

**CONTEC**

Comissão de Normalização  
Técnica

**SC-11**

Machines

**General Purpose Steam Turbines**

Revalidation

Revalidated in 04/2020.

## General Purpose Steam Turbines

### Specification

This Standard replaces and cancels its previous revision.

The CONTEC - Authoring Subcommittee provides guidance on the interpretation of this Standard when questions arise regarding its contents. The Department of PETROBRAS that uses this Standard is responsible for adopting and applying the sections, subsections and enumerates thereof.

**Technical Requirement:** A provision established as the most adequate and which shall be used strictly in accordance with this Standard. If a decision is taken not to follow the requirement ("non-conformity" to this Standard) it shall be based on well-founded economic and management reasons, and be approved and registered by the Department of PETROBRAS that uses this Standard. It is characterized by imperative nature.

**Recommended Practice:** A provision that may be adopted under the conditions of this Standard, but which admits (and draws attention to) the possibility of there being a more adequate alternative (not written in this Standard) to the particular application. The alternative adopted shall be approved and registered by the Department of PETROBRAS that uses this Standard. It is characterized by verbs of a nonmandatory nature. It is indicated by the expression: **[Recommended Practice]**.

Copies of the registered "non-conformities" to this Standard that may contribute to the improvement thereof shall be submitted to the CONTEC - Authoring Subcommittee.

Proposed revisions to this Standard shall be submitted to the CONTEC - Authoring Subcommittee, indicating the alphanumeric identification and revision of the Standard, the section, subsection and enumerate to be revised, the proposed text, and technical/economic justification for revision. The proposals are evaluated during the work for alteration of this Standard.

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### Introduction

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## Foreword

This Standard is the English version (issued in 04/2014) of PETROBRAS N-2648 REV. C 04/2014. In case of doubt, the Portuguese version, which is the valid document for all intents and purposes, shall be used.

This Standard is based on API [STD 611:2008](#), 5th edition, march 2008.

## 1 Scope

1.1 This Standard establishes the minimum conditions required for steam turbine drivers and their auxiliary equipment or systems, to be supplied in accordance with API [STD 611:2008](#).

1.2 The requirements of this Standard are additions to, or modifications of the API [STD 611:2008](#), which is an integral part of this Standard.

1.3 Except for new clauses, item numbers referred in parentheses in this Standard are the same API [STD 611:2008](#), paragraph ones.

1.4 General Purpose Steam Turbines shall be in accordance with API [STD 611:2008](#), plus the following changes, as noted in parenthesis for each clause, according to the definitions stated below. The information of each clause shall be read as follows, whenever starting with:

- addition: continuation of that particular API [STD 611:2008](#) paragraph;
- modification: replacement of part of that affected API [STD 611:2008](#) paragraph;
- substitution: replacement of that API [STD 611:2008](#) paragraph in its entirety;
- new: insertion of a requirement not found in API [STD 611:2008](#);
- exclusion: removal of that particular API [STD 611:2008](#) paragraph;
- comment: clarification or interpretation on that API [STD 611:2008](#) paragraph.

1.5 PETROBRAS considers all items of API [STD 611:2008](#), other than those mentioned herein, as valid to this PETROBRAS Standard.

1.6 This Standard applies to design starting from its issue date.

1.7 This Standard only contains Technical Requirements.

## 2 Normative References

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document applies.

API [STD 611:2008](#) - General-purpose Steam Turbines for Petroleum, Chemical, and Gas Industry Services;

API [STD 670](#) - Machinery Protection Systems;

ASME [B16.5](#) - Pipe Flanges and Flanged Fittings;

ASME [B16.42](#) - Ductile Iron Pipe Flanges and Flanged Fittings Classes 150 and 300.

**NOTE** For documents referred in this Standard and for which only the Portuguese version is available, the PETROBRAS department that uses this Standard should be consulted for any information required for the specific application.

### 3 Terms and Definitions

For the purposes of this document, the following terms and definitions apply.

#### **unit responsibility - substitution (3.42 of API STD 611:2008)**

unit responsibility refers to the technical responsibility for coordinating the general arrangement of the whole train to be supplied (driver and driven equipment-including gears, clutches and couplings, as applicable to each case), as well as power, torque and speed requirements, direction of rotation, and so forth; for analyzing noise, lateral and torsional vibration data; for designing, laying out and supplying piping and appurtenances, controls and instrumentation, cooling, heating, lubrication and sealing systems and for supervising and coordinating all required tests and material reports, preparation for shipment, shipment and field assembly, pre-commissioning, commissioning, start up, pre operation and field acceptance test of all equipment within the scope of this Standard, as required by the contracted scope of supply. Usually, steam turbine supplier/manufacturer is not considered by PETROBRAS as the main equipment vendor (mostly assigned to the supplier of driven equipment) and thus the scope of responsibility defined above shall only apply to those orders where steam turbine manufacturer is referred to as the vendor. When referred to as supplier of manufacturer, its scope of responsibility shall be considered as agreed and stated on the contract with main equipment vendor.

### 4 Requirements - Exclusion (5.3 of API STD 611:2008)

Removed from API STD 611:2008.

### 5 Basic Design (Section 6 of API STD 611:2008)

#### **5.1 Modification [6.1.4 b) of API STD 611:2008]**

Replace the second paragraph by: The driven rated power shall be achieved with no hand valves open, under normal steam conditions. The turbine rated power can be achieved by using a hand valve or valves under normal steam conditions and an additional hand valve or valves under minimum inlet and maximum exhaust steam conditions.

#### **5.2 Substitution (6.1.6 of API STD 611:2008)**

Turbines shall be suitable for immediate (automatic) start-up (from zero RPM) to full load without a preliminary warm-up period. Turbine acceleration time at loaded and unloaded conditions shall be informed in proposal. PETROBRAS shall be permitted for proper drainage of the inlet piping, turbine casing, steam chest, and packing glands. PETROBRAS shall also keep exhaust steam piping pressurized, heated, and drained while turbine is in standby condition. Turbine supplier/vendor shall include a detailed description of additional construction features that may be needed to comply with this requirement and any recommendations of special procedures that PETROBRAS should implement.

#### **5.3 Addition (6.1.9 of API STD 611:2008)**

Turbine components that are very similar among each other (such as wheels, shafts, seals and seal glands, sleeves, nozzle rings, stationary blades and casings) shall be indelibly identified with the order of assembly and to which sub-set they belong (e.g.: stage/wheel number, coupling end etc.). Lifting lugs or eyebolts shall be provided for any equipment or component that weighs more than 30 kg (66 lb).

**5.4 Addition (6.1.11 of API STD 611:2008)**

Tubes shall have, as minimum, an outside diameter of 16 mm (5/8 inch). Number of tubes shall be established according to velocity criterion, and quality material of the tubes.

**5.5 Substitution (6.1.12 of API STD 611:2008)**

Unless otherwise specified, the whole train furnished by the vendor (driven, driver, gear and auxiliary equipment) shall conform to the maximum allowable sound pressure level of 85 dB(A), slow-response, measured at 1 m (3,28 ft) from the equipment surfaces. Bidder/vendor shall inform in his proposal the expected maximum sound pressure and sound power level data per octave band for the quoted equipment and including copies of noise level test certificates performed on similar equipment.

**5.6 New (6.1.17)**

Turbine supplier/vendor shall include in installation and maintenance manuals the procedures and diagrams for hot and cold alignment of shafts, couplings and flanges. Allowances and tolerances shall be included as well.

**5.7 New (6.1.18)**

Only well-proven machinery, sturdy designs shall be proposed. Prototypes or undersized equipment (e.g., equipment or components that, in order to comply with specified transient service conditions, might come to operate close to design limitations) are not acceptable. Refurbished equipment or parts are not acceptable.

**5.8 Substitution (6.3.10 of API STD 611:2008)**

On condensing turbines, if required by the orientation of the exhaust nozzle or piping, an automatic drain system shall be provided by the vendor.

**5.9 Addition (6.5.6 of API STD 611:2008)**

Threaded openings shall not be used unless specifically approved by the purchaser.

**5.10 Substitution [6.5.10 g) of API STD 611:2008]**

For the purpose of manufacturing mating parts, the vendor shall supply equipment flange details to the purchaser if connections larger than those covered by ASME B16.5 or ASME B16.42 are supplied. These mating parts shall be furnished by the vendor.

**5.11 New [6.5.10 h)]**

Whenever nonstandard flanges are approved by PETROBRAS, their respective companions shall be furnished as well.

**5.12 Substitution (6.7.2.4 of API STD 611:2008)**

Shafts shall be protected by corrosion-resistant material under carbon ring packing for casing glands. Chromium-plated electrolyte processes are preferred, thermal spray aspersion processes shall not be used. Any other alternate method shall be submitted by vendor for PETROBRAS approval. The chosen application method, the coating material used, and the finished thickness shall be stated on the data sheets.

**5.13 Substitution (6.8.3 of API STD 611:2008)**

Turbine shaft seals may be carbon ring or labyrinth type packing. Non-contacting (gas face) seals shall not be used.

**5.14 Substitution (6.8.5 of API STD 611:2008)**

If labyrinth type packing is adopted, a separate vacuum device system shall be furnished by vendor for connection to the glands to reduce external steam leakage.

**5.15 Substitution (6.9.3.1 of API STD 611:2008)**

For units including gears, units comprising three or more coupled machines (excluding any gears), or two coupled machines with power above 500 kW, the vendor having unit responsibility shall ensure that a torsional vibration analysis of the complete coupled train is carried out and shall be responsible for directing any modifications necessary to meet the requirements of API STD 611:2008 Annex B.

**5.16 Substitution (6.10.4.2.2 of API STD 611:2008)**

The vendor shall submit bearing isolation seals design for purchaser approval.

**5.17 Substitution (6.10.4.4.3 of API STD 611:2008)**

Bearing housings shall be prepared for seismic vibration transducers in accordance with API STD 670. The spotface and drilling are to be per Figure 3 of API STD 611:2008 and located on the top of each bearing housing. The thread size is to be agreed upon between the customer and vendor.

**5.18 Substitution (6.11.5 of API STD 611:2008)**

For rapid-starting, according to 6.1.6 of API STD 611:2008 (5.2 of this Standard), or if a wide-speed-range is specified, the turbine vendor shall verify that adequate lubrication is available to the turbine.

**6 Accessories (Section 7 of API STD 611:2008)****6.1 Substitution (7.2.1 of API STD 611:2008)**

Unless otherwise specified, flexible element spacer couplings and guards between horizontal turbines and driven equipment shall be supplied by the manufacturer with unit responsibility. The driver half of the coupling shall be mounted by the turbine manufacturer. For vertical turbines, a rigid non-spacer coupling between the turbine and driven equipment shall be supplied by the manufacturer with unit responsibility.

**6.2 Substitution (7.3.2.9 of API STD 611:2008)**

Alignment positioning screws shall be provided, regardless of the weight of any train component, to facilitate longitudinal and transverse horizontal adjustments. Horizontal jackscrews shall be same size of or larger than the vertical screws. The lugs holding these jackscrews shall be attached to the mounting plates so that they do not interfere with the installation or removal of the equipment.

**6.3 Modification (7.4.2.1.5 of API STD 611:2008)**

Replace first sentence by: For turbines above 300 kW or if remote control is specified, an electronic governor with pneumatic actuator shall be supplied.

**6.4 Substitution (7.4.4.7.2 of API STD 611:2008)**

All gauges shall be liquid-filled type.

**6.5 Substitution (7.4.4.9.1 of API STD 611:2008)**

The vendor shall furnish the relief valves that are to be installed on equipment or piping that the vendor is supplying. The exhaust steam relief valve to protect the turbine outer casing shall be furnished by the turbine vendor. The vendor's quotation shall list all relief valves and shall clearly state that these valves shall be furnished by the vendor.

**6.6 Substitution (7.4.5.2 of API STD 611:2008)**

A sentinel warning valve shall not be supplied.

**7 Inspection, Testing and Preparation for Shipment (Section 8 of API STD 611:2008)****7.1 New (8.2.3.3)**

Hydrodynamic bearings shall be inspected during manufacturing and turbine assembling. The actual contact area among each journal/collar and its corresponding bearing, checked by blueing, shall be at least 70 % of the design contact area. Blueing is not required for radial tilting pads type bearing.

**7.2 Exclusion (8.3.1.2 of API STD 611:2008)**

Removed from API STD 611:2008.

**7.3 Addition (8.3.2.2 of API STD 611:2008)**

The hydrostatic test liquid shall include a wetting agent to reduce surface tension.

**7.4 Addition (8.3.2.4 of API STD 611:2008)**

Polytetrafluoroethylene (PTFE) tape or any threaded compounds shall not be used in order to help prevent leakage of threaded plugs and connections during hydrostatic tests.

**7.5 New (8.3.2.5)**

Vises or any other devices for clamp pressing of nozzle flanges shall not be used during hydrostatic tests.

## 7.6 Substitution [8.3.3.1 b) of API STD 611:2008]

When forced feed lube oil systems are used, lube-oil inlet pressures and temperatures shall be varied through the range permitted in the turbine operating manual. This shall be done during the 4 hour test. This option does not constitute a waiver of the other specified test requirements. All test-monitored parameters shall be within the range of operating values recommended in the vendor's operating instructions for the specific unit being tested. Oil flow rates for each bearing housing shall be determined.

## 7.7 Addition [8.4.3 i) of API STD 611:2008]

Spare parts shall also be identified and tagged (or indelibly stamped with respective serial or part numbers) as applicable to each case.

# 8 Vendor's Data (Section 9 of API STD 611:2008)

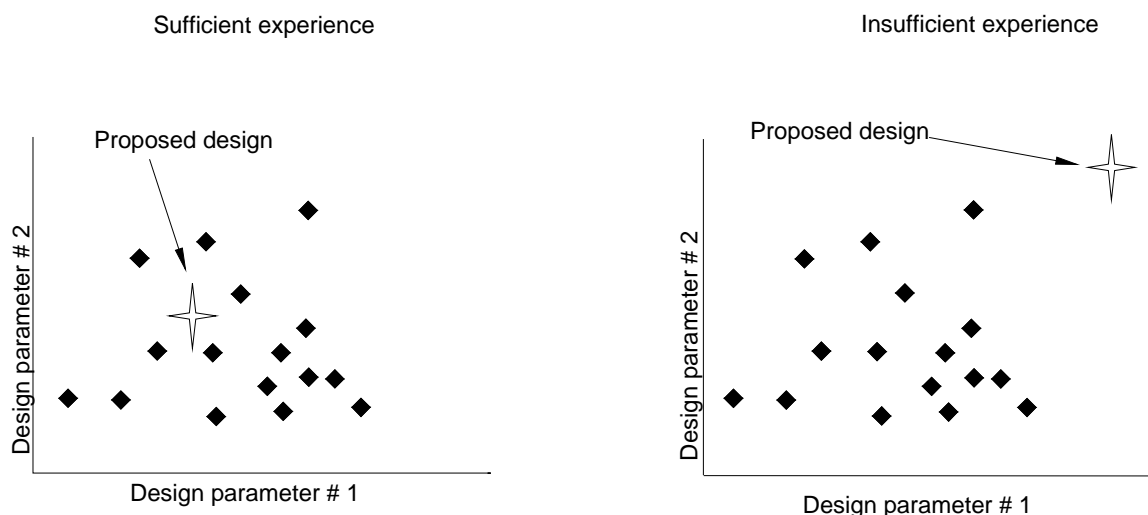
## 8.1 Substitution [9.2.3 I) of API STD 611:2008]

8.1.1 A list of similar machines installed and operating under conditions at least as severe as the specified on data sheets, including the following information:

- a) rated steam operating point data;
- b) minimum and maximum continuous speeds;
- c) power rated output;
- d) steam consumption at rated conditions.

8.1.2 Unless otherwise specified, running designs, with successful experience of continuous and satisfactory operation under similar conditions (at least as severe as those specified on the data sheets) shall be demonstrated, at least 25 of same model and 15 of same size, with a minimum service time of 25 000 hours.

8.1.3 To demonstrate successful experience with complete equipment or capital components, such as blades, bearings etc., bidders shall provide parametric diagrams or charts "Experience Diagrams" where plotted scattered points show former designs and proposed design, as per the following generic example (see Figure 1 of this Standard).



**Figure 1 - Experience Diagrams**



8.1.4 Most common design parameters (among others) to be plotted for experience diagrams should be according the Table 1.

**Table 1 - Experience Parameters**

Type of equipment/component	Most common set of parameters
Turbines	Power, RPM, inlet pressure, inlet temperature, steam flow


**8.2 Substitution [9.2.4 a) of API STD 611:2008]**

A performance curve of steam flow versus power for various hand valve settings when they are operated at normal speed and for each one of the specified steam conditions on 6.1.4.b) of API STD 611:2008 (5.1 of this Standard).

**8.3 Exclusion (9.3.5.4 of API STD 611:2008)**


Removed from API STD 611:2008.


[illegible]

		DATA SHEET		No.	REV.
				SHEET	2 of 5
TITLE:		STEAM TURBINE			
1 APPLICABLE TO: <input checked="" type="checkbox"/> PROPOSAL <input type="checkbox"/> PURCHASE <input type="checkbox"/> AS BUILT 2 FOR: _____ UNIT: _____ 3 SITE: _____ SERVICE: _____ 4 N° REQ'D: _____ MANUFACTURER: _____ 5 MODEL: _____ VENDOR: _____ 6 SIZE/TYPE: _____ DRIVEN: _____ 7 SERIAL N°: _____ MANUFACTURER N°: _____					
OPERATING CONDITIONS			PERFORMANCE		
9	OPERATING POINT	POWER, kW	SPEED, rpm	OPERATING POINT /	N° HAND
10	NORMAL			STEAM CONDITION	VALVES OPEN
11	RATED			NORMAL / NORMAL	
12	OTHER			CERTIFIED STEAM RATE	
13				RATED /	
14	DUTY, SITE AND UTILITY DATA			NORMAL	
15	APPLICATIONS IS (SPARED, UNSPARED) _____			RATED@MIN.INLET	
16	START: <input type="checkbox"/> MANUAL <input type="checkbox"/> AUTOMATIC <input type="checkbox"/> _____			MAX. EXH	
17	<input type="checkbox"/> WIDE SPEED RANGE <input type="checkbox"/> RAPID START			TOTAL N° OF HAND VALVES	
18	<input type="checkbox"/> SLOW ROLL REQ. <input type="checkbox"/> HAND VALVES REQ.				
19	DUTY: <input type="checkbox"/> CONTINUOUS <input type="checkbox"/> INTERMITTENT <input type="checkbox"/> STANDBY			APPLICABLE SPECIFICATION	
20	<input type="checkbox"/> UNATTENDED AUTO START			<input checked="" type="checkbox"/> API STD 611:2008 <input checked="" type="checkbox"/> OTHER PETROBRAS N-2648	
21	LOCATION <input type="checkbox"/> INDOOR <input type="checkbox"/> HEATED <input type="checkbox"/> UNHEATED			CONSTRUCTION	
22	<input type="checkbox"/> OUTDOOR <input type="checkbox"/> ROOF <input type="checkbox"/> W/O ROOF			TURBINE TYPE <input type="checkbox"/> HORIZONTAL <input type="checkbox"/> VERTICAL	
23	AMBIENT TEMP., °C: MIN. _____ MAX. _____			N° STAGES _____ WHEEL DIA, mm _____	
24	UNUSUAL CONDITIONS <input type="checkbox"/> DUST <input type="checkbox"/> SALTY ATMOSPHERE			ROTOR: <input type="checkbox"/> BUILT UP <input type="checkbox"/> SOLID <input type="checkbox"/> BETWEEN BRGS	
25	<input type="checkbox"/> FUMES <input type="checkbox"/> OTHER _____			BLADING: <input type="checkbox"/> 2 ROW <input type="checkbox"/> 3 ROW <input type="checkbox"/> RE-ENTRY	
26	AREA CLASS. ZONE _____ GROUP _____ CLASS _____			CASING SPLIT: <input type="checkbox"/> AXIAL <input type="checkbox"/> RADIAL	
27				CASING SUPPORT: <input type="checkbox"/> CENTERLINE <input type="checkbox"/> FOOT	
28	CONTROL POWER V _____ PH. _____ Hz _____			VERT./HOR. JACKSCREWS <input checked="" type="checkbox"/> FURNISHED BY VENDOR	
29	AUX. MOTORS V _____ PH. _____ Hz _____			TRIP VALVE: <input type="checkbox"/> INTEGRAL <input type="checkbox"/> SEPARATE	
30	COOLINGWATER PRESS. kgf/cm² g _____ ΔP, kgf/cm² _____			INTERSTAGE SEALS: <input type="checkbox"/> LABYRINTH <input type="checkbox"/> CARBON	
31	FLOW, m³/h _____ ΔT, °C _____			END SEALS:	
32	ALLOW. SOUND PRESS LEVEL _____ dBA@ _____ m			EXTERNAL <input type="checkbox"/> CARBON RING, N°/BOX _____	
33				<input type="checkbox"/> LABYRINTH <input type="checkbox"/> MATERIAL _____	
34	STEAM CONDITIONS			INTERNAL <input type="checkbox"/> CARBON RING, N°/BOX _____	
35		MAX	NORMAL	<input type="checkbox"/> LABYRINTH <input type="checkbox"/> MATERIAL _____	
36	INLET PRESS., kgf/cm² g			<input type="checkbox"/> MECHANICAL SEALS <input type="checkbox"/> MFR _____	
37	INLET TEMP., °C			<input type="checkbox"/> CARBON RING, N°/BOX _____	
38	EXHAUST PRESS., kgf/cm² g			<input type="checkbox"/> LABYRINTH <input type="checkbox"/> MATERIAL _____	
39				<input type="checkbox"/> MECHANICAL SEALS <input type="checkbox"/> MFR _____	
40	<input type="checkbox"/> STEAM CONTAMINANTS _____			TYPE RADIAL BEARINGS _____	
41				TYPE THRUST BEARING _____	
42	TURBINE DATA			CALCULATED THRUST LOAD (kgf/cm²) MIN _____ MAX _____	
43	ALLOWABLE, rpm	MAX	MIN	BRG MFR ULTIMATE RATING (kgf/cm²) _____	
44	MAX CONT SPEED, rpm			THRUST COLLAR <input type="checkbox"/> REPLACEABLE <input type="checkbox"/> INTEGRAL	
45	TRIP SPEED, rpm		BLADE TIP VEL, mm/s	LUBE OIL VISCOSITY ISO GRADE _____	
46	FIRST CRITICAL SPEED, rpm			LUBRICATION <input type="checkbox"/> RING OILED <input type="checkbox"/> PRESSURE	
47	EXH. TEMP °C	NORMAL	NO LOAD	OIL MIST <input type="checkbox"/> PURGE OIL MIST <input type="checkbox"/> PURE OIL MIST	
48	POTENTIAL MAX POWER, kW			BEARING HOUSING OILER TYPE _____	
49	MAX. NOZZLE STEAM FLOW, kg/h			BEARING HOUSING SEAL _____ SEAL SUPPLIER _____	
50	ROTATION FACING GOVERNOR END <input type="checkbox"/> CCW <input type="checkbox"/> CW			CASING DESIGN	INLET
51	<input type="checkbox"/> VERTICAL DRIVEN EQUIPMENT THRUST, kgf			MAX. ALLOW. PRESS., kgf/cm² g	EXHAUST
52	<input type="checkbox"/> VERTICAL TURBINE THRUST CAPACITY, kgf			MAX. ALLOW. TEMP., °C	
53	<input type="checkbox"/> AUTO DRAIN SYST. REQ. FURN. BY <input type="checkbox"/> VENDOR <input type="checkbox"/> OTHERS			HYDRO TEST PRESS., kgf/cm² g	
54	<input type="checkbox"/> WATER PIPING FURNISHED BY <input type="checkbox"/> VENDOR <input type="checkbox"/> OTHERS				
55	<input type="checkbox"/> OIL PIPING FURNISHED BY <input type="checkbox"/> VENDOR <input type="checkbox"/> OTHERS				
56					
57					
58					
59					


DATA SHEET		No.	REV.																									
		SHEET	3 of 5																									
		TITL E: <b>STEAM TURBINE</b>																										
<b>1 MATERIALS</b>		<b>ACCESSORY EQUIPMENT BY VENDOR</b>																										
2 HIGH PRESSURE CASING _____ GRADE _____ 3 EXHAUST CASING _____ GRADE _____ 4 NOZZLES _____ GRADE _____ 5 BLADING _____ GRADE _____ 6 WHEELS _____ GRADE _____ 7 SHAFT _____ GRADE _____ 8 <input checked="" type="checkbox"/> SHAFT COATING UNDER PACKING 9 MATERIAL _____ 10 APPLICATION METHOD _____ 11 THICKNESS _____ 12 GOV. VALVE TRIM _____ 13 INLET STRAINER _____ MESH SIZE _____ 14 COUPLING SPACER / HUBS _____ 15 COUPLING DIAPHRAGMS (DISKS) _____		<input type="checkbox"/> REMOTE TRIP SOLENOID <input type="checkbox"/> VACUUM BREAKER <input type="checkbox"/> AUTOMATIC STEAM SEALING SYSTEM GLAND VACUUM DEVICE WITH: <u>STEAM EJECTOR</u> <input type="checkbox"/> TURBINE TRIPPED SIGNAL GLAND CONDENSER SUPPLIED BY <u>TURBINE MFR.</u> <input type="checkbox"/> SENTINEL WARNING VALVE <input checked="" type="checkbox"/> INSULATION. TYPE: <u>REMOVABLE BLANKET</u> <input type="checkbox"/> TACHOMETER TYPE: _____ <input type="checkbox"/> MFR _____ <input type="checkbox"/> MODEL _____ <input type="checkbox"/> MOUNTED BY _____ <input type="checkbox"/> THERMAL RELIEF VALVES _____ <input type="checkbox"/> SHUTOFF VALVES _____ <input type="checkbox"/> LOCAL GAUGE BOARD WITH FOLLOWING PRESS. GAUGES: <input type="checkbox"/> THROTTLE STEAM <input type="checkbox"/> FIRST STAGE <input type="checkbox"/> NOZZLE RING _____ <input type="checkbox"/> EXHAUST _____ <input type="checkbox"/> LIQUID FILLED GAUGES <input type="checkbox"/> INSTRUMENT PANEL <input type="checkbox"/> BASEMOUNT <input type="checkbox"/> FREE STANDING <input type="checkbox"/> SEALING STEAM _____ kgf/cm <sup>2</sup> g _____ K																										
<b>16 GOVERNING SYSTEM</b>		<b>EXTERNAL LUBE OIL SYSTEM</b>																										
17 GOVERNOR TYPE _____ 18 MANUFACTURER _____ MODEL _____ 19 SPEED RANGE _____ SPEED SETPOINT ADJ. _____ 20 LOCAL HAND SPEED CH. _____ REMOTE SP SETPOINT _____ 21 <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <th style="width:33%;">VARIABLE</th> <th style="width:33%;">OPERATING RANGE</th> <th style="width:33%;">CONTROL SIGNAL</th> </tr> <tr> <td>SPEED _____ TO _____ RPM</td> <td>_____ TO _____ mA</td> <td></td> </tr> <tr> <td>SPEED _____ TO _____ RPM</td> <td>_____ TO _____ kPa g</td> <td></td> </tr> </table> 22 23 24 GOV. POWER SUPPLY _____ OVERSPEED TRIP _____ 25 REMOTE TRIP INPUT TO ELECTRONIC GOVERNOR _____ 26 ELECTRONIC GOVERNOR SUITABLE FOR SLOW ROLL _____ 27 OVERSPEED TRIP _____ NFACT. DEVICE _____ MFR. _____ MDL _____		VARIABLE	OPERATING RANGE	CONTROL SIGNAL	SPEED _____ TO _____ RPM	_____ TO _____ mA		SPEED _____ TO _____ RPM	_____ TO _____ kPa g		<input type="checkbox"/> CIRCULATING <input type="checkbox"/> PRESSURE VENDOR FURNISH SYSTEM FOR: <input type="checkbox"/> TURBINE <input type="checkbox"/> OTHER OIL SYSTEM TO BE: <input type="checkbox"/> CONSOLE TYPE <input type="checkbox"/> MOUNTED ON BASEPLATE OIL SYSTEM TO INCLUDE FOLLOWING EQUIPMENT: <input type="checkbox"/> STAND BY OIL PUMP: DRIVER TYPE _____ <input type="checkbox"/> LOW OIL PRESS ALARM <input type="checkbox"/> LOW OIL PRESS TRIP <input type="checkbox"/> RESERVOIR WITH LEVEL TRANSMITTER <input type="checkbox"/> HEATER: <input type="checkbox"/> ELECTRIC <input type="checkbox"/> STEAM <input type="checkbox"/> OIL COOLER: <input type="checkbox"/> SINGLE <input type="checkbox"/> TWIN <input type="checkbox"/> OIL FILTER MODEL: _____ MFR: _____ <input type="checkbox"/> SINGLE <input type="checkbox"/> TWIN SIZE: _____ MICRONS _____ <input type="checkbox"/> STAINLESS STEEL SUPPLY PIPING <input type="checkbox"/> DRAIN PIPING <input type="checkbox"/> COMPLETE <input type="checkbox"/> DOWNSTREAM OF FILTER <input type="checkbox"/> OIL DRAIN SIGHT FLOW INDICATORS <input type="checkbox"/> HAND OPERATED STAND-BY PUMP																	
VARIABLE	OPERATING RANGE	CONTROL SIGNAL																										
SPEED _____ TO _____ RPM	_____ TO _____ mA																											
SPEED _____ TO _____ RPM	_____ TO _____ kPa g																											
<b>28 CONNECTIONS</b>		<b>VIBRATION AND POSITION DETECTORS</b>																										
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STEAM INLET	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>																																																																	
STEAM EXHAUST	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>																																																																	
LUBE OIL COOLER	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>																																																																	


	<b>DATA SHEET</b>		No.	REV.
				SHEET 5 of 5
	TITLE: <b>STEAM TURBINE</b>			
GENERAL NOTES				


 <b>PETROBRAS</b>	<b>DATA SHEET</b>		N°						
	CLIENT:			SHEET 1 of 4					
	JOB:								
	AREA:								
TITLE:			<b>VENDOR DRAWING AND DATA REQUIREMENTS</b>						
<b>INDEX OF REVISIONS</b>									
REV.	DESCRIPTION AND/OR REVISED SHEETS								
	REV. 0	REV. A	REV. B	REV. C	REV. D	REV. E	REV. F	REV. G	REV. H
DATE									
DESIGN									
EXECUTION									
CHECK									
APPROVAL									
THIS DOCUMENT IS PROPERTY OF PETROBRAS, BEING PROHIBITED OUTSIDE OF THEIR PURPOSE.									
FORM OWNED TO PETROBRAS N-2648 REV.C ANNEX B - SHEET 01/04.									



		<b>DATA SHEET</b>		No.	REV.
				SHEET	2 of 4
TITLE:		<b>VENDOR DRAWING AND DATA REQUIREMENTS</b>			
THE DOCUMENTS STARTED BELOW SHALL BE SUPPLIED IN ENGLISH OR BRAZILIAN PORTUGUESE (NOTE 4 AND 5)					
PROPOSAL (NOTE 1)	BIDDER SHALL FURNISH	3	COPIES OF DATA FOR ALL ITEMS INDICATED BY AN "X".		
REVIEW (NOTE 2)	VENDOR SHALL FURNISH	3	COPIES AND - TRANSPARENCES OF DRAWING AND DATA INDICATED.		
FINAL (NOTE 3)	VENDOR SHALL FURNISH	3	COPIES AND - TRANSPARENCES OF DRAWINGS AND DATA INDICATED.		
	VENDOR SHALL FURNISH	3	OPERATING AND MAINTENANCE MANUALS.		
			FINAL - RECEIVED FROM VENDOR		
	DISTRIBUTION		FINAL - DUE FROM VENDOR (NOTE 3)		
	RECORD		REVIEW - RETURNED TO VENDOR		
			REVIEW - RECEIVED FROM VENDOR		
			REVIEW - DUE FROM VENDOR (NOTE 3)		
<b>GENERAL PURPOSE STEAM TURBINE</b>					
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	1. CERTIFIED DIMENSIONAL OUTLINE DRAWING AND LIST OF CONNECTIONS		
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	2. CROSS-SECTIONAL DRAWING, PART LIST AND BILL OF MATERIALS		
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	3. ROTOR ASSEMBLY DRAWING, PART LIST AND BILL OF MATERIALS		
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	4. THRUST BEARING ASSEMBLY DRAWING, PART LIST AND BILL OF MATERIALS		
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	5. JOURNAL BEARING ASSEMBLY DRAWING, PART LIST AND BILL OF MATERIALS		
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	6. SEALS/PACKINGS/LABYRINTHS CROSS-SECTION DWG, ASSEMB. DWG, PART LIST AND BILL OF MTL		
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	7. SHAFT COUPLING ALIGNMENT DIAGRAM, ASSEMBLY DRAWING, PART LIST AND BILL OF MATERIALS		
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	8. GLAND SEALING AND LEAK-OFF SCHEMATICS, PART LIST AND BILL OF MATERIALS		
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	9. GLAND SEALING AND LEAK-OFF ARRANGEMENT DRAWING AND LIST OF CONNECTIONS		
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	10. GLAND SEALING AND LEAK-OFF EQUIPMENT AND COMPONENT DWG, PART LIST AND DATA SHEETS		
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	11. LUBE-OIL SCHEMATIC AND BILL OF MATERIALS		
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	12. LUBE-OIL SYSTEM ARRANGEMENT DRAWING AND LIST OF CONNECTIONS		
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	13. LUBE-OIL COMPONENT DRAWINGS AND DATA SHEETS		
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	14. ELECTRICAL AND INSTRUMENTATION SCHEMATICS, WIRING DIAGRAMS, AND BILL OF MATERIALS		
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	15. ELECTRICAL AND INSTRUMENTATION ARRANGEMENT DRAWINGS AND LIST OF CONNECTIONS		
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	16. GOVERNOR AND TRIP DETAILS		
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	17. STEAM FLOW VERSUS POWER		
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	18. STEAM FLOW VERSUS FIRST STAGE PRESSURE		
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	19. STEAM FLOW VERSUS SPEED AND EFFICIENCY		
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	20. STEAM FLOW VERSUS THRUST-BEARING LOAD		
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	21. STEAM CORRECTION CHARTS		
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	22. VIBRATION ANALYSIS DATA		
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	23. LATERAL CRITICAL ANALYSIS		
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	24. ALIGNMENT DIAGRAM		
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	25. TORSIONAL ANALYSIS AND REPORT		
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	26. WELD PROCEDURES (FABRICATION AND REPAIR)		
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	27. HYDROSTATIC TEST LOGS		
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	28. MECHANICAL RUNNING TEST LOGS		
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	29. ROTOR BALANCE LOGS		
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	30. ROTOR MECHANICAL AND ELECTRICAL RUNOUT (PROCEDURES, REPORT AND DATA)		
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	31. DATA SHEETS APPLICABLE TO PROPOSALS, PURCHASE AND AS-BUILT		
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	32. AS-BUILT DIMENSIONS AND DATA		
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	33. INSTALLATION, OPERATING AND MAINTENANCE MANUAL		
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	34. SPARE PARTS RECOMMENDATION AND PRICE LIST		
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	35. DRAWINGS AND DOCUMENTS INDEX		
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	36. EQUIPMENT GENERAL DESCRIPTION AND CATALOGS		
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	37. SPECIAL AND OPTIONAL TESTS PROCEDURES, REPORTS AND DATA		
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	38. LIST OF SPECIAL TOOLS		
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	39. TECHNICAL DATA MANUAL		
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	40. PAINTING SPECIFICATION		
NOTE 1	PROPOSAL DRAWINGS AND DATA DO NOT HAVE TO BE CERTIFIED OR AS-BUILT.				
NOTE 2	PURCHASER SHALL INFORM IN CONTRACT, OFFICIAL DOCUMENTATION OR INDICATE IN THIS COLUMN THE DESIRED TIME FRAME FOR SUBMISSION OF MATERIALS USING THE API NOMENCLATURE.				
NOTE 3	VENDOR SHALL COMPLETE THIS COLUMN TO REFLECT HIS ACTUAL DISTRIBUTION SCHEDULE AND SHALL INCLUDE THIS FORM IN HIS PROPOSAL.				
NOTE 4	ALL DOCUMENTS AND DRAWINGS SHALL ALSO BE PROVIDED IN MAGNETIC MEDIA (CD) AND SHALL BE ISSUED BY VENDOR. FILES SHALL BE IN ACCORDANCE WITH CONTRACT AND PETROBRAS REQUIREMENTS.				
NOTE 5	VENDOR SHALL MERGE SIMILAR DOCUMENTS ASKED IN DIFFERENT LISTS, BUT IT SHALL BE CLEARLY STATED IN PROPOSAL, REVIEW AND FINAL PHASE WHERE THE INFORMATION IS (ITEMS AND SUB-ITEMS).				



	<b>DATA SHEET</b>	No.	REV.
			SHEET 3 of 4
	TITLE: <b>VENDOR DRAWING AND DATA REQUIREMENTS</b>		
<b>GENERAL NOTES</b>			
<p>1 - VENDOR SHALL FILL IN PETROBRAS DATA SHEETS, WHEN IT'S FURNISHED. VENDOR DATA SHEETS SHALL NOT BE ACCEPTABLE IN THIS CASE. FOR OTHER EQUIPMENTS, VENDOR SHALL USE API DATA SHEETS.</p> <p>2 - ALL DATA, DRAWINGS, HARDWARE AND EQUIPMENT SUPPLIED TO THIS SPECIFICATION SHALL USE SI UNITS, EXCEPT FOR ORDINARY PIPING, FLANGES, ACCESSORIES AND APPURTENANCES, WHICH SHALL BE IN INCHES.</p> <p>3 - ALL DRAWINGS AND DOCUMENTS (INCLUDING SUB-SUPPLIERS) SHALL BE IDENTIFIED AT LEAST WITH THE FOLLOWING INFORMATION:</p> <ul style="list-style-type: none"> <li>— CLIENT'S NAME;</li> <li>— CLIENT'S STATION;</li> <li>— JOB LOCATION;</li> <li>— PURCHASER'S REQUISITION NUMBER;</li> <li>— PURCHASER'S ORDER NUMBER;</li> <li>— TAG NUMBER;</li> <li>— SERVICE.</li> </ul> <p>4 - REVISION BOXES SHALL BE PROVIDED TO DESCRIBE THE LATEST REVISIONS IN FULL DETAIL AND AN INDICATION OF REVISIONS SHALL BE MADE AT REVISED INFORMATION BY SUCH MEANS AS CIRCLED REVISION NUMBER.</p> <p>5 - LANGUAGE AND TRANSLATION:</p> <ul style="list-style-type: none"> <li>— DOCUMENTS, DRAWINGS, INSTRUCTION BOOKS AND OTHER COMMERCIAL OR ENGINEERING DATA SHALL BE IN ENGLISH OR BRAZILIAN PORTUGUESE LANGUAGE, EXCEPT FOR THOSE FROM THE BRAZILIAN MARKET, WHICH SHALL BE IN BRAZILIAN PORTUGUESE LANGUAGE;</li> <li>— INSTALLATION, OPERATION AND MAINTENANCE MANUALS (IOMs) MUST BE ISSUED BY EQUIPMENT VENDOR IN BOTH BRAZILIAN PORTUGUESE AND ENGLISH, UNDER VENDOR'S RESPONSIBILITY;</li> <li>— INDEPENDENT (THIRD-PARTY) TRANSLATIONS ARE NOT ACCEPTABLE;</li> <li>— IN CASE OF CONFLICTS BETWEEN IOM INSTRUCTIONS, PORTUGUESE VERSION SHALL PREVAIL;</li> <li>— PETROBRAS HAS NO RESPONSIBILITY ABOUT MISTAKES, ACTIONS OR DECISIONS BASED ON, OR ORIGINATED FROM, MISTRANSLATED INSTRUCTIONS PROVIDED BY VENDOR;</li> <li>— BOTH LANGUAGES SHALL BE USED IN ALL HUMAN-MACHINE INTERFACES (HMI) COMPUTER SCREENS INSTALLED ON CONTROL PANELS (WHEN APPLICABLE). LANGUAGE SELECTION SHALL BE PERFORMED AT ANY TIME, WITHOUT REQUIRING COMPUTER RESET OR DISTURBING ANY MONITORING / CONTROL PROCESS BEING RUN BY COMPUTER PLC;</li> <li>— ALL WARNINGS, SUCH AS CAUTION, DANGER, HAZARDOUS SIGNS AND OTHER BASIC SAFETY INSTRUCTIONS TO BE APPLIED ON EQUIPMENT / COMPONENT EXTERNAL SURFACES, ENCLOSURES, DOORS, HANDLES, LEVERS, EMERGENCY STOP BUTTONS ETC. SHALL BE SUPPLIED BY VENDOR AND SHALL BE WRITTEN IN BRAZILIAN PORTUGUESE (PRIMARY TEXT, IN CAPITAL LETTERS) AND ENGLISH (SECONDARY TEXT, WITH SMALLER FONTS);</li> <li>— ORDINARY / STANDARD DOCUMENTATION OF FOREIGN ITEMS (MAIN AND AUXILIARY EQUIPMENT) MAY BE SUPPLIED IN ENGLISH. WHENEVER DOCUMENTS ARE WRITTEN IN LANGUAGES OTHER THAN ENGLISH, TRANSLATIONS SHALL BE PROVIDED AS WELL.</li> </ul> <p>6 - THE TECHNICAL DATA MANUALS SHALL BE DIVIDED IN THREE SECTIONS AND SHALL INCLUDE AT LEAST THE TOPICS DESCRIBED BELOW:</p> <p><b>SECTION I:</b></p> <ul style="list-style-type: none"> <li>— CERTIFIED AND ILLUSTRATED PART LIST (EXPLODED VIEWS OF INTERNAL PARTS);</li> <li>— CATALOGUES;</li> <li>— TECHNICAL SPECIFICATIONS;</li> <li>— PERFORMANCE CURVES FOR DRIVEN AND DRIVER EQUIPMENT;</li> <li>— CALCULATION SHEETS;</li> <li>— DATA SHEETS;</li> <li>— DYNAMIC LOADS FOR ALL OPERATING CONDITIONS.</li> </ul> <p><b>SECTION II:</b></p> <ul style="list-style-type: none"> <li>— INSTRUCTIONS FOR STORAGE AND TRANSPORTATION;</li> <li>— COMMISSIONING PROCEDURE;</li> <li>— INSTRUCTIONS FOR INSTALLATION AND OPERATION (INCLUDING AUXILIARIES);</li> <li>— INSTRUCTIONS FOR MAINTENANCE;</li> <li>— MAINTENANCE PROCEDURES, INCLUDING: DISASSEMBLY, SPECIAL TOOLS, CLEANING, INSPECTION, REPAIR AND ASSEMBLY OF MAIN EQUIPMENT AND AUXILIARIES.</li> </ul> <p><b>SECTION III:</b></p> <ul style="list-style-type: none"> <li>— MATERIAL CERTIFICATES;</li> <li>— TEST REPORTS, DATA AND CURVES CERTIFICATES;</li> <li>— WELDING PROCEDURES;</li> <li>— QUALITY PLANS;</li> <li>— ELECTRICAL AND ELECTRONIC INSTRUMENT CERTIFICATES FOR AREA CLASSIFICATION.</li> </ul>			

	<b>DATA SHEET</b>	No.	REV.
	SHEET 4 of 4		
	TITLE: <b>VENDOR DRAWING AND DATA REQUIREMENTS</b>		
<p>NOTA VENDOR MAY BE REQUESTED, AT ANY TIME DURING SERVICE LIFE OF EQUIPMENT, TO PROVIDE ADDITIONAL INFORMATION REQUIRED TO OVERCOME PROBLEMS RELATED TO THE PERFORMANCE OF SUPPLIED EQUIPMENT.</p> <p>7 - PURCHASER APPROVAL OF VENDOR'S DRAWINGS SHALL NOT BE CONSIDERED AS RELIEVING THE VENDOR OF ANY RESPONSIBILITY FOR DETAILED DESIGN, DIMENSION AND CONSTRUCTION OF EQUIPMENT OR DEVIATIONS FROM SPECIFICATIONS.</p> <p>8 - DIMENSIONAL DRAWINGS SHALL INFORM ALL DIMENSIONS THAT MAY BE REQUIRED BY PURCHASER FOR INSTALLATION AND TO ACCESS CLEARANCE TO ADJACENT EQUIPMENT WHEN INSTALLING EQUIPMENT TRAIN.</p> <p>9 - VENDOR SHALL GIVE ALL NECESSARY DATA AND COMMENTS CONCERNING FOLLOWING POINTS, AT LEAST FOR (BUT NOT LIMITED TO):</p> <ul style="list-style-type: none"> <li>— CIVIL WORKS AND FOUNDATIONS DRAWINGS AND SPECIFICATIONS;</li> <li>— PROCESS DRAWINGS PIPING AROUND PUMP.</li> </ul> <p>10 - ALL EQUIPMENT AND PANELS SHALL HAVE A NAMEPLATE, EASY TO ACCESS, TO SEE AND READ. NAMEPLATE SHALL BE MADE IN AISI-316 STAINLESS STEEL AND BE BOLTED (WITH STAINLESS STEEL ELEMENTS) TO THE EQUIPMENT. IT SHALL CONTAIN THE FOLLOWING INFORMATION:</p> <ul style="list-style-type: none"> <li>— CLIENT'S NAME;</li> <li>— SUPPLIER'S NAME;</li> <li>— SERIES NUMBER AND MODEL;</li> <li>— YEAR OF MANUFACTURING;</li> <li>— MAIN DESIGN AND TEST DATA: PRESSURE, TEMPERATURE, VOLTAGE, ROTATION ETC;</li> <li>— SPECIFIC DATA;</li> <li>— CLIENT'S STATION;</li> <li>— TAG NUMBER;</li> <li>— PURCHASER'S REQUISITION NUMBER (RM);</li> <li>— PURCHASER'S REQUEST FOR QUOTATION NUMBER (RFQ);</li> <li>— PURCHASER'S ORDER NUMBER (PO);</li> <li>— EMPTY WEIGHT.</li> </ul> <p>11 - IN ADDITION TO THE REFERRED NAMEPLATES, EVERY EQUIPMENT COMPONENT OR PACKAGE SHALL HAVE A FIXED ASSET NAMEPLATE. ALL NAMEPLATES LAY OUT DRAWINGS SHALL BE SUBMITTED TO PURCHASER FOR APPROVAL.</p> <p>12 - CURVES SHALL PROVIDE PERFORMANCE FOR FULL RANGE OF OPERATIONAL CONDITIONS (INCLUDING ALL LIMITATIONS). VALIDATION OF THESE CURVES SHALL BE PROVIDED FOLLOWING TESTS IN ACCORDANCE WITH PETROBRAS SPECIFICATION.</p> <p>13 - FOUNDATION AND BASEPLATE DRAWINGS SHALL CLEARLY SHOW THE WEIGHTS AND OTHER LOADS AT EACH POINT OF SUPPORT. IF THE EQUIPMENT REQUIRES A SUPPORTING STRUCTURE AND WHERE SUCH STRUCTURE IS WITHIN PURCHASER SCOPE OF SUPPLY THEN VENDOR SHALL PROVIDE COMPLETE LOADING DIAGRAM.</p>			

## ÍNDICE DE REVISIONES

**REV. A**

Affected Parts	Description of Alteration
4.1.12	Substitution
4.6.2.1	Substitution
5.4.2.2	Modification
6.3.3.1.2	Substitution

## REV. B

Affected Parts	Description of Alteration
All	General Revision

**REV. C**

[illegible]