



TECHNICAL SPECIFICATION

No. I-ET-3000.00-1500-29B-PAZ-005 REV. A

CLIENT: E&P

SHEET 1 of 4

JOB: UMBILICAL SYSTEMS FOR SUBSEA APPLICATION

-

AREA: OFFSHORE BASINS - BRAZIL

E&P-CORP/EEPIP/ES

TITLE: METALLIC TUBES FOR SUBSEA UMBILICALS

NP-1
E&P-CORP/EEPIP/ES

INDEX OF REVISIONS

REV.

DESCRIPTION AND/OR REVISED SHEETS

0 Original

A All pages, including document title.

	REV. 0	REV. A	REV. B	REV. C	REV. D	REV. E	REV. F	REV. G	REV. H
DATE	AUG/2010	FEB/2015							
DESIGN	IPP/ES	EEPIP/ES							
EXECUTION	FBA	BF6S							
CHECK	YR / AAG	CJME							
APPROVAL	CASP	CSMP							



TECHNICAL SPECIFICATION

No. I-ET-3000.00-1500-29B-PAZ-005

REV. A

Umbilicals for Subsea Application

SHEET 2 of 4

TITLE:

**METALLIC TUBES FOR SUBSEA
UMBILICALS**

NP-1

E&P-CORP/EEPIP/ES

INDEX

1. PURPOSE	3
2. REFERENCES	3
3. RESPONSIBILITY	3
4. REQUIREMENTS	3
4.1. MATERIAL	3
4.2. DOCUMENTATION	3
4.3. WALL THICKNESS CALCULATION	4
4.4. WELDS	4
4.5. HYDROGEN EMBRITTLEMENT	4
4.6. TERMINATIONS	4
4.7. TESTS	4
4.7.1. QUALIFICATION TESTS	4
4.7.2. FATIGUE S-N AND/OR E-N CURVES	4



TITLE:

**METALLIC TUBES FOR SUBSEA
UMBILICALS**

NP-1

E&P-CORP/EEPIP/ES

1. PURPOSE

This specification defines additional requirements to those stated in [1] for metallic tubes to be supplied to PETROBRAS as functional components of subsea umbilicals.

2. REFERENCES

NOTE: Unless otherwise stated, the latest revision of the following documents shall be considered.

- [1] **ISO 13628-5**, *Petroleum and natural gas industries – Design and operation of subsea production systems – Subsea Umbilicals*
- [2] **I-ET-3000.00-1500-29B-PAZ-006**, *Qualification for Power, Control and Injection Umbilicals*
- [3] **DNV-RP-F112**, *Design of Duplex Stainless Steel Subsea Equipment Exposed to Cathodic Protection*

3. RESPONSIBILITY

PETROBRAS understands that MANUFACTURER is responsible for the selection of the tube manufacturer and to require that it fully complies with the requirements of [1], of its quality plan and of PETROBRAS specifications.

Nevertheless, PETROBRAS claims the right to evaluate the tube manufacturer by means of documentation analysis and/or qualification tests witness and/or tube factory inspection. MANUFACTURER must have PETROBRAS approval on the tube manufacturer prior to umbilical production. Procurement of metallic tubes without PETROBRAS approval on the tube manufacturer is performed at MANUFACTURER's own risk.

4. REQUIREMENTS

The metallic tubes shall be capable of continuous operation immersed in a seawater environment and must withstand all loads transmitted by the umbilical layers in contact with them during the phases of manufacturing, handling, storage, transport, installation and operation, considering the service life specified for the umbilical line on the material requisition document.

4.1. MATERIAL

Metallic tubes for subsea umbilicals shall be seamless super duplex stainless steel, being UNS S32750 and UNS S39274 the accepted grades. Other materials are not acceptable even if a bonding film, coating or layer is applied.

4.2. DOCUMENTATION

The quality plan of the metallic tube manufacturer shall be submitted by the MANUFACTURER for PETROBRAS approval. The minimum content of the quality plan is stated on [1].

The sheath shall be applied following requirements described on [1]. MANUFACTURER's procedure for coating the metallic tubes, which minimum content is also described on [1], shall be submitted to PETROBRAS.



TITLE:

**METALLIC TUBES FOR SUBSEA
UMBILICALS**

NP-1

E&P-CORP/EEPIP/ES

4.3. WALL THICKNESS CALCULATION

Design calculation (including criteria for collapse and propagating buckling) shall be part of the Functional Component Qualification Report additionally to the items stated on [2], considering the following:

- external pressure according to the qualification water depth and water density of 1025 kg/m³
- minimum internal pressure of 1 atm (\cong 0.1 MPa)
- 1.5% ovality

4.4. WELDS

Both MANUFACTURER and tube manufacturer must follow the requirements stated on [1] regarding tube welding and non-destructive examination (NDE) on the girth welds. MANUFACTURER's welding, inspection and non-destructive weld testing procedures (including acceptance criteria) shall be available for PETROBRAS evaluation.

All tube girth welds shall be automated produced, exception made to repair girth welds between tube strings and in the terminations, which may be done by means of manual process.

4.5. HYDROGEN EMBRITTLEMENT

Recommendations presented on [3] shall be considered for preventing hydrogen induced cracks on metallic tubes subjected to cathodic protection. Additionally, MANUFACTURER shall consider a maximum hardness of 32HRC for the metallic tubes.

4.6. TERMINATIONS

Metallic tubes shall be supplied with Autoclave[®] medium pressure (20,000 psi) fittings.

4.7. TESTS**4.7.1. Qualification Tests**

The proposed metallic tube designs must be qualified for the functional requirements (i.e. design working pressure, inner diameter, maximum operating water depth, inner fluids, service life, etc.) defined on the specific material requisition.

At least the tests stated on [1] shall be performed. PETROBRAS and MANUFACTURER may agree to perform additional tests to better investigate failure modes applicable to the proposed design concept, including welds.

4.7.2. Fatigue S-N and/or ϵ -N Curves

Fatigue curves of the proposed tube designs must be presented to Petrobras and shall be raised through fatigue testing (either tensile or bending test).