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	CLIENT:	SRGE	SHEET: 1 of 17
	JOB:	REFERENCE BASIC DESIGN	1001056398 0010
	UNIT:	BÚZIOS	
DP&T-SRGE	TITLE:	<b>HYDROCYCLONES</b>	NP-1 ESUP

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PRELIMINARY

## 1 INTRODUCTION

This specification covers the minimum requirements for design, engineering, materials, fabrication, inspection, testing, commissioning and pre-commissioning of the HYDROCYCLONES.

The package is composed by the following items:

DESCRIPTION	QTY.	LOCATION
PRODUCED WATER SYSTEM HYDROCYCLONES	5 X 20% - See Note (*)	M-10

(\*) Refer to 4.2 for equipment configuration.

## 2 NORMATIVE REFERENCES

The Hydrocyclones shall comply with the requirements of this specification, with the rules, codes, standards and design specifications as stated below and with those referred to herein.


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

API RP 14C	Recommended Practice for Analysis, Design, Installation and Testing of Safety Systems for Offshore Production Platforms
API RP 14E	Recommended Practice for Design and Installation of Offshore Production Platform Piping Systems
API RP 14FZ	Recommended Practice for Design and Installation of Electrical Systems for Fixed and Floating Offshore Petroleum Facilities for Unclassified and Class 1, Zone 0, 1 and 2 Locations
API RP 14J	Recommended practice for design and Hazard Analysis for Offshore Production Facilities
API STD 520	Selection and Installation of Pressure Relieving Devices in Refineries All Parts
API STD 521	Guide for Pressure Relieving and De-pressuring Systems
ASME B16.5	Pipe Flanges and Flanged Fittings
ASME B31.3	Process Piping
ASME/BPVC SEC V	Boiler and Pressure Vessel Code - Non-destructive Examination
ASME/BPVC SEC VIII	Rules for Construction of Pressure Vessels

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ASME/BPVC SEC IX	Welding and Brazing Qualifications
AWS D1.1	Structural Welding Code – Steel
IEC 60092-502	Electrical Installation in Ships – Tankers – Special Features
IEC 61892	Mobile and Fixed Offshore Units – Electrical Installations – All Parts
ISO 13702	Control and Mitigation of Fires and Explosions on Offshore Production Installations
ISO 15156	Materials for use in H2S containing environments in Oil and Gas Production – All Parts


### 2.3 GOVERNAMENTAL REGULATION

CONAMA	- Brazilian Environment Ministry (Resolution 393/2007)
IBAMA	- Brazilian environmental regulations concerning the discharge of all types of effluents
INMETRO	- Resolution nº 179, May 18 <sup>th</sup> 2010 and its annexes and resolution 270 June 21 <sup>st</sup> 2011
NR 10	- Brazilian Ministry of Labor (Ministério do Trabalho e Emprego – Norma Regulamentadora Nº 10, Segurança em Instalações e Serviços em Eletricidade)
NR 12	- Brazilian Ministry of Labor (Ministério do Trabalho e Emprego – Norma Regulamentadora Nº 12, Segurança no Trabalho em Máquinas e Equipamentos)
NR 13	- Brazilian Ministry of Labor (Ministério do Trabalho e Emprego – Norma Regulamentadora Nº 13, Pressure Vessels and Boiler Regulations)
NR 26	- Brazilian Ministry of Labor (Ministério do Trabalho e Emprego – Norma Regulamentadora Nº 26, Sinalização de Segurança)
NR 30	- Brazilian Ministry of Labor (Ministério do Trabalho e Emprego – Norma Regulamentadora Nº 30, Segurança e Saúde no Trabalho Aquaviário – Anexo 2)
NR 37	- Brazilian Ministry of Labor (Ministério do Trabalho e Emprego – Norma Regulamentadora Nº 37, Segurança e Saúde em Plataformas de Petróleo)

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

### 2.4 REFERENCE DOCUMENTS

DR-ENGP-M-I-1.3	SAFETY ENGINEERING
DR-ENGP-I-1.15	COLOR CODING
I-DE-3010.1M-1200-942-P4X-002	GENERAL ARRANGEMENT
I-DE-3010.1M-5331-943-P4X-001	UTILITY FLOW DIAGRAM – PRODUCED WATER SYSTEM

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I-DE-3010.1M-5331-944-P4X-002	HYDROCYCLONES
I-FD-3010.1M-5331-587-P4X-001	HYDROCYCLONES (CI-5331001A/E) – M-10
I-DE-3010.1M-5400-94A-P4X-001	AREA CLASSIFICATION – GENERAL
I-ET-3010.00-1200-251-P4X-001	BOLT MATERIALS
I-ET-3010.1M-1200-300-P4X-001	NOISE CONTROL REQUIREMENTS FOR TOPSIDE
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-3010.00-1200-800-P4X-002	AUTOMATION, CONTROL AND INSTRUMENTATION ON PACKAGE UNITS
I-ET-3010.1M-1200-800-P4X-014	AUTOMATION INTERFACE OF PACKAGED UNITS
I-ET-3010.00-1200-956-P4X-002	GENERAL PAINTING
I-ET-3010.00-1200-431-P4X-001	THERMAL INSULATION FOR MARITIME INSTALLATIONS
I-ET-3010.00-5140-700-P4X-003	ELECTRICAL REQUIREMENTS FOR PACKAGES FOR OFFSHORE UNITS
I-ET-3A26.00-1000-941-PPC-001_D	METOCEAN DATA
I-RL-3010.1M-1200-940-P4X-001	GENERAL SPECIFICATION FOR AVAILABLE UTILITIES
I-RL-3010.1M-1350-960-P4X-009	MOTION ANALYSIS

## 2.5 CONFLICTING REQUIREMENTS

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.

## 3 DEFINITIONS AND ABBREVIATIONS

### 3.1 DEFINITIONS

Can:	Can requirements are conditional and indicate the possibility of using the standard.
May:	Indicates a course of action that is permissible within the limits of the standard (a permission).
Shall:	An absolute requirement which shall be strictly followed in order to conform with the standard.
Should:	A recommendation. Alternative solutions having the same functionality and quality are acceptable.

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 Unit:	An assembly of equipment supplied interconnected, tested and Package operating, requiring only the available utilities from the unit for its operation.
Purchaser:	The Company designated as such in the contract or purchase order.

### 3.2 ABBREVIATIONS

API	American Petroleum Institute
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWS	American Welding Society
FAT	Factory Acceptance Test
IEC	International Electrotechnical Commission
NDT	Non-Destructive Testing
P&ID	Piping & Instrumentation Diagram
CS	Carbon Steel

## 4 GENERAL FUNCTIONAL REQUIREMENTS

### 4.1 OPERATION ENVIRONMENT/ MOTION REQUIREMENTS

#### 4.1.1 Operation Environment

The equipment shall be suitable for the environment and range of ambient conditions, including, atmospheric pressure, relative humidity, rainfall, air temperature (dry-bulb – see note), characteristic monthly values and wind motions defined in I-ET-3A26.00-1000-941-PPC-001\_D - METOCEAN DATA

Note: For dry bulb air temperature of electrical equipment, use the most critical conditions, among those defined by CS and the specific equipment documentation.

#### 4.1.2 Motion Requirements

For design data on motion requirements, see I-RL-3010.1M-1350-960-P4X-009 MOTION ANALYSIS.

### 4.2 DESIGN CONDITIONS

PACKAGER/ MANUFACTURER shall design the Package for the maximum capacity and for the full range of process conditions stated on I-FD-3010.1M-5331-587-P4X-001 HYDROCYCLONES (CI-5331001A/E) – M-10.

Produced water flow rate varies throughout the service life of the Unit, therefore the liners (hydrocyclones) shall be divided into groups, in order to allow flexible operation.

The hydrocyclones batteries can be installed in vessels or in manifolds. Manufacturer shall advise the most economical configuration, at least 5 X 20%, not exceeding the area

available in arrangement. The proposed configuration shall be approved by PETROBRAS.

For *vessel* configuration, a minimum number of five vessels shall be considered per single train. Each vessel shall be equally divided into four parts, each compartment comprising the same number of liners. The vessel shall allow opening of the inlet head for internal cleaning.

In case of *manifold* configuration (five manifolds as a minimum), the liners shall be grouped into four identical sets, separated from one another by block valves.

#### 4.3 EQUIPMENT LOCATION

The Package shall be installed outdoors, on the Main Deck.

PACKAGER/ MANUFACTURER shall submit the layout plan, limited to the dimensions shown for reference in the arrangement drawing I-DE-3010.1M-1200-942-P4X-002 GENERAL ARRANGEMENT.

#### 4.4 DESIGN LOADS

In addition to Codes described loads and loads due to equipment 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;
- Weight loads.

#### 4.5 DESIGN LIFETIME

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

#### 4.6 NOISE

Noise control analysis is a mandatory item to be carried out. Refer to I-ET-3010.1M-1200-300-P4X-001 NOISE CONTROL REQUIREMENTS FOR TOPSIDE.

### 5 PACKAGE SPECIFICATION

PACKAGER/ MANUFACTURER shall be responsible for supplying a complete and fully operative system in accordance with the requirements of this specification.

Hydrocyclones shall be, as much as possible, PACKAGER/ MANUFACTURER's standard design. Prototypes are not acceptable.

#### 5.1 PACKAGER/ MANUFACTURER SCOPE OF SUPPLY AND DESIGN REQUIREMENTS

##### 5.1.1 General

A complete engineering package including design, fabrication, inspection, testing, certification and preparation for shipment of the Hydrocyclones. The package shall

include drawings showing dimensions, weights, instrumentation and any additional information.

### 5.1.2 Materials Specification

Horizontal vessels or manifolds shall comply with ASME VIII Div 1 Code.

Component/ Part	Material
Shell and heads	CS SA 516 Gr 70 with internal coating (note 1)
Internals	SuperDuplex Steel
Bolts/ Nuts (external)	SA 193 Gr B7 / SA 194 Gr. 2H (note 2)
Saddles	SA 516 Gr 70 / SA 36

#### Notes:

- Internal coating for vessels shall comply with I-ET-3010.00-1200-956-P4X-002 GENERAL PAINTING
- Bolts and Nuts shall be according to I-ET-3010.00-1200-251-P4X-001 BOLT MATERIALS.

### 5.1.3 Process Design

5.1.3.1 Process design by PACKAGER/ MANUFACTURER shall include:

- Definition of number, size and location of all process- and instrument-related nozzles of Hydrocyclones;
- Design and configuration of the vessels or manifolds arrangement;
- Design and definition of the vessel internals and their appropriate locations, as applicable;
- Design of vessel internals supporting.

5.1.3.2 Quotation shall specify the following data:

- Liquid handling capacity;
- Oil handling capacity (m<sup>3</sup>/h);
- Oil removal efficiency (%);
- Allowable pressure drop;
- Any other relevant operating/ design data.

### 5.1.4 Safety

5.1.4.1 General


Maximum allowable pressure drop for pressure relief devices shall comply with API requirements.

Piping supports, instrument tappings, design pressures etc. shall be suitable for sustained operation under the pressure pulsations that occur if the bladders of pulsation dampeners fail.

For area classification see I-DE-3010.1M-5400-94A-P4X-001 – AREA CLASSIFICATION – GENERAL.

All safety signs shall be in Portuguese.



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#### 5.1.4.2 Layout

The use of fittings in pipes with flammable liquids between FPSO decks and the plant shall be minimized so as to reduce the risk of pool fire.

The use of fittings in gas lines shall be minimized.

Any SDV (Shutdown Valve) shall be installed in places where they will not be affected by fire originating in other areas.

Instrumentation cables for emergency consumers shall have two different routings. The definition of the routes shall consider that a fire risk scenario shall not reach both of them simultaneously. The routing of such cables shall be as far as possible from fire risky areas. As an alternative to the use of two different routes, a fire resistant cable can be used.

#### 5.1.5 Mechanical and Piping

All pressure vessels shall be designed and fabricated in accordance with 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 Safety Rules).

Liquid shall be automatically removed using a level control valve (by PETROBRAS).

Vessels shall be provided with baffle plate at normal liquid level with vertical orientation to minimize incomplete wetting.

Vessels shall have removable internals suitably sized in sections, to pass through manway.

All piping shall be routed and terminated with flanges at the package limit.

Piping shall be designed so that the specified nozzle loadings are not exceeded.

Flange ratings shall be in accordance with ASME B16.5.

All process, utility and drainage piping, pipe supports and valves shall be provided;

Piping shall be routed to allow access for maintenance. Removal or replacement of equipment shall be possible with a minimum dismantling of piping.

Piping systems shall not extend over the operating floor.

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

All valves shall be positioned with the stem pointing upwards, and located in such a way that the handwheel or actuator will not obstruct walkways and will be easy accessible for operation and maintenance. Where hand operated valves are not easily operable, gear operated valves shall be used.

Valves, instruments etc. located higher than 1.75 m above the module base plate, shall be designed to have access ladders or platforms.

Sampling points/ facilities shall be provided, complete with necessary fittings and valves, and the design shall be proper for the fluids being sampled.

All major equipment shall be provided with lifting lugs.

All structural steel works including, support frames, supports for equipment, grating and drip pan, shall be provided.

For bolt materials apply the requirements of I-ET-3010.00-1200-251-P4X-001 BOLT MATERIALS.

### 5.1.6 Instrumentation

The Package shall be provided with all necessary instruments and devices to operate safely, adequately and without interruption in a tropical marine environment.

The classification of the Hydrocyclones is presented in I-ET-3010.1M-1200-800-P4X-014 – AUTOMATION INTERFACE OF PACKAGED UNITS and all instrumentation equipment and interface with FPSO Automation and Control design shall comply with I-ET-3010.00-1200-800-P4X-002 AUTOMATION, CONTROL AND INSTRUMENTATION ON PACKAGE UNITS.

Package shall include all local instruments (level, pressure, temperature etc.), control valves, control monitoring and safety protection instruments and devices for remote indication, control, alarms, protection and shutdown.

### 5.1.7 Electrical


For electrical equipment and material requirements, power supply definition and related subjects MANUFACTURER/PACKAGER shall comply with the requirements of I-ET-3010.00-5140-700-P4X-003 – ELECTRICAL REQUIREMENTS FOR PACKAGES FOR OFFSHORE UNITS, which will in turn guide on the use of other specific applicable electrical design specifications.

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 nº179, 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.

### 5.1.8 Welding

Welding shall be carried out with procedures and operators qualified in accordance with ASME Section IX. Welding shall not be performed before qualified welding procedures etc. are approved.

Structural skid welds, including lifting facilities, shall be continuous and conform to AWS D1.1 – Structural Welding Code, Steel. Intermittent fillet welds are not permitted.

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### 5.1.9 Painting

All paint requirements for external and internal coating shall be according to I-ET-3010.00-1200-956-P4X-002 – GENERAL PAINTING.

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

## 6 NAMEPLATES

PACKAGER/ MANUFACTURER shall attach corrosion resistant SS 316 nameplates on each item of equipment in an accessible location, fastened with corrosion resistant pins, in Portuguese.

Nameplates shall include, as a minimum, the following information:

- Petróleo Brasileiro S.A. – PETROBRAS;
- Purchase order number;
- Manufacturer and year of build;
- Service;
- Tag number;
- Serial number;
- Main data for design, operation and testing (Power, Pressure, Volume, Temperature, Rotation, Flow rate), where applicable;
- Specific requirements;
- Installation identification;
- Design code;
- NR 13 class (for pressure vessels);
- Empty, operation and test weight.

Nameplates for vessels shall be according to I-ET-3010.00-1200-540-P4X-001 REQUIREMENTS FOR PRESSURE VESSELS DESIGN. Valves, instruments and orifices shall be tagged with the applicable number only.

## 7 TAG NUMBERING

Tagging of all instruments, electrical, mechanical and piping items, including valves, shall be carried out. Tag numbers shall be according to I-ET-3000.00-1200-940-P4X-001-TAGGING PROCEDURE FOR PRODUCTION UNITS DESIGN.

Tag numbers for remaining ancillary equipment shall be given after purchase order placement.


## 8 CERTIFICATION REQUIREMENTS

### 8.1 CLASS CERTIFICATION

A Classification Society Certificate shall be supplied to attest full compliance of the Package with the Rules requirements.

### 8.2 MATERIAL CERTIFICATION

PACKAGER/ MANUFACTURER shall be responsible for obtaining all necessary certification of the equipment. PACKAGER/ MANUFACTURER, through the independent

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

For pressure containing parts of equipment and main components, PACKAGER/ MANUFACTURER shall specify material properties and chemical composition of the materials used in the equipment by means of appropriated certificate.

## 9 INSPECTION, TESTING AND COMMISSIONING

### 9.1 GENERAL

PACKAGER/ MANUFACTURER shall submit to PETROBRAS approval a program for inspection and testing of all supplied equipment, prior to beginning of work in accordance with document schedule.

Unless otherwise stated, all inspections and tests shall be performed at the PACKAGER/ MANUFACTURER workshop in the presence of PETROBRAS representative and CLASS surveyor as applicable.

Inspections and tests are an integral part of the order which will not be considered complete until such inspections and tests have been carried out in full.

PETROBRAS shall issue an Inspection Release Certificate (I.R.C) only after completion of these inspections and tests.

All equipment shall be delivered as one piece condition and subsequently assembled by MODULE SUPPLIER onto the module at the FPSO site.

### 9.2 MECHANICAL COMPLETION

Term used to indicate satisfactory completion of fabrication scope of work, including basic inspection and checks carried out to demonstrate that the equipment has been fabricated correctly and according to PETROBRAS requirements. Relevant documentation to prove that these inspections and checks have been completed shall be established by PACKAGER/ MANUFACTURER.

### 9.3 INSPECTIONS

PACKAGER/ MANUFACTURER shall provide document schedules with the appropriate completion dates. Drawings shall be submitted for approval as indicated in the agreed document schedule.

PETROBRAS reserves the right to inspect the equipment at any time during fabrication to ensure that the material and workmanship are in accordance with this specification.

PACKAGER/ MANUFACTURER shall be responsible for the compliance certificate, carrying out all work, examinations and tests, and shall be financially responsible for final inspection and testing which is necessary to ensure such compliance with the requirements of the Classification Society.

In addition to PETROBRAS inspection, equipment such as valves, fittings etc., shall be subject to all classification authority and may range from a review of PACKAGER/ MANUFACTURER quality manual up to a physical survey of PACKAGER/ MANUFACTURER and/ or SUB-MANUFACTURER's shop or final products.

The inspector shall have the right to request inspections or examinations to ensure that the equipment complies with the relevant classification society requirements. In case examination reveals faults or shortcomings, PACKAGER/ MANUFACTURER shall bear the full cost of such inspection and replacement where necessary.

Any repair shall be previously approved by PETROBRAS. The subsequent examination necessary to ensure compliance will be at PACKAGER/ MANUFACTURER cost.

Except as approved by PETROBRAS inspector, all equipment shall be presented for inspection in an unpainted state. PACKAGER/ MANUFACTURER shall provide at least two weeks notice to the inspector to witness the specified tests.

#### 9.4 HYDROSTATIC TESTING

Hydrostatic testing shall be carried out in the presence of PETROBRAS inspector, and shall include:

- All fabricated retaining pipework to ASME B31.3;
- All vessels to ASME VIII, Div. 1 Code and I-ET-3010.00-1200-540-P4X-001 REQUIREMENTS FOR PRESSURE VESSELS DESIGN.
- All equipment and piping systems shall be drained of water and dried after hydrostatic testing.

#### 9.5 IMPACT TESTING

Taking into account the minimum design temperature, PACKAGER/ MANUFACTURER shall verify the need for carrying out a Charpy impact test, as per code.

Impact testing shall be as per material specifications and codes. Guaranteed values are not acceptable; impact testing shall show the actual results.

#### 9.6 NDT EXAMINATION

Final non-destructive examinations for acceptance purpose shall be carried out after completion of any post weld heat treatment (when applicable) and before the application of painting, hydrostatic testing etc.

#### 9.7 INSTRUMENTATION


Testing shall be witnessed by PETROBRAS inspector and shall include, at least:

- Hydrostatic test (valves);
- Running test (actuators);
- Review of calibration certificate (PSVs).

#### 9.8 PACKAGE FUNCTION TEST

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 fault protection equipment and indicators shall be demonstrated and, if necessary, failure simulations shall be performed.

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## 9.9 PACKAGE INSPECTION

Unless waived by PETROBRAS, the following inspections and checks shall be witnessed by PETROBRAS surveyor:

- Verification of construction materials of the package (hydrocyclones, vessels etc.) for conformity with the requirements of the specification;
- Verification that piping, fittings and valves conform to specification of materials and fabrication;
- Radiographic, dye penetrant, magnetic particles, ultrasonic inspection of welds on the pressure retaining parts of the equipment;
- Approval of the relief valve settings and witness of their testing after setting;
- Review of I.T.R's (Inspection and Test Report);
- A visual check noting:
  - That the thickness of pressure retaining parts meets or exceeds the quoted design thickness;
  - Any repairs;
  - Dry-film thickness quoted;
  - General appearance, materials, workmanship and finish standard are acceptable;
  - Dimensional check;
  - Alignment;
  - Location and orientation of equipment and instruments.

## 9.10 FACTORY ACCEPTANCE TEST (FAT)

PACKAGER/ MANUFACTURER shall prepare a factory acceptance test procedure (FAT) for the package and submit it to PETROBRAS approval.

The following factory are included in PACKAGER/ MANUFACTURER scope:

- Hydrotest of all vessels and pipes;
- Electrical continuity checks on all wiring and earthing;
- Functional checks on all instruments and valves.
- Spark testing GFL coating.

FAT will be witnessed by PETROBRAS representatives.


PACKAGER/ MANUFACTURER shall advise PETROBRAS of the test schedule at least two (2) weeks for Brazilian PACKAGER/ MANUFACTURER/ Sub-Suppliers and 3 (three) weeks for foreign PACKAGER/ MANUFACTURER/ Sub-Suppliers before the planned test dates. PACKAGER/ MANUFACTURER shall invite CLASS surveyor for FAT.

Approval of the FAT will not be considered as the final acceptance test of the package.

## 9.11 ASSEMBLY ASSISTANCE AND COMMISSIONING REQUIREMENTS

PACKAGER/ MANUFACTURER is responsible for assembly supervision of the equipment, including assembly of components to be delivered loose (for example, pump components such as stuffing box; vessel internals etc).

PACKAGER/ MANUFACTURER shall be responsible for pre-commissioning and commissioning supervision of the supplied equipment/ system. Final acceptance will be on satisfactory completion of commissioning tests as specified by PETROBRAS.

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## 10 PACKAGER/ MANUFACTURER RESPONSIBILITY

Any conflict between the requirements of this specification and related codes and standards, specification etc. shall be presented in writing for PETROBRAS resolution prior to manufacturing.

PACKAGER/ MANUFACTURER shall assume sole contractual and total engineering responsibility for the equipment supplied.

PACKAGER/ MANUFACTURER responsibility shall include, but not be limited to:

- Resolving all engineering questions and/or problems relating to design and manufacture.
- Providing details as requested of any vendors relating to design and manufacturing.
- In such cases, PACKAGER/ MANUFACTURER shall inform PETROBRAS of the conflict and seek clarification.
- Commissioning & Training for operation.

Installation at site shall be performed by others, however, presence of supervision by PACKAGER/ MANUFACTURER is required.

Compliance by PACKAGER/ MANUFACTURER with the provisions of this specification does not relieve the PACKAGER/ MANUFACTURER of his responsibility to furnish equipment and accessories of a proper mechanical design suited to meet the specified service conditions.

## 11 PREPARATION FOR SHIPMENT

### 11.1 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;
- Minimum Breaking Load;
- Item Number;
- Classification Society Surveyor's Stamp.

### 11.2 SHIPMENT PACKING

Shipment packing preparation of the equipment shall be suitable for 24 months outdoor storage from time of shipment.

All open ends of pipes shall be treated and closed off by plastic caps and taped. Small bore threaded connections shall be taped over.

**TECHNICAL SPECIFICATION**

Nº: I-ET-3010.1M-5331-587-P4X-001

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UNIT: BÚZIOS

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TITLE: **HYDROCYCLONES**

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ESUP

All carbon steel vessels etc. shall be protected with corrosion inhibitor prior to shipment.

Equipment and accessories must be protected from corrosion.

Vulnerable instruments shall be removed and separately packed for shipment.

Transportation bracing/ support should be used where necessary and should be clearly identified as temporary.

All crates and boxes shall contain sufficient moisture absorbing agent to avoid condensation.

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

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

PRELIMINARY



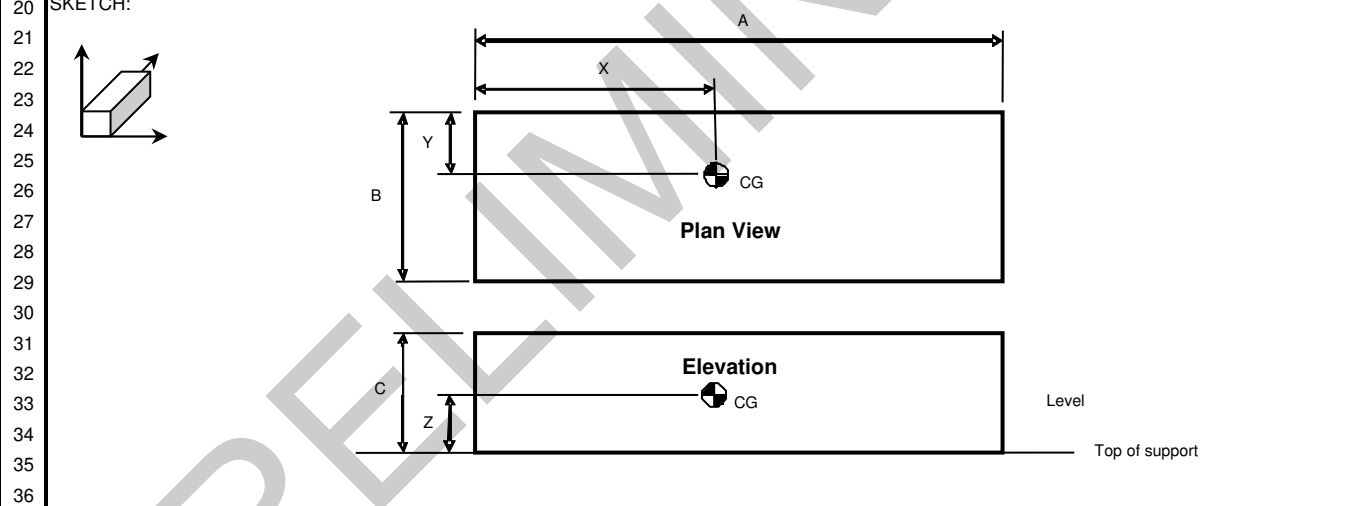
**FORM I – WEIGHT CONTROL**

1	APPLICABLE TO [1]:	<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: _____		

<b>WEIGHT DATA [2]</b>				
9	DATA STATUS:	<input type="checkbox"/> ESTIMATED	<input type="checkbox"/> CALCULATED	<input type="checkbox"/> WEIGHTED
10	EQUIPMENT WEIGHT:	ACCURACY: _____		
11	DRY:	_____ kg	± _____ %	<b>REMARKS:</b> _____ _____ _____
12	OPERATING (NORMAL):	_____ kg	± _____ %	
13	OPERATING (MAXIMUM):	_____ kg	± _____ %	
14	TEST:	_____ kg	± _____ %	
15	MAX MAINTENANCE	_____ kg	± _____ %	
16	_____	_____ kg	± _____ %	

**DIMENSIONS DATA [3]**

19	DATA STATUS:	<input type="checkbox"/> ESTIMATED	<input type="checkbox"/> CALCULATED	<input type="checkbox"/> MEASURED
----	--------------	------------------------------------	-------------------------------------	-----------------------------------



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 the 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%.