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	JOB: HIGH CAPACITY FPSO - GAS EXPORTATION ALL ELECTRIC								
	AREA: ATAPU 2 AND SÉPIA 2								
SRGE	TITLE: STRUCTURAL TANKS GAS RECOVERY COMPRESSOR PACKAGE SPECIFICATION (UC-1350001)		INTERNAL						
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INDEX OF REVISIONS									
REV.	DESCRIPTION AND/OR REVISED SHEETS								
0	ORIGINAL ISSUE								
A	REVISED WHERE INDICATED								
	REV. 0	REV. A	REV. B	REV. C	REV. D	REV. E	REV. F	REV. G	REV. H
DATE	APR/28/22	AUG/23/22							
DESIGN	EEA	EEA							
EXECUTION	CFQ2	CFQ2							
CHECK	UP4Y	UP4Y							
APPROVAL	CXM6	CXM6							
INFORMATION IN THIS DOCUMENT IS PROPERTY OF PETROBRAS, BEING PROHIBITED OUTSIDE OF THEIR PURPOSE									
FORM OWNED TO PETROBRAS N-0381 REV. L									



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1. INTRODUCTION


- 1.1 This document objective is to detail information related to liquid ring 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 systems: UC-1350001 – STRUCTURAL TANKS GAS 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 points shown in the data sheet, as well as operating points not shown with lower flow rates or intermediate molecular weight, have equal probability of occurrence. There is no predominant operating point. The certified point does not represent the most frequent operating point.

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4. UC-1350001 SPECIFIC REQUIREMENT

- 4.1 STRUCTURAL TANKS GAS RECOVERY COMPRESSION UNIT (UC-1350001) shall be design and supplied as complete package, in compliance with the provisions of this document and its attachments, all applicable codes, standards, regulations and Classification Society requirements.
- 4.2 Complete package shall consist of a closed loop water system, including Liquid Ring compressors and drivers, Coolers, Filters, Vessels, and Control panel, accessories, machinery protection system, oil system, etc. See details at I-FD-3010.2D-1350-320-P4X-001 – STRUCTURAL TANKS GAS RECOVERY COMPRESSION UNIT (UC-1350001) and I-FD-3010.2D-1350-320-P4X-101 – STRUCTURAL TANKS GAS RECOVERY COMPRESSION UNIT (UC-1350001). Additional process design cases shall be included as minimum in the I-FD-3010.2D-1350-320-P4X-001 – STRUCTURAL TANKS GAS RECOVERY COMPRESSION UNIT (UC-1350001):
- a) 1 case for inert gas running test according to I-ET-3010.2D-1350-320-P4X-001 – STRUCTURAL TANKS GAS RECOVERY COMPRESSION UNIT (UC-1350001);
- 4.3 Due to limited capacity of fresh water production by FPSO, PACKAGER and PURCHASER shall minimize fresh water consumption. Utilities consumption shall be approved by PETROBRAS prior purchase.
- 4.4 System and utilities shall be designed in order to permit one or two compressors in operation simultaneously. It means that spare unit shall be able to start and run before shutdown the other unit.
- 4.5 A suction vessel is required and it shall be design and supplied, see details at I-FD-3010.2D-1350-320-P4X-001 – STRUCTURAL TANKS GAS RECOVERY COMPRESSION UNIT (UC-1350001)

5. PETROBRAS GENERAL DELIVERY REQUIREMENTS

- 5.1 Besides the documentation listed in Annex “G” of API 681, 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 $\pm 10\%$ in proposal phase and $\pm 3\%$ 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:

- Liquid ring compressor
- Driver Electric Motor Diesel Engine Steam Turbine
- Gear (If applicable)
- Couplings and Guards
- Baseplate (Skid)
- Lubrication system, including: Constant Level Oiler Oil Mist provisions
- Seal system (seal, piping, accessories, etc.)
- Piping (auxiliary process fluid, steam, cooling water, lubrication oil, etc.)
- Ring liquid flow system: Once through system Partial recirculation system Total recirculation system
- Inlet pressure control valve
- Suction separator including: Pressure relief valve Ring liquid drain trap Level control
- Discharge separator including: Pressure relief valve Ring liquid drain trap Level control
- Inlet and discharge check valves
- Shutdown valves and associated instruments
- All safety equipment and systems such as emergency shutdown valves, pressure safety valves, etc. within skid limits
- Ring liquid recirculation pump and driver (To be confirmed by manufacture)
- Ring liquid cooler
- Instrumentation and control: Local panel Control room panel Gauge board
- Protection Control / Interlock Monitoring
- Instrumentation Junction boxes Interconnections and wiring
- Variable speed driver (VSD)
- Capital spare parts (all required parts included in main quotation with list of itemized prices and its container dimensions)
- Special tools for main & auxiliary equipment maintenance (field maintenance)

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- Foundation bolts
- Design
- Supply
- Nameplates in stainless steel
- Grounding clips in stainless steel
- Painting
- Anticorrosive protection for storage
- Inspection and tests
- Technical documents and drawings, including data-book
- Preparation for shipment
- Transportation
- Supervision Field assembly
- Start up supervision
- Commissioning
- Training course for PETROBRAS staff in Brazil
- Technical Assistance at job site and/or offshore of the following services: erection, installation, commissioning and start-up of main and auxiliary equipment, included in main quotation, with itemized prices.
- A complete Engineering Package including design, fabrication, inspection, testing, certification and preparation for shipment of the STRUCTURAL TANKS GAS RECOVERY SYSTEM
- Safety signaling in Portuguese language
- Maintenance lifting beams and hoists
- Common skid with drip pans, lifting lugs, earthing lugs and flanged drains with valves
- All the instruments and instrument supports
- Electrical and instrument installation (including cabling, cable termination details, motor terminal box details and grounding)
- Stainless steel (316), copper free aluminium or non metallic material junction boxes mounted at skid edge
- Data books
- Installation, operation and maintenance manuals in Portuguese language
- Utilities Consumption
- Supply & application of noise attenuation devices
- Ladders, platforms, handrails, guardrails, gratings where applicable
- Specification for bolts and nuts with indication of torque values on baseplate
- Instrumentation data shall be provided in a API standard spreadsheet
- Cables, cables trays, junction boxes and accessories within skid limits
- Motion requirements
- Spare parts for tests, NR-13 for tests (if applicable), commissioning, start-up and for one year assisted operation.
- Packing, coating, anticorrosive protection and preservation



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- 6.2 For details about equipment and systems, see complete PETROBRAS specification I-ET-3010.2D-1350-320-P4X-001 – STRUCTURAL TANKS GAS RECOVERY COMPRESSION UNIT (UC-1350001).
- 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, thermowells 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: "DISPOSIÇÕES GERAIS"
NR-10	BRAZILIAN MINISTRY OF ECONOMY - REGULATION STANDARD 10: "INSTALAÇÕES E SERVIÇOS EM ELETRICIDADE"
NR-11	BRAZILIAN MINISTRY OF ECONOMY - REGULATION STANDARD 11: "TRANSPORTE, MOVIMENTAÇÃO, ARMAZENAGEM E MANUSEIO DE MATERIAIS"
NR-12	BRAZILIAN MINISTRY OF ECONOMY - REGULATION STANDARD 12: "MÁQUINAS E EQUIPAMENTOS"
NR-13	BRAZILIAN MINISTRY OF ECONOMY - REGULATION STANDARD 13: "CALDEIRAS E VASOS DE PRESSÃO"
NR-15	BRAZILIAN MINISTRY OF ECONOMY - REGULATION STANDARD 15: "ATIVIDADES E OPERAÇÕES INSALUBRES"
NR-17	BRAZILIAN MINISTRY OF ECONOMY - REGULATION STANDARD 17: "ERGONOMIA"
NR-20	BRAZILIAN MINISTRY OF ECONOMY - REGULATION STANDARD 20: "LÍQUIDOS COMBUSTÍVEIS E INFLAMÁVEIS"
NR-23	BRAZILIAN MINISTRY OF ECONOMY - REGULATION STANDARD 23: "PROTEÇÃO CONTRA INCÊNDIO"
NR-26	BRAZILIAN MINISTRY OF ECONOMY - REGULATION STANDARD 26: "SINALIZAÇÃO DE SEGURANÇA"
NR-37	BRAZILIAN MINISTRY OF ECONOMY - REGULATION STANDARD 37: "SEGURANÇA E SAÚDE EM PLATAFORMAS DE PETRÓLEO"
API STD 521	PRESSURE RELIEVING AND DEPRESSURING SYSTEM
API STD 610	CENTRIFUGAL PUMPS FOR PETROLEUM, PETROCHEMICAL AND NATURAL GAS INDUSTRIES
API STD 614	LUBRICATION, SHAFT-SEALING AND CONTROL-OIL SYSTEMS AND AUXILIARIES
API STD 681	LIQUID RING VACUUM PUMP AND COMPRESSORS FOR PETROLEUM, CHEMICAL AND GAS INDUSTRY SERVICES
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

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Document Nº	Description
API RP 14E	RECOMMENDED PRACTICE FOR DESIGN AND INSTALLATION OF OFFSHORE PRODUCTION PLATFORM PIPING SYSTEMS
API RP 582	WELDING GUIDELINES FOR THE CHEMICAL, OIL AND GAS INDUSTRIES
API RP 520	SIZING, SELECTION AND INSTALLATION OF PRESSURE-RELIEVING DEVICES
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
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 DIVISION I
ASME S. IX	QUALIFICATION STANDARD FOR WELDING, BRAZING AND FUSING PROCEDURES, WELDERS, BRAZERS AND WELDING, BRAZING AND FUSING OPERATORS
ISO 15156	PETROLEUM AND NATURAL GAS INDUSTRIES: MATERIALS FOR USE IN H2S 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
IEC60034	ROTATING ELECTRICAL MACHINES
IEC 61260	OCTAVE BAND AND FRACTIONAL-OCTAVE-BAND FILTERS
IEC 61672	ELECTROACOUSTICS - SOUND LEVEL METERS
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.):



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Document Nº	Discipline	Title	
I-ET-3000.00-0000-940-P4X-002	COO	SYMBOLS FOR PRODUCTION UNITS DESIGN	(1)
I-ET-3A36.00-1000-941-PPC-001	COO	METOCEAN DATA	(1)
I-DE-3010.2D-1200-942-P4X-002	ARR	GENERAL ARRANGEMENT	(1)
I-DE-3010.2D-1411-942-P4X-001	ARR	M-01 - FLARE SYSTEM - EQUIPMENT LAYOUT PLAN	(1)
I-DE-3010.00-5140-700-P4X-003	ELE	GROUNDING INSTALLATION TYPICAL DETAILS	(1)
I-ET-3010.00-5140-700-P4X-002	ELE	SPECIFICATION FOR ELECTRICAL MAT FOR OFFSHORE UNITS	(1)
I-ET-3010.00-5140-700-P4X-003	ELE	ELECTRICAL REQUIREMENTS FOR PACKAGES FOR OFFSHORE UNITS	(1)
I-ET-3010.00-5140-712-P4X-001	ELE	LOW VOLTAGE INDUCTION MOTORS FOR OFFSHORE UNIT	(1)
I-ET-3010.00-5140-712-P4X-002	ELE	MEDIUM-VOLTAGE INDUCTION MOTORS FOR OFFSHORE UNIT	(1)
I-ET-3010.00-5140-741-P4X-004	ELE	SPECIFICATION FOR LOW-VOLTAGE GENERIC ELECTRICAL PANELS FOR OFFSHORE UNITS	(1)
I-ET-3010.00-5140-700-P4X-005	ELE	REQUIREMENTS FOR HUMAN ENGINEERING DESIGN FOR ELECTRICAL SYSTEM FOR OFFSHORE UNITS	(1)
I-ET-3010.00-5140-700-P4X-007	ELE	SPECIFICATION FOR GENERIC ELECTRICAL EQUIPMENT FOR OFFSHORE UNITS	(1)
I-ET-3010.00-5140-700-P4X-009	ELE	GENERAL REQUIREMENTS FOR ELECTRICAL MATERIAL AND EQUIPMENT FOR OFFSHORE UNIT	(1)
I-ET-3010.00-5140-797-P4X-001	ELE	ELECTRICAL SYSTEM AUTOMATION ARCHITECTURE	(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-3010.00-1200-800-P4X-002	INS	AUTOMATION, CONTROL AND INSTRUMENTATION ON PACKAGED 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 PACKAGE UNITS	(1)
I-ET-3010.00-1200-956-P4X-002	MEC	GENERAL PAINTING	(2)
I-ET-3010.00-1200-956-P4X-001	MEC	QUALIFICATION TESTS FOR PAINTING SYSTEMS	(2)
I-ET-3010.2D-1350-320-P4X-001	MEC	STRUCTURAL TANKS GAS RECOVERY COMPRESSION UNIT (UC-1350001)	(2)
I-ET-3010.00-1200-540-P4X-001	MEC	REQUIREMENTS FOR PRESSURE VESSELS DESIGN AND FABRICATION	(2)
I-FD-3010.2D-1350-320-P4X-101	MEC	STRUCTURAL TANKS GAS RECOVERY COMPRESSION UNIT (UC-1350001)	(1)
I-RL-3010.2D-1350-960-P4X-002	NAV	MOTION ANALISYS	(1)
I-DE-3010.2D-1200-944-P4X-001	PRO	GENERAL NOTES	(1)
I-DE-3010.2D-1350-944-P4X-001	PRO	STRUCTURAL TANKS GAS RECOVERY SYSTEM	(1)
I-FD-3010.2D-1350-320-P4X-001	PRO	STRUCTURAL TANKS GAS RECOVERY COMPRESSION UNIT (UC-1350001)	(1)



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I-RL-3010.00-1200-940-P4X-001	PRO	GENERAL SPECIFICATION FOR AVAILABLE UTILITIES	(1)
I-DE-3010.2D-1200-94A-P4X-001	SAF	AREA CLASSIFICATION - GENERAL	(1)

- (1) The requirements of these documents are mandatory and refer to this package and other 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	Liquid Ring 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	Ring liquid Schematic and Bill of Materials	X	X	6W	X	2D	X
A04	Cooling Water Schematic and Bill of Materials		X	6W	X	2D	X
A05	Ring Liquid System Arrangement Drawing and List of Connections	X	X	6W	X	2D	X
A06	Ring Liquid component Drawings and Data		X	6W	X	2D	X
A07	Seal Drawing and Bill of Materials		X	6W	X	2D	X
A08	Coupling Assembly Drawing and Bill of Materials	X	X	6W	X	2D	X
A09	Relief Valve Calculations	X	X	6W	X	2D	X
A10	Vibration Analysis Data		X	6W	X	2D	X
A11	Lateral Critical Speed Analysis Report		X	6W	X	2D	X
A12	Torsional Critical Speed Analysis Report		X	6W	X	2D	X
A13	Coupling Alignment Diagram		X	6W	X	2D	X
A14	Weld Procedures and Welders Qualification Certificates		X	6W	X	2D	X
A15	Mechanical Running Test Logs				X	1T	1D
A16	Performance Curves	X			X	1T	1D
A17	Certified Hydrostatic Test Data				X	1T	1D
A18	Performance Test Data				X	1T	1D
A19	Rotor Mechanical and Electrical Runout				X	1T	1D
A20	Data Sheets (Proposal / As-Built)	X	X	6W	X	2D	X



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Item	Description	With Proposal	For Approval		Certified		Final
		Document	Document	Schedule	Document	Schedule	
A21	As-Built Dimensions and Data (Including Assemblies Clearances)		X	6W	X	2D	X
A22	Nondestructive Test Procedures and Acceptance Criteria		X	6W	X	2D	X
A23	Progress Reports		X	6W	X	2D	X
A24	Procedures for Special or Optional Tests		X	6W	X	2D	X
A25	Installation Manual		X	10W	X	2D	X
A26	Operating and Maintenance Manuals		X	10W	X	2D	X
A27	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
A28	Engineering, Fabrication, Test and Delivery Schedule	X	X	4W	X	2D	X
A29	List of Drawings and Documents Index (Status and Delivery Schedule)		X	6W	X	2D	X
A30	List of Drawings		X	6W	X	2D	X
A31	Shipping List		X	6W	X	2D	X
A32	List of Special Tools Furnished for Maintenance		X	10W	X	2D	X
A33	Technical Data Manual		X	10W	X	2D	X
A34	Material Safety Data Sheets	X	X	10W	X	2D	X
A35	Metallurgy of Major Components	X	X	6W	X	2D	X
A36	Preservation, Packaging, and Shipping Procedures, including vendors.		X	6W	X	2D	X
A37	Noise Sound Level	X	X	6W	X	2D	X
A38	Piping and Support Drawings, Arrangement and Details	X	X	4W	X	2D	X
A39	Pressure Vessels, Coolers and Auxiliaries Equipment Data Sheets and Drawings	X	X	6W	X	2D	X
A40	Structure (Walkways, Handrails, Grating, etc.) Drawings and List of Components		X	4W	X	2D	X
A41	Baseplate Drawings and List of Components	X	X	6W	X	2D	X
A42	Foundation Plan (With Anchor Bolts Location)		X	6W	X	2D	X
A43	Dimensions, Weights, Static / Dynamic Loads, Moments and Centers of Gravity	X	X	6W	X	2D	X
A44	Equipment General Description and Catalogs	X					



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REV. A

AREA: ATAPU 2 AND SÉPIA 2

SHEET 12 of 20

TITLE: **STRUCTURAL TANKS GAS RECOVERY
COMPRESSOR PACKAGE SPECIFICATION (UC-1350001)**

INTERNAL
ESUP

Item	Description	With Proposal	For Approval		Certified		Final
		Document	Document	Schedule	Document	Schedule	
A45	Reference List of Similar Equipment Installed and Operating Under Analogous Conditions	X					
A46	Painting Specification	X	X	6W	X	2D	X
A47	List of VENDORS	X	X	6W	X	2D	X
A48	Nameplate Drawings for Each Part, Including Applicable Code Stamp		X	6W	X	2D	X
A49	List of Exceptions to the Specifications and Applicable Standards	X					
A50	Preparation for Storage at Job Site Before Installation		X	6W	X	4D	1D
A51	Weather Protection, Insulation and Tropicalization		X	6W	X	4D	1D
A52	Tabulation of All Utilities	X	X	6W	X	2D	X
A53	Certified Rotor Balance Data				X	1T	1D
A54	Rotor Balancing Logs				X	1T	1D
A55	Inspection and Test Plan	X	X	4W	X	2D	
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
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	Record of Deviations From Manufacturing Process Control System		X	6W	X	2D	X
B10	Mass Elastic Data		X	6W	X	2D	X
B11	Lateral Critical Speed Analysis Report		X	6W	X	2D	X
B12	Torsional Critical Speed Analysis Report		X	6W	X	2D	X
B13	Input and Output Shaft Position Diagram	X	X	6W	X	2D	X



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Item	Description	With Proposal	For Approval		Certified		Final
		Document	Document	Schedule	Document	Schedule	
B14	Welding Procedures and Welders Qualification Certificates		X	6W	X	2D	X
B15	Lube-oil Arrangement Drawing and List of Connections	X	X	6W	X	2D	X
B16	Tooth-contact Drawing and Specifications	X	X	6W	X	2D	X
B17	Tooth-contact Check Records	X	X	6W	X	2D	X
B18	Rotor Balancing Logs	X	X	6W	X	2D	X
B19	Optional Test Data and Reports	X	X	6W	X	2D	X
B20	Material Safety Data Sheets (OSHA Form 20)	X	X	6W	X	2D	X
B21	Quality Data Manual	X	X	6W	X	2D	X
B22	Hydrostatic Test Logs Oil System				X	1T	1D
B23	Mechanical Running Test Logs				X	1T	1D
B24	Rotor Mechanical and Electrical Runout				X	1T	1D
B25	Proposals, Purchase and As-Built Data Sheets	X	X	6W	X	2D	X
B26	As-Built Dimensions or Data (Including Assembly Clearances)				X	2D	X
B27	Installation Manual		X	10W	X	2D	X
B28	Operating and Maintenance Manual		X	10W	X	2D	X
B29	Technical Manual		X	10W	X	2D	X
B30	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
B31	Engineering, Fabrication, Test and Delivery Schedule	X	X	4W	X	2D	X
B32	Preservation, Packaging and Shipping Procedures, including vendors.		X	6W	X	2D	X
B33	List of Special Tools Furnished For Maintenance		X	10W	X	2D	X
B34	Nondestructive Test Procedures and Acceptance Criteria		X	6W	X	2D	X
B35	Book With All Quality Assurance Documents		X	10W	X	2D	X
B36	Dimensions, Weights, Static / Dynamic Loads, Moments and Centers of Gravity	X	X	10W	X	2D	X
B37	Equipment General Description and Catalogs	X					
B38	Reference List of Similar Equipment Installed and Operating under Analogous Conditions	X					



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Item	Description	With Proposal	For Approval		Certified		Final
		Document	Document	Schedule	Document	Schedule	
B39	Painting Specification		X	6W	X	2D	X
B40	List of VENDORS	X	X	6W			X
B41	Nameplate Drawings for each Piece or Part, Including Applicable Code Stamp		X	6W	X	2D	X
B42	List of Exceptions to the Specifications and Applicable Standards	X					
B43	Inspection and Test Plan	X	X	4W	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	Engineering, Fabrication, Test and Delivery Schedule	X	X	4W	X	2D	X
D15	List of Drawings and Documents Index (Status and Delivery Schedule)		X	6W	X	2D	X
D16	Shipping List		X	6W	X	2D	X
D17	Special Weather Protection and Tropicalization Requirements		X	6W	X	2D	X
D18	Deleted.						



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Item	Description	With Proposal	For Approval		Certified		Final
		Document	Document	Schedule	Document	Schedule	
D20	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
D21	Material Safety Data Sheets	X	X	6W	X	2D	X
D22	Cause x Effect Matrix, Ladder Block, Control Narratives, Logic (including Start-Up, Alarm and Shutdown) and Loop Diagrams		X	6W	X	2D	X
D23	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
D24	EMI and RFI Test Logs				X	1T	1D
D25	Fire Fighting System List of Components, Drawings, Data Sheets and Bill of Materials		X	6W	X	2D	X
D26	Gas Detection System List of Components, Drawings, Data Sheets and Bill of Materials		X	6W	X	2D	X
D27	Preservation, Packing and Shipping Procedures, including vendors.		X	6W	X	2D	X
D28	Dimensions, Weights, Static / Dynamic Loads, Moments and Centers of Gravity	X	X	6W	X	2D	X
D29	Equipment General Description and Catalogs	X					
D30	Reference List of Similar Equipment Installed and Operating Under Analogous Conditions	X					
D31	Painting Specification	X	X	6W	X	2D	X
D32	List of VENDORS	X	X	6W	X	2D	X
D33	Nameplate Drawings for Each Piece or Part, Including Applicable Code Stamp		X	6W	X	2D	X
D34	List of Exceptions to the Specifications and Applicable Standards	X					
D35	Package Control System Architecture Diagram	X	X	6W	X	2D	X
D36	List of Data / Tags for Remote Monitoring from HMI Unit A&C System		X	6W	X	2D	X
D37	Control Panel I/O List		X	6W	X	2D	X
D38	Field Acceptance Test and Site Acceptance Test Procedures		X	6W	X	2D	X



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Item	Description	With Proposal	For Approval		Certified		Final
		Document	Document	Schedule	Document	Schedule	
D39	Electrical and Instrumentation Drawing and List of Connections		X	4W	X	2D	X
D40	Inspection and Test Plan	X	X	4W	X	2D	X
D41	Instrument List		X	10W	X	2D	X
D42	Alarm & Events List		X	10W	X	2D	X
D43	Cable List		X	10W	X	2D	X
D44	PLC Technical Specification		X	10W	X	2D	X
D45	Instrument/Instrumented Valve Datasheets (one per type of instrument/instrumented valve)		X	10W	X	2D	X
D46	Instrument/Instrumented Valve Calculations (Control Valves, PSVs, Orifice Plates/Restriction Orifices and Thermowells)		X	10W	X	2D	X
D47	UCP and RIO Panels General Arrangement		X	10W	X	2D	X
D48	UCP and RIO Panels Internal Interconnections Diagram		X	10W	X	2D	X
D49	Wiring Diagram		X	10W	X	2D	X
D50	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



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Item	Description	With Proposal	For Approval		Certified		Final
		Document	Document	Schedule	Document	Schedule	
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
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	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



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Item	Description	With Proposal	For Approval		Certified		Final
		Document	Document	Schedule	Document	Schedule	
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	6D	X
E23	Technical Reports for All Tests				X	1T	1D
E24	Hazard area certificates for all electrical equipment		X	6W	X	2D	X
E25	Motors data sheets fulfilled	X	X	6W	X	2D	X
E26	Dimension, weight and functional diagrams for all electrical panels		X	6W	X	1T	1D
E27	Electrical lead list of auxiliares		X	6W	X	1T	1D
E28	Electrical Interconnecting Diagrams		X	6W	X	1T	1D
E29	Engineering, Fabrication, Test and Delivery Schedule	X	X	4W	X	2D	X
E30	Inspection and Test Plan	X	X	4W	X	2D	X
E31	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



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INTERNAL
ESUP

Item	Description	With Proposal	For Approval		Certified		Final
		Document	Document	Schedule	Document	Schedule	
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		X	4W	X	2W	1D
F14	Material certificates of all pressurized components, specially for pressure vessels		X	4W	X	2W	1D
F15	Painting and insulation inspection report		X	4W	X	2W	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		X	6W	X	2W	1D
F19	Piping isometrics		X	6W	X	2W	1D
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		X	6W	X	2W	1D
F21	Calculation report from pipe thickness dimensioning and any other element on piping class		X	6W	X	2W	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		X	6W	X	2W	1D
F23	Expansion joint calculation report and draws (if existent on project)		X	6W	X	2W	1D
F24	Piping code compliance (ASME B31.3) in a calculation report attending the flexibility analysis requirements from code		X	6W	X	2W	1D
F25	General arrangement	X	X	6W	X	2W	1D
F26	Piping plant		X	6W	X	2W	1D

Remarks:

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ESUP			

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.