

	TECHNICAL SPECIFICATION	Nº. I-ET-3010.1M-1200-450-P4X-001	
	CLIENT:	SRGE	SHEET: 1 of 8
	JOB:	REFERENCE BASIC DESIGN	1001056398 0010
	AREA:	BÚZIOS	
DP&T-SRGE	TITLE:	MATERIAL SPECIFICATION FOR HEAT EXCHANGERS	NP-1
			ESUP

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DATE	AUG/06/19								
DESIGN	ESUP								
EXECUTION	MMARROIG								
CHECK	PONTE								
APPROVAL	TMCAMPOS								

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TECHNICAL SPECIFICATION

Nº. I-ET-3010.1M-1200-450-P4X-001

REV: 0

AREA: BÚZIOS

SHEET: 2 of 8

TITLE: **MATERIAL SPECIFICATION FOR HEAT EXCHANGERS**

NP-1

ESUP

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PRELIMINARY

1 SCOPE

This document covers the material specification for plate and printed circuit heat exchangers to be supplied to **PETROBRAS** for **REFERENCE BASIC DESIGN FPSO** topside.

All calculations and mechanical datasheets shall be submitted to **PETROBRAS** approval by MANUFACTURER/PACKAGER.

2 NORMATIVE REFERENCES

Equipment design and fabrication shall comply with the requirements of this specification, data sheets, the rules, codes, standards and the project specifications as stated below and with those referred to herein.

2.1 CLASSIFICATION

- 2.1.1 PACKAGER/ MANUFACTURER shall perform the work in accordance with the requirements of Classification Society.
- 2.1.2 PACKAGER/ MANUFACTURER is responsible for submitting to the Classification Society all documentation in compliance with stated Rules.

2.2 CODES AND STANDARDS

2.2.1 The following codes and standards include provisions which, through reference in this text, constitute provisions of this specification. The latest issue of the references shall be used unless otherwise agreed. Other recognized standards may be used, provided it can be shown that they meet or exceed the requirements of the standards referenced below:

API 6A	-	Specification for Welhead and Tree Equipment
ASME BPCV Code SEC II	-	Material Specifications
ASME BPCV Code SEC V	-	Non-Destructive Examination
ASME BPCV Code SEC VIII	-	Rules for Construction of Pressure Vessels
ASME BPCV Code SEC IX	-	Welding Brazing and Fusing Qualifications
ASME B16.11	-	Forged Steel Fittings, Socket-Welding and Threaded
ASME B16.47	-	Large Diameter Steel Flanges: NPS 26 Through NPS 60
ASME B16.5	-	Pipe Flanges and Flanged Fittings
ASME B31.3	-	Process Piping
ASTM	-	American Society for Testing and Materials
AWS D1.1	-	Structural Welding Code
ISO 27509	-	Petroleum and Natural Gas Industries – Compact Flanged with IX Seal Ring
ISO 15156	-	Petroleum and Natural Gas Industries – Materials for use in H2S Containing Environments in Oil and Gas Production

2.3 GOVERNAMENTAL REGULATION

- NR 13 - Caldeiras, Vasos de Pressão e Tubulações
- NR 26 - Sinalização de Segurança (Safety Signaling - Brazilian Labor Ministry Rules)
- NR 37 - Segurança e Saúde em Plataformas de Petróleo

*Note: Government codes, regulations, ordinances or rules applicable to the equipment in Brazil shall prevail over the requirements of this specification, including reference codes and standards, only if more stringent.

2.4 REFERENCE DOCUMENTS

- DR-ENGP-M-I-1.3 - SAFETY GUIDELINE
- DR-ENGP-I-1.15 - COLOR CODING
- I-DE-3010.1M-XXXX-944-P4X-XXX - *DESIGN P&IDs
- I-DE-3010.1M-1200-942-P4X-002 - GENERAL ARRANGEMENT
- I-ET-3000.00-1200-940-P4X-001 - TAGGING PROCEDURE FOR PRODUCTION UNITS DESIGN.
- I-ET-3010.00-1200-251-P4X-001 - BOLT MATERIALS
- I-ET-3010.00-1200-431-P4X-001 - THERMAL INSULATION FOR MARITIME INSTALLATIONS
- I-ET-3010.00-1200-540-P4X-001 - REQUIREMENTS FOR PRESSURE VESSELS DESIGN
- I-ET-3010.00-1200-540-P4X-002 - REQUIREMENTS FOR PRESSURE VESSELS FABRICATION
- I-ET-3010.00-1200-955-P4X-001 - WELDING
- I-ET-3010.00-1200-956-P4X-002 - GENERAL PAINTING
- I-ET-3010.00-1200-956-P4X-003 - THERMAL SPRAY COATING APPLICATION OF ALUMINUM
- I-ET-3010.00-1200-456-P4X-001 - PLATE HEAT EXCHANGER SPECIFICATION
- I-ET-3010.00-1200-459-P4X-001 - PRINTED CIRCUIT HEAT EXCHANGER SPECIFICATION
- I-ET-3010.1M-1200-200-P4X-001 - PIPING SPECIFICATION FOR TOPSIDE
- I-FD-3010.1M-XXXX-XXX-XXX - *DESIGN DATASHEET

*The specific document (Design P&IDs and Datasheets) are detailed in each equipment table.

2.5 CONFLICTING REQUIREMENTS

- 2.5.1 In case of conflicting information between this technical Specification (ET) and the referred applicable standards, this ET shall prevail.
- 2.5.2 In case of conflicting information between this Specification (ET) and other specific **PETROBRAS'** document (data sheet) the specific **PETROBRAS'** document shall prevail.
- 2.5.3 In all cases of conflict between this specification and applicable documents listed herein, the more stringent requirements shall prevail. In such cases, PACKAGER/ MANUFACTURER shall inform **PETROBRAS** of the conflict and seek clarification.

3 DEFINITIONS AND ABBREVIATIONS

3.1 DEFINITIONS

- 3.1.1 MAY: May indicates a course of action that is permissible within the limits of the standard (a permission).
- 3.1.2 SHALL: Shall is an absolute requirement which must be followed strictly in order to conform with the standard.
- 3.1.3 PACKAGER: Company responsible for the project, assembly, construction, fabrication, test and furnishing of the Package.
- 3.1.4 MANUFACTURER: The supplier, vendor or Contractor. Company responsible for the fabrication of equipment or components internal to the Package.

3.2 ABBREVIATIONS

API	-	American Petroleum Institute
ASME	-	American Society of Mechanical Engineers
ASTM	-	American Society for Testing and Materials
AWS	-	American Welding Society
CRA	-	Corrosion Resistant Alloy
FPSO	-	Floating Production Storage and Offloading
GRP	-	Glass – Reinforced plastic
P&ID:	-	Piping & Instrumentation Diagram
TSA	-	Thermal Spray Aluminum

4 GENERAL REQUIREMENTS

4.1 DESIGN

- 4.1.1 PACKAGER/ MANUFACTURER shall design and fabricate the equipment for a minimum lifetime of 25 years.
- 4.1.1.1 The PACKAGER is responsible detailing the materials selection in accordance with this specification. In all cases, PACKAGER/MANUFACTURER shall submit the detailed material list, including all equipment and their components, for **PETROBRAS** approval prior manufacture activities.

4.2 FLANGES AND GASKETS

- 4.2.1 Flanges materials shall be compatible with the shell materials, except where explicit mentioned in this document.

- 4.2.1.1 Flange materials is specified due to low temperature requirement at flange (-80°C). At this case, the use of clad or weld overlaid is only possible if base material have the required impact proprieties.
- 4.2.2 The type of nozzles flanges and flanges gaskets shall be compatible with the connected piping flange (shown in P&ID and defined in I-ET-3010.1M-1200-200-P4X-001 – PIPING SPECIFICATION FOR TOPSIDE). Different types of flanges and gaskets might be acceptable in the following cases:
- If the pressure rating of the nozzle flange is higher than the pressure rating of the pipe flange.
 - For CLADED/COATED piping specification.
 - If flange manufacture is unfeasible;

In all cases of conflict the PACKAGER/ MANUFACTURER shall inform **PETROBRAS** of the conflict and seek clarification.

4.3 BOLTS AND NUTS

- 4.3.1 Studs, bolts, tightening bolts and nuts shall be according I-ET-3010.00-1200-251-P4X-001 – BOLT MATERIALS

4.4 COATING AND INSULATION REQUIREMENTS

- 4.4.1 Equipment subjected to temperature of 60°C and above shall receive a personal protection system, by means of 316SS wire mesh / perforated plates. Alternatively, a thermally insulated may be applied. Equipment in which heat conservation is necessary shall be thermal insulated. The thermal insulation shall be according latest revision of I-ET-3010.00-1200-431-P4X-001 – THERMAL INSULATION FOR MARITIME INSTALLATIONS
- 4.4.2 Painting requirements shall be according I-ET-3010.00-1200-956-P4X-002 -GENERAL PAINTING
- 4.4.3 Color code adopted shall be in accordance with DR-ENGP-I-1.15 – COLOR CODING.

5 PLATE HEAT EXCHANGERS

PACKAGER/MANUFACTURER shall be responsible for supplying the equipment in accordance with the requirements of this specification, codes and standards referenced therein.

Gaskets of plate heat exchangers shall be according to requirements of I-ET-3010.1M-1200-456-P4X-001 - PLATE HEAT EXCHANGER SPECIFICATION

5.1 OIL COLLECTIONG AND SEPARATING (U-1223)

5.1.1 OIL COOLER (P-1223005)

P-1223005- MATERIAL DATA	
Plates:	Titanium
Flanges:	According spec
Special Service	ISO151565 H ₂ S Service.
Reference Documents	I-FD-3010.1M-1223-456-P4X-002 I-DE-3010.1M-1223-944-P4X-013

5.2 PRODUCED WATER UNIT (U-5331)

5.2.1 PRODUCED WATER COOLER (P-5331001 A/B)

P-5331001 A/B - MATERIAL DATA	
Plates:	Titanium
Flanges:	According spec
Special Service	ISO151565 H ₂ S Service.
Reference Documents	I-FD-3010.1M-5331-456-P4X-001 I-DE-3010.1M-5331-944-P4X-001

5.3 COOLING WATER SYSTEM (U-5124)

5.3.1 COOLING WATER HEAT EXCHANGER – CLASSIFIED AREA (P-5124001 A/F)

P-5124001 A/F - MATERIAL DATA	
Plates:	Titanium
Flanges:	According spec
Special Service	Not Applicable
Reference Documents	I-FD-3010.1M-5124-511-P4X-002 I-DE-3010.1M-5124-944-P4X-001

5.3.2 COOLING WATER HEAT EXCHANGER – NON CLASSIFIED AREA (P-5124002 A/B)

P-5124002 A/B - MATERIAL DATA	
Plates:	Titanium
Flanges:	According spec
Special Service	Not Applicable
Reference Documents	I-FD-3010.1M-5124-511-P4X-001 I-DE-3010.1M-5124-944-P4X-002

6 PRINTED CIRCUIT HEAT EXCHANGERS

PACKAGER/MANUFACTURER shall be responsible for supplying the equipment in accordance with the requirements of this specification, codes and standards referenced therein.

6.1 INJECTION GAS COMPRESSION UNIT (U-1252)

6.1.1 INJECTION GAS COMPRESSION DISCHARGE COOLER (P-UC-1252001A/B-A/D)

P-UC-1252001A/B-A/D - MATERIAL DATA	
Core	Duplex (UNS31803)
Sheath	Suplex Duplex (UNS32750)
Flanges:	Flange type according spec J12 of I-ET-3010.1M-1200-200-P4X-001
Special Service	ISO151565 H ₂ S Service.
Reference Documents	I-FD-3010.1M-1252-459-P4X-001 I-DE-3010.1M-1252-944-P4X-001 I-DE-3010.1M-1252-944-P4X-002

PRELIMINARY