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	CLIENT: SRGE		SHEET: 1 of 15
	JOB : REFERENCE HULL 01		
	AREA: -		
SRGE	TITLE: OILY WATER SEPARATOR PACKAGE (SAO-5330501)		INTERNAL
			ESUP

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PROJECT	ESUP/ENE	ESUP/ENE							
EXECUTION	CXZ0	CXZ0							
CHECK	T3P7	T3P7							
APPROVAL	BYA6	BYA6							

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THIS FORM IS PART OF PETROBRAS N-381 REV.M ANNEX A – FIGURE A.1.




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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 and tests of OILY WATER SEPARATOR PACKAGE (SAO-5330501) in conformance with relevant regulations and REFERENCE HULL 01 basic design documentation.

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.

OILY WATER SEPARATOR PACKAGE (SAO-5330501) 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.

- ASME B31.3 – Process Piping
- ASME B16.5 – Pipe Flanges & Flanged Fittings
- AWS D1.1 – Structural Welding Code

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- ISO – International Standard Organization
- IMO Resolution MEPC 107 (49)
- IEC – International Electrotechnical Commission
- MARPOL Regulations
- SOLAS II-1, Regulation 3-5, and MSC.1/Circ. 1379
- 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.
- INMETRO Resolution 115, Mach 21st 2022 (hazardous areas)


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

3.1. REFERENCE HULL 01 FPSO BASIC DESIGN

REF DOC NUMBER	REF DOC NAME
HULL SYSTEMS	
I-DE-3010.2E-5330-944-P4X-001	BILGE, SLUDGE, BALLAST (AFT) AND GENERAL SERVICE SEAWATER SYSTEM
I-MD-3010.2E-1200-940-P4X-027	DESCRIPTIVE MEMORANDUM - HULL SYSTEMS
MECHANICAL	
I-ET-3010.00-1352-130-P4X-001	FLOOR GRATINGS, TRAY SYSTEMS AND GUARDRAILS MADE OF COMPOSITE MATERIALS.
OUTFITTING	


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I-DE-3010.2E-1351-140-P4X-001	HULL GENERAL NOTES AND TYPICAL DETAILS
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Table 1 – Reference Hull 01 FPSO basic design.

3.2. TYPICAL DOCUMENTS

REF DOC NUMBER	REF DOC NAME
GENERAL	
I-ET-3000.00-0000-940-P4X-002	SYMBOLS FOR PRODUCTION UNITS DESIGN
I-ET-3010.00-1200-940-P4X-002	GENERAL TECHNICAL TERMS
I-ET-3000.00-1200-940-P4X-001	TAGGING PROCEDURE FOR PRODUCTION UNITS DESIGN
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
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


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PIPING	
I-ET-3010.00-1200-251-P4X-001	REQUIREMENTS FOR BOLTING MATERIALS
I-ET-3010.00-1200-200-P4X-115	REQUIREMENTS FOR PIPING FABRICATION AND COMMISSIONING
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-3010.00-1200-800-P4X-013	GENERAL CRITERIA FOR INSTRUMENTATION PROJECTS
I-ET-3010.00-5520-888-P4X-001	AUTOMATION PANELS
I-ET-3010.00-1200-800-P4X-015	REQUIREMENTS FOR TUBING AND FITTING (ALIGNED TO IOGP-JIP33 S-716)

Table 2 – Reference Hull 01 Typical Documents.

3.3. SPECIFIC PROJECT DOCUMENTS

REF DOC NUMBER	REF DOC NAME
GENERAL	

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I-DE-GENERAL ARRANGEMENT	GENERAL ARRANGEMENT
I-DE-AREA CLASSIFICATION – GENERAL	AREA CLASSIFICATION – GENERAL
I-ET-AUTOMATION INTERFACE OF PACKAGE UNITS	AUTOMATION INTERFACE OF PACKAGE UNITS
I-ET-METOCEAN DATA	METOCEAN DATA
I-RL-MOTION ANALYSIS	MOTION ANALYSIS

Table 3 – Specific Project Documents.

- Note: these above item 0 documents title and number may vary slightly from one project to another. Project’s document list shall be consulted to verify the correct document number and title.


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 FPSO REFERENCE HULL 01 basic design reference documents.

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”.

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

4.2.6. For additional safety requirements refer to DR-ENGP-M-I-1.3 – SAFETY ENGINEERING GUIDELINE.

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-METOCEAN DATA.

4.4.4. For the Hull loading conditions details and the maximum designed operational trim and heel inclinations refer to I-ET-3010.00-1350-960-P4X-001 – DESIGN REQUIREMENTS – NAVAL ARCHITECTURE.

4.4.5. For the design data and information regarding motion requirements refer to I-RL-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


5.1.1. PACKAGE is composed by the following equipment:


	TAG	Description	Qty
1	SAO-5330501	Oily Water Separator	1x100%
2	PN-SAO-5330501	Oily Water Separator Package Control Panel	1x100%


Table 4 – Scope of Supply

5.1.2. In addition to the table 4, PACKAGE shall supply the following items:

- a. An oily water pump.
- b. An oil / water separation section.

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<p>c. A sludge pump for the sludge removal to the Hull sludge system.</p> <p>d. Oily water discharge monitor.</p> <p>e. Filtering system where necessary.</p> <p>f. Skid mounted with drip trays, lifting lugs, earthing lugs and flanged drains with valves.</p> <p>5.1.3. All necessary ancillaries, control panel, electrical and instrumentation installation, interconnecting piping, fittings and valves within the limits of skid and all other parts or components required for safe and suitable operation of the system.</p> <p>5.2. EQUIPMENT LOCATION</p> <p>5.2.1. PACKAGE will be installed on Engine Room: a closed and non-classified compartment as defined on I-DE-AREA CLASSIFICATION – GENERAL.</p> <p>5.2.2. I-DE-GENERAL ARRANGEMENT and shall be used as reference for equipment location.</p> <p>6. PACKAGE SPECIFICATION</p> <p>6.1. OILY WATER SEPARATOR PACKAGE (SAO-5330501)</p> <p>6.1.1. PACKAGE shall be designed for continuous operation at full load duty, unless otherwise stated in the process data sheets.</p> <p>6.1.2. PACKAGE equipment shall be designed to perform the bilge water suction from the structural tank Bilge water settling tank (TQ-5330501) installed inside the Engine Room with a minimum flow rate of 5 m³/h with the maximum oil content of 500 ppm.</p> <p>6.1.2.1. PACKAGE shall have protection against low pressure at the Bilge water settling tank (TQ-5330501) suction.</p> <p>6.1.3. PACKAGE shall discharge the bilge water to overboard with a maximum oil content of 15 ppm, as required by IMO Resolution MEPC 107 (49) and MARPOL requirements.</p> <p>6.1.3.1. PACKAGE shall have protection against high pressure at the Oily Water Separator (SAO-5330501) discharge.</p> <p>6.1.4. Oily Water Separator (SAO-5330501) shall be IMO type approved for MARPOL requirements attendance.</p> <p>6.1.5. Oily Water Separator (SAO-5330501) shall have a control system to activate an alarm on SOS-HMI with set for oil content in water of 15 ppm or more. After alarm activation, the following actions shall be taken by the system:</p>			

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<p>a. Automatic redirection of oily water to the Bilge Water Settling Tank (TQ-5330501) and automatic interruption of the oily water discharge to the sea.</p> <p>b. Oily Water Separator Package pump shall be automatically stopped after the above redirection conclusion.</p> <p>c. The automatic redirection of the oily water to the Bilge Water Settling Tank (TQ-5330501) in conjunction with the PACKAGE discharge interruption shall be performed by a three-way valve.</p> <p>d. The three-way valve shall be supplied by PACKAGER. This valve shall be installed on SAO-5330501 inside the PACKAGE limits and upstream the discharge line of the SAO-5330501 to the overboard.</p> <p>6.1.6. An oily water discharge monitoring and alarm shall be supplied by PACKAGER and installed in the PACKAGE. This system shall be composed by the following items:</p> <p>a. One (1) IMO type approved oil cell to attend the MARPOL requirements with oil content monitoring range between 0 and 30 ppm.</p> <p>b. One (1) continuous sampling collecting point to monitor the oil content on the Oily Water Separator (SAO-5330501) overboard discharge.</p> <p>c. A continuous oil content signal to be transmitted to the Oily Water Separator (SAO-5330501) control system.</p> <p>6.1.7. Oily Water Separator PACKAGE shall have protection and control devices for the safe operation of the system.</p> <p>6.2. GENERAL</p> <p>6.2.1. PACKAGE shall be PACKAGER's standard design, provided it covers the requirements of this specification. Prototypes are not acceptable.</p> <p>6.2.2. PACKAGER shall assume full unit responsibility for the complete PACKAGE, including drivers and all auxiliaries.</p> <p>6.2.3. The utility requirements and consumption of the equipment shall be clearly defined by the PACKAGER.</p> <p>6.2.4. Dissimilar materials shall be isolated to avoid galvanic corrosion.</p> <p>6.2.5. PACKAGE weight and dimensions shall be minimized.</p> <p>6.2.6. Each PACKAGE component and respective accessories shall be resistant to the marine environment and shall follow manufacturer standard.</p> <p>6.2.7. The PACKAGER shall furnish drawings and procedure for handling and installation of the Units and specify the required devices for the Units maintenance, such as davits, monorails, etc.</p>			

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6.2.8. Manufactures to supply Data Sheets filled out with all details on the whole of the equipment mounted on the unit. Data Sheets shall contain technical characteristics of equipment such as: type, capacity, flow rates, pressures, temperatures, materials, diameters of connections, dimensions, weight, air, water and electric consumption, location of center of gravity, electric power rating and such other information as may be deemed necessary.

6.2.9. PACKAGE shall be connected, wired and supplied as a complete unit, ready for installation and operation.

7. GENERAL REQUIREMENTS

7.1. ELECTRICAL REQUIREMENTS

7.1.1. PACKAGE electrical equipment, material, low voltage induction motors, and grounding installation shall comply with the following references:

- a) I-ET-3010.00-5140-700-P4X-001 – SPECIFICATION FOR ELECTRICAL DESIGN FOR OFFSHORE UNITS.
- b) I-ET-3010.00-5140-700-P4X-002 – SPECIFICATION FOR ELECTRICAL MATERIAL AND EQUIPMENT FOR OFFSHORE UNITS.
- c) I-ET-3010.00-5140-700-P4X-003 – ELECTRICAL REQUIREMENTS FOR PACKAGES FOR OFFSHORE UNITS.
- d) I-ET-3010.00-5140-712-P4X-001 – LOW-VOLTAGE INDUCTION MOTORS FOR OFFSHORE UNITS.
- e) I-DE-3010.00-5140-700-P4X-003 – GROUNDING INSTALLATION TYPICAL DETAILS.


7.2. INSTRUMENTATION AND AUTOMATION REQUIREMENTS

7.2.1. PACKAGE criteria for instrumentation, automation, interface and control design shall follow the below technical specifications:

- a) I-ET-3010.00-1200-800-P4X-002 – AUTOMATION, CONTROL AND INSTRUMENTATION ON PACKAGE UNITS.
- b) I-ET-3010.00-1200-800-P4X-013 – GENERAL CRITERIA FOR INSTRUMENTATION PROJECTS.
- c) I-ET- AUTOMATION INTERFACE OF PACKAGE UNITS.
- d) I-ET-3010.00-5520-888-P4X-001 – AUTOMATION PANELS.

7.3. PAINTING REQUIREMENTS

7.3.1. PACKAGE painting and coating shall be performed in accordance with I-ET-3010.00-1200-956-P4X-002 – GENERAL PAINTING and DR-ENGP-I-1.15

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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. SKIDS LAYOUT AND FOUNDATION REQUIREMENTS

- 7.4.1. PACKAGE shall be assembled as a single skid designed to withstand the design conditions mentioned on item 4.4 and to ensure the lifting conditions on manufacturing site and at the shipyard. Lifting lugs shall be provided according to PACKAGER lifting procedure.
- 7.4.2. Skid foundation structural steel components shall be designed and fabricated with the skid main frame all welded constructed. Structural skid welds, including lifting facilities shall be continuous and shall comply with AWS D1.1 (structural welding code) and CS Rules.
- 7.4.3. 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.
- 7.4.4. All necessary maintenance davits, monorails, padeyes or trolleys shall be provided to ensure the safe and easy maintenance conditions.
- 7.4.5. Access ladders, platforms, gratings and any other access device shall comply with I-ET-3010.00-1352-130-P4X-001 - FLOOR GRATINGS, TRAY SYSTEMS AND GUARDRAILS MADE OF COMPOSITE MATERIALS. Metallic material is also acceptable and I-DE-3010.2E-1351-140-P4X-001 – HULL GENERAL NOTES AND TYPICAL DETAILS, item 3.23, shall be followed for metallic grating requirements.
- 7.4.6. PACKAGE Equipment and components shall be located entirely within the skids / equipment base perimeter, including all equipment, piping, valves, and instrumentation.
- Note: for the Oily Water Separator Package Control Panel (PN-SAO-5330501) location requirements refer to I-ET-3010.00-5140-700-P4X-003 – ELECTRICAL REQUIREMENTS FOR PACKAGES FOR OFFSHORE UNITS.

7.5. NAMEPLATES AND TAG NUMBERING

- 7.5.1. 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

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and accessible location.

- Note 1: additional nameplates shall be provided as per NR13 rules.
- Note 2: for further requirements refer to EXHIBIT V – DIRECTIVES FOR PROCUREMENT.

7.5.2. Tagging of all instruments, electrical, mechanical and piping items, including valves, shall be carried out as detailed on I-ET-3000.00-1200-940-P4X-001 – TAGGING PROCEDURE FOR PRODUCTION UNITS DESIGN.


8. PACKAGE MANUFACTURING AND DELIVERY REQUIREMENTS

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 REFERENCE HULL 01 basic design related specifications and requirements.
- 8.1.3. Field proven definition as EXHIBIT V – DIRECTIVES FOR PROCUREMENT: 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. WELDING

- 8.2.1. PACKAGE equipment, structures and piping welding, welding inspection, non-destructive testing (NDT), bolted joints assembly and piping fabrication and commissioning activities shall be performed in compliance with the following technical specifications:
- a) I-ET-3010.00-1000-970-P4X-002 – Requirements for NDT.
 - b) I-ET-3010.00-1000-955-P4X-002 – Requirements for Welding Inspection.
 - c) I-ET-3010.00-1000-955-P4X-001 – Welding.
 - d) I-ET-3010.00-1200-200-P4X-001 – Requirements for Bolted Joints Assembly and Management.
 - e) I-ET-3010.00-1200-200-P4X-115 – Requirements for Piping Fabrication and Commissioning.

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8.3. DOCUMENTATION

8.3.1. For the PACKAGE documentation and data-book requirements refer to EXHIBIT III – DIRECTIVES FOR ENGINEERING and to EXHIBIT V – DIRECTIVES FOR PROCUREMENT.

8.4. SPARE PARTS

8.4.1. For the PACKAGE, spare parts, special tools, CS required spare parts and spare parts list recommended for two (2) years of operation refer to EXHIBIT V – DIRECTIVES FOR PROCUREMENT.

8.5. INSPECTION AND TESTS

8.5.1. For PACKAGE inspection, tests, factory acceptance test (FAT) and inspection release certificate (IRC), refer to EXHIBIT V – DIRECTIVES FOR PROCUREMENT.

8.5.2. For PACKAGE inspection and test plan (ITP) requirements refer to EXHIBIT VII – DIRECTIVES FOR QUALITY ASSURANCE SYSTEM.

8.6. PRESERVATION, PACKING AND TRANSPORTATION

8.6.1. For PACKAGE preservation, packing and transportation requirements refer to EXHIBIT V – DIRECTIVES FOR PROCUREMENT.