



TECHNICAL SPECIFICATION

Nº: I-ET-3010.1M-1233-560-P4X-002

CLIENT:	SRGE	SHEET:	1 of 14
PROJECT:	REFERENCE BASIC DESIGN	1001056398 0010	
UNIT:	BUZIOS		
DP&T-SRGE	TITLE: MOLECULAR SIEVE UNIT	NP-1	
		ESUP	

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INDEX OF REVISIONS

REV.	DESCRIPTION AND/OR REVISED SHEETS
0	ORIGINAL ISSUE

PRELIMINARY

	REV. 0	REV. A	REV. B	REV. C	REV. D	REV. E	REV. F	REV. G	REV. H
DATE	JAN/18/19								
DESIGN	ESUP								
EXECUTION	TMCAMPOS								
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TECHNICAL SPECIFICATION	Nº: I-ET-3010.1M-1233-560-P4X-002	REV. 0
UNIT: BUZIOS	SHEET 2 of 14	
TITLE: MOLECULAR SIEVE UNIT	NP-1	
	ESUP	

INDEX

1	INTRODUCTION.....	3
2	NORMATIVE REFERENCES AND DESIGN SPECIFICATIONS.....	3
3	DEFINITIONS AND ABBREVIATIONS.....	5
4	SCOPE OF SUPPLY	5
5	GENERAL TECHNICAL REQUIREMENTS.....	6
6	CERTIFICATION REQUIREMENTS	11
7	INSPECTION, TESTING AND COMMISSIONING.....	11
8	PREPARATION FOR SHIPMENT.....	12
9	PACKAGER/MANUFACTURER RESPONSIBILITY	13
10	WEIGHT CONTROL	14

PRELIMINARY



TECHNICAL SPECIFICATION	Nº: I-ET-3010.1M-1233-560-P4X-002	REV. 0
UNIT: BUZIOS	SHEET 3 of 14	
TITLE: MOLECULAR SIEVE UNIT	NP-1	
	ESUP	

1 INTRODUCTION

This Technical Specification covers the minimum requirements for design, engineering, materials, fabrication, inspection, testing, commissioning and pre-commissioning of the MOLECULAR SIEVE UNIT package to be installed in the Exportation Gas Dehydration System on the FPSO.

The MOLECULAR SIEVE UNIT package shall be provided with all necessary instruments for safe, efficient and uninterrupted operation in a tropical marine environment.

2 NORMATIVE REFERENCES AND DESIGN SPECIFICATIONS

All equipment shall comply with the requirements of this technical specification and references stated below.

As a general guideline, in case of conflicting requirements between this technical specification and other cited references, the most stringent shall prevail. If necessary the PACKAGER/MANUFACTURER may revert to PETROBRAS for clarification.


2.1 CLASSIFICATION

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

2.2 CODES AND STANDARDS

The latest editions of the following codes and standards shall be used as design guidelines.

API 14 C	Recommended Practice for Analysis, Design, Installation and Testing of Safety System for Offshore Production Facilities
API STD 520	Sizing, Selection and Installation of Pressure-relieving Devices
API 6D	Specification for Pipeline and Piping Valves
ASME B16.5	Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard
ASME B31.3	Process Piping
ASME BPVC VIII	Rules for Constructions of Pressure Vessels
IEC 60092-502	Electrical Installation in Ships – Tankers Special Features
IEC 61892-3	Mobile and Fixed Offshore Units – Electrical Installations – Equipment
IEC 61892-6	Mobile and Fixed Offshore Units – Electrical Installations – Installation
IEC 61892-7	Mobile and Fixed Offshore Units Electrical Installation – Hazardous Area
INMETRO	<i>Portaria</i> n° 179, May 18th 2010
INMETRO	<i>Portaria</i> n° 89, Feb 23rd 2012

	TECHNICAL SPECIFICATION	Nº: I-ET-3010.1M-1233-560-P4X-002	REV. 0
	UNIT: BUZIOS	SHEET 4 of 14	
	TITLE:	NP-1	
	MOLECULAR SIEVE UNIT	ESUP	

2.3 GOVERNMENTAL REGULATION

NR 10 *Segurança em Instalações e Serviços em Eletricidade (Safety in Electrical Facilities and Services)*

NR 13 *Caldeiras e Vasos de Pressão (Boilers and Pressure Vessels)*

Brazilian Government regulations are mandatory and shall prevail, if more stringent, over the requirements of this specification and other references herein.

2.4 DESIGN SPECIFICATIONS

I-FD-3010.1M-1233-560-P4X-002	MOLECULAR SIEVE UNIT (UT-1233001) - M-06B
I-DE-3010.1M-1233-943-P4X-002	PROCESS FLOW DIAGRAM – EXPORTATION GAS DEHYDRATION SYSTEM
I-DE-3010.1M-1233-944-P4X-002	EXPORTATION GAS DEHYDRATION SYSTEM (P&ID)
I-DE-3010.1M-1233-944-P4X-003	EXPORTATION - REGENERATION GAS COMPRESSION AND PRE-HEATING (P&ID)
I-DE-3010.1M-1233-944-P4X-004	EXPORTATION - REGENERATION GAS COOLING (P&ID)
I-RL-3010.1M-1200-940-P4X-001	GENERAL SPECIFICATION FOR AVAILABLE UTILITIES
I-DE-3010.1M-1416-942-P4X-002	M-06B - GAS DEHYDRATION AND FUEL GAS - EQUIPMENT LAYOUT PLAN
I-ET-3010.00-1200-540-P4X-001	REQUIREMENTS FOR PRESSURE VESSELS DESIGN
I-ET-3010.00-1200-540-P4X-002	REQUIREMENTS FOR PRESSURE VESSELS FABRICATION
I-ET-3010.00-1200-431-P4X-001	THERMAL INSULATION FOR MARITIME INSTALLATIONS
I-ET-3010.00-1200-251-P4X-001	BOLT MATERIALS
I-RL-3010.1M-1350-960-P4X-009	MOTION ANALYSIS
I-ET-3010.00-1200-800-P4X-002	AUTOMATION, CONTROL AND INSTRUMENTATION ON PACKAGE UNITS
I-ET-3010.1M-1200-800-P4X-014	AUTOMATION INTERFACE OF PACKAGED UNITS
I-ET-3010.00-5140-700-P4X-002	SPECIFICATION FOR ELECTRICAL MATERIAL AND EQUIPMENT FOR OFFSHORE UNITS
I-ET-3010.00-1200-956-P4X-002	GENERAL PAINTING
I-DE-3010.1M-5400-94A-P4X-001	AREA CLASSIFICATION – GENERAL
I-ET-3010.1M-1200-940-P4X-002	CORROSION MONITORING SYSTEM
I-ET-3A36.00-1000-941-PPC-001_D	METOCEAN DATA
I-ET-3000.00-1200-940-P4X-001	TAGGING PROCEDURE FOR PRODUCTION UNITS DESIGN
DR-ENGP-M-I-1.3	SAFETY ENGINEERING
DR-ENGP-I-1.15	COLOR CODING



TECHNICAL SPECIFICATION	Nº: I-ET-3010.1M-1233-560-P4X-002	REV. 0
UNIT: BUZIOS	SHEET 5 of 14	
TITLE: MOLECULAR SIEVE UNIT	NP-1	
	ESUP	

3 DEFINITIONS AND ABBREVIATIONS

3.1 DEFINITIONS

- Packager: Company responsible for the project, assembly, construction, fabrication, test and furnishing of the Package.
- Manufacturer: Company responsible for the fabrication of equipment or components internal to the Package.
- Package: An assembly of equipment supplied interconnected, tested and operating, requiring only the available utilities from the FPSO for full operation.
- Purchaser: The Company designated as such in the contract or purchase order.
- Field proven: Field proven equipment is defined by PETROBRAS as having a reference list with at least 3 (three) operating equipment supplied by MANUFACTURER/PACKAGER, of similar capacity, installed in offshore production units.

3.2 ABBREVIATIONS

- CS: Classification Society
- FAT: Factory Acceptance Test
- FPSO: Floating Production, Storage and Offloading (vessel)
- HAZOP: Hazard and Operability Study
- HMI: Human-Machine Interface
- ITP: Inspection and Test Plan
- ITR: Inspection and Test Record
- UCP: Unit Control Panel

4 SCOPE OF SUPPLY

PACKAGER/ MANUFACTURER scope of supply shall include, but not necessarily be limited to, the following:

- A complete engineering package including design, fabrication, inspection, testing, certification and preparation for shipment of the Molecular Sieve Unit, as well as all documents and data required, considering the minimum requirements listed in the Process Data Sheet I-FD-3010.1M-1233-560-P4X-002 – MOLECULAR SIEVE UNIT (UT-1233001) - M-06B. The package documentation shall include drawings with dimensions, weights, instrumentation and electrical connections and all required information.
- **Molecular Sieve Adsorbers (V-UT-1233001-A/C)**, 3 (three) vessels including vessel internals, desiccant bed (molecular sieve), ladders and platforms for operation and maintenance. Supplier shall include in the proposal a complete suggested procedure for desiccant bed replacement, considering all maintenance and cargo handling issues involved.
- **Molecular Sieve Unit Control Panel (PN-UT-1233001)**;
- Complete Control and Protection system with HMI, suitable for location in a safe area, including all hardware and software for the package, installed in the UCP.



TECHNICAL SPECIFICATION	Nº: I-ET-3010.1M-1233-560-P4X-002	REV. 0
UNIT: BUZIOS	SHEET 6 of 14	
TITLE: MOLECULAR SIEVE UNIT	NP-1	
	ESUP	

- All cycle switching control valves as required.
- All isolation valves (SDV) and blowdown valves (BDVs) as required.
- All pressure safety relief valves as required.
- Sampling facilities and regeneration gas flow measurement.
- Static Mixer.
- All material and equipment certificates (including electrical).
- Testing and inspection throughout the manufacturing process, in accordance with the PACKAGER/ MANUFACTURER's Quality Plan:
 - Witnessed pressure testing of pressurized items.
 - Witnessed performance testing of the complete unit including function testing of all instruments and controls.
 - Performance test of the complete unit may be locally done offshore.
- Tagging of individual items of equipment and instruments, as described herein.
- Lifting beams, spreader bars, slings, shackles etc. as required for package transportation and installation.
- Packing and preparation for shipment.
- PACKAGER shall list in the tender the respective manufacturers for the Molecular Sieve Adsorbers (V-UT-1233001-A/C) and other major components.

All equipment, including sub-orders, shall be of field proven design within the PACKAGER/ MANUFACTURER's experience.

Deviations from the "field proven design" criterion may be accepted only for equipment which is part of research or development programs, in which case their use shall be formally approved by PETROBRAS program coordinator.

5 GENERAL TECHNICAL REQUIREMENTS

5.1 DESIGN CONDITIONS

PACKAGER/MANUFACTURER shall design the equipment for the full range of process conditions as specified in the Process Data Sheet I-FD-3010.1M-1233-560-P4X-002 – MOLECULAR SIEVE UNIT (UT-1233001) - M-06B.

For available utilities see I-RL-3010.1M-1200-940-P4X-001 – GENERAL SPECIFICATION FOR AVAILABLE UTILITIES.

For additional information and package interfaces also refer to the Process Flow Diagram and Piping & Instrument Diagrams listed in item 2.4.

5.2 EQUIPMENT LOCATION AND LAYOUT CONSIDERATIONS

The MOLECULAR SIEVE UNIT will be installed in the Exportation Gas Dehydration System on module M-06B.

TECHNICAL SPECIFICATION	Nº:	I-ET-3010.1M-1233-560-P4X-002	REV.	0	
	UNIT:	BUZIOS		SHEET	7 of 14
	TITLE:	MOLECULAR SIEVE UNIT		NP-1	
				ESUP	

The total volume occupied by the package shall not exceed the available space according to I-DE-3010.1M-1416-942-P4X-002 - M-06B – GAS DEHYDRATION AND FUEL GAS - EQUIPMENT LAYOUT PLAN.

Safe and adequate ladders and platforms shall be installed for access to all operation and maintenance areas (e.g. valves, instruments etc.) located higher than 1.75 m above the skid base plate.

Valves shall preferably be positioned with their stem pointing upwards and located in such way that the hand wheel or stem will not obstruct walkways. Where hand operated valves are not easily operable, gear operated valves shall be used.

Sufficient withdrawal spaces and clearances shall be provided for all removable vessel/ pipe internals. Lifting facilities provided by PACKAGER/ MANUFACTURER shall be in place to allow general maintenance duties on all equipment within the package limits.

5.3 DESIGN LOADS

In addition to Code described loads and loads due to vessel motions defined in I-RL-3010.1M-1350-960-P4X-009 - MOTION ANALYSIS, the following loads must be considered where relevant:

- Equipment transportation and erection loads;
- Nozzle loads;
- Thermal loads;
- Wind loads (wind data in I-ET-3A36.00-1000-941-PPC-001_D – METOCEAN DATA);
- Weight loads.

5.4 CORROSION MONITORING AND DESIGN LIFETIME

PACKAGER/MANUFACTURER shall verify the need for corrosion monitoring within the package and submit verification to PETROBRAS for approval. Refer to I-ET-3010.1M-1200-940-P4X-002 - CORROSION MONITORING SYSTEM.

PACKAGER/ MANUFACTURER shall design and fabricate the complete equipment for a minimum service life of 25 years.

5.5 MECHANICAL AND PIPING

The MOLECULAR SIEVE UNIT, including all ancillary equipment, shall be assembled to the maximum extent possible, aligned and pre-checked at the MANUFACTURER's shop, allowing shipment to the installation site with minimal fieldwork.

PACKAGER/MANUFACTURER shall consider the following requirements regarding each molecular sieve vessel bed support, as a minimum:

- Support ring welded to the vessel wall;
- Support grid above the support ring;
- Coarse mesh screen above the support grid (structural function);
- Fine mesh screen above the coarse mesh screen (sealing function).
- Ring fixed by bolts to the support ring in order to hold both screens in between (overlap in the screen shall be avoided).
- No gaps between grid and vessel wall/internal thermal insulation, if applicable (gaps shall be properly sealed by using a ceramic fiber rope).



TECHNICAL SPECIFICATION	Nº: I-ET-3010.1M-1233-560-P4X-002	REV. 0
UNIT: BUZIOS	SHEET 8 of 14	
TITLE: MOLECULAR SIEVE UNIT	NP-1	
	ESUP	

Any different solution will only be accepted if previously approved by PETROBRAS.

All gaskets materials shall be suitable for high temperature.

Equipment and piping subject to temperatures $\geq 60^{\circ}\text{C}$, or which require heat conservation, shall be thermally insulated according to I-ET-3010.00-1200-431-P4X-001 – THERMAL INSULATION FOR MARITIME INSTALLATIONS.

All interconnecting piping shall comply with the requirements of ASME B31.3.

All skid piping within the limits of supply shall be fabricated and terminated at the baseplate edge by means of valves and/or flanges and blind flanges according to ASME B16.5.

The flanges shall be flush with the transverse ends of the skid having a uniform B.O.P. (Bottom of Pipe) at an elevation as low as practical. This shall be shown on PACKAGER/MANUFACTURER's P&ID's and General Arrangement drawings. All tubing for the off-skid interfaces shall be terminated at the skid by means of compression fitting valves.

All piping shall be rigidly supported for service and shipment, supports on the module plates shall not be accepted without under-deck stiffening. Supporting and installation shall allow piping removal without disturbing structural members.

All drain lines shall be routed through the deck to a common drain header, which shall be terminated in one flange at the skid edge 300 mm below the pancake level, for connection to PETROBRAS overboard drain system. Drain lines shall have a continuous slope towards the end point, with no low spots. Drain line connections into the drain header shall enter from the top. All drain lines shall be rigid pipes fitted with means to prevent vacuum build-up.

Fabricated branch welded connections (fittings, couplings etc.) shall be directly joined to the header with full penetration welds, where applicable.

After fabrication completion, all fabricated pipe spools shall be internally and externally cleaned to remove all loose scale, weld spatter, sand and any other foreign matter.

PACKAGER shall check and approve all piping with respect to stresses, vibration and piping layout. Anchor points shall be provided at skid edge.

For bolt material apply the requirements of I-ET-3010.00-1200-251-P4X-001 – BOLT MATERIALS. The use of asbestos or materials containing asbestos is prohibited.

5.6 PRESSURE VESSELS DESIGN AND FABRICATION

All pressure vessels shall be designed and fabricated according to I-ET-3010.00-1200-540-P4X-001 – REQUIREMENTS FOR PRESSURE VESSELS DESIGN and I-ET-3010.00-1200-540-P4X-002 – REQUIREMENTS FOR PRESSURE VESSELS FABRICATION

All pressure vessels shall comply with the requirements of NR-13 – Brazilian Labor Ministry Rules.

Each vessel shall have its own support and may not be supported by piping, even in case of small vessels.

When using austenitic SS, only materials that are not susceptible to sensitization shall be used (low C steels, types L and ELC or stabilized steels).

To avoid corrosion underneath insulation, only non-hygroscopic insulation material shall be selected for personal protection.



TECHNICAL SPECIFICATION	Nº: I-ET-3010.1M-1233-560-P4X-002	REV. 0
UNIT: BUZIOS	SHEET 9 of 14	
TITLE: MOLECULAR SIEVE UNIT	NP-1	
	ESUP	

All welds subjected to pressure loads shall be butt welded, full penetration and allow radiography. In case any weld defects not approved by the construction code are found, inspection level shall be increased to 100% of the welds. In case of hardness above the maximum established, heat treatment of affected part shall be limited to maximum 2 (two) heat treatment cycles. All shell reinforcements, integral or not, shall have the same P-number as the shell.

5.7 INSTRUMENTATION AND CONTROL

The Molecular Sieve Unit (UT-1233001) shall be provided with all necessary instruments and controls meeting the requirements listed in the Process Data Sheet I-FD-3010.1M-1233-560-P4X-002 - MOLECULAR SIEVE UNIT (UT-1233001) - M-06B.

For automation type classification MANUFACTURER/PACKAGER shall refer to I-ET-3010.1M-1200-800-P4X-014 – AUTOMATION INTERFACE OF PACKAGED UNITS.

The UCP (Molecular Sieve Unit Control Panel – PN-UT-1233001) shall be installed in the AEPR (Automation & Electrical Panel Room), which is a non-hazardous area.

In addition to the control logic of the gas flow performed by the valves and instruments attached to the vessels in the package skid, all valves and instruments not belonging to the skid supply scope, but related to this process, shall also be operated and managed by the Molecular Sieve Unit Control Panel (PN-UT-1233001), including the Regeneration Gas Compression Unit Control Panels (PN-UC-1233001A/B-01), Regeneration Gas Heater Power Panels (PN-P-1233005A/D), etc.

MANUFACTURER/PACKAGER shall identify all relevant signals to be received from related equipment, valves and instruments supplied by others, included in the FPSO Topsides A&C system, and provide the required outputs in order to ensure the coordinated operation of the whole system. The Molecular Sieve Unit Control Panel (PN-UT-1233001) shall guarantee the reliability of the Exportation Gas Dehydration System operation.

The complete correlation between these sub-systems is described in the Piping & Instrument Diagrams listed in item 2.4.

5.8 ELECTRICAL

Electrical equipment and material shall comply with requirements of I-ET-3010.00-5140-700-P4X-002 – SPECIFICATION FOR ELECTRICAL MATERIAL AND EQUIPMENT FOR OFFSHORE UNITS.

Equipment, accessories, piping and structures shall be grounded according to requirements of IEC 61892-6 and IEC 60092-502. For installations in hazardous area, the grounding requirements of IEC 61892-7 shall also be complied with.

All electrical equipment shall be certified, according to I-DE-3010.1M-5400-94A-P4X-001 – AREA CLASSIFICATION – GENERAL. All materials and equipment proper to be used in hazardous areas, shall have conformity certificates complying with INMETRO Portaria nº 179, May 18th 2010 and its annexes and Portaria nº 89, Feb 23rd 2012 and shall be approved by CS. Electrical equipment installed in external safe areas, that shall be kept operating during emergency shutdown ESD-3P and ESD-3T shall be certified for installation in hazardous areas Zone 1 Group IIA temperature T3.



TECHNICAL SPECIFICATION	Nº: I-ET-3010.1M-1233-560-P4X-002	REV. 0
UNIT: BUZIOS	SHEET 10 of 14	
TITLE: MOLECULAR SIEVE UNIT	NP-1	
	ESUP	

5.9 SKID DETAILS

This section is only applicable for skid mounted equipment. The skid shall be designed to accommodate the entire equipment within the scope of supply.

The skid shall be of rigid construction, which will not distort during hoisting, operation and shipment and shall withstand all moments and forces due to the vessel motion.

Lifting facilities shall permit the equipment to be lifted by crane as a single point lift for transportation and installation. The design and manufacture of the lifting lugs shall be certified. The arrangement of equipment, piping and superstructure shall be such that the centre of gravity coincides approximately with the geometrical centre of the skid. When lifting the skids, complete with all equipment mounted, beam deflection shall not exceed 1/400L. The skid shall resist all sling forces, including both horizontal and vertical components of the applied sling angle (sling angles shall be between 50° and 90° with the horizontal plane).

The floor shall be made of plate material with a raised on-slip tread. Drip trays with drain connections shall be provided underneath equipment where serious spillage is likely to occur.

The skid shall be welded to the supporting structures. Welds underneath skid beams shall be ground flush. Welding shall be carried out with procedures and operators qualified as per ASME.

Skid shall have 2 diagonally opposed earthing bosses.

5.10 MAINTENANCE LIFTING BEAMS

If required to enable maintenance within the package unit boundaries, lifting beams, complete with hoists and lifting gear, shall be provided.

All lifting beams shall overhang by at least 1.2 m into agreed lay-down areas.

The deflection of the maintenance cranes/ hoisting beams shall not exceed 1/500 of the span length.

All beams and lifting gear shall be subject to witnessed load testing by PETROBRAS and CS representatives.

5.11 PAINTING

Paint system for external coating shall be according to I-ET-3010.00-1200-956-P4X-002 – GENERAL PAINTING.

Color code shall comply with DR-ENGP-I-1.15 – COLOR CODING

5.12 NAMEPLATES, TAGGING AND SAFETY SIGNS

MANUFACTURER shall attach SS 316 nameplates on each item of equipment in an accessible location, fastened with corrosion resistant pins, and in Portuguese language. Nameplates shall be according to I-ET-3010.00-1200-540-P4X-001 – REQUIREMENTS FOR PRESSURE VESSELS DESIGN.

Tagging of all instrumentation, electrical, mechanical, and piping items, including valves, shall be carried out according to I-ET-3000.00-1200-940-P4X-001 - TAGGING



TECHNICAL SPECIFICATION	Nº: I-ET-3010.1M-1233-560-P4X-002	REV. 0
UNIT: BUZIOS	SHEET 11 of 14	
TITLE: MOLECULAR SIEVE UNIT	NP-1	
	ESUP	

PROCEDURE FOR PRODUCTION UNITS DESIGN. The main items shall have individual tag numbers as dictated by PETROBRAS. Tags shall be supplied with the number and description in English, unless otherwise stated in the project data sheets.

All safety signs shall be in Portuguese.

6 CERTIFICATION REQUIREMENTS

6.1 MATERIAL CERTIFICATION

In order to ensure that the materials of construction are in accordance with data sheets, all certificates shall contain the following information:

- Name of manufacturer
- Purchase order number and issue date
- Identification number of certificate and issue date
- Material specification(s)
- Material charge, batch or heat number
- Mechanical properties recorded from test results
- Nondestructive Testing method and results
- Heat treatment procedure

6.2 GENERAL CERTIFICATION

PACKAGER/ MANUFACTURER shall be responsible for obtaining all required certification of the equipment.

PACKAGER/ MANUFACTURER, through the independent certifying authority shall supply all certificates related to the materials, inspections, tests and qualification activities detailed in the approved Quality Plan.

7 INSPECTION, TESTING AND COMMISSIONING

PACKAGER shall submit an ITP with the bid. PETROBRAS shall identify all the required witnessed inspections and tests on a marked up copy of the ITP. PETROBRAS reserves the right to inspect the package equipment anytime during fabrication to ensure that material and workmanship are in accordance with this specification. PACKAGER shall ensure that all the witnessed inspection and test requirements by the CS are met and due notice is given. The notification period for such inspections shall be mutually agreed upon during the kick-off meeting.

7.1 INSPECTIONS AND TESTS

Unless waived by PETROBRAS, as a minimum the following inspections and tests shall be witnessed by PETROBRAS surveyor:

- Verification of the equipment, piping and fittings for conformity with the construction materials and fabrication requirements of the specification
- A visual check noting:
 - That the thickness of pressure retaining parts meets or exceeds the quoted design thickness;
 - Any repairs;

- Internal coating is complete (dry-film thickness as quoted);
- General appearance, materials, workmanship and finish standard are acceptable;
- Dimensional check;
- Inspection by radiographic, dye penetrant, magnetic particles, ultrasonic inspection of welds of the pressure retaining parts of vessels;
- Hydrotest of all pressure vessels;
- Approval of relieve valve settings and their testing after setting;
- All instrumentation, control panels, electrical and ancillary equipment shall be built, checked, tested and function tested prior to installation as defined in the specification.
- Review of ITR's;

7.2 FAT

PACKAGER/ MANUFACTURER shall prepare an FAT procedure covering all items within the scope of supply and submit it to PETROBRAS for approval. The FAT will be witnessed by PETROBRAS and PACKAGER shall invite CS representatives.

A full function test of completed package shall be performed. The satisfactory operation of all indicators, selectors and controllers shall be demonstrated. The correct operation of all controllers, alarm and failure protection equipment and indicators shall be demonstrated and if necessary failure simulations.

7.3 ASSEMBLY ASSISTANCE AND COMMISSIONING REQUIREMENTS

PACKAGER is responsible for assembly supervision of the equipment, including assembly of components delivered loose.

PACKAGER is responsible for pre-commissioning and commissioning supervision of the equipment/ system.

Final acceptance will be on satisfactory completion of commissioning tests as specified by PETROBRAS.

8 PREPARATION FOR SHIPMENT

8.1 MARKING

All items supplied to this specification shall be adequately marked for identification against a certificate or relevant test documentation. Marking shall be such that it will not damage or impair the component.

Items that cannot be identified shall be rejected. Rejected items may be re-certified by carrying out all relevant testing, with prior approval of PETROBRAS.

As a minimum, the following identification shall be provided:

- Project Number
- Manufacturer's name
- Purchase Order Number
- Shipping Weight
- Item Number
- CS surveyor's stamp



TECHNICAL SPECIFICATION	Nº: I-ET-3010.1M-1233-560-P4X-002	REV. 0
UNIT: BUZIOS	SHEET 13 of 14	
TITLE: MOLECULAR SIEVE UNIT	NP-1	
	ESUP	

8.2 SHIPMENT PACKING

The equipment shall be supplied tested, flushed and preserved. The preparation shall make the equipment suitable for 12 months outdoor storage from the time of shipment.

The equipment shall be protected from corrosion.

PACKAGER shall submit the packing design to PETROBRAS for approval. PACKAGER shall pack the equipment in accordance with the packaging requirements of the country which the equipment is being shipped to.

PACKAGER shall provide the procedures for unpacking, handling and installation, as well as repacking and long-term storage requirements.

PACKAGER shall specify any limitations applicable to the transportation and installation phase.

9 PACKAGER/MANUFACTURER RESPONSIBILITY

PACKAGER shall assume sole contractual and total engineering responsibility for the package equipment. PACKAGER responsibility shall include, but is not limited to:

- Technical responsibility for the entire scope of supply.
- Resolving all engineering questions and/ or problems relating to design and manufacturing.
- All coordination with manufacturers and collection of all details, drawings, calculations, and data to achieve optimum design and full submission of the documents requested in the specification.
- Providing details as requested of any sub-vendors relating to design and manufacturing.
- To submit to the certifying authority the documentation as described in the latest edition of their rules for equipment on offshore facilities.
- Installation at site by others (however, presence of supervision will be required).
- Pre-Commissioning, Commissioning & Training Operations.
- If necessary, PACKAGER shall attend HAZOP meetings arranged by PETROBRAS.

Any exclusion and/or alternative to what is specified in this Technical Specification, including the use of the PACKAGER/MANUFACTURER's standard and exclusive technology, shall be presented in a Deviation List, subject to PETROBRAS acceptance during the clarification phase, preceding the proposal presentation. Otherwise the requirements herein will be considered as "Agreed", and so required.

The Deviation List mentioned above shall contain, at least, for each requirement that the PACKAGER/ MANUFACTURER intends to change:

- The document description, code and section that contains the requirement;
- The PACKAGER/MANUFACTURER proposal;
- The reason for deviation, and the costs, schedule and technical benefits/impacts of the change;



TECHNICAL SPECIFICATION

Nº: I-ET-3010.1M-1233-560-P4X-002

REV. 0

UNIT: BUZIOS

SHEET 14 of 14

TITLE: **MOLECULAR SIEVE UNIT**

NP-1
ESUP

10 WEIGHT CONTROL

PACKAGER shall fill in the following weight control form and submit to PURCHASER.

1	APPLICABLE TO:	<input checked="" type="checkbox"/> PROPOSAL	<input type="checkbox"/> PURCHASE	<input type="checkbox"/> AS BUILT
2	FOR:	UNIT / MODULE: _____		
3	SITE:	SERVICE: _____		
4	No REQ / TAG:	MANUFACTURER: _____		
5	MODEL:	VENDOR: _____		
6	SIZE / TYPE:	MAIN EQUIPMENT: _____		
7	SERIAL No.	MANUFACTURER No: _____		

WEIGHT DATA				
9	DATA STATUS:	<input type="checkbox"/> ESTIMATED	<input type="checkbox"/> CALCULATED	<input type="checkbox"/> WEIGHTED
10	EQUIPMENT WEIGHT:			ACCURACY: _____
11	DRY:	_____ kg	± _____ %	REMARKS: _____ _____ _____
12	OPERATING (NORMAL):	_____ kg	± _____ %	
13	OPERATING (MAXIMUM):	_____ kg	± _____ %	
14	TEST:	_____ kg	± _____ %	
15	MAX MAINTENANCE	_____ kg	± _____ %	
16	_____	_____ kg	± _____ %	

DIMENSIONS DATA				
19	DATA STATUS:	<input type="checkbox"/> ESTIMATED	<input type="checkbox"/> CALCULATED	<input type="checkbox"/> MEASURED
20	SKETCH:			
21				
22				
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36				

37	OVERALL DIMENSIONS:	DRY DIMENSIONS:	OPERATING DIMENSIONS:	MAINTENANCE DIMENSIONS:
38	A: _____ mm	X: _____ mm	X: _____ mm	_____ : _____ mm
39	B: _____ mm	Y: _____ mm	Y: _____ mm	_____ : _____ mm
40	C: _____ mm	Z: _____ mm	Z: _____ mm	_____ : _____ mm
41				

NOTES

- General:**
- Vendor shall fill in all blank spaces in the weight control data sheet (fields and check boxes). All missing information will be considered as not applicable or not according to vendor's proposal.
 - Vendor shall fill in data sheets for main and auxiliary equipment, furnished separately or on different skids. If necessary, manufacturer shall produce additional copies of the weight control data sheet.
- Weight data:**
- Accuracy of weight figures shall be ±10% in the proposal phase. After placing of purchase order, the accuracy shall be refined to ±3%.
- Dimensional data:**
- Manufacturer shall indicate equipment orientation.
 - Any variation in center of gravity from dry to operating mode shall be noted.
 - Manufacturer shall indicate with dashed lines on sketch and respective dimensions on the information table all maintenance areas required for assembly and disassembly of equipment.
 - Accuracy of dimensions shall be ± 10% in the proposal phase. After placing of the purchase order, the accuracy shall be refined to ± 3%.