

	TECHNICAL SPECIFICATION	Nº: I-ET-3010.2D-1225-323-P4X-101
	CLIENT: AGUP	SHEET: 1 of 22
	JOB: HIGH CAPACITY FPSO - GAS EXPORTATION ALL ELECTRIC	
	AREA: ATAPU 2 AND SÉPIA 2	
SRGE	TITLE: VAPOR RECOVERY UNIT PACKAGE SPECIFICATION	INTERNAL ESUP

INDEX OF REVISIONS

REV.	DESCRIPTION AND/OR REVISED SHEETS
0	ORIGINAL ISSUE
A	REVISED WHERE INDICATED
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DATE	MAR/15/22	AUG/30/22	DEC/09/22						
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EXECUTION	CFQ2	CFQ2	CFQ2						
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APPROVAL	CXM6	CXM6	CXM6						

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REV. B

AREA: ATAPU 2 AND SÉPIA 2

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TITLE: VAPOR RECOVERY UNIT PACKAGE SPECIFICATION

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1. INTRODUCTION

- 1.1 This document objective is to detail information related to vapor recovery unit (VRU) compressor packages of HIGH CAPACITY FPSO - GAS EXPORTATION ALL ELECTRIC project.
- 1.2 Design shall comply with rules and regulations stated by Brazilian Authorities, Classification Society, International Standards. PURCHASER and PACKAGER shall also comply with local codes / regulations and shall be responsible for their legal translations.
- 1.3 PURCHASER and PACKAGER shall comply with Contract exhibits. Requirements for capital spare, spare parts, field proven experience, training, commissioning support and Classification society, among other contractual requirements, shall be according to Contract exhibits.
- 1.4 This document will cover the compression package of the following system: UC-1225001A/B - VAPOR RECOVERY UNIT

2. DEFINITIONS

PETROBRAS	FPSO contracting and operating company.
PACKAGER	Company responsible for project, assembly, construction, fabrication, test of compressor and project, assembly, tests, integration and furnishing of all other main equipment in the skid, including the auxiliary systems.
PURCHASER	EPC company responsible for project, assembly, erection, construction, fabrication, test and furnishing, lift, hook up, installation and integration of all Modules of FPSO, with complete and fully operative systems in accordance with the requirements of this specification, codes and standards referenced therein.
VENDOR	Company hired by the purchaser or packager to supply equipment, components of equipment, instruments, control systems, etc. that will be part of the main system to be supplied.

3. GENERAL DESIGN REQUIREMENTS

- 3.1 Equipment shall be designed to meet PETROBRAS requirements and for unattended, fail-safe, continuous service as well as for idle periods up to several months in saline atmosphere (marine environment) on the FPSO. Prime importance is given to approve high degree of reliability, durability and maintainability.
- 3.2 PACKAGER shall be the compressor OEM (Original Equipment Manufacturer) and shall assume unit responsibility and shall assure that all subvendors comply with the requirements stated herein.
- 3.3 All cases shown in the data sheet, as well as all possible operating condition inside of interval between minimum and maximum flow rates and/or molecular weight that was not clearly stated in the data sheet, have equal probability of occurrence. There is no predominant operating point. The certified point does not represent the



most frequent operating point. UC-1225001A/B – VAPOR RECOVERY UNIT – SPECIFIC REQUIREMENTS.

- 3.4 Each vapor recovery unit consist of an electrical driven screw type compressor, two (2) stages, with recycle valve control for each stage, gearbox and auxiliaries equipment integrated for perfect functioning of the required service (accessories, control panel, machinery protection system, oil system, seal gas system, etc.). A total of 2 units shall be delivered. Each unit shall be designed according I-ET-3010.00-1225-323-P4X-001 - TECHNICAL SPECIFICATION FOR VAPOR RECOVERY UNIT. Units shall not share auxiliaries systems. Although compression units are 2x100% configuration, package shall be designed to run all compressor units simultaneously.
- 3.5 Process design cases shall be as per I-FD-3010.2D-1225-323-P4X-001 - VRU MOTOCOMPRESSION (C-UC-1225001A/B). Additional design cases shall be included as minimum:
 - a) 1 case for inert gas running test according to I-ET-3010.00-1225-323-P4X-001 - TECHNICAL SPECIFICATION FOR VAPOR RECOVERY UNIT.
- 3.6 Primary seal gas shall be according to I-ET-3010.00-1225-323-P4X-001 - TECHNICAL SPECIFICATION FOR VAPOR RECOVERY UNIT. Prior start-up, ambient temperature might be low and tie-in conditions for primary seal gas supply might not be as required. In order to avoid presence of condensate during start-up at primary seal supply line (including pipe segment outside package) and to increase seal gas line temperature (including pipe segment outside package), from ambient temperature to operating temperature, a purge cycle shall be foreseen. Therefore, the package shall have a connection from primary seal gas line to flare, to be use at start-up sequence. This procedure shall be automatically done, and PACKAGER shall furnish automatic valves and instruments required to accomplish that.
- 3.7 To perform Shipyard Acceptance Test (SYAT), PURCHASER shall use inert gas at primary seal. Available utilities at platform do not fulfill test requirement. Therefore, PURCHASER shall furnish external source or means to provide required primary seal gas during test.
- 3.8 Equipment and piping served by cooling water shall also be design with protections/detections against scenario of lack of supply and/or overpressure and/or high cooling water temperature.

4. I-ET-3010.00-1225-323-P4X-001 SPECIFIC PROJECT TERMS

- 4.1 Considering this specific project, the following terms shall be replaced at the I-ET-3010.00-1225-323-P4X-001 - TECHNICAL SPECIFICATION FOR VAPOR RECOVERY UNIT:

FROM:	TO:
SPECIFIC PROJECT AUTOMATION AND CONTROL ARCHITECTURE	I-DE-3010.2D-5520-800-P4X-002 - AUTOMATION AND CONTROL ARCHITECTURE



SPECIFIC PROJECT PIPING SPECIFICATION FOR TOPSIDE	I-ET-3010.2D-1200-200-P4X-001 - PIPING SPECIFICATION FOR TOPSIDES
SPECIFIC PROJECT INSTRUMENTATION ADDITIONAL TECHNICAL REQUIREMENTS	I-ET-3010.2D-1200-800-P4X-001 - INSTRUMENTATION ADDITIONAL TECHNICAL REQUIREMENTS
SPECIFIC PROJECT FIELD INSTRUMENTATION	I-ET-3010.2D-1200-800-P4X-005 - FIELD INSTRUMENTATION
SPECIFIC PROJECT AUTOMATION INTERFACE OF PACKAGED UNITS	I-ET-3010.2D-1200-800-P4X-014 - AUTOMATION INTERFACE OF PACKAGED UNITS
PETROBRAS TOPSIDE'S MECHANICAL HANDLING PROCEDURES	I-ET-3010.2D-5266-630-P4X-001 - TOPSIDE'S MECHANICAL HANDLING PROCEDURES
SPECIFIC PROJECT EQUIPMENT LIST	I-LI-3010.2D-1200-940-P4X-002 - EQUIPMENT LIST
SPECIFIC PROJECT ELECTRICAL SYSTEM DESCRIPTIVE MEMORANDUM	I-MD-3010.2D-5140-700-P4X-001 - ELECTRICAL SYSTEM DESCRIPTIVE MEMORANDUM
SPECIFIC PROJECT AUTOMATION AND CONTROL SYSTEM FUNCTIONS	I-MD-3010.2D-5520-800-P4X-001 - AUTOMATION AND CONTROL SYSTEM FUNCTIONS
SPECIFIC PROJECT AUTOMATION NET WORK DESCRIPTION	I-MD-3010.2D-5520-800-P4X-003 - AUTOMATION NET WORK DESCRIPTION

5. PETROBRAS GENERAL DELIVERY REQUIREMENTS

- 5.1 Besides the documentation listed in Annex "I" of API 619, which shall be considered as required, **VENDOR** shall submit the documents described at Annex A of this technical specification. Different schedule may be proposed by **VENDOR** and submitted to **PETROBRAS** approval.
- 5.2 Proposal drawings and data shall not be certified or as-built.
- 5.3 **PETROBRAS** drawings approval shall not be considered as relieving the **PURCHASER** and **PACKAGER** from any responsibility for detailed design, dimensioning and construction of equipment or deviations from specifications.
- 5.4 All data, drawings and equipment supplied according to this specification shall use the SI measurement system, except for ordinary piping, flanges, accessories and appurtenances, which shall be in inches.
- 5.5 **PURCHASER** and **PACKAGER** shall provide weights, dimensions and center of gravity for all equipment, including auxiliaries in different skids or shipped loose, with accuracy of ± 10% in proposal phase and ± 3% after order. **PURCHASER** and **PACKAGER** shall also furnish required data for dry, operation, test and maintenance cases.
- 5.6 **PURCHASER** and **PACKAGER** are required to note on respective data sheets of main equipment the moments of inertia (kg.m²) of each rotor.



6. MINIMUM SCOPE OF SUPPLY

6.1 PURCHASER and PACKAGER shall be responsible for the design, development, engineering, coordination, procurement, fabrication, assembly and shall guarantee overall performance (fully functional and operable) of the whole package, including as a minimum:

- | | | | |
|---|---|---|---|
| <input checked="" type="checkbox"/> Rotary screw compressor | <input checked="" type="checkbox"/> Gearbox | <input checked="" type="checkbox"/> Electric motor | <input checked="" type="checkbox"/> Auxiliary equipment |
| <input checked="" type="checkbox"/> Couplings and guards: | <input checked="" type="checkbox"/> Main equipment | | <input checked="" type="checkbox"/> Auxiliary equipment |
| <input checked="" type="checkbox"/> Baseplate (skid): | <input checked="" type="checkbox"/> Main equipment | | <input checked="" type="checkbox"/> Auxiliary equipment |
| <input checked="" type="checkbox"/> Inlet system: | <input checked="" type="checkbox"/> Heat exchanger** | <input checked="" type="checkbox"/> Silencer*** | <input checked="" type="checkbox"/> Knock-out drum*, ** |
| | <input type="checkbox"/> Temporary strainer | <input checked="" type="checkbox"/> Permanent Filter | |
| <input checked="" type="checkbox"/> Interstage system: | <input checked="" type="checkbox"/> Heat exchanger** | <input checked="" type="checkbox"/> Silencer*** | <input checked="" type="checkbox"/> Knock-out drum** |
| <input checked="" type="checkbox"/> Discharge system: | <input type="checkbox"/> Heat exchanger | <input checked="" type="checkbox"/> Silencer*** | <input type="checkbox"/> Knock-out drum |
| | <input type="checkbox"/> Oil Separator | <input type="checkbox"/> Coalescer filter | |
| <input checked="" type="checkbox"/> Instrumentation, automation and control: | | <input checked="" type="checkbox"/> Unit control panel | |
| | | <input checked="" type="checkbox"/> Machinery protection system | |
| <input checked="" type="checkbox"/> Load sharing control | <input checked="" type="checkbox"/> Design & supply | <input checked="" type="checkbox"/> Design data | |
| <input checked="" type="checkbox"/> Capacity control | <input checked="" type="checkbox"/> Design & supply | <input checked="" type="checkbox"/> Design data | |
| | <input type="checkbox"/> Sliding valve: | <input type="checkbox"/> Design & supply | <input type="checkbox"/> Design data |
| | <input checked="" type="checkbox"/> Spill-back valve: | <input checked="" type="checkbox"/> Design & supply | <input checked="" type="checkbox"/> Design data |
| | <input type="checkbox"/> HVSD: | <input type="checkbox"/> Design & supply | <input type="checkbox"/> Design data |
| | <input type="checkbox"/> VFD: | <input type="checkbox"/> Design & supply | <input type="checkbox"/> Design data |
| <input checked="" type="checkbox"/> Operational | <input type="checkbox"/> Design & supply | <input checked="" type="checkbox"/> Design data | |
| depressurizing valve, | | | |
| with restriction orifice: | | | |
| <input checked="" type="checkbox"/> Oil system: | <input checked="" type="checkbox"/> Lube | <input type="checkbox"/> Control | <input type="checkbox"/> Seal |
| <input checked="" type="checkbox"/> Sealing system: | <input checked="" type="checkbox"/> Main equipment | <input checked="" type="checkbox"/> Auxiliary equipment | |
| <input checked="" type="checkbox"/> Cooling system: | <input checked="" type="checkbox"/> Main equipment | <input checked="" type="checkbox"/> Auxiliary equipment | |
| <input type="checkbox"/> Deluge system | | | |
| <input checked="" type="checkbox"/> Piping and accessories for all utility system within skid limits | | | |
| <input type="checkbox"/> MCC | <input type="checkbox"/> Transformers | <input type="checkbox"/> Uninterruptible power supply | |
| <input checked="" type="checkbox"/> Grounding | | | |
| <input checked="" type="checkbox"/> All safety equipment and systems such as emergency shutdown valves, pressure safety valves, etc. within skid limits | | | |



- Cables, cables trays, junction boxes and accessories within skid limits
- Lateral analysis of the whole train, with model & report: Typical Dedicated
- Torsional analysis of the whole train, with model & report: Typical Dedicated
- Transient torsional analysis of the whole train, with model & report: Typical Dedicated
- Forced unbalance rotor response analysis of all units, with model & report: Typical Dedicated
- Special tools for main & auxiliary equipment maintenance (field maintenance)
- Capital spare (all required parts included in main quotation with list of itemized prices and its container dimensions)
- Spare parts for tests, commissioning, start-up and assisted operation.
- Design and coordination of complete arrangement within package limits ***
- Painting and procedures
- Preparation for shipment, including a single spreader bar for each FPSO for compressor skid
- Packing, coating, anticorrosive protection and preservation
- Hydrostatic test (HT), Performance Test (PT), Mechanical Running Test (MRT), Sound Level Test (SLT), Shipyard Acceptance Test (SYAT), Pulsation Acceptance Test (PAT), Site Acceptance Test (SAT).
- Supply & application of thermal insulation
- Supply & application of support system, where applicable
- Supply & application of heat tracing devices
- Supply & application of noise attenuation devices
- All consumables (oils, greases, fluids, products, etc.) for installation, commissioning and start-up
- Nameplates
- Full package documentation
- Full compliance to local codes & regulations
- Certification by Classification Society
- Quality assurance program
- Technical assistance of the following services: engineering during Detailed Engineering Design, erection, installation, onshore / offshore commissioning and start-up of main and auxiliary equipment, Site Acceptance Test, assisted operation before Offshore Acceptance Test and during Offshore Acceptance Test, included in main quotation, with itemized prices.
- Training.

[*] If necessary

[**] PACKAGER shall verify and approve Heat Exchangers and Pressure Vessels Data Sheets, which will be supplied by PURCHASER.



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[***] To include in the analysis of pulsation, noise suppression and all related mechanical analysis required by Annex C from "I-ET-3010.00-1225-323-P4X-001 - TECHNICAL SPECIFICATION FOR VAPOR RECOVERY UNIT" and all related interfaces.

6.2 For details about equipment and systems, see complete PETROBRAS specification I-ET-3010.00-1225-323-P4X-001 - TECHNICAL SPECIFICATION FOR VAPOR RECOVERY UNIT.

6.3 PURCHASER and PACKAGER are responsible for the complete package. Even if some sub-item is not described (for instance bolts, gaskets, expansion joints, etc.) PURCHASER and PACKAGER shall take it into account and include it in the scope of supply.

7. APPLICABLE DOCUMENTS (STANDARDS, REGULATIONS, ETC.):

Document Nº	Description
NR-1	Brazilian Ministry of Economy - Regulation Standard 1: " <i>Disposições Gerais</i> "
NR-10	Brazilian Ministry of Economy - Regulation Standard 10: " <i>Instalações e Serviços em Eletricidade</i> "
NR-11	Brazilian Ministry of Economy - Regulation Standard 11: " <i>Transporte, Movimentação, Armazenagem e Manuseio de Materiais</i> "
NR-12	Brazilian Ministry of Economy - Regulation Standard 12: " <i>Máquinas e Equipamentos</i> "
NR-13	Brazilian Ministry of Economy - Regulation Standard 13: " <i>Caldeiras e Vasos de Pressão</i> "
NR-15	Brazilian Ministry of Economy - Regulation Standard 15: " <i>Atividades e Operações Insalubres</i> "
NR-17	Brazilian Ministry of Economy - Regulation Standard 17: " <i>Ergonomia</i> "
NR-20	Brazilian Ministry of Economy - Regulation Standard 20: " <i>Líquidos Combustíveis e Inflamáveis</i> "
NR-23	Brazilian Ministry of Economy - Regulation Standard 23: " <i>Proteção Contra Incêndio</i> "
NR-26	Brazilian Ministry of Economy - Regulation Standard 26: " <i>Sinalização de Segurança</i> "
NR-37	Brazilian Ministry of Economy - Regulation Standard 37: " <i>Segurança e Saúde em Plataformas de Petróleo</i> "
API Std 521	Pressure-Relieving and Depressuring Systems
API Std 541	Form-Wound Squirrel-Cage Induction Motors - 500 Horsepower and Larger
API Std 610	Centrifugal Pumps for Petroleum, Petrochemical and Natural Gas Industries
API Std 613	Special Purpose Gear Units for Petroleum, Chemical and Gas Industry Services
API Std 614	Lubrication, Shaft-Sealing and Control-Oil Systems and Auxiliaries
API Std 619	Rotary-Type Positive Displacement Compressors for Petroleum, Petrochemical, and Natural Gas Industries
API Std 660	Shell-and-Tube Heat Exchangers
API Std 662	Plate Heat Exchangers for General Refinery Services
API Std 670	Machinery Protection System
API Std 671	Special-Purpose Couplings for Petroleum, Chemical and Gas Industry Services
API Std 676	Positive Displacement Pumps - Rotary
API Std 682	Pumps - Shaft Sealing Systems for Centrifugal and Rotary Pumps
API Std 692	Dry Gas Sealing Systems for Axial, Centrifugal, Rotary Screw Compressors and Expanders
API RP 14E	Recommended Practice for Design and Installation of Offshore Production Platform Piping Systems
API RP 520	Sizing, Selection and Installation of Pressure-Relieving Devices
API RP 582	Welding Guidelines for the Chemical, Oil and Gas Industries.
API RP 684	API Standard Paragraphs Rotordynamic Tutorial: Lateral Critical Speeds, Unbalance Response, Stability, Train Torsionals and Rotor Balancing
API RP 686	Recommended Practice for Machinery Installation and Installation Design
ASME B 16.5	Pipe Flanges and Flanged Fittings

Document Nº	Description
ASME B 16.34	Valves - Flanged, Threaded and Welding End
ASME B 31.3	Process Piping
ASME S.VIII	Rules for Construction of Pressure Vessels
ASME S. IX	Qualification Standard for Welding, Brazing and Fusing Procedures, Welders, Brazers and Welding, Brazing and Fusing Operators
ISO 1217	Displacement Compressors – Acceptance tests
ISO 15156	Petroleum and Natural Gas Industries: Materials for use in H ₂ S Containing Environments in Oil and Gas Production
ISO 12944-9	Paints and Varnishes – Corrosion Protection of Steel Structures by Protective Paint Systems – Part 9: Protective Paint Systems and Laboratory Performance Test Methods for Offshore and Related Structures.
ISO 23936.2	Petroleum, petrochemical and natural gas industries — Non-metallic materials in contact with media related to oil and gas production – Part 2: Elastomers
IEC 61260	Octave Band and Fractional-Octave-Band Filters
IEC 61672	Electroacoustics - Sound Level Meters
IEC60034	Rotating Electrical Machines
IEC 61892	Mobile and Fixed Offshore Units – Electrical Installations
IEC 60079	Explosive Atmosphere Standards
IEC 60092	Electrical Installations in Ships
IEC 62381	Automation systems in the process industry – Factory acceptance test (FAT), site acceptance test (SAT), and site integration test (SIT)

8. ATTACHED AND REFERENCED DOCUMENTS

- 8.1 The documents listed below form an integral part of this project. Any deviation from the specifications mentioned in these documents shall be clearly stated by the PURCHASER and PACKAGER and submitted to PURCHASER for approval.
- 8.2 PURCHASER and PACKAGER shall also consider deviations or comments from paragraphs marked with a bullet in API standards, even if a decision is required or further information will be provided.
- 8.3 Attached documents (data sheets, drawings, technical specifications, etc.):

Document Nº	Discipline	Title	
I-DE-3010.2D-1200-942-P4X-002	ARR	GENERAL ARRANGEMENT	(1)
I-DE-3010.2D-1415-942-P4X-002	ARR	M-05B - VRU SYSTEM AND LAYDOWN AREA - EQUIPMENT LAYOUT PLAN	(1)
I-ET-3000.00-0000-940-P4X-002	COO	SYMBOLS FOR PRODUCTION UNITS DESIGN	(2)
I-ET-3A26.00-1000-941-PPC-001	COO	METOCEAN DATA	(2)
I-ET-3A36.00-1000-941-PPC-001	COO	METOCEAN DATA	(2)
I-DE-3010.00-5140-700-P4X-003	ELE	GROUNDING INSTALLATION TYPICAL DETAILS	(1)
I-DE-3010.00-5140-797-P4X-001	ELE	ELECTRICAL SYSTEM AUTOMATION ARCHITECTURE DIAGRAM	(1)
I-DE-3010.00-5140-797-P4X-002	ELE	ELECTRICAL SYSTEM AUTOMATION TYPICAL ACTUATION DIAGRAMS	(1)
I-LI-3010.00-5140-797-P4X-001	ELE	ELECTRICAL SYSTEM AUTOMATION INTERFACE SIGNALS LIST	(1)
I-ET-3010.00-5140-700-P4X-002	ELE	SPECIFICATION FOR ELECTRICAL MATERIAL FOR OFFSHORE UNITS	(1)



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Document Nº	Discipline	Title	
I-ET-3010.00-5140-700-P4X-003	ELE	ELECTRICAL REQUIREMENTS FOR PACKAGES FOR OFFSHORE UNITS	(1)
I-ET-3010.00-5140-700-P4X-005	ELE	REQUIREMENTS FOR HUMAN ENGINEERING DESIGN FOR ELECTRICAL SYSTEMS OF OFFSHORE UNITS	(1)
I-ET-3010.00-5140-700-P4X-007	ELE	SPECIFICATION FOR GENERIC ELECTRICAL EQUIPMENT FOR OFFSHORE UNIT	(1)
I-ET-3010.00-5140-700-P4X-009	ELE	GENERAL REQUIREMENTS FOR ELECTRICAL MATERIAL AND EQUIPMENT FOR OFFSHORE UNITS	(1)
I-ET-3010.00-5140-712-P4X-001	ELE	LOW-VOLTAGE INDUCTION MOTORS FOR OFFSHORE UNITS	(1)
I-ET-3010.00-5140-712-P4X-002	ELE	MEDIUM-VOLTAGE INDUCTION MOTORS FOR OFFSHORE UNITS	(1)
I-ET-3010.00-5140-797-P4X-001	ELE	ELECTRICAL SYSTEM AUTOMATION ARCHITECTURE	(1)
I-ET-3010.00-5140-741-P4X-004.	ELE	SPECIFICATION FOR LOW-VOLTAGE GENERIC ELECTRICAL PANELS FOR OFFSHORE UNITS.	(1)
I-ET-3010.00-5140-741-P4X-003	ELE	POWER PANEL FOR THYRISTORIZED HEATER FOR OFFSHORE UNITS	(1)
I-DE-3010.2D-5265-946-P4X-001	ELE	TOPSIDES UPS AND DC SYSTEMS ONE-LINE DIAGRAM	(1)
I-ET-3010.00-1200-800-P4X-002	INS	AUTOMATION, CONTROL AND INSTRUMENTATION ON PACKAGE UNITS	(1)
I-ET-3010.00-5500-854-P4X-001	INS	MACHINERY MONITORING SYSTEM (MMS)	(1)
I-ET-3010.2D-1200-800-P4X-014	INS	AUTOMATION INTERFACE OF PACKAGED UNITS	(1)
I-ET-3010.00-1200-956-P4X-001	MEC	QUALIFICATION TESTS FOR PAINT SYSTEMS	(1)
I-ET-3010.00-1200-956-P4X-002	MEC	GENERAL PAINTING	(1)
I-ET-3010.00-1200-540-P4X-001	MEC	REQUIREMENTS FOR PRESSURE VESSELS DESIGN	(1)
I-ET-3010.00-1225-323-P4X-001	MEC	TECHNICAL SPECIFICATION FOR VAPOR RECOVERY UNIT	(1)
I-FD-3010.2D-1225-323-P4X-101	MEC	ROTARY COMPRESSOR FOR VRU	(1)
I-FD-3010.2D-1225-341-P4X-001	MEC	GEARBOX FOR ROTARY COMPRESSOR FOR VRU	(1)
I-FD-3010.2D-1225-392-P4X-001	MEC	OIL SYSTEM FOR ROTARY COMPRESSOR FOR VRU	(1)
I-FD-3010.2D-1225-854-P4X-001	MEC	MACHINERY PROTECTION SYSTEM FOR VRU	(1)
I-RL-3010.2D-1350-960-P4X-002	NAV	MOTION ANALISYS	(1)
I-FD-3010.2D-1225-323-P4X-001	PRO	VRU MOTOCOMPRESSION (C-UC-1225001A/B)	(1)
I-DE-3010.2D-1231-943-P4X-001	PRO	MAIN GAS COMPRESSION UNIT	(2)
I-DE-3010.2D-1231-944-P4X-001	PRO	SAFETY GAS K.O. DRUM	(2)
I-DE-3010.2D-1225-944-P4X-001	PRO	VRU K.O.DRUM	(2)
I-DE-3010.2D-1225-944-P4X-002	PRO	VAPOR RECOVERY UNIT - TRAIN A - 1ST STAGE	(2)
I-DE-3010.2D-1225-944-P4X-003	PRO	VAPOR RECOVERY UNIT - TRAIN B - 1ST STAGE	(2)
I-DE-3010.2D-1225-944-P4X-004	PRO	VAPOR RECOVERY UNIT - TRAIN A - 2ND STAGE	(2)

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I-DE-3010.2D-1225-944-P4X-005	PRO	VAPOR RECOVERY UNIT - TRAIN B - 2ND STAGE	(2)
I-RL-3010.2D-1200-940-P4X-001	PRO	GENERAL SPECIFICATION FOR AVAILABLE UTILITIES	(1)
I-DE-3010.2D-1200-944-P4X-001	PRO	GENERAL NOTES	(1)
I-DE-3010.2D-1200-94A-P4X-001	SAF	AREA CLASSIFICATION - GENERAL	(1)

(1) The requirements of these documents are mandatory. Valid to any packages or equipment on the unit.

(2) These documents shall only be used by PURCHASER and PACKAGER for reference.

Note: Electrical datasheets shall be included during detailed design.



9. ANNEX

9.1 ANNEX A

Item	Description	With Proposal	For Approval		Certified		Final
		Document	Document	Schedule	Document	Schedule	
A	Rotary Type Positive Displacement Compressor Package						
A01	Certified Dimensional Outline Drawing and List of Connections	X	X	4W	X	2D	X
A02	Cross-Sectional Drawings and Part Numbers	X	X	6W	X	2D	X
A03	Rotor Assembly Drawings and Part Numbers	X	X	6W	X	2D	X
A04	Thrust-Bearing Assembly Drawings, Part Numbers, Data Sheet and Sizing Calculations		X	6W	X	2D	X
A05	Journal-Bearing Assembly Drawings, Bill of Materials, Data Sheet and Sizing Calculations		X	6W	X	2D	X
A07	Coupling Assembly Drawing and Bill of Materials	X	X	6W	X	2D	X
A06	Seal Gas System Assembly Drawing and Bill of Materials		X	6W	X	2D	X
A07	Seal Gas System Schematic and Bill of Materials	X	X	6W	X	2D	X
A08	Seal Gas System Arrangement Drawing and List of Connections		X	4W	X	2D	X
A09	Seal Gas System Component Drawings and Data		X	6W	X	2D	X
A10	Seal Gas System Leakage Rates	X	X	6W	X	2D	X
A11	Oil System Schematics and Bills of Materials	X	X	6W	X	2D	X
A12	Oil System Assembly and Arrangement Drawings		X	4W	X	2D	X
A13	Oil System Component Drawings and Data		X	4W	X	2D	X
A14	Oil Separator Vessel Arrangement						
A15	Injection-System Schematic (If Necessary)						
A16	Inlet Capacity, Power, and Discharge Temp. Versus Compression Ratio and Speed	X	X	6W	X	2D	X
A17	Starting Torque Versus Speed	X	X	6W	X	2D	X
A18	Vibration Analysis Data		X	6W	X	2D	X
A19	Lateral Critical Speed Analysis Report		X	6W	X	2D	X
A20	Torsional Critical Speed Analysis Report		X	6W	X	2D	X
A21	Transient Torsional Critical Speed Analysis Report		X	6W	X	2D	X
A22	Allowable Flange Loadings		X	6W	X	2D	X
A23	Coupling Alignment Diagram		X	6W	X	2D	X
A24	Weld Procedures and Welders Qualification Certificates		X	6W	X	2D	X
A25	Certified Pressure Test Logs				X	1T	1D



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REV. B

AREA: ATAPU 2 AND SÉPIA 2

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TITLE: **VAPOR RECOVERY UNIT PACKAGE SPECIFICATION**

INTERNAL
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Item	Description	With Proposal	For Approval		Certified		Final
		Document	Document	Schedule	Document	Schedule	
A26	Mechanical Running Test Logs				X	1T	1D
A27	Performance Test Logs				X	1T	1D
A28	Performance Curves - Standard Inlet Volumetric Flow, Discharge Temperature, Volumetric Efficiency, Adiabatic Efficiency and Power versus Discharge Pressure. Operation limits shall be clearly indicated.	X	X	4W	X	2D	X
A29	Rotor Balancing Logs				X	1T	1D
A30	Rotor Mechanical and Electrical Runout				X	1T	1D
A31	Data Sheets (Proposal / As-Built)	X	X	6W	X	2D	X
A32	As-Built Dimensions and Data (Including Assemblies Clearances)		X	6W	X	2D	X
A33	Silencer Drawings and Data (If Necessary)		X	6W	X	2D	X
A34	Process Gas Coolers Drawings and Data						
A35	Nondestructive Test Procedures and Acceptance Criteria		X	6W	X	2D	X
A36	Procedures for Special or Optional Tests		X	6W	X	2D	X
A37	Installation Manual		X	10W	X	2D	X
A38	Operating and Maintenance Manuals		X	10W	X	2D	X
A39	Spare Parts Recommendations Lists with Itemized Prices (Start-Up, Commissioning, Compulsory Set per Classification. Society, One (1) and Two (2) Years of Operation)	X	X	10W	X	2D	X
A40	List of Drawings and Documents Index (Status and Delivery Schedule)	X	X	2W	X	2D	X
A41	Shipping List		X	6W	X	2D	X
A42	List of Special Tools Furnished for Maintenance		X	10W	X	2D	X
A43	Technical Data Manual		X	10W	X	2D	X
A44	Material Safety Data Sheets	X	X	10W	X	2D	X
A45	Metallurgy of Major Components	X	X	6W	X	2D	X
A46	Preservation, Packaging, and Shipping Procedures, including vendors.	X	X	6W	X	2D	X
A47	Bearing Babbitt Strength Versus Temperature Curves		X	6W	X	2D	X
A48	Noise Sound Level (datasheet and report)	X	X	6W	X	2D	X
A49	Ventilation System Calculation, Data Sheet, Arrangement and Bill of Materials (If Necessary)	X	X	6W	X	2D	X



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Item	Description	With Proposal	For Approval		Certified		Final
		Document	Document	Schedule	Document	Schedule	
A50	Piping and Support Drawings, Arrangement and Details	X	X	4W	X	2D	X
A51	Pressure Vessels, Coolers and Auxiliaries Equipment Data Sheets and Drawings	X	X	6W	X	2D	X
A52	Structure (Walkaways, Handrails, Grating, etc.) Drawings and List of Components		X	4W	X	2D	X
A53	Baseplate Drawings and List of Components	X	X	6W	X	2D	X
A54	Foundation Plan (With Anchor Bolts Location)		X	6W	X	2D	X
A55	Dimensions, Weights, Static / Dynamic Loads, Moments and Centers of Gravity	X	X	6W	X	2D	X
A56	Equipment General Description and Catalogs	X					
A57	Reference List of Similar Equipment Installed and Operating Under Analogous Conditions	X					
A58	Painting Specification	X	X	6W	X	2D	X
A59	List of Vendors	X	X	6W	X	2D	X
A60	Nameplate Drawings for Each Part, Including Applicable Code Stamp		X	6W	X	2D	X
A61	List of Exceptions to the Specifications and Applicable Standards	X					
A62	Preparation for Storage at Job Site Before Installation		X	6W	X	4D	1D
A63	Weather Protection, Insulation and Tropicalization		X	6W	X	4D	1D
A64	Tabulation of All Utilities	X	X	6W	X	2D	X
A65	Rotor Balancing Logs				X	1T	1D
A66	Vent Study Report		X	6W	X	2D	X
B	Gearbox						
B01	Certified Dimensional Outline Drawing and List of Connections	X	X	4W	X	2D	X
B02	Cross-Sectional Drawing, Parts List and Bill of Materials	X	X	6W	X	2D	X
B03	Rotor Assembly Drawing, Parts List and Bill of Materials	X	X	6W	X	2D	X
B04	Thrust Bearing Assembly Drawing, Parts List, Bill of Materials, Data Sheet and Sizing Calculations		X	6W	X	2D	X
B05	Journal Bearing Assembly Drawing, Parts List, Bill of Materials and Data Sheet and Sizing Calculations	X	X	6W	X	2D	X
B06	Coupling Assembly Drawing, Parts List and Bill of Materials	X	X	6W	X	2D	X



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Item	Description	With Proposal	For Approval		Certified		Final
		Document	Document	Schedule	Document	Schedule	
B07	Lube-Oil Schematic and Bill of Materials	X	X	6W	X	2D	X
B08	Lube-Oil Component Drawings and Data Sheets		X	6W	X	2D	X
B09	Anticipated Tooth Contact Drawing and Specifications		X	6W	X	2D	X
B10	Record of Deviations From Manufacturing Process Control System	X	X	6W	X	2D	X
B11	Mass Elastic Data		X	6W	X	2D	X
B12	Lateral Critical Speed Analysis Report		X	6W	X	2D	X
B13	Torsional Critical Speed Analysis Report		X	6W	X	2D	X
B14	Input and Output Shaft Position Diagram	X	X	6W	X	2D	X
B15	Welding Procedures and Welders Qualification Certificates		X	6W	X	2D	X
B16	Hydrostatic Test Logs				X	1T	1D
B17	Mechanical Running Test Logs				X	1T	1D
B18	Rotor Mechanical and Electrical Runout				X	1T	1D
B19	Proposals, Purchase and As-Built Data Sheets	X	X	6W	X	2D	X
B20	As-Built Dimensions or Data (Including Assembly Clearances)				X	2D	X
B21	Installation Manual		X	10W	X	2D	X
B22	Operating and Maintenance Manual		X	10W	X	2D	X
B23	Technical Manual		X	10W	X	2D	X
B24	Spare Parts Recommendations Lists with Itemized Prices (Start-Up, Commissioning, Compulsory Set per Classification Society, One (1) and Two (2) Years of Operation)	X	X	10W	X	2D	X
B25	Preservation, Packaging and Shipping Procedures, including vendors.		X	6W	X	2D	X
B26	List of Special Tools Furnished For Maintenance		X	10W	X	2D	X
B27	Nondestructive Test Procedures and Acceptance Criteria		X	6W	X	2D	X
B28	Book With All Quality Assurance Documents		X	10W	X	2D	X
B29	Dimensions, Weights, Static / Dynamic Loads, Moments and Centers of Gravity	X	X	10W	X	2D	X
B30	Equipment General Description and Catalogs	X					



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Item	Description	With Proposal	For Approval		Certified		Final
		Document	Document	Schedule	Document	Schedule	
B31	Reference List of Similar Equipment Installed and Operating under Analogous Conditions	X					
B32	Painting Specification		X	6W	X	2D	X
B33	List of Vendors	X	X	6W			X
B34	Nameplate Drawings for each Piece or Part, Including Applicable Code Stamp		X	6W	X	2D	X
B35	List of Exceptions to the Specifications and Applicable Standards	X					
C	Oil System						
C01	Certified Dimensional Outline Drawing and List of Connection	X	X	4W	X	2D	X
C02	Components Drawings and Bill of Materials	X	X	6W	X	2D	X
C03	System Schematics, Bill of Materials and Components Sizing Criteria	X	X	6W	X	2D	X
C04	Component Data Sheets	X	X	6W	X	2D	X
C05	Electrical and Instrumentation Wiring Diagrams and Bill of Materials	X	X	6W	X	2D	X
C06	Electrical and Instrumentation Terminal Box Layout and List of Connections		X	6W	X	2D	X
C07	Test Procedures		X	6W	X	2D	X
C08	Welding Procedures		X	6W	X	2D	X
C09	Hydrostatic Test Logs				X	1T	1D
C10	Operational Test Logs				X	1T	1D
C11	Data Sheets (Proposal / As-Built)	X	X	6W	X	2D	X
C12	Installation, Operation and Maintenance Manuals		X	10W	X	2D	X
C13	Spare Parts Recommendations Lists with Itemized Prices (Start-Up, Commissioning, Compulsory Set per Classification Society, One (1) and Two (2) Years of Operation)	X	X	10W	X	2D	X
C14	Pressure Vessel Certification Data		X	6W	X	2D	X
C15	Preservation, Packing and Shipping Procedures, including vendors.		X	6W	X	2D	X
C16	Dimensions, Weights, Static / Dynamic Loads, Moments and Centers of Gravity	X	X	6W	X	2D	X
C17	List of Exceptions to the Specifications and Applicable Standards	X					



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Item	Description	With Proposal	For Approval		Certified		Final
		Document	Document	Schedule	Document	Schedule	
C18	Reference List of Similar Equip. Installed and Operating Under Analogous Conditions	X					
C19	Painting Specification	X	X	6W	X	2D	X
C20	List of Vendors	X	X	6W	X	2D	X
C21	Nameplate Drawings for Each Piece or Part, Including Applicable Code Stamp		X	6W	X	2D	X
D	Automation & Machinery Protection System						
D01	Certified Dimensional Outline Drawing and List of Connections	X	X	4W	X	2D	X
D02	Cross-Sectional Drawing, Part List and Bill of Materials	X	X	6W	X	2D	X
D03	Control and Electrical System Schematics and Bill of Materials	X	X	6W	X	2D	X
D04	Electrical and Instrumentation System Arrangement Plans	X	X	6W	X	2D	X
D05	Grounding Plan		X	6W	X	2D	X
D06	Calibration Curves (Certified)		X	6W	X	2D	X
D07	Rotor Nodal Point Analysis Data		X	6W	X	2D	X
D08	Recommended Alarm (Alert) and Shutdown (Danger) Set-Points	X	X	6W	X	2D	X
D09	Data Sheets (ISA)	X	X	6W	X	2D	X
D10	Dimensions and Data	X	X	6W	X	2D	X
D11	Installation Manual		X	10W	X	2D	X
D12	Operation and Maintenance Manuals		X	10W	X	2D	X
D13	Spare Parts Recommendations Lists with Itemized Prices (Start-Up, Commissioning, Compulsory Set per Classification Society, One (1) and Two (2) Years of Operation)	X	X	10W	X	2D	X
D14	List of Drawings and Documents Index (Status and Delivery Schedule)		X	6W	X	2D	X
D15	Shipping List		X	6W	X	2D	X
D16	Special Weather Protection and Tropicalization Requirements		X	6W	X	2D	X
D17	deleted						
D18	Technical Data Manual: Hardware and Software Manuals, Application Program, Communication Drivers, Drawings); Instrumentation Cable List with Complete Specification; Electronic Cards Schematic Drawings with Connections)		X	10W	X	2D	X
D19	Material Safety Data Sheets	X	X	6W	X	2D	X
D20	Cause x Effect Matrix, Ladder Block, Control Narratives, Logic (including Start-Up, Alarm and Shutdown) and Loop Diagrams		X	6W	X	2D	X



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Item	Description	With Proposal	For Approval		Certified		Final
		Document	Document	Schedule	Document	Schedule	
D21	P&ID Drawings and Schematics including, as a minimum: Steam, Seal Gas, Electrical Power, Fuel, Water, Lubrication and Process Fluid System	X	X	6W	X	2D	X
D22	EMI and RFI Test Logs				X	1T	1D
D23	Fire Fighting System List of Components, Drawings, Data Sheets and Bill of Materials		X	6W	X	2D	X
D24	Gas Detection System List of Components, Drawings, Data Sheets and Bill of Materials		X	6W	X	2D	X
D25	Preservation, Packing and Shipping Procedures, including vendors.		X	6W	X	2D	X
D26	Dimensions, Weights, Static / Dynamic Loads, Moments and Centers of Gravity	X	X	6W	X	2D	X
D27	Equipment General Description and Catalogs	X					
D28	Reference List of Similar Equipment Installed and Operating Under Analogous Conditions	X					
D29	Painting Specification	X	X	6W	X	2D	X
D30	List of Vendors	X	X	6W	X	2D	X
D31	Nameplate Drawings for Each Piece or Part, Including Applicable Code Stamp		X	6W	X	2D	X
D32	List of Exceptions to the Specifications and Applicable Standards	X					
D33	Package Control System Architecture Diagram	X	X	6W	X	2D	X
D34	List of Data / Tags for Remote Monitoring from HMI Unit A&C System		X	6W	X	2D	X
D35	Control Panel I/O List		X	6W	X	2D	X
D36	Field Acceptance Test and Site Acceptance Test Procedures		X	6W	X	2D	X
D37	Electrical and Instrumentation Drawing and List of Connections		X	4W	X	2D	X
D38	Instrument List		X	10W	X	2D	X
D39	Alarm & Events List		X	10W	X	2D	X
D40	Cable List		X	10W	X	2D	X
D41	PLC Technical Specification		X	10W	X	2D	X
D42	Instrument/Instrumented Valve Datasheets (one per type of instrument/instrumented valve)		X	10W	X	2D	X
D43	Instrument/Instrumented Valve Calculations (Control Valves, PSVs, Orifice Plates/Restriction Orifices and Thermowells)		X	10W	X	2D	X



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INTERNAL
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Item	Description	With Proposal	For Approval		Certified		Final
		Document	Document	Schedule	Document	Schedule	
D44	UCP and RIO Panels General Arrangement		X	10W	X	2D	X
D45	UCP and RIO Panels Internal Interconnections Diagram		X	10W	X	2D	X
D46	Wiring Diagram		X	10W	X	2D	X
D47	Instrumentation certificates, such as, but not limited to: calibration certificates, hazardous areas certificates and IP degree certificates in accordance with INMETRO		X	10W	X	2D	X
E	Main Motor & Electrical System						
E01	Dimensional Drawings, Including Weights	X	X	6W	X	2D	X
E02	Dimensional Drawing and Technical Information for Air-Water Coolers (if any)		X	6W	X	2D	X
E03	Dimensional Drawing and Technical Information for Bearings		X	6W	X	2D	X
E04	Dimensional Drawing and Technical Information for Pressurisation System		X	6W	X	2D	X
E05	Required Data-Sheets	X	X	6W	X	2D	X
E06	Starting Time Calculation Report Including Calculation of the Relation Ta/Tlr, Current-Speed Curves and Torque-Speed Curves for Motor and Driven Machine, Printed on the Same Chart (100% and 85% of Rated Voltage)	X	X	6W	X	2D	X
E07	Temperature Rise Test Report for Motors Installed in Hazardous Area		X	6W	X	2D	X
E08	Electrical and Mechanical Parameter List in P.U., Including Locked-Rotor, Pull-Up and Breakdown Torques; Rotor Inertia Moment; Rotor Time Constants; Power Factor at Locked-Rotor and at Rated Conditions; Motor Electrical Model with Reactances, Resistances, Slip Dependence, Current Dependence	X	X	6W	X	2D	X
E09	Painting Method	X	X	6W	X	2D	X
E10	Complete Tests List	X	X	6W	X	2D	X
E11	Spare Parts Recommendations Lists with Itemized Prices (Start-Up, Commissioning, Compulsory Set per Classification Society, One (1) and Two (2) Years of Operation)	X	X	10W	X	2D	X



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Item	Description	With Proposal	For Approval		Certified		Final
		Document	Document	Schedule	Document	Schedule	
E12	Wiring Diagram(s) for Motor, Instruments, Panels, Sensors, Lubrication and Pressurisation Equipment		X	6W	X	2D	X
E13	Saturation Curves for Current Transformers		X	6W	X	2D	X
E14	Details of Power and Control Terminal Boxes	X	X	6W	X	2D	X
E15	Nameplate Drawings for Each Piece of Equipment or Part, Including Applicable Code Stamp		X	6W	X	2D	X
E16	Speed-Torque and Speed-Current Curves At 100% And 85% Rated Voltage	X	X	6W	X	2D	X
E17	Protection Study Including the Compatibility of Protection Devices With Permissible Thermal Times at Ambient (Cold Start) and Running (Hot Start) Temperatures						
E18	Heating and Cooling Time Constants		X	6W	X	2D	X
E19	Time-Current Curves Showing the Allowable Starting Condition and Continuous Operation at Rated Voltage and Ambient Temperature		X	6W	X	2D	X
E20	Temperature-Time Curves Showing the Required Stator and Rotor Limits and the Cool-Down Time After All Possible Operational Conditions, Including and Indicating the Worst One.		X	6W	X	2D	X
E21	Assembly, Installation, Operation and Maintenance Manuals		X	10W	X	2D	X
E22	Design of all power and control cable routes and sub routes within the machine skid, including trays, supports, grounding connections and other similar structures, giving identification, quotes, elevations, rated sizes, orientation of design.		X	6W	X	6W	X
E23	Technical Reports for All Tests				X	1T	1D
E24	Hazardous area certificates for all electrical equipment	X	X	6W	X	2D	X
E25	Motor, datasheets fulfilled	X	X	6W	X	2D	X
E26	Dimension, weight and functional diagram for all electrical panels		X	6W	X	1T	1D
E27	Electrical load list at auxiliares	X	X	6W	X	1T	1D
E28	Electrical interconnection diagrams		X	6W	X	1T	1D



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INTERNAL
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Item	Description	With Proposal	For Approval		Certified		Final
		Document	Document	Schedule	Document	Schedule	
E29	Dispatch Dossier						1D
F	General documents						
F1	Inspection and Test Plan	X	X	4W	X	2W	1D
F2	Engineering, Fabrication, Inspection, Test Plan and Delivery Schedule of the PACKAGE (including details of each major equipment and components)	X	X	2W	X	2D	1D
F3	Factory Acceptance Test, Site Acceptance Test and Site Integration Test Reports.		X	2T	X	4W	1D
F4	Handling drawing for installation		X	4W	X	2W	1D
F5	Instrument and instrumented valve list		X	4W	X	2W	1D
F6	Instrument and instrumented valve data sheet		X	4W	X	2W	1D
F7	Calibration certificates of instruments, control valves and PSVs						1D
F8	Packing list		X	4D	X	2W	1D
F9	Details drawing of pressure vessels, including internal parts.		X	6W	X	2W	1D
F10	Fabrication procedures of pressure vessels classified in NR-13		X	6W	X	2W	1D
F11	NDT procedures of pressure vessels classified in NR-13		X	6W	X	2W	1D
F12	Calculation reports of pressure vessels		X	4W	X	2W	1D
F13	Welding, heat treatment and NDT reports, especially for pressure vessels						1D
F14	Material certificates of all pressurized components, specially for pressure vessels						1D
F15	Painting and insulation inspection report						1D
F16	Hydrotest procedures and reports of piping and pressure vessels. For pressure vessels classified in NR-13, Hydrotest reports shall contain the Qualified Professional signature, as per NR-13 requirement		X	6W	X	2W	1D
F17	Databook index		X	6W	X	2W	1D
F18	Dispatch Dossier						1D
F19	Piping isometrics						1D



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		Document	Document	Schedule	Document	Schedule	
F20	Piping class (piping specification data sheet) - which shall contain at least information about: material, sizes, standard and codes of piping, valve and piping fittings						1D
F21	Calculation report from pipe thickness dimensioning and any other element on piping class						1D
F22	Piping support catalog – which shall contain at least support code (tag), detailed draw, material table with: base material, quantity and size of each support element						1D
F23	Expansion joint calculation report and draws (if existent on project)						1D
F24	Piping code compliance (ASME B31.3) in a calculation report attending the flexibility analysis requirements from code						1D
F25	General arrangement						1D
F26	Piping plant						1D
F27	Acoustic Pulsation Study Report		x	6W	x	6W	

Remarks:

Indicated schedule is the required time for PURCHASER and PACKAGER submits documents after order, return of reviewed documents or test execution, with the following legend:

- W: Weeks after order (e.g.: 2 weeks = 2W).
- D: Weeks prior to dispatch;
- T: Weeks after testing, completion or inspection.