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	CLIENT:	SRGE	SHEET: 1 of 16
	JOB :	REFERENCE HULL 01	
	AREA:		
SRGE	TITLE: FRESH WATER HYDROPHORE UNIT (Z-5115501)		INTERNAL
			ESUP

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PROJECT	ESUP/ENE	ESUP/ENE							
EXECUTION	CXZ0	CXZ0							
CHECK	T3P7	PMX4							
APPROVAL	BYA6	BYA6							

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THIS FORM IS PART OF PETROBRAS N-381 REV.J 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 FRESH WATER HYDROPHORE UNIT (Z-5115501) in conformance with relevant regulations and REFERENCE HULL 01 basic design documentation.

FRESH WATER HYDROPHORE UNIT (Z-5115501) PACKAGE is to be assembled in a skid composed by the Hydrophore vessel, two redundant pumps to control the fresh water level inside the Hydrophore vessel and a skid control panel.

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.

FRESH WATER HYDROPHORE UNIT 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

PSV..... Pressure Safety Valves


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.

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- ASME B31.3 – Process Piping
- ASME B16.5 – Pipe Flanges & Flanged Fittings
- AWS D1.1 – Structural Welding Code
- ISO – International Standard Organization
- IMO – International Maritime Organization
- IEC – International Electrotechnical Commission
- 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.


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-5115-944-P4X-002	FRESH, HOT AND POTABLE WATER SYSTEM
I-DE-3010.2E-5115-944-P4X-003	FRESH, HOT AND POTABLE WATER SYSTEM DISTRIBUTION
I-MD-3010.2E-1200-940-P4X-027	DESCRIPTIVE MEMORANDUM - HULL SYSTEMS
MECHANICAL	
I-ET-3010.2E-1200-500-P4X-001	MATERIAL SPECIFICATION FOR HULL SYSTEM PRESSURE VESSELS AND TANKS
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-3010.00-1352-130-P4X-001	FLOOR GRATINGS, TRAY SYSTEMS AND GUARDRAILS MADE OF COMPOSITE MATERIALS.
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	

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I-ET-3010.00-5400-947-P4X-002	SAFETY SIGNALING
DR-ENGP-M-I-1.3	SAFETY ENGINEERING GUIDELINE
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

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REF DOC NUMBER	REF DOC NAME
GENERAL	
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-GENERAL SPECIFICATION FOR AVAILABLE UTILITIES	GENERAL SPECIFICATION FOR AVAILABLE UTILITIES
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,

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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. 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. Fresh Water Hydrophore Package is composed by the following equipment:

	TAG	Description	Qty
1	B-Z-5115501A/B	FRESH WATER HYDROPHORE PUMP	2 x 100%

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2	V-Z-5115501	FRESH WATER HYDROPHORE VESSEL	1 X 100%
3	PN-Z-5115501	FRESH WATER HYDROPHORE VESSEL CONTROL PANEL	1 X 100%

Table 4 – Scope of Supply

5.1.2. The above equipment shall be supplied by the same PACKAGER and with all interconnection piping, accessories, valves, electrical panels, instruments and all necessary devices to ensure the safe and full performance of the PACKAGE under the design and operational minimum requirements.

5.1.3. All necessary ancillaries, electrical and instrumentation installation, interconnecting piping, fittings and valves within the limits of skid.

5.1.4. All other parts or components required for safe and suitable operation of the system.

5.2. EQUIPMENT LOCATION

5.2.1. PACKAGE shall be installed in Engine Room: a closed and non-classified compartment as defined on I-DE-AREA CLASSIFICATION PLAN.

5.2.2. I-DE-GENERAL ARRANGEMENT and shall be used as reference for equipment location.


6. PACKAGE SPECIFICATION

6.1. FRESH WATER HYDROPHORE PACKAGE

6.1.1. As detailed on item 5.1, PACKAGE shall be composed by the vessel, pumps, control valves and control panel which shall all be supplied by the same PACKAGER.

6.1.2. Fresh Water Hydrophore PACKAGE consumers shall be the following below, as either indicated on I-DE-3010.2E-5115-944-P4X-002 – HOT, FRESH AND POTABLE WATER SYSTEM:

- i. Main Deck, Engine Room and Accommodation Distribution.
- ii. Topsides Distribution.
- iii. Expansion Tank for ER Central Cooling Fresh Water (TQ-5120501).
- iv. Diesel Oil Purifiers (SC-5133501A/B).
- v. Oily Water Separator (SAO-5330501).
- vi. Eye wash stations and sinks.


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- vii. Lifeboats and rescue boat areas.
- viii. Workshops and stores.
- ix. Any other fresh water / potable water service points.

6.1.3. PACKAGE flanges for interconnection with the Hull systems shall be designed as ASME B16.5.

6.2. FRESH WATER HYDROPHORE VESSEL (V-Z-5115501)

- 6.2.1. Fresh Water Hydrophore Vessel (V-Z-5115501) shall have volumetric capacity of 22 m³.
- 6.2.2. As a pressure vessel, Fresh Water Hydrophore Vessel (V-Z-5115501) shall be designed, manufactured, and tested in compliance with the requirements of the NR-13 – Brazilian Federal Government Regulatory Norms which is mentioned on item 2.
- 6.2.3. For the Fresh Water Hydrophore Vessel (V-Z-5115501) shell, heads and nozzles material specification and the internal coating specification refer to I-ET-3010.2E-1200-500-P4X-001 – MATERIAL SPECIFICATION FOR HULL SYSTEM PRESSURE VESSELS AND TANKS.
- 6.2.4. Fresh Water Hydrophore Vessel (V-Z-5115501) pressurization shall be performed by the Unit Hull essential air distribution supplied by the Hull service / instrument air system as indicated on I-DE-3010.2E-5115-944-P4X-002 – FRESH, HOT AND POTABLE WATER SYSTEM.
- Note: PACKAGER shall advise the vessel supplied air standard to ensure the adequate quality to avoid any fresh water contamination.
- 6.2.5. Fresh Water Hydrophore Vessel (V-Z-5115501) shall be supplied with at least the following devices:
- i. Pressure or level switches to be applied on start / stop logic for the Fresh Water Hydrophore Pumps (B-Z-5115501A/B) operation according to the pressure or level of fresh water inside the Fresh Water Hydrophore Vessel (V-Z-5115501).
 - ii. Level gauge magnetic type (LG) and level transmitters associated with the vessel low and high indication alarms.
 - Note: level gauge (LG) lowest connection point shall be installed at the Hydrophore vessel bottom to ensure the accuracy on low level indication.
 - iii. Pressure relief system performed by two (02) pressure safety valves (PSV), specified according to the NR-13 requirements.
 - iv. Purge and drain system specified according to the NR-13 requirements.

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v. Manhole for inspection purposes with the design and dimensions specified according to the NR-13 requirements.

6.2.6. PACKAGER shall provide means to maintain the fresh water supply to the consumers in the condition of the hydrophore vessel not operational (for example: bypass during maintenance). In this operation mode, PACKAGER shall protect the pump regarding the situation of the low demand of fresh water from the consumers.

6.2.7. For the Fresh water system details refer to I-DE-3010.2E-5115-944-P4X-002 – HOT, FRESH AND POTABLE WATER SYSTEM.

6.3. FRESH WATER HYDROPHORE PUMP (B-Z-5115501A/B)

6.3.1. Two (2x100%) centrifugal electrical driven pumps with the flow capacity as defined on I-DE-3010.2E-5115-944-P4X-002 – HOT, FRESH AND POTABLE WATER SYSTEM shall be supplied by PACKAGER, being one pump in stand-by for the other.

6.3.2. Fresh water hydrophore pumps shall be installed in the same skid as the Fresh Water Hydrophore Vessel (V-Z-5115501).

6.3.3. Fresh water hydrophore skid suction lines from the fresh water storage tanks shall be segregated from any other suction lines of the tanks.

6.3.4. Logic for start and stop the fresh water hydrophore pumps shall be designed and supplied by PACKAGER.

6.3.5. One (1) low pressure alarm on the suction of each pump (B-Z-5115501A/B) with interlocking to stop the pumps.

6.3.6. PACKAGER shall ensure the automatic start of the stand-by pump by the failure scenario of the pump in operation.

6.3.7. PACKAGER shall provide means to prevent excessive fresh water filling scenario on V-Z-5115501.

6.4. FRESH WATER HYDROPHORE VESSEL CONTROL PANEL (PN-Z-5115501)


6.4.1. For control panel (PN-Z-5115501) specification refer to item 7.1 and 7.2 of this technical specification.


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-002 – SPECIFICATION FOR ELECTRICAL MATERIAL AND EQUIPMENT FOR OFFSHORE UNITS.

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<p>b) I-ET-3010.00-5140-712-P4X-001 – LOW-VOLTAGE INDUCTION MOTORS FOR OFFSHORE UNITS.</p> <p>c) I-ET-3010.00-5140-700-P4X-003 – ELECTRICAL REQUIREMENTS FOR PACKAGES FOR OFFSHORE UNITS.</p> <p>d) I-ET-3010.00-5140-700-P4X-001 – SPECIFICATION FOR ELECTRICAL DESIGN FOR OFFSHORE UNITS.</p> <p>e) I-DE-3010.00-5140-700-P4X-003 – GROUNDING INSTALLATION TYPICAL DETAILS.</p>			
<p>7.2. INSTRUMENTATION AND AUTOMATION REQUIREMENTS</p> <p>7.2.1. PACKAGE criteria for instrumentation, automation, interface and control design shall follow the below technical specifications:</p> <p>a) I-ET-3010.00-1200-800-P4X-002 – AUTOMATION, CONTROL AND INSTRUMENTATION ON PACKAGE UNITS.</p> <p>b) I-ET-3010.00-1200-800-P4X-013 – GENERAL CRITERIA FOR INSTRUMENTATION PROJECTS.</p> <p>c) I-ET-AUTOMATION INTERFACE OF PACKAGE UNITS.</p> <p>d) I-ET-3010.00-5520-888-P4X-001 – AUTOMATION PANELS.</p>			
<p>7.3. PAINTING REQUIREMENTS</p> <p>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 COLOR CODING.</p> <p>7.3.2. All components shall be delivered fully painted/coated, unless otherwise indicated on this specification.</p> <p>7.3.3. The performed pre-treatment and complete coating shall be in accordance with the paint manufacturer's data sheets.</p>			
<p>7.4. SKIDS LAYOUT AND FOUNDATION REQUIREMENTS</p> <p>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.</p> <p>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.</p>			

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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 instruments.

- Note: For the FRESH WATER HYDROPHORE VESSEL CONTROL PANEL (PN-Z-5115501) 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 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

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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.

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.

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8.6. PRESERVATION, PACKING AND TRANSPORTATION

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