS
NAVAL	
I-ET-3010.1Y-1350-960-P4X-002	DESIGN REQUIREMENTS - NAVAL ARCHITECTURE
I-RL-3010.1Y-1350-960-P4X-009	MOTION ANALYSIS
MECHANICAL	
I-ET-3010.00-1200-300-P4X-001	NOISE AND VIBRATION CONTROL REQUIREMENTS

PAINTING	
I-ET-3010.00-1200-956-P4X-002	GENERAL PAINTING
DR-ENGP-I-1.15	COLOR CODING
SAFETY	
I-ET-3010.00-5400-947-P4X-002	SAFETY SIGNALING
DR-ENGP-M-I-1.3	SAFETY ENGINEERING GUIDELINE
PIPING	
I-ET-3010.1Y-1200-200-P4X-002	PIPING SPECIFICATION FOR HULL
I-ET-3010.00-1200-251-P4X-001	REQUIREMENTS FOR BOLTING MATERIALS
ELECTRICAL	
I-DE-3010.00-5140-700-P4X-003	GROUNDING INSTALLATION TYPICAL DETAILS.
I-ET-3010.00-5140-700-P4X-001	SPECIFICATION FOR ELECTRICAL DESIGN FOR OFFSHORE UNITS
I-ET-3010.00-5140-700-P4X-002	SPECIFICATION FOR ELECTRICAL MATERIAL AND EQUIPMENT FOR OFFSHORE UNITS
I-ET-3010.00-5140-700-P4X-003	ELECTRICAL REQUIREMENTS FOR PACKAGES FOR OFFSHORE UNITS
I-ET-3010.00-5140-712-P4X-001	LOW-VOLTAGE INDUCTION MOTORS FOR OFFSHORE UNITS
INSTRUMENTATION AND AUTOMATION	
I-ET-3010.00-1200-800-P4X-002	AUTOMATION, CONTROL AND INSTRUMENTATION ON PACKAGE UNITS
I-ET-3010.1Y-1200-800-P4X-014	AUTOMATION INTERFACE OF PACKAGE UNITS
I-ET-3010.00-1200-800-P4X-013	GENERAL CRITERIA FOR INSTRUMENTATION PROJECTS

I-ET-3010.00-5520-888-P4X-001	AUTOMATION PANELS

Table 1 – Reference Documents

Note: Reference Documents latest revision shall be considered.

4. DESIGN REQUIREMENTS

4.1. DESIGN CONDITIONS

4.1.1 PACKAGE Equipment shall be designed for a 30-year life in a corrosive offshore environment without the need for replacement of any major component due to wear, corrosion, fatigue, or material failure.

4.1.2 PACKAGER shall design the equipment for the full range of operational conditions as specified in this technical specification.

4.1.3 PACKAGE Equipment shall be designed with the compliance of the normative and design requirements as stated in this specification and complying with the technical parameters stated on the above item 3 with the High Capacity FPSO design reference documents.

4.1.4 All elements of the PACKAGE shall be of proven design and well within the manufacturer's actual experience.

4.2. SAFETY REQUIREMENTS

4.2.1 Personnel safety protection shall be provided according to Brazilian Regulatory Norms (NR) issued by Brazilian Government.

4.2.2 Warning signs in Brazilian Portuguese language shall be provided where risk of personnel injury exist.

4.2.3 Rotating equipment outer parts, such as pulleys, couplings, belts and flywheels, shall have rigid protection, manufactured with aluminum ASTM B211 and shall be capable of being easily removed.

4.2.4 In accordance with the requirements of SOLAS II-1, Regulation 3-5, and MSC.1/Circ. 1379, all equipment and material to be supplied by PACKAGER must be "asbestos free".

4.2.5 Safety signaling shall be in full compliance with I-ET-3010.00-5400-947-P4X-002 – SAFETY SIGNALING.

4.2.6 Double block & bleed arrangements are required for isolation of equipment in piping classes of 300# and above.

4.3. NOISE AND VIBRATIONS

4.3.1 Noise and vibrations limits shall be in conformance with I-ET-3010.00-1200-300-P4X-001 – NOISE AND VIBRATION CONTROL REQUIREMENTS.

4.4. MOTIONS AND ACCELERATION

4.4.1 All equipment shall be able to withstand with the UNIT subjected to 100-year return period environmental conditions.

4.4.2 All equipment shall be able to operate with the UNIT subjected to 1-year return period environmental conditions.

4.4.3 All environmental conditions are defined in I-ET-3A36.00-1000-941-PPC-001 – METOCEAN DATA, at any draft from fully loaded to the minimum loaded / ballasted condition.

4.4.4 For the Hull loading conditions details and the maximum designed operational trim and heel inclinations refer to I-ET-3010.1Y-1350-960-P4X-002 – DESIGN REQUIREMENTS - NAVAL ARCHITECTURE.

4.4.5 For the design data and information regarding motion requirements refer to I-RL-3010.1Y-1350-960-P4X-009 – MOTION ANALYSIS.

4.4.6 PACKAGE is also to withstand inertial forces during transportation from construction site to the final offshore location.

5. PACKAGE SCOPE OF SUPPLY

5.1. SCOPE OF SUPPLY:

Equipment	TAG	Qty
Diesel Oil Purifier	SC-5133501A/B	2 x 100%
Diesel Oil Centrifugal Purifier Control Panel	PN-SC-5133501A/B	2 x 100%

Table 2 – PACKAGE Scope of Supply

5.1.1 In addition to the table 2, Diesel Oil Purifier PACKAGE shall also be composed by the following items to be assembled on the PACKAGE Skid:

i. Electrical motors for Diesel Oil Purifiers with all necessary interconnections since Diesel Oil Purifier shall be electrical driven type.

ii. Diesel Oil feed pumps.

iii. PACKAGE Skid control valves.

iv. Diesel Oil heaters (if applicable).

v. Tank for the sludge removed from the purifying process.

vi. Sludge pump for the sludge removal.

5.1.2 All interconnection piping, valves and accessories, instruments, alarms and other

devices to ensure the proper and safe operation of the PACKAGE.

5.1.3 All items shall be assembled at the same Skid that shall be fabricated and supplied by PACKAGER.

5.2. PACKAGE LOCATION

5.2.1 PACKAGE shall be installed in a dedicated room inside the Engine Room which is a closed and non-classified compartment.

5.2.2 For PACKAGE location refer to I-DE-3010.1Y-1200-942-P4X-001 – GENERAL ARRANGEMENT and I-DE-3010.1Y-5400-94A-P4X-001 – AREA CLASSIFICATION – GENERAL.

6. PACKAGE SPECIFICATION

6.1. DIESEL OIL PURIFIERS (SC-5133501A/B)

6.1.1 Diesel Oil Purifiers (SC-5133501A/B) shall be self-cleaning electric driven, vertical shaft, compact and provided with sludge tank, diesel oil feed pumps, sludge pump, starter/control panels and mechanical accessories mounted and coupled in a common skid.

6.1.2 Diesel Oil Purifiers (SC-5133501A/B) shall have 2x100% redundancy configuration.

6.1.3 Diesel Oil Purifiers (SC-5133501A/B) shall be installed downstream the Diesel Oil Storage Tanks (TQ-5133501 P/S) and upstream the Diesel Oil Service Tanks (TQ-5133502 P/S).

6.1.4 Each Diesel Oil Purifier (SC-5133501A/B) shall be able to perform the suction from both Diesel Oil Storage Tanks (TQ-5133501 P/S).

6.1.5 Each Diesel Oil Purifier (SC-5133501A/B) shall be able to transfer the treated diesel oil for both structural Diesel Oil Service Tanks (TQ-5133502 P/S) ready for consumers.

6.1.6 PACKAGE shall be designed to receive the treated diesel oil return from the structural Diesel Oil Service Tanks (TQ-5133502 P/S) back to the Purifiers for a new purifying process. This return lines from diesel oil service tanks shall have the same inlet on the PACKAGE as the untreated diesel oil receiving lines from the diesel oil storage tanks.

6.1.7 PACKAGER shall provide PACKAGE control and protection against pressure deviation.

6.1.8 As an electric driven PACKAGE, Diesel Oil Purifiers (SC-5133501A/B) shall have the motors supplied as the I-ET-3010.00-5140-712-P4X-001 – LOW-VOLTAGE INDUCTION MOTORS FOR OFFSHORE UNITS as detailed on the item 7.1 of this technical specification.

6.1.9 Diesel Oil standard to be reached after the purifying process are informed on I-RL-

3010.1Y-1200-940-P4X-001 – GENERAL SPECIFICATION FOR AVAILABLE UTILITIES.

6.2. UTILITIES AVAILABLE ONBOARD

6.2.1 For Hull fresh water system refer to I-DE-3010.1Y-5115-944-P4X-002 – FRESH, HOT AND POTABLE WATER SYSTEM.

6.2.2 For Hull essential / service instrument air system refer to I-DE-3010.1Y-6124-944-P4X-001 – HULL SERVICE AND INSTRUMENT AIR DISTRIBUTION.

6.2.3 For general utilities refer to I-RL-3010.1Y-1200-940-P4X-001 – GENERAL SPECIFICATION FOR AVAILABLE UTILITIES.

6.3. SLUDGE REMOVAL

6.3.1 Sludge generated during the purifying process shall be destinated to a dedicated tank which shall be installed underneath the Purifiers on the PACKAGE skid.

6.3.2 This sludge collecting tank shall be rectangular atmospheric type with vent piping flange inside the skid limits for connection with the Hull vent system.

6.3.3 PACKAGER shall evaluate the tank vent dimension informed on I-DE-3010.00-5415-944-P4X-004 – VENT AND SOUNDING SYSTEM and I-DE-3010.1Y-5133-944-P4X-003 – DIESEL OIL PURIFIER AND SERVICE SYSTEM according to the sludge collecting tank design.

6.3.4 Sludge collection tank shall have a connection with a sludge removal pump for the purifying process sludge discard to the Sludge Tank (TQ-5330502).

- Sludge Tank (TQ-5330502) is a Hull Engine Room structural tank not on the PACKAGER scope.

6.3.5 Sludge collection tank shall be hydrotested following the CS requirements.

6.3.6 For structural works PACKAGER / MANUFACTURER shall follow AWS D1.1 – Structural Welding Code.

6.3.7 For welding refer to I-ET-3010.00-1200-955-P4X-001 – WELDING and I-ET-3010.00-1200-955-P4X-002 – REQUIREMENTS FOR WELDING INSPECTION.

6.3.8 Sludge collecting tank shall have painting scheme according to PACKAGER standard and painting preparation and color according to the item 7.3 of this document.

6.3.9 Sludge collecting tank shall have at least one level indicator.

6.3.10 A Sludge Pump shall be supplied by PACKAGER to destinate the sludge oil from the collecting tank to the Sludge Tank (TQ-5330502) which is not scope of the PACKAGER.

6.3.11 Sludge Pump and any interlocking with other PACKAGE elements as sludge collecting tank shall be designed and supplied as the PACKAGER standard.

6.4. DIESEL OIL CENTRIFUGAL PURIFIER PANEL (PN-SC-5133501A/B)

6.4.1 For the Diesel Oil Centrifugal Purifier Panels (PN-SC-5133501A/B) the specification shall follow the references shown on item 7.2 of this technical specification.

6.4.2 Control valves design and supply are PACKAGER scope. Control set point and eventual interlocking for the system protection, alarm and control shall be supplied by PACKAGER.

6.5. INSTRUMENT, VALVES AND ACCESSORIES

6.5.1 The level gauges shall be installed in such position that the level indicated in receiver will be easily seen. All level gauges shall have flanged connections, which can be isolated and completed with vent / drain, valves, and connections.

6.5.2 All valves shall be positioned with the stem pointing upwards. They shall be located in such a way that the handwheel or actuator will not obstruct walkways and be easy accessible for operation and maintenance. Where hand operated valves are not easily operable, gear operated valves shall be used.

6.5.3 Valves, instruments, etc. elevated above 1.75 m above the floor, shall have access ladders or platform provided.

6.5.4 For bolt and nuts materials apply the requirements of I-ET-3010.00-1200-251-P4X-001 – REQUIREMENTS FOR BOLT MATERIALS.

6.5.5 Sampling point / facilities shall be provided complete with necessary fittings and valves, and the design shall reflect nature of the fluids being sampled.

6.5.6 Manual valves, filters, flowmeters, and any other devices to ensure the safe performance of the PACKAGE are under PACKAGER scope of supply.

6.6. SKID REQUIREMENTS

6.6.1 PACKAGE skid structure shall be designed to withstand the design conditions mentioned on item 4.4 and to ensure the lifting conditions on manufacturing site and shipyard. Lifting lugs shall be provided according to PACKAGER lifting procedure.

6.6.2 The Skid main frame shall be all welded construction. Structural skid welds, including lifting facilities shall be continuous and shall comply with AWS D1.1 (structural welding code) and CS Rules.

6.6.3 Skid structure shall be designed to be welded to the supporting structure unless otherwise specified.

6.6.4 PACKAGE skid layout and arrangement shall be designed to provide sufficient access to pumps, instruments, equipment, and control panels to ease the operability and maintenance with safe conditions. Instruments and valves shall be installed on

a suitable height to allow safe access for monitoring, operation, and maintenance.

6.6.5 All necessary maintenance davits, monorails, padeyes or trolleys shall be provided to ensure the safe and easy maintenance conditions.

6.6.6 Access ladders, platforms, gratings and any other access device shall be metallic type and designed according to PACKAGER / MANUFACTURER standard and to the industrial recognized international codes.

6.6.7 Drip trays with drain connections shall be provided underneath the PACKAGE Skid. Draining from those trays shall be directed to the Bilge Water Settling Tank (TQ-5330501).

6.6.8 PACKAGE Equipment and components shall be located entirely within the skids / equipment base perimeter, including all equipment, piping, valves, electrical, instrumentation and controls.

7. GENERAL REQUIREMENTS

7.1. ELECTRICAL REQUIREMENTS

7.1.1 All electrical equipment installed in hazardous areas (see Area Classification documentation) or installed outdoors and kept on during emergency condition (ESD) shall be certified according to IEC 61892, INMETRO Resolution 179, May 18th 2010 and INMETRO resolution 89, February 23rd 2012.

7.1.2 All electrical signal connections for external interconnection with the panel shall be clustered in junction boxes with at least IP-56 level of protection, located inside the panel and grouped according to the different types of signals involved.

7.1.3 Electrical equipment and material shall comply with requirements of I-ET-3010.00-5140-700-P4X-002 – SPECIFICATION FOR ELECTRICAL MATERIAL AND EQUIPMENT FOR OFFSHORE UNITS.

7.1.4 Electrical induction motors shall comply with requirements of I-ET-3010.00-5140-712-P4X-001 – LOW-VOLTAGE INDUCTION MOTORS FOR OFFSHORE UNITS.

7.1.5 Concerning electrical system voltages and quantity of feeders for motors, panels and auxiliaries, centrifugal pumps shall be fed according to definitions of I-ET-3010.00-5140-700-P4X-003 – ELECTRICAL REQUIREMENTS FOR PACKAGES FOR OFFSHORE UNITS.

7.1.6 Power lighting and grounding installations inside the package shall comply with requirements of I-ET-3010.00-5140-700-P4X-003 – ELECTRICAL REQUIREMENTS FOR PACKAGES FOR OFFSHORE UNITS.

7.1.7 Grounding installations shall comply with I-ET-3010.00-5140-700-P4X-001 – SPECIFICATION FOR ELECTRICAL DESIGN FOR OFFSHORE UNITS and I-DE-3010.00-5140-700-P4X-003 – GROUNDING INSTALLATION TYPICAL DETAILS.

7.2. INSTRUMENTATION AND AUTOMATION REQUIREMENTS

7.2.1 PACKAGE shall be protected with all necessary instruments to operate safely, adequately and without interruption in a tropical marine environment.

7.2.2 The instrumentation and control design shall fulfill the requirements of the following technical specifications:

i. I-ET-3010.00-1200-800-P4X-002 – AUTOMATION, CONTROL AND INSTRUMENTATION ON PACKAGE UNITS.

ii. I-ET-3010.00-1200-800-P4X-013 – GENERAL CRITERIA FOR INSTRUMENTATION PROJECTS.

7.2.3 The minimum requirements for the adequate interfacing of the PACKAGE Automation and Instrumentation System with the UNIT are described on I-ET-3010.1Y-1200-800-P4X-014 – AUTOMATION INTERFACE OF PACKAGE UNITS.

7.2.4 For the control and automation panels design requirements I-ET-3010.00-5520-888-P4X-001 – AUTOMATION PANELS shall be considered.

7.3. PAINTING REQUIREMENTS

7.3.1 Painting and coating in accordance with I-ET-3010.00-1200-956-P4X-002 – GENERAL PAINTING and DR-ENGP-I-1.15 COLOR CODING.

7.3.2 All components shall be delivered fully painted/coated, unless otherwise indicated on this specification.

7.3.3 The performed pre-treatment and complete coating shall be in accordance with the paint manufacturer's data sheets.

7.4. NAMEPLATES AND TAG NUMBERING

7.4.1 PACKAGER / MANUFACTURER Equipment shall have nameplates in Brazilian Portuguese language, made of stainless steel AISI 316L, with 3 mm minimum thickness and fixed by stainless steel (AISI 316L) bolts or fasteners on visible and accessible location.

7.4.2 Tagging of all instruments, electrical, mechanical and piping items, including valves, shall be carried out.

7.4.3 Tags shall be supplied with the number and description in the Brazilian Portuguese Language, unless otherwise stated in the technical data sheets.

7.4.4 For TAG numbering refer to I-ET-3000.00-1200-940-P4X-001 – TAGGING PROCEDURE FOR PRODUCTION UNITS DESIGN

7.4.5 For Instrumentation tagging the ISA –5.1 and N-1710 shall be followed.

8. PACKAGE MANUFACTURING

8.1. GENERAL

8.1.1 All materials and equipment supplied by PACKAGER / MANUFACTURER shall be brand new (not overhauled), field proven, free from defects and accepted by Owner and the Classification Society.

8.1.2 Materials and equipment shall be manufactured according to internationally recognized standards for the offshore oil drilling and production industries, and shall be in conformance with the Basic Design and Agreement specifications and requirements.

8.1.3 Field proven definition: Systems and equipment shall demonstrate satisfactory operation at least in 3 floating offshore installation units, operating under process conditions (pressure, flow, capacity and similar fluids) for a minimum of 24,000 hours. For rotating equipment, they must demonstrate operation with fluid, flow and discharge pressure similar to the design. Unproven designs or prototypes (including components) without offshore service will not be accepted.

8.2. QUALITY ASSURANCE AND CONTROL SYSTEM

8.2.1 PACKAGER shall submit his Quality Assurance / Quality Control handbook to HULL SUPPLIER for information.

8.2.2 Engineering, fabrication, and manufacturing shall conform to good manufacturing practices. Quality system according to ISO 9001 in relevant extent shall be in place and implemented.

8.3. WELDING AND NDT

8.3.1 All equipment, structures and piping welds shall be performed according to the requirements described in the latest revision of I-ET-3010.00-1200-955-P4X-001 – WELDING.

8.3.2 Welding shall be carried out with procedures and welders qualified in accordance with ASME Section IX. Welding shall not be performed before qualified welding procedures have been approved.

8.3.3 Intermittent fillet welds are not acceptable.

8.3.4 Welding inspection and NDTs shall be performed according to the requirements described in the latest revision of

- I-ET-3010.00-1000-970-P4X-002 – REQUIREMENTS FOR NDT and
- I-ET-3010.00-1200-955-P4X-002 – REQUIREMENTS FOR WELDING INSPECTION.

8.3.5 Qualification and Certification for procedures and personnel shall be in accordance with I-ET-3010.00-0000-970-P4X-001 – REQUIREMENTS FOR PROCEDURES

AND PERSONNEL QUALIFICATION AND CERTIFICATION.

8.3.6 Final NDTs, for acceptance purposes shall be carried out after completion of any post weld heat treatment (when applicable) and before the applications of painting, hydrostatic testing, etc.

8.4. INSPECTION AND TESTS

8.4.1 PACKAGER / MANUFACTURER shall develop and implement an Inspection and Test Plan (ITP) containing hold points, review and witness points following the schedule of the PACKAGE inspections, tests and events accordingly.

8.4.2 PACKAGE inspection, tests and events shall be attended by the MANUFACTURER, PACKAGER, HULL SUPPLIER, CS and OWNER inspection team whenever necessary.

8.4.3 PACKAGE shall be tested according to the design codes, applicable industry standards, CS Rules and any other one requirement stated on this technical specification.

8.4.4 Unless waive by OWNER, the following PACKAGE inspections and checks shall be witnessed by OWNER inspector:

i. verification of equipment construction materials (vessels, heat exchangers, pumps, etc.) for conformity with the specification requirements.

ii. verification of piping, fittings and valves conform to specification of materials and fabrication.

iii. reports for all NDT performed on the pressure retaining parts (radiographic, dye penetrant, magnetic particles and ultrasonic inspection).

iv. approval of the relief valve settings and witness of their testing after setting.

v. review of Inspection and Test Records.

vi. visual check.

vii. Electrical tests as:

- a MEGGER test for cables and electric motors.

- all tests stated in the respective motors and power / control panel respective specifications.

8.5. FACTORY ACCEPTANCE TEST (FAT)

8.5.1 FAT is a set of functional and performance tests to be executed in any equipment, electrical, instrumentation and telecom panels or any other commissionable item carried out on the PACKAGER / MANUFACTURER factory or in specialized test facilities, in order to demonstrate its compliance with the project specifications and allow its release to shipyard.

8.5.2 For Factory Acceptance Test (FAT) minimum scope requirements:

i. Pressure test (usually hydrostatic) test of all vessels, heat exchangers, tanks, pumps, pipes and valves.

- Note: All piping systems and equipment shall be drained and dried after hydrostatic testing.

ii. Electrical continuity checks on all wiring and earthing.

iii. Functional checks on all instruments and valves.

iv. Alarms and Equipment Protection Tests.

v. All other equipment tests and factory checking to be carried out according to the FAT procedure.

8.5.3 For Factory Acceptance Test (FAT) event invitation e reports:

i. OWNER, CS and HULL SUPPLIER shall be communicated about the FAT event following ITP and the fabrication schedule. FAT invitation schedule shall be negotiated during PACKAGE kick-off meeting on the detail design phase.

ii. PACKAGER shall issue the FAT procedure for all parts involved as OWNER, HULL SUPPLIER and CS, where applicable, and submit to them for approval.

iii. PACKAGER shall issue the FAT report with all test results and duly signed or stamped by all parts that witnessed the FAT and with the test reference documentation attached.

iv. Acceptance of FAT will not be considered as the final acceptance test of the PACKAGE.

8.6. PRE-COMMISSIONING AND COMMISSIONING

8.6.1 PACKAGER / MANUFACTURER shall be required to provide any necessary support for installation, assembly, pre-commissioning and commissioning of the PACKAGE either at a shore based fabrication yard or onboard the FPSO.

8.6.2 PACKAGER / MANUFACTURER is responsible for assembly supervision of the PACKAGE equipment, including the assembly of components to be delivered loose

(for example, some components of the pumps, like stuffing box, etc.).

8.6.3 Final acceptance will be on satisfactory completion of commissioning tests as specified by OWNER.

9. PACKAGE DELIVERY REQUIREMENTS

9.1. PRESERVATION, PACKING AND TRANSPORTATION

9.1.1 PACKAGER / MANUFACTURER shall ensure all the conditions and practices of preservation, packing and transportation are fulfilled and following the PACKAGE / Equipment specific and technical characteristics recommendations.

9.1.2 PACKAGER / MANUFACTURER shall submit to HULL SUPPLIER the PACKAGE preservation requirements and recommendations with all necessary considerations for the PACKAGE Equipment preservation during the UNIT whole design life.

9.1.3 Preservation and packing shall be proper for transportation and storage in a marine environment and protected against moisture and damage during transport, handling and lifting.

9.1.4 In any case, suitable preservation and protective measures shall be provided to prevent equipment deterioration prior to entering into service.

9.1.5 All packings shall be clearly marked for shipping, including lifting points, gross weight, dimensions and center of gravity.

9.1.6 All sea fastening and temporary supports used on the equipment for shipment shall be clearly identified.

9.1.7 PACKAGER / MANUFACTURER shall ensure that all loose valves, tubes and instruments are supplied with plastic caps.

9.1.8 PACKAGER / MANUFACTURER shall also ensure that all electric panels and motors will be supplied with Volatile Corrosion Inhibitor (VCI) impregnated plastic protection or similar, and external plug for space heater connection.

9.1.9 PACKAGER / MANUFACTURER shall provide clear and comprehensive instructions on the exterior of all packages advising the necessary warning notices for unpacking, handling and installing the equipment on arrival at destination.

9.1.10 The equipment shall be thoroughly cleaned internally and be free of all loose foreign materials.

i. The preparation shall make the equipment suitable for outdoor storage in a coastal tropical climate from the time of Shipment.

ii. If there is a risk of damage to valves and other appurtenances during transportation, they shall be disconnected and tagged. All components shall then be securely packed as above.

iii. Spare parts and tools to be packed separately and clearly marked “Spare Parts” and “Tools” respectively.

9.2. SPARE PARTS, CONSUMABLES AND TOOLS

9.2.1 All equipment / material consumable and spare parts recommended by PACKAGER / MANUFACTURER for the construction, testing, commissioning, pre-operation and start-up phases.

9.2.2 All spare parts recommended or required by the CS: such spare parts will be delivered together with the relevant equipment;

9.2.3 All special tools required for construction, pre-commissioning, commissioning and all levels of maintenance and operation.

9.2.4 Spare parts list recommended by PACKAGER / MANUFACTURER for two years of operation.

9.3. DOCUMENTATION

9.3.1 Drawings and Weight Control

For Engineering Documentation minimum requirements:

i. PACKAGER / MANUFACTURER design drawings shall show all necessary dimensions and details required for interface information and installation.

ii. Clearances for maintenance shall be shown on the drawings.

iii. Drawings and documents shall be clear and completely legible with all text in the English language.

iv. Instruction manuals for operation and maintenance of the PACKAGE equipment shall be provided in Portuguese language.

v. Drawings are only accepted when signed by PACKAGER as checked and approved. All revised editions of drawings or documents shall show the revisions clearly marked up, the issue date and PACKAGER's checked and approved signatures.

vi. PACKAGER / MANUFACTURER shall produce a weight / center of gravity data sheet considering each PACKAGE component with the respective assembly dry and operational weight and CoG.

- Note: Operational weight means the component dry weight added to the respective component fluid weight on operational condition.

vii. PACKAGER shall send in advance all recommendations for PACKAGE installation, maintenance and commissioning.

9.3.2 Data Book

PACKAGER shall issue a PACKAGE / Equipment Data Book to be delivered to HULL SUPPLIER for approval. Data Book minimum content shall be as the following:

i. Certified drawings, data sheets, technical specifications, performance curves and calculation memorandum.

ii. Construction, maintenance and operating manuals, instructions for preservation and commissioning, and all catalogs, including of the sub-suppliers.

iii. All certificates of materials and equipment, certificates of electrical cables and equipment to hazardous areas, all tests, destructive and non-destructive examinations, test reports (including FAT), certificates and reports of classification society, procedures for welding qualifications and welding processes.

iv. The documentation requested by Brazilian law NR-13, subdivided for equipment (if applicable).

v. The documentation requested by Brazilian law NR-10, subdivided for equipment (if applicable).

Data Book delivery standard and conditions including number of parts and sections, number of printed and electronic copies will be further defined by OWNER on detail design phase.

9.4. TRAINING

9.4.1 PACKAGER shall provide training to qualify OWNER technicians for operation and maintenance (install, dismantle, replace parts, make adjustment, etc.) of each equipment.