

	<b>TECHNICAL SPECIFICATION</b>		Nº: I-ET-3010.2D-1200-500-P4X-002	
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	JOB: HIGH CAPACITY FPSO - GAS EXPORTATION ALL ELECTRIC			
	AREA: ATAPU 2 AND SÉPIA 2			
SRGE	<b>TITLE: MATERIAL SPECIFICATION FOR UTILITY PRESSURE VESSELS AND TANKS</b>		INTERNAL	
			ESUP	

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TECHNICAL SPECIFICATION

Nº I-ET-3010.2D-1200-500-P4X-002

REV. 0

AREA: ATAPU 2 AND SÉPIA 2

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TITLE: MATERIAL SPECIFICATION FOR UTILITY PRESSURE VESSELS AND TANKS

INTERNAL  
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## 1. OBJECTIVE

This document covers the material specification for pressure vessels, filters and tanks of UTILITY SYSTEMS to be supplied to BUYER for ATAPU 2 AND SEPIA 2 FPSO units.

The requirements herein listed apply to all players which will perform any activity related to the scope of this unit, including manufacturers, packagers, main contractor, subcontractors, suppliers, sub-suppliers, integrators, constructors, and all technical personnel involved. Within the scope of this document, they are all referred to as being a SELLER.

In addition to the requirements of this technical specification, SELLER shall follow all the requirements of the Exhibit I (SCOPE OF WORK), as well as Exhibit III (DIRECTIVES FOR ENGINEERING EXECUTION), Exhibit IV (DIRECTIVES FOR CONSTRUCTION AND ASSEMBLY), Exhibit V (DIRECTIVES FOR PROCUREMENT), Exhibit VI (DIRECTIVES FOR PLANNING AND CONTROL), Exhibit VII (DIRECTIVES FOR QUALITY MANAGEMENT SYSTEM) and Exhibit VIII (DIRECTIVES FOR COMMISSIONING PROCESS).

All calculations and mechanical datasheets shall be submitted to BUYER approval by SELLER.

## 2. NORMATIVE REFERENCES

All equipment shall comply with the requirements of this technical specification and references stated below. All equipment parts and details not complying with any of these requirements shall be informed on a "Deviation List". Otherwise, they will be considered as "Agreed", and so required.

### 2.1. CLASSIFICATION SOCIETY

2.1.1. SELLER shall perform the work in accordance with the requirements of Classification Society.

2.1.2. SELLER is responsible for submitting to the Classification Society all documentation in compliance with stated Rules.

2.1.3. Classification Society rules may only be waived upon the formal approval from the Classification Society itself and from BUYER.

### 2.2. CODES AND STANDARDS

2.2.1. The following codes and standards include provisions that, through reference herein, constitute provisions of this specification. The latest issue of the references shall be used unless otherwise agreed.

2.2.2. Other recognized international standard may be used, whether they meet or exceed the requirements of the standards referenced below. Formal approval from BUYER and from the Classification Society is also required.

ASME BPCV Code SEC II	Material Specifications
ASTM	American Society for Testing and Materials
ISO 15156	Petroleum and Natural Gas Industries – Materials for use in H2S Containing Environments in Oil and Gas Production



### 2.3. GOVERNAMENTAL REGULATION

Regulatory Standard are mandatory and shall prevail, if more stringent, over the requirements of this specification and other references herein.

- NR-13 Brazilian Regulatory Standard - Boilers, Pressure Vessels, Pipes and Metallic Storage Tanks
- NR-26 Brazilian Regulatory Standard - Safety Signing
- NR-37 Brazilian Regulatory Standard - Safety and Health in Petroleum Platforms

### 2.4. REFERENCE DOCUMENTS

DR-ENGP-M-I-1	SAFETY ENGINEERING
DR-ENGP-I-1.15	COLOR CODING
I-DE-3010.2D-1251-944-P4X-001	INJECTION WATER COARSE FILTER
I-DE-3010.2D-5111-944-P4X-002	SEA WATER LIFT FILTER
I-DE-3010.2D-5115-944-P4X-001	FRESH WATER MAKE UP TANK
I-DE-3010.2D-5122-944-P4X-002	FRESH WATER MAKER FOR OIL DILUTION
I-DE-3010.2D-5124-944-P4X-001	COOLING WATER SYSTEM - CLASSIFIED AREA
I-DE-3010.2D-5124-944-P4X-002	COOLING WATER SYSTEM - NON-CLASSIFIED AREA
I-DE-3010.2D-5125-944-P4X-001	HOT WATER VESSEL AND PUMPS
I-DE-3010.2D-5125-944-P4X-006	UTILITY HOT WATER SYSTEM
I-DE-3010.2D-5133-944-P4X-001	DIESEL INJECTION SYSTEM
I-DE-3010.2D-5134-944-P4X-001	INSTRUMENT AND SERVICE AIR SYSTEM
I-DE-3010.2D-5336-944-P4X-001	SLOP VESSEL
I-DE-3010.2D-5336-944-P4X-005	AFT SLOP VESSEL
I-DE-3010.2D-5336-944-P4X-004	DRAINAGE SYSTEM
I-DE-3010.2D-5147-944-P4X-001	TURBOGENERATOR INTERCONNECTION A/B
I-DE-3010.2D-5147-944-P4X-002	TURBOGENERATOR INTERCONNECTION C/D
I-DE-3010.2D-5147-944-P4X-003	TURBOGENERATOR INTERCONNECTION E/F
I-ET-3010.00-1200-251-P4X-001	REQUIREMENTS FOR BOLTING MATERIALS
I-ET-3010.00-1200-510-P4X-001	METALLIC TANKS DESIGN FOR TOPSIDE
I-ET-3010.00-1200-540-P4X-001	REQUIREMENTS FOR PRESSURE VESSELS DESIGN AND FABRICATION
I-ET-3010.00-1200-940-P4X-002	GENERAL TECHNICAL TERMS
I-ET-3010.00-1200-500-P4X-001	NON METALLIC TANKS AND PRESSURE VESSELS DESIGN
I-ET-3010.00-1200-431-P4X-001	THERMAL INSULATION FOR MARITIME INSTALLATIONS
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-3010.00-1200-751-P4X-001	ANODES SPECIFICATION FOR MECHANICAL EQUIPMENT
I-ET-3010.2D-1200-200-P4X-001	PIPING SPECIFICATION FOR TOPSIDES
I-ET-3010.2D-1200-940-P4X-001	MATERIAL SELECTION PHILOSOPHY FOR DETAILED DESIGN
I-FD-3010.2D-5111-561-P4X-001	SEA WATER LIFT FILTER (FT-5111001A/E)



I-FD-3010.2D-5111-561-P4X-002	START-UP SEA WATER LIFT FILTER (FT-5111002)
I-FD-3010.2D-5115-511-P4X-001	FRESH WATER MAKE-UP TANK (TQ-5115001)
I-FD-3010.2D-5115-511-P4X-002	DILUTION WATER STORAGE TANK (TQ-5115002)
I-FD-3010.2D-5115-511-P4X-003	FLARE AND SLOP VESSEL FRESH WATER MAKE-UP TANK (TQ-5115003)
I-FD-3010.2D-5124-511-P4X-001	COOLING WATER EXPANSION TANK - NON CLASSIFIED AREA (TQ-5124001)
I-FD-3010.2D-5124-540-P4X-001	COOLING WATER EXPANSION VESSEL - CLASSIFIED AREA (V-5124001)
I-FD-3010.2D-5124-540-P4X-002	COOLING WATER CHEMICAL INJECTION VESSEL - CLASSIFIED AREA (V-5124002)
I-FD-3010.2D-5124-540-P4X-003	COOLING WATER CHEMICAL INJECTION VESSEL - NON CLASSIFIED AREA (V-5124003)
I-FD-3010.2D-5124-561-P4X-001	COOLING WATER FILTER - CLASSIFIED AREA (FT-5124001)
I-FD-3010.2D-5125-511-P4X-001	UTILITY HEATING WATER EXPANSION TANK (TQ-5125001)
I-FD-3010.2D-5125-540-P4X-001	HOT WATER EXPANSION VESSEL (V-5125001)
I-FD-3010.2D-5125-540-P4X-002	HOT WATER CHEMICAL INJECTION VESSEL (V-5125002)
I-FD-3010.2D-5125-540-P4X-003	UTILITY HEATING CHEMICAL INJECTION VESSEL (V-5125003)
I-FD-3010.2D-5133-540-P4X-001	WELL SERVICE DIESEL BUFFER VESSEL (V-5133001)
I-FD-3010.2D-5133-561-P4X-001	WELL SERVICE OIL TRANSFER FILTER (FT-5133001)
I-FD-3010.2D-5133-561-P4X-001	TURBOGENERATORS DUPLEX DIESEL FILTER (FT-5133002A/F)
I-FD-3010.2D-5134-540-P4X-001	INSTRUMENT AND SERVICE AIR RECEIVERS (V-5134001A/B)
I-FD-3010.2D-5336-511-P4X-001	NON CLASSIFIED AREA - OPEN DRAIN TANK (TQ-5336001)
I-FD-3010.2D-5336-540-P4X-001	SLOP VESSEL (V-5336501)
I-FD-3010.2D-5336-540-P4X-002	AFT SLOP VESSEL (V-5336502)
I-FD-3010.2D-5336-561-P4X-001	NON CLASSIFIED AREA - OPEN DRAIN FILTER (FT-5336001A/B)
I-FD-3010.2D-5336-561-P4X-002	CLASSIFIED AREA - OPEN DRAIN FILTER (FT-5336002A/B)

## 2.5. CONFLICTING REQUIREMENTS

In case of conflicting requirements between this technical specification and other cited references, the most stringent shall prevail. If necessary, the SELLER may revert to BUYER for clarification.

## 3. DEFINITIONS AND ABBREVIATIONS

### 3.1. DEFINITIONS

All Terms and definitions are established in the latest revision I-ET-3010.00-1200-940-P4X-002 - GENERAL TECHNICAL TERMS.

3.1.1. CLASS I PARTS: Parts of the pressure wall of the vessel in contact with the process fluid (e.g.: shells, heads, nozzle necks, flanges, blind flanges and others) and other pressure parts in contact with the process fluid (e.g.: tubesheets). This class also includes internal parts welded to vessels and subject to primary stress (e.g.: rings, plates and other elements for supporting trays, gratings, internal



heads and others). This class also includes reinforcements (any type) of openings on the vessel pressure wall.

3.1.2. CLASS II PARTS: Parts of the vessel pressure wall not in contact with the process fluid such as external reinforcements, vacuum reinforcements and others, except reinforcements of openings (included in Class I).

3.1.3. CLASS III PARTS: Internal parts welded to the vessel but not subject to primary stress (e.g.: baffles, vortex breakers, weir plates and others). External parts welded to the vessel subject to stress during operation, such as any type of support (e.g.: skirts, columns, saddles etc.), supporting elements for ladders, platforms, external piping and others. For supports, this class only includes the parts of supports directly welded to the vessel or very close to it.

3.1.4. Note: The supports shall have a section 1000 mm long from the attachment to the vessel, with the same shell material in the following cases:

3.1.5. a) design temperature lower than or equal to 15 °C;

3.1.6. b) design temperature over 340 °C;

3.1.7. c) service with hydrogen;

3.1.8. d) vessels made of alloy steel, stainless steels and nonferrous materials.

3.1.9. CLASS IV PARTS: Internal removable parts (not welded to the vessel), such as trays, bubble caps, gratings, supporting beams, distributors, tube bundles and others.

3.1.10. CLASS V PARTS: Parts of supports of any type not included in Classes III and IV. For all parts of this class, the design temperature is always the ambient temperature.

3.1.11. CLASS VI PARTS: External parts welded directly to the vessel but subject to loads only during assembly, maintenance, disassembly and others, such as lifting eyes, davits and others. For all parts of this class, the design temperature is always the ambient temperature.

### 3.2. ABBREVIATIONS

CRA	Corrosion Resistant Alloy
GRP	Glass – Reinforced plastic
P&ID:	Piping & Instrumentation Diagram

## 4. GENERAL REQUIREMENTS

### 4.1. DESIGN

4.1.1. SELLER shall design and fabricate the equipment for a minimum lifetime of 30 years.

4.1.2. The design of the vessels, filter and tanks shall be in accordance with I-ET-3010.00-1200-540-P4X-001 – REQUIREMENTS FOR PRESSURE VESSELS DESIGN AND FABRICATION; I-ET-3010.00-1200-510-P4X-001 – METALLIC TANKS DESIGN FOR TOPSIDE and I-ET-3010.00-1200-500-P4X-001 – NON-METALLIC TANKS AND PRESSURE VESSELS DESIGN.

4.1.3. The SELLER is responsible detailing the materials selection in accordance with this specification. In all cases, SELLER shall submit the detailed material list, including all equipment and their components, for BUYER approval prior manufacture activities.

4.1.4. In case of any equipment not specified in this document, the material selection shall be based on I-ET-3010.2D-1200-940-P4X-001 - MATERIAL SELECTION PHILOSOPHY FOR DETAILED DESIGN.



## 4.2. MATERIAL

4.2.1. All valves, pipes and components specified for hydrogen sulfide service shall be in accordance with ISO 15156 requirements. For carbon and low alloy steels, in case of sour service, the environmental severity shall be Region 3 as default, per NACE MR0175/ISO 15156-2.

4.2.2. The 316/316L dual graded stainless steel materials may be acceptable in place of SS316L. These materials require dual certification and stamp (i.e., 316/316LSS material shall be dual certified and stamped); i.e., material shall comply with the mechanical property requirements of 316 SS and chemical requirements of 316L SS per applicable material manufacturing specifications. In this case, the equipment shall only have dual certificate 316 material.

4.2.3. The use of an integral corrosion resistance alloy base material as an alternative to a carbon steel with organic coating may be acceptable, provided that the selection is in accordance with I-ET-3010.2D-1200-940-P4X-001 - MATERIAL SELECTION PHILOSOPHY FOR DETAILED PROJECT and is approved by BUYER.

## 4.3. FLANGES AND GASKETS

4.3.1. Flanges materials shall be compatible with the shell and heads materials (Class I Parts), except where explicit mentioned in this document.

4.3.2. 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-3010.2D-1200-200-P4X-001 - PIPING SPECIFICATION FOR TOPSIDES). Different types of flanges and gaskets might be acceptable, under BUYER approval, in the following cases:

- 4.3.2.1. If the pressure rating of the nozzle flange is higher than the pressure rating of the pipe flange;
- 4.3.2.2. For CLADED/COATED piping specification.
- 4.3.2.3. If flange manufacture is unfeasible;

4.3.3. In all cases of conflict, the SELLER shall inform BUYER of the conflict and seek clarification.

## 4.4. BOLTS AND NUTS

4.4.1. All fasteners (studs, bolts, tightening bolts and nuts shall be according to I-ET-3010.00-1200-251-P4X-001 – REQUIREMENTS FOR BOLTING MATERIALS.

4.4.2. When the flange connection is specified for low temperature special service, the bolt material shall be compatible with this condition

4.4.3. The material for internal bolts shall have the same corrosion resistance of Class IV Parts (removable internals).

4.4.4. When the pressure vessel is specified for sour service, the internal bolts shall meet the requirements of ISO 15156.

## 4.5. COATING AND INSULATION REQUIREMENTS

4.5.1. Equipment subjected to temperature of 60°C and above shall receive a personal protection system, by means of 316SS wire mesh / perforated plates. Equipment in which heat conservation is necessary shall be thermal insulated. The thermal insulation shall be according to latest revision of I-ET-3010.00-1200-431-P4X-001 – THERMAL INSULATION FOR MARITIME INSTALLATIONS

4.5.2. Painting requirements shall be according to I-ET-3010.00-1200-956-P4X-002 -GENERAL PAINTING

4.5.3. Color code adopted shall be in accordance with DR-ENGP-I-1.15 – COLOR CODING.

## 5. SEA WATER LIFT UNIT MATERIAL SPECIFICATION (U-5111)

### 5.1. FILTERS

#### 5.1.1. SEA WATER FILTERS (FT-5111001A/E)

FT-5111001A/E- MATERIAL DATA		
	Option 1	Option 2
Shell and Heads (Class I Parts):	Superduplex UNS S32760/3275 <sup>1</sup>	Duplex (UNS S31803) <sup>1</sup>
Internal Coating/ Cladding	Not applicable	Not applicable
Corrosion allowance:	Not applicable	Not applicable
Nozzles reinforcements (Class II Parts):	Superduplex UNS S32760/32750	Duplex (UNS S31803) <sup>1</sup>
Welded attachments (Class III Parts):	- externals: Superduplex UNS S32760/32750	- externals: Duplex (UNS S31803)
	- internals: Superduplex UNS S32760/32750	- internals: Duplex (UNS S31803)
Removable internals (Class IV Parts):	Superduplex UNS S32760/32750	Duplex (UNS S31803)
Support (Class V Parts):	Superduplex UNS S32760/32750	Duplex (UNS S31803)
Special Service	Not applicable	
Reference Documents	I-FD-3010.2D-5111-561-P4X-001 I-DE-3010.2D-5111-944-P4X-002	
Note (1): Anodes according to I-ET-3010.00-1200-751-P4X-001		

#### 5.1.2. START-UP SEA SEAWATER LIFT FILTER (FT-511102)

FT-511102- MATERIAL DATA	
Shell and Heads (Class I Parts):	GRP
Internal Coating/ Cladding	Chemical Resistant layer <sup>1, 2</sup>
Corrosion allowance:	Not applicable
Nozzles reinforcements (Class II Parts):	GRP
Welded attachments (Class III Parts):	- externals: GRP
	- internals: GRP
Removable internals (Class IV Parts):	GRP
Support (Class V Parts):	GRP
Special Service	Not applicable
Reference Documents	I-FD-3010.2D-5111-561-P4X-002 I-DE-3010.2D-5111-944-P4X-002
<sup>1</sup> Reference. CONTRACTOR is responsible for the selection of suitable material for fluid and operational conditions.	
<sup>2</sup> External liner or protective layer (topcoat) with a minimum thickness of 2.0 mm and anti-UV additives.	





## 6. INJECTION WATER UNIT MATERIAL SPECIFICATION (U-1251)

### 6.1. FILTERS

#### 6.1.1. INJECTION WATER COARSE FILTER (FT-1251001A/C)

FT-1251001A/C - MATERIAL DATA		
	Option 1	Option 2
Shell and Heads (Class I Parts):	Superduplex UNS S32760/3275 <sup>1</sup>	Duplex (UNS S31803) <sup>1</sup>
Internal Coating/ Cladding	Not applicable	Not applicable
Corrosion allowance:	Not applicable	Not applicable
Nozzles reinforcements (Class II Parts):	Superduplex UNS S32760/32750	Duplex (UNS S31803) <sup>1</sup>
Welded attachments (Class III Parts):	- externals: Superduplex UNS S32760/32750	- externals: Duplex (UNS S31803)
	- internals: Superduplex UNS S32760/32750	- internals: Duplex (UNS S31803)
Removable internals (Class IV Parts):	Superduplex UNS S32760/32750	Duplex (UNS S31803)
Support (Class V Parts):	Superduplex UNS S32760/32750	Duplex (UNS S31803)
Special Service	Not applicable	
Reference Documents	I-FD-3010.2D-1251-561-P4X-001 I-DE-3010.2D-1251-944-P4X-001	
Note (1): Anodes according to I-ET-3010.00-1200-751-P4X-001		

## 7. COOLING WATER SYSTEM MATERIAL SPECIFICATION (U-5124)

### 7.1. PRESSURE VESSELS

#### 7.1.1. COOLING WATER EXPANSION VESSEL - CLASSIFIED AREA (V-5124001)

V-5124001- MATERIAL DATA		
	Option 1	Option 2
Shell and Heads (Class I Parts):	GRP	SS 316L (UNS S31603)
Internal Coating/ Cladding	Chemical Resistant layer <sup>1, 2</sup>	Not applicable
Corrosion allowance:	Not applicable	Not applicable
Nozzles reinforcements (Class II Parts):	GRP	SS 316L (UNS S31603)
Welded attachments (Class III Parts):	- externals: GRP	- externals: SS 316L (UNS S31603)
	- internals: GRP	- internals: SS 316L (UNS S31603)
Removable internals (Class IV Parts):	GRP	SS 316 (UNS S31603)
Support (Class V Parts):	GRP	SS 316L (UNS S31603)
Special Service	Not applicable	
Reference Documents	I-FD-3010.2D-5124-540-P4X-001 I-DE-3010.2D-5124-944-P4X-001	
<sup>1</sup> Reference. CONTRACTOR is responsible for the selection of suitable material for fluid and operational conditions. <sup>2</sup> External liner or protective layer (topcoat) with a minimum thickness of 2.0 mm and anti-UV additives.		

**7.1.2. COOLING WATER CHEMICAL INJECTION - CLASSIFIED AREA (V-5124002)**

V-5124002- MATERIAL DATA		
	Option 1	Option 2
Shell and Heads (Class I Parts):	GRP	SS 316L (UNS S31603)
Internal Coating/ Cladding	Chemical Resistant layer <sup>1, 2</sup>	Not applicable
Corrosion allowance:	Not applicable	Not applicable
Nozzles reinforcements (Class II Parts):	GRP	SS 316L (UNS S31603)
Welded attachments (Class III Parts):	- externals: GRP	- externals: SS 316L (UNS S31603)
	- internals: GRP	- internals: SS 316L (UNS S31603)
Removable internals (Class IV Parts):	GRP	SS 316 (UNS S31603)
Support (Class V Parts):	GRP	SS 316L (UNS S31603)
Special Service	Not applicable	
Reference Documents	I-FD-3010.2D-5124-540-P4X-002	
	I-DE-3010.2D-5124-944-P4X-001	

<sup>1</sup> Reference. CONTRACTOR is responsible for the selection of suitable material for fluid and operational conditions.  
<sup>2</sup> External liner or protective layer (topcoat) with a minimum thickness of 2.0 mm and anti-UV additives.

**7.1.3. COOLING WATER CHEMICAL INJECTION – NON-CLASSIFIED AREA (V-5124003)**

V-5124003- MATERIAL DATA	
Shell and Heads (Class I Parts):	GRP
Internal Coating/ Cladding	Chemical Resistant layer <sup>1,2</sup>
Corrosion allowance:	Not applicable
Nozzles reinforcements (Class II Parts):	GRP
Welded attachments (Class III Parts):	- externals: GRP
	- internals: GRP
Removable internals (Class IV Parts):	GRP
Support (Class V Parts):	GRP
Special Service	Not applicable
Reference Documents	I-FD-3010.2D-5124-540-P4X-003
	I-DE-3010.2D-5124-944-P4X-002

<sup>1</sup> Reference. CONTRACTOR is responsible for the selection of suitable material for fluid and operational conditions.  
<sup>2</sup> External liner or protective layer (topcoat) with a minimum thickness of 2.0 mm and anti-UV additives.

## 7.2. FILTERS

### 7.2.1. COOLING WATER FILTER - CLASSIFIED AREA (FT-5124001)

FT-5124001- MATERIAL DATA	
Shell and Heads (Class I Parts):	GRP
Internal Coating/ Cladding	Chemical Resistant layer <sup>1, 2</sup>
Corrosion allowance:	Not applicable
Nozzles reinforcements (Class II Parts):	GRP
Welded attachments (Class III Parts):	- externals: GRP
	- internals: GRP
Removable internals (Class IV Parts):	GRP
Support (Class V Parts):	GRP
Special Service	Not applicable
Reference Documents	I-FD-3010.2D-5124-561-P4X-001 I-DE-3010.2D-5124-944-P4X-001

<sup>1</sup> Reference. CONTRACTOR is responsible for the selection of suitable material for fluid and operational conditions.  
<sup>2</sup> External liner or protective layer (topcoat) with a minimum thickness of 2.0 mm and anti-UV additives

## 7.3. TANKS

### 7.3.1. COOLING WATER EXPANSION TANK - NON CLASSIFIED AREA (TQ-5124001)

TQ-5124001- MATERIAL DATA	
Materials:	GRP
Internal Coating	Chemical Resistant layer <sup>1, 2</sup>
Corrosion allowance:	Not applicable
Special Service	Not applicable
Reference Documents	I-FD-3010.2D-5124-511-P4X-001 I-DE-3010.2D-5124-944-P4X-002

<sup>1</sup> Reference. CONTRACTOR is responsible for the selection of suitable material for fluid and operational conditions.  
<sup>2</sup> External liner or protective layer (topcoat) with a minimum thickness of 2.0 mm and anti-UV additives.



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## 8. HOT WATER UNIT MATERIAL SPECIFICATION (U-5125)

### 8.1. PRESSURE VESSELS

#### 8.1.1. HOT WATER EXPANSION VESSEL (V-5125001)

##### V-5125001- MATERIAL DATA

	Option 1	Option 2
Shell and Heads (Class I Parts):	Superduplex UNS S32760/3275	Carbon Steel, SA 516 Gr. 70
Internal Coating/ Cladding	Not applicable	Organic Coating <sup>1</sup>
Corrosion allowance:	Not applicable	3.00 mm
Nozzles reinforcements (Class II Parts):	Superduplex UNS S32760/32750	SA 516 Gr. 70N
Welded attachments (Class III Parts):	- externals: Superduplex UNS S32760/32750 - internals: Superduplex UNS S32760/32750	- externals: Carbon Steel, SA 516 Gr. 70 - internals: Carbon Steel, SA 516 Gr. 70
Removable internals (Class IV Parts):	Superduplex UNS S32760/32750	SS 316L
Support (Class V Parts):	Superduplex UNS S32760/32750	SA-36 or SA-516 Gr. 70
Special Service	Not applicable	
Reference Documents	I-FD-3010.2D-5125-540-P4X-001 I-DE-3010.2D-5125-944-P4X-001	
Note (1): Internal Organic Coating according to paint system 14 of I-ET-3010.00-1200-956-P4X-002.		

#### 8.1.2. HOT WATER CHEMICAL INJECTION VESSEL (V-5125002)

##### V-5125002- MATERIAL DATA

	Option 1	Option 2
Shell and Heads (Class I Parts):	Superduplex UNS S32760/3275	Carbon Steel, SA 516 Gr. 70
Internal Coating/ Cladding	Not applicable	Organic Coating <sup>1</sup>
Corrosion allowance:	Not applicable	3.00 mm
Nozzles reinforcements (Class II Parts):	Superduplex UNS S32760/32750	SA 516 Gr. 70N
Welded attachments (Class III Parts):	- externals: Superduplex UNS S32760/32750 - internals: Superduplex UNS S32760/32750	- externals: Carbon Steel, SA 516 Gr. 70 - internals: Carbon Steel, SA 516 Gr. 70 <sup>1</sup>
Removable internals (Class IV Parts):	Superduplex UNS S32760/32750	SS 316L
Support (Class V Parts):	Superduplex UNS S32760/32750	SA-36 or SA-516 Gr. 70
Special Service	Not applicable	
Reference Documents	I-FD-3010.2D-5125-540-P4X-002 I-DE-3010.2D-5125-944-P4X-001	
Note (1): Internal Organic Coating according to paint system 14 of -ET-3010.00-1200-956-P4X-002.		



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8.1.3. UTILITY HEATING CHEMICAL INJECTION VESSEL (V-5125003)

V-5125003- MATERIAL DATA		
	Option 1	Option 2
Shell and Heads (Class I Parts):	Superduplex UNS S32760/3275	Carbon Steel, SA 516 Gr. 70
Internal Coating/ Cladding	Not applicable	Organic Coating <sup>1</sup>
Corrosion allowance:	Not applicable	3.00 mm
Nozzles reinforcements (Class II Parts):	Superduplex UNS S32760/32750	SA 516 Gr. 70N
Welded attachments (Class III Parts):	- externals: Superduplex UNS S32760/32750	- externals: Carbon Steel, SA 516 Gr. 70
	- internals: Superduplex UNS S32760/32750	- internals: Carbon Steel, SA 516 Gr. 70 <sup>1</sup>
Removable internals (Class IV Parts):	Superduplex UNS S32760/32750	SS 316L
Support (Class V Parts):	Superduplex UNS S32760/32750	SA-36 or SA-516 Gr. 70
Special Service	Not applicable	
Reference Documents	I-FD-3010.2D-5125-540-P4X-003 I-DE-3010.2D-5125-944-P4X-006	
Note (1): Internal Organic Coating according to paint system 14 of I-ET-3010.00-1200-956-P4X-002.		

8.2. TANKS

8.2.1. UTILITY HEATING WATER EXPANSION TANK (TQ-5125001)

TQ-5125001- MATERIAL DATA	
Materials:	GRP
Internal Coating	Chemical Resistant layer <sup>1, 2</sup>
Corrosion allowance:	Not Applicable
Special Service	Not Applicable
Reference Documents	I-FD-3010.2D-5125-511-P4X-001 I-DE-3010.2D-5125-944-P4X-006
<sup>1</sup> Reference. CONTRACTOR is responsible for the selection of suitable material for fluid and operational conditions.	
<sup>2</sup> External liner or protective layer (topcoat) with a minimum thickness of 2.0 mm and anti-UV additives.	



## 9. FRESH WATER UNIT MATERIAL SPECIFICATION (U-5115)

### 9.1. TANKS

#### 9.1.1. FRESH WATER MAKE-UP TANK (TQ-5115001)

TQ-5115001- MATERIAL DATA		
	Option 1	Option 2
Materials:	GRP	SS 316L (UNS S31603)
Internal Coating	Chemical Resistant layer <sup>1,2</sup>	Not applicable
Corrosion allowance:	Not Applicable	Not Applicable
Special Service	Not Applicable	
Reference Documents	I-FD-3010.2D-5115-511-P4X-001 I-DE-3010.2D-5115-944-P4X-001	
<sup>1</sup> Reference. CONTRACTOR is responsible for the selection of suitable material for fluid and operational conditions <sup>2</sup> External liner or protective layer (topcoat) with a minimum thickness of 2.0 mm and anti-UV additives.		

#### 9.1.2. DILUTION WATER STORAGE TANK (TQ-5115002)

TQ-5115002- MATERIAL DATA		
	Option 1	Option 2
Materials:	GRP	Carbon Steel, SA 516 Gr. 70
Internal Coating	Chemical Resistant layer <sup>1,2</sup>	Organic Coating <sup>3,4</sup>
Corrosion allowance:	Not Applicable	Not Applicable
Special Service	Not Applicable	
Reference Documents	I-FD-3010.2D-5115-511-P4X-002 I-DE-3010.2D-5122-944-P4X-002	
Note (1) Reference. CONTRACTOR is responsible for the selection of suitable material for fluid and operational conditions (2) External liner or protective layer (topcoat) with a minimum thickness of 2.0 mm and anti-UV additives. (2): Internal Organic Coating according to according to paint system 24 of I-ET-3010.00-1200-956-P4X-002. (3): Anodes according to I-ET-3010.00-1200-751-P4X-001		

#### 9.1.3. FLARE AND SLOP VESSEL FRESH WATER MAKE-UP TANK (TQ-5115003)

TQ-5115003- MATERIAL DATA		
	Option 1	Option 2
Materials:	GRP	SS 316L (UNS S31603)
Internal Coating	Chemical Resistant layer <sup>1,2</sup>	Not applicable
Corrosion allowance:	Not Applicable	Not Applicable
Special Service	Not Applicable	
Reference Documents	I-FD-3010.2D-5115-511-P4X-003 I-DE-3010.2D-5122-944-P4X-002	
<sup>1</sup> Reference. CONTRACTOR is responsible for the selection of suitable material for fluid and operational conditions <sup>2</sup> External liner or protective layer (topcoat) with a minimum thickness of 2.0 mm and anti-UV additives.		

## 10. DIESEL UNIT MATERIAL SPECIFICATION (U-5133)

### 10.1. PRESSURE VESSELS

#### 10.1.1. WELL SERVICE DIESEL / OIL BUFFER VESSEL (V-5133001)

V-5133001- MATERIAL DATA	
Shell and Heads (Class I Parts):	Carbon Steel, SA 516 Gr. 70
Internal Coating/ Cladding	Organic Coating <sup>1,2</sup>
Corrosion allowance:	3.00 mm
Nozzles reinforcements (Class II Parts):	SA 516 Gr. 70
Welded attachments (Class III Parts):	- externals: Carbon Steel, SA 516 Gr. 70
	- internals: Carbon Steel, SA 516 Gr. 70 + Organic Coating <sup>1,2</sup>
Removable internals (Class IV Parts):	SS 316L
Support (Class V Parts):	SA-36 or SA-516 Gr. 70
Special Service	Not applicable
Reference Documents	I-FD-3010.2D-5133-540-P4X-001
	I-DE-3010.2D-5133-944-P4X-001
Note (1): Internal Organic Coating according to paint system 12 of I-ET-3010.00-1200-956-P4X-002 up to 2m height from bottom. (2): Anodes according to I-ET-3010.00-1200-751-P4X-001.	

### 10.2. FILTER

#### 10.2.1. WELL SERVICE OIL TRANSFER FILTER (FT-5133001)

FT-5133001- MATERIAL DATA	
Shell and Heads (Class I Parts):	SS 316L (UNS S31603)
Internal Coating/ Cladding	Not applicable
Corrosion allowance:	Not applicable
Nozzles reinforcements (Class II Parts):	SS 316L (UNS S31603)
Welded attachments (Class III Parts):	- externals: SS 316L (UNS S31603)
	- internals: SS 316L (UNS S31603)
Removable internals (Class IV Parts):	SS 316L (UNS S31603)
Support (Class V Parts):	SS 316L (UNS S31603)
Special Service	Not applicable
Reference Documents	I-FD-3010.1Y-5133-561-P4X-001
	I-DE-3010.1Y-5133-944-P4X-001

### 10.2.2. TURBOGENERATORS DUPLEX DIESEL FILTER (FT-5133002 A/F)

FT-5133002A/F- MATERIAL DATA	
Shell and Heads (Class I Parts):	SS 316L (UNS S31603)
Internal Coating/ Cladding	Not applicable
Corrosion allowance:	Not applicable
Nozzles reinforcements (Class II Parts):	SS 316L (UNS S31603)
Welded attachments (Class III Parts):	- externals: SS 316L (UNS S31603)
	- internals: SS 316L (UNS S31603)
Removable internals (Class IV Parts):	SS 316L (UNS S31603)
Support (Class V Parts):	SS 316L (UNS S31603)
Special Service	Not applicable
Reference Documents	I-FD-3010.2D-5133-561-P4X-001 I-DE-3010.2D-5147-944-P4X-001/ 002 / 003

## 11. INSTRUMENT AND SERVICE AIR UNIT MATERIAL SPECIFICATION (U-5134)

### 11.1. PRESSURE VESSELS

#### 11.1.1. INSTRUMENT/ SERVICE AIR RECEIVERS (V-5134501 A/C)

V-5134501 A/C - MATERIAL DATA		
	Option 1	Option2
Shell and Heads (Class I Parts):	SS 316L (UNS S31603)	Carbon Steel, SA 516 Gr. 70
Internal Coating/ Cladding	Not applicable	Organic Coating <sup>1</sup>
Corrosion allowance:	Not applicable	3.00 mm
Nozzles reinforcements (Class II Parts):	SS 316L (UNS S31603)	SA 516 Gr. 70
Welded attachments (Class III Parts):	- externals: SS 316L (UNS S31603)	- externals: Carbon Steel, SA 516 Gr. 70
	- internals: SS 316L (UNS S31603)	- internals: Carbon Steel, SA 516 Gr. 70 + Organic Coating <sup>1,2</sup>
Removable internals (Class IV Parts):	SS 316.	SS 316L
Support (Class V Parts):	SS 316L (UNS S31603)	SA-36 or SA-516 Gr. 70
Special Service	Not applicable	
Reference Documents	I-FD-3010.2D-5134-540-P4X-001 I-DE-3010.2D-5134-944-P4X-001	

Note:

(1): Internal Organic Coating according to paint system 12 of I-ET-3010.00-1200-956-P4X-002.



## 12. DRAINAGE AND SLOPE UNIT MATERIAL SPECIFICATION (U-5336)

### 12.1. PRESSURE VESSELS

#### 12.1.1. SLOPE VESSEL (V-5336501)

V-5336501 - MATERIAL DATA	
Shell and Heads (Class I Parts):	Carbon Steel, SA 516 Gr. 70
Internal Coating/ Cladding	Organic Coating <sup>1,2</sup>
Corrosion allowance:	3.00 mm
Nozzles reinforcements (Class II Parts):	SA 516 Gr. 70
Welded attachments (Class III Parts):	- externals: Carbon Steel, SA 516 Gr. 70
	- internals: Carbon Steel, SA 516 Gr. 70 + Organic Coating <sup>1,2</sup>
Removable internals (Class IV Parts):	SS 316L
Support (Class V Parts):	SA-36 or SA-516 Gr. 70
Special Service	Not Applicable
Reference Documents	I-FD-3010.2D-5336-540-P4X-001
	I-DE-3010.2D-5336-944-P4X-001
Note (1): Internal Organic Coating according to paint system 14 of I-ET-3010.00-1200-956-P4X-002. (2): Anodes according to I-ET-3010.00-1200-751-P4X-001	

#### 12.1.2. AFT SLOPE VESSEL (V-5336502)

V-5336502 - MATERIAL DATA	
Shell and Heads (Class I Parts):	Carbon Steel, SA 516 Gr. 70
Internal Coating/ Cladding	Organic Coating <sup>1,2</sup>
Corrosion allowance:	3.00 mm
Nozzles reinforcements (Class II Parts):	SA 516 Gr. 70
Welded attachments (Class III Parts):	- externals: Carbon Steel, SA 516 Gr. 70
	- internals: Carbon Steel, SA 516 Gr. 70 + Organic Coating <sup>1,2</sup>
Removable internals (Class IV Parts):	SS 316L
Support (Class V Parts):	SA-36 or SA-516 Gr. 70
Special Service	Not Applicable
Reference Documents	I-FD-3010.2D-5336-540-P4X-002
	I-DE-3010.2D-5336-944-P4X-005
Note (1): Internal Organic Coating according to paint system 14 of I-ET-3010.00-1200-956-P4X-002. (2): Anodes according to I-ET-3010.00-1200-751-P4X-001	

## 12.2. FILTERS

### 12.2.1. NON CLASSIFIED AREA - OPEN DRAIN FILTER (FT-5336001A/B)

FT-5336001A/B - MATERIAL DATA	
Shell and Heads (Class I Parts):	GRP
Internal Coating/ Cladding	Chemical Resistant layer <sup>1, 2</sup>
Corrosion allowance:	Not applicable
Nozzles reinforcements (Class II Parts):	GRP
Welded attachments (Class III Parts):	- externals: GRP
	- internals: GRP
Removable internals (Class IV Parts):	GRP
Support (Class V Parts):	GRP
Special Service	Not applicable
Reference Documents	I-FD-3010.2D-5336-561-P4X-001 I-DE-3010.2D-5336-944-P4X-004

<sup>1</sup> Reference. CONTRACTOR is responsible for the selection of suitable material for fluid and operational conditions  
<sup>2</sup> External liner or protective layer (topcoat) with a minimum thickness of 2.0 mm and anti-UV additives.

### 12.2.2. CLASSIFIED AREA - OPEN DRAIN FILTER (FT-5336002A/B)

FT-5336002A/B - MATERIAL DATA	
Shell and Heads (Class I Parts):	Carbon Steel, SA 516 Gr. 70
Internal Coating/ Cladding	Organic Coating <sup>1,2</sup>
Corrosion allowance:	3.00 mm
Nozzles reinforcements (Class II Parts):	SA 516 Gr. 70
Welded attachments (Class III Parts):	- externals: Carbon Steel, SA 516 Gr. 70
	- internals: Carbon Steel, SA 516 Gr. 70 + Organic Coating <sup>1,2</sup>
Removable internals (Class IV Parts):	SS 316L
Support (Class V Parts):	SA-36 or SA-516 Gr. 70
Special Service	Not Applicable
Reference Documents	I-FD-3010.2D-5336-561-P4X-002 I-DE-3010.2D-5336-944-P4X-004

Note  
 (1): Internal Organic Coating according to paint system 14 of I-ET-3010.00-1200-956-P4X-002.  
 (2): Anodes according to I-ET-3010.00-1200-751-P4X-001



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### 12.3. TANKS

#### 12.3.1. OPEN DRAIN TANK - NON CLASSIFIED AREA (TQ-5336001)

##### TQ-5336001- MATERIAL DATA

Materials:	GRP
Internal Coating	Chemical Resistant layer <sup>1, 2</sup>
Corrosion allowance:	Not Applicable
Special Service	Not Applicable
Reference Documents	I-FD-3010.2D-5336-511-P4X-001 I-DE-3010.2D-5336-944-P4X-004

<sup>1</sup> Reference. CONTRACTOR is responsible for the selection of suitable material for fluid and operational conditions

<sup>2</sup> External liner or protective layer (topcoat) with a minimum thickness of 2.0 mm and anti-UV additives.