PETROBRAS	TECHNICAL SPECIFICATION	Nº: I-ET-0000.00-0000-974-P9U-001	
	CLIENT: -		SHEET: 1 de 14
	JOB: -		-
	AREA: PIPELINES		-
	TITLE: HYDROSTATIC TEST OF SUBSEA PIPELINES AND RISERS		EDD/EDR -

INDEX OF REVISIONS

REV.	DESCRIPTION AND/OR REVISED SHEETS
0	ORIGINAL
A	REVISION ON ITEMS 2, 3, 5, 6, 7, 8, 9, 12, 14
B	SECTIONS 2, 4.4, 7.3, 9.8, 12 AND 15
C	SECTION 2, 3, 6.13, 8 AND 9.1

	REV. 0	REV. A	REV. B	REV. C	REV. D	REV. E
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1 SCOPE

1.1 The scope of the present specification cover, as per the project requirements, the flooding, cleaning, gauging, caliper pig operations, the hydrotest activity and the analysis of the results.

1.2 This specification applies both for hydrostatic testing of offshore pipelines, their risers and jumpers.

1.3 This specification applies for liquid, gas or water pipelines.

2 REFERENCES

2.1 International Codes

[A1]	DNV-SE-0474	RISK BASED VERIFICATION
[A2]	DNV-SE-0475	VERIFICATION AND CERTIFICATION OF SUBMARINE PIPELINES
[A3]	DNV-ST-F101	SUBMARINE PIPELINE SYSTEMS
[A4]	DNV-RP-F115	PRE-COMMISSIONING OF SUBMARINE PIPELINES

2.2 Technical Specifications

[B1]	I-ET-0000.00-0000-295-P9U-001	CALIPER PIG´S REQUIREMENTS
[B2]	I-ET-0000.00-0000-24A-P9U-002	TIE-IN SPOOL MANUFACTURING

3 DEFINITIONS AND ABBREVIATIONS

3.1 Definitions

1	CONTRACTOR	The company responsible for procurement of necessary material, fabrication and load out of the Tie-in Spool. NOTE: When the term “CONTRACTOR” is referred in this technical specification, it refers to the CONTRACTOR responsible for the scope fulfillment
2	Filtered Seawater	Seawater used for pre-commissioning, collected at an open sea and filtered in accordance with the design standard.
3	Filtered Treated Seawater	Seawater used for pre-commissioning, collected at an open sea, filtered in accordance with the design standard and treated with inhibitors in accordance with Brazilian regulations
4	Filtered fresh water	Fresh or potable water used for pre-commissioning, filtered in accordance with the design standard and attending the requirements defined within this document.
5	May	A course of action permissible within the limits of this specification (used when referring to CONTRACTOR).
6	Must not	Prohibited requirement (used when referring to CONTRACTOR).

7	Pre-commissioning	Refers to activities required to prepare a pipeline for filling with the final product. The activity comprises water filling, cleaning, gauging, caliper, pressure testing, dewatering, drying and nitrogen purging, if applicable which take place prior operation.
8	Shall	Mandatory requirement (used when referring to CONTRACTOR).
9	Should	Preferred requirement (used when referring to CONTRACTOR).
10	THIRD PARTY	Independent company responsible for verification that an activity, a product or a service is in accordance with the specified requirements.
11	Verification	Definition in accordance with [A1].

3.2 Abreviations

1	BAHT	Total heterotrophic aerobic bacteria.
2	BANHT	Total heterotrophic anaerobic bacteria.
3	CRA	Corrosion Resistance Alloy.
4	PLR	Pig Launcher and/or Receiver.
5	NMP/ml	Most Probable Number per ml.
6	THPS	Tetrakis (hydroxymethyl) Phosphonium Sulfate.
7	ufc/ml	colony-forming unit per ml

4 GENERAL

4.1 The submarine pipelines, their risers and jumpers shall be hydrostatically tested as soon as practicable after being advised by the Construction group that the pipelines, risers and jumpers are approved for testing.

4.2 The limits of the test section shall be from PLR to PLR.

4.3 Prior to be hydrostatic tested, the as-laid route survey of the offshore pipeline shall be performed and completed to verify that the pipeline has been laid in agreement with the specifications for the alignment sheets, pipeline crossings, length and height of free spans, etc.

4.4 The hydrostatic pressure test shall be executed considering a stable holding test period of at least 24 hours without interruption. In case of the pipeline total volume to be tested is less than 5000 m3, the stable holding test period shall be at least 8 hours without interruption.

4.5 When the pressure measuring device is located, for example, on the platform above mean sea level, a reduction in recorded pressure equivalent to the hydrostatic head between the mean sea level and location of the pressure measuring device is required.

4.6 For each test, a Test Data Sheet shall be prepared indicating at least, the name of the line, the owner of the line, the main CONTRACTOR, the overall length of the pipeline, the detailed description of the pipeline section to be tested, the outside diameter, the steel grades, the various thickness(es), the design pressure and the test pressure.

4.7 This data sheet shall be attached to the hydrostatic test procedure.

4.8 The test of pipelines, risers and jumpers and associated accessories shall be approved and witnessed by PETROBRAS. No test shall be started before approval of the procedure is obtained.

4.9 CONTRACTOR shall be responsible to provide all necessary resources to perform the scope of work.

4.10 CONTRACTOR shall be responsible for contracting a THIRD PARTY, in accordance with ANP (Brazilian Regulatory State Agency for Oil and Natural Gas), Art. 18º III from Resolução ANP Nº 52, 2015, related to the Pre-Commissioning.

5 PRE-COMMISSIONING PHILOSOPHY

5.1 CONTRACTOR shall issue a document with the philosophy for pre-commissioning of the pipeline in compliance with Ref. [A4] to be approved by PETROBRAS. This document shall highlight all points requested by Environment Impact Assessment Authority, and the method proposed to achieve an agreement. CONTRACTOR shall establish a procedure to collect the chemicals, when applicable. In addition, this document shall provide calculations for pigging, pressure test, drying and nitrogen purging, i. e., all operations, when applicable.

5.2 The preliminary document for pre-commissioning philosophy shall include the description of the methodology to be used to perform the flooding, cleaning, gauging, caliper, hydrotest, hibernation, dewatering, drying and nitrogen purging, when applicable.

5.3 In case of using hibernation fluids, CONTRACTOR shall provide solutions to permit this fluid be removed before opening the test cap in the future.

5.4 CONTRACTOR shall perform the design of the pigging heads, including the pressure testing procedure and functionality test procedure.

6 DESIGN CONSIDERATIONS

6.1 The hydrotest pressure for pipeline shall be defined in accordance with the maximum design pressure of the system. The hydrotest pressure is defined in the project data sheet.

6.2 The stresses during hydrotest shall be in accordance with pipeline design documents.

6.3 For pipelines demonstrating important variations of the elevation profile - typical cases being export lines from deepwater fields, or deepwater systems connecting subsea units to floating supports - the Engineering Study shall aim to perform a realistic hydrotest for the pipeline and if necessary divide the pipeline in sections, when possible.

6.4 The seawater temperatures shall be taken during hydrotest. It is recommended to monitor and register the temperature at intervals of at least 10km along the pipeline length. For long pipelines the seawater temperatures and currents shall be taken into account in order to define number of temperature monitoring points.

6.5 Based on these temperature records, pressure variations while testing may be explained and stabilization periods be established. These temperatures shall be registered.

6.6 Pre-commissioning activities shall not be performed without an approved procedure showing at least:

6.6.1 Test Procedure Diagram;

6.6.2 Pipe specifications and manufacturer;

6.6.3 Proof test pressures;

6.6.4 Test medium;

6.7 Calculations showing the effect of variations of volume due to temperature variations, variations of pressure due to temperature variations and variations of volume due to pressure variations;

6.8 Pipeline filling, cleaning, and caliper pig procedures;

6.9 Pressurizing procedure including location of injection points and acceptance criteria;

6.10 Water intake and water discharge lines;

6.11 Theoretical pressure volume curve for hand-plot during test and temperature volume curves.

6.12 The pigs used during pre-commissioning activities shall be previously qualified when internal diameter variations are defined.

6.13 The distance between pig sealing disks shall take into account and be greater than the distance between gaps inside the flexible joint in order to avoid the pig from stopping in this section due to loss of sealing, when applicable.

6.14 The procedure shall include an isometric drawing showing all fill and testing equipment and associated piping. This procedure shall be accompanied with a detailed description of all equipment and instrumentation.

6.15 All the calculations shall be presented in MATHCAD format including all steps of the calculation methodology.

7 HYDROTEST WATER

7.1 For offshore pipelines, water for filling and testing will be taken from the open sea on site. CONTRACTOR also may consider using fresh water or potable water. The seawater collection as well as its location shall be in compliance with the Environmental Authorities requirements.

7.2 Inhibitors, oxygen scavenger and bactericide when required shall be in accordance with EIA/RIMA reports and approved by Brazilian environmental authority.

7.3 The seawater shall be dosed with dye (Fluorescein 20%) at 40 ppm and propel the last pig, before hydrotest.

7.4 Hydrotest water with chemicals shall not be discharged into the sea, except dye which its disposal shall be in compliance with the Environmental Authorities regulations.

7.5 CONTRACTOR shall be responsible for disposal of all chemical products.

8 WATER REQUIREMENTS FOR THE 625CRA PIPELINES

8.1 Using filtered seawater. The water shall be collected at open sea, preferably at depths of at least 15 meters below the sea level. It shall be filtered in accordance with design requirements and shall not stay into pipeline for more than 90 days. When 90 days is exceeded the water shall be completely removed from the pipeline by the use of pigs. The pipeline is to be filled

again with filtered sea water from open sea under the same conditions as above.

8.2 Using filtered treated seawater. Considered when pipeline is filled with seawater for more than 90 days and less than one year. The water shall be treated with oxygen scavenger (160mg/l of a sodium bisulfite 40%solution) and biocide (100mg/L of THPS at 75% w/w). In this case the oxygen scavenger shall be pumped into pipeline in advance (at least 5 minutes) of dosing the biocide (in order to avoid a significative content of residual scavenger that will react and consume the biocide, impacting negatively its efficiency). One year is the maximum period of time the treated seawater can stay inside the pipeline when this water shall be completely removed and replaced.

8.3 When pipeline is filled with filtered treated seawater for more than 90 days and less than six months, the water shall be treated with oxygen scavenger (185mg/L of a sodium bisulfite 40%solution). When six months is exceeded the water shall be completely removed from the pipeline by the use of pigs and replaced by the same hibernation fluid. For gathered pipelines, diesel may also be used for replacement.

8.4 Using filtered fresh or potable water. There is no limitation for the period of time pipeline can stay flooded since the water comply with the following requirements:

- Chloride contents less than 200ppm;
- 6.0 ≤ pH ≤ 7.5;
- Sulfide (H_2S) < 0.1 ppm;
- Dissolved oxygen > 1 ppm;
- Sulfate ≤ 6 ppm;
- Total organic carbon ≤ 2 mg/l;
- Total solids in water ≤ 20 mg/l;
- Total heterotrophic aerobic bacteria (BAHT) ≤ 10^4 ufc/ml;
- Total heterotrophic anaerobic bacteria (BANHT) ≤ 10^3 NMP/ml;

9 FLOODING, CLEANING, GAUGING AND CALLIPER PIG OPERATIONS

9.1 All water used in the pipeline shall be filtered through 50 μm mesh screen, removing all solids. In cases where the water collection point is at a distance of up to 20 m above the seabed, it shall be filtered through 25 μm mesh screen.

9.2 Extreme care in filling the pipelines using pigs shall be taken to ensure that all air is removed and that no air is introduced during filling. The maximum air content shall be in compliance with Ref. [A3]. Gauging operation may be optionally performed during the filling operation if pipeline is considered cleaned.

9.3 It is not permitted free flooding of a subsea pipeline. Subsea pressure due to water depth can be considered for flooding a pipeline but in this case filters shall be added and water height uptake shall be controlled.

9.4 The pigs shall be fitted with magnets for subsea detection with magnetic pig signaler with cradle to be assembled at each end of the pipeline, totaling at least 2 for all pre-commissioning operations. If CONTRACTOR propose another method for pig detection, this method shall be considered as a secondary system, being the magnetic detection the primary system.

Diverless operated pig launch/receivers shall be used in deep water operations.

9.5 The cleaning operation consists in launching high sealing bi-directional brush pigs (2 high performance disc material which is both high sealing and hard wearing + 2 brushes) equipped with magnets. The pig velocity shall be controlled between minimum 0.25m/s and maximum 1 m/s throughout the entire duration of the pigging run. Always a plug of water is to be pumped ahead of the cleaning pigs.

9.6 In case of pipelines with internal coating or CRA layer, the material of pigs' brushes shall be compatible with the internal coating in order to avoid any damage to the coating or the CRA layer. No steel to be in contact with the internal coating.

9.7 Gauge pig shall be designed in order to not contaminate and damage the internal coating and CRA layer. Gauge pig shall be submitted for PETROBRAS approval. The use of gauge pig is permitted only in case there is no change in internal diameter of the pipeline, risers, jumpers, accessories and its equipment associated.

9.8 CONTRACTOR shall consider that all pipelines, risers, jumpers and equipment systems that contain internal diameter transitions shall require the utilization of caliper pig, see Ref. [B1].

9.9 Cleaning operation shall be finished and accepted before start the caliper pig operation. The acceptance criteria shall be that the brush pig and magnetic pig are received without damages and the pipeline is cleaned. The pigs shall be photographed.

9.10 The water expelled to the sea during the cleaning process shall be done upwards through the output placed on the level, at least, 4 meters above the seabed. The discharge at sea level is not allowed.

9.11 The caliper pig requirements shall be in compliance with Ref. [B1], unless specified in the project.

9.12 The acceptance criteria for intelligent pig running shall be in compliance with Ref. [B1] or the criteria specified in the project.

9.13 Optionally, if approved in the specific project, can be launched a gauge pig equipped with a calibrated aluminium plate of 10 mm thickness and an edge of 45° - 3 mm width. External diameter of aluminium plate shall be in accordance with Ref. [A3] and internal diameter of all pipeline and accessories shall be considered. Acceptance criteria for the gauge plate is no damage when remove at pipeline extremity.

9.14 It is mandatory that a certified calibrated turbine flow meter be used during the filling operations. The certifying authority must be one approved by PETROBRAS. Certification is valid during 6 months.

9.15 Volumes pumped into pipeline shall be controlled and registered during all operations. Estimative of water pig losses shall be made to permit location of pig position at any time.

9.16 The pigs shall be removed from the pig receiver in the presence of the PETROBRAS representative and Certify Authority, when required. Recovered pigs shall be carefully examined in order to ascertain the degree and regularity of the wear of cups.

9.17 Recordings made by electronic geometric pig concerning size, location of diameter reductions such as dents, buckles, flat spots, construction debris, etc. shall be analysed. Any necessary substitutes and repairs shall be made to restore the structural integrity of the pipeline.

9.18 Blocking of brush or batching pigs at any point along the pipeline shall entail suspension of filling operations. In such cases, the blocked pig shall be located, recovered, and causes for blockage shall be ascertained and carry out work performed to restore the pipeline to the testing condition. On completion of work the pipeline shall be refilled and cleaned, as described above.

9.19 Special attention must be paid to the in line valves during the pigging cleaning operation because passage of pigs with the subsequent pushed debris will badly damage the internal of the valves. In line valves shall be replaced by temporary spools, when applicable.

9.20 In case of heated pipelines, a inertial pig running shall be performed, if specified by the project.

10 PRESSURE TEST

10.1 The battery limits of the pressure test shall be as per the Project Requirements.

10.2 A complete inventory of equipment or spares shall be available prior to start of testing. Main spares needed in case of breakdown of any equipment or instruments shall be available on site.

10.3 The equipment, which affects the accuracy of the measurements upon which, the validity of the hydrostatic tests shall be in compliance with the range to be measured.

10.4 Certified proof of accuracy of gauges and test equipment shall be submitted prior to the start of the testing and be included in the final test report. Maximum validity of certificates is six months.

10.5 The air content shall be assessed in compliance with Ref. [A3].

10.6 During the 24-hour test period, after the stabilization, the following measurements shall be taken:

10.6.1 Pressure and temperature of the test fluid;

10.6.2 Ambient temperature and the sea water temperature shall be recorded;

10.6.3 Tide level shall be recorded together with the water depths;

10.6.4 Seabed temperatures shall be recorded at least at each half hour;

10.6.5 The temperature recording during the 24 hour pressure tests and during the cleaning and filling operations can be a basis for accepting a pressure drop during the pressure test. In case that there is any doubt about leaks due to temperature variations, the test shall be extended for as many hours as necessary to justify this variation.

10.6.6 All operation during test shall be recorded and reported.

10.7 All test data shall be gathered and submitted to the PETROBRAS representative. Test termination is defined by PETROBRAS representative and Certified authority approval.

10.8 The acceptance criteria shall be in compliance with Ref. [A3].

11 CONTINGENCY PROCEDURES

11.1 CONTRACTOR shall describe the possible situations such as pig blocked, leakage during hydrotest, pig stuck, equipment failure or breakdown, caliper pig run failure, caliper pig data acceptance criteria, excessive air inclusion, bad weather, stabilization of test pressure, etc.

11.2 CONTRACTOR shall present contingency procedures for at least, each situation described above as well as elaborate, when necessary, and provide the required equipment.

12 EQUIPMENT AND MATERIALS

12.1 The following equipment and materials shall be provided as a minimum:

12.1.1 Fill-pump or pumps and the stuffing shall be water sealed to prevent air from entering. Should a single pump be furnished, a standby unit shall be available.

12.1.2 The suction hose at inlet point shall have a filter with 100 μm mesh screens and must be airtight at junctions.

12.1.3 Variable speed positive displacement pump equipped with a stroke counter for pressurizing the pipeline with a known volume per stroke and capable of exceeding the maximum test pressure by at least 15%.

12.1.4 Two turbine meters shall have a certified accuracy of ±2% or better of the intended pumping rates. Flowmeters shall show digital readouts of both instantaneous and cumulative flow.

12.1.5 A continuous supply of treated water to feed the pumps during the filling and the final pressure adjustments. Water is not supplied by PETROBRAS.

12.1.6 At least, six Bourdon pressure gauges of suitable pressure ranges and increment divisions.

12.1.7 Two digital recording pressure gauges for 48 hours shall be available. These gauges shall be calibrated prior to use.

12.1.8 Two temperature recorders for fill water.

12.1.9 Two temperature recorders for air ambient temperature.

12.1.10 Two invertible thermometers to measure sea bottom temperature.

12.1.11 Means to measure the volume of water necessary to drop the pipeline pressure by 0.5 bar. Container on scales or graduated cylinder may be chosen.

12.1.12 Means to display total water volume and part volume added.

12.1.13 Injection pump(s) to inject corrosion inhibitors, oxygen scavenger and bactericide into the test medium in the required proportions with a certified flow meter to control the volume pumped, if applicable.

12.1.14 Pressure and temperature recorders charts.

12.1.15 Subsea datalogger, if applicable. The calibration certificates shall accompany the equipment and copies made available for PETROBRAS. Datalogger shall meet requirements of DNV as a minimum. Datalogger to be inclusive Spare datalogger c/w Relevant spares kits.

12.1.16 Crossovers.

12.1.17 Test heads with all associated valves, fittings and connections (diver assisted or diverless), also suitable for use as pig launcher and receiver during filling, cleaning, gauging, testing, and dewatering (if required) of the pipeline.

12.1.18 High sealing pigs, caliper pig, pig with gauge plate, if approved. The pigs shall be bi-directional and able to pass through the bends and the subsea equipment (PLETs, T, Y derivations and reductions) in compliance with the design requirements.

12.1.19 Pig tracking system.

12.1.20 Pig Launchers and Receivers (PLRs).

12.1.21 Dye and all necessary chemical products.

12.1.22 Necessary equipment for the communication.

12.1.23 All rigging materials, containers, tanks, test cabin, temporary pipework, fittings, filters, pressure relief valves, spare parts, chemicals, hoses and necessary equipment and materials to perform the test.

13 OTHERS REQUIREMENTS FOR HYDROSTATIC TEST

13.1 The pipeline pressurizing shall be performed at constant rates not exceeding 1bar/min and 0.5 bar/min when pressure test is between 70 % to 80 % of the final pressure test. When approximately 80% of the specified test pressure is reached, this pressure shall be maintained for a period of time sufficient for its stabilization.

13.2 All pressure operation steps shall be properly monitored and registered. The pressure and volume recordings shall be taken, such that an adequate plot is obtained allowing to appreciate a maximum of 0.2 % of air entrapment into pipeline.

13.3 While pressurizing, the pipe connections shall be periodically checked for leaks. When the test pressure is reached, the filling valve shall be closed and the filling line disconnected from the valve.

13.4 The temperature of the pipeline filing water shall be as much as practical the same as the seawater surrounding temperature. In case this temperature differs more than 1°C the stabilization period shall be increased and properly documented by calculations.

13.5 During the 24-hour accepted period of test, the test heads, as well as any instruments used in connection with the test, must be properly protected against sun radiation, rain and wind, when applicable.

13.6 During the stabilization and the hold period, CONTRACTOR shall be aware to not exceed the maximum test pressures. If it is necessary to drain off water for this purpose, the pressure drop and the amount of water shall be measured accurately. Care must be taken that no greater quantity of water is drained than is necessary to reach the setting pressure.

13.7 In case it is necessary to add or remove water from the pipeline during the hold period the 24 hours hold period shall start again.

13.8 Once the pressure reaches the test pressure, additional 2 barg will be introduced for stabilization purposes. The minimum period for stabilization is 2 hours and if the system require re-pressurization or depressurization during the stabilization period, the additional water added to or removed from the system will be monitored and recorded. Following the stabilization, test pressure shall be held for a minimum period of 24 hours and commencement shall be agreed with PETROBRAS and THIRD PARTY representative, if required.

13.9 During the pressure test, the test pressures and temperatures shall be measured and recorded continuously. After the pressure in the pipeline has been raised to test pressure, all connecting pipes (except those for the pressure measurement) shall be disconnected.

13.10 The 24-hour hold period is to commence at a time to be agreed with PETROBRAS and Certifying Authority. The pressure test termination shall be agreed with PETROBRAS and Certifying Authority. Pressure test may be extended after complete the 24 hour hold period. Extension test period shall be in accordance with PETROBRAS and Certifying Authority.

13.11 After test approval, pressure shall be carefully released and the depressurization shall be regulated to ensure a moderate and constant reduction pressure at a rate not exceeding 3 bar/min.

13.12 The pipelines shall be left in accordance with specific project definitions.

14 JUMPERS HYDROSTATIC TEST

14.1 The hydrostatic test of jumpers shall be performed onshore and a specific procedure shall be issued for PETROBRAS approval. See also reference [B2].

14.2 The procedure shall present, at least, the following activities:

14.3 Flooding, cleaning and gauging with pigs

14.4 Hydrotest

14.5 Dewatering and MEG-Gel filling, if applicable

14.6 The hydrotest shall be performed after fit up test.

14.7 In case of hydrotest is performed with pig inside of the jumper, this pig shall be suitable and specified for hydrostatic pressure in place. In this case, foam pigs are not allowable.

14.8 The minimum hold period for hydrotest shall be 8 hours and the pressure test shall be in accordance with data sheet of the pipeline.

14.9 The acceptance criteria shall be in compliance with section 8.7 of Ref. [A3].

15 IN-LINE EQUIPMENT HYDROSTATIC TEST

15.1 The following requirements shall be considered when installing a pipeline with in-line equipment with valves:

15.1.1 All valves within the equipment shall be installed in a closed position;

15.1.2 After installation and before cleaning operation all valves (in contact with the cleaning fluid) shall be opened 100%;

15.1.3 After cleaning operation and before hydrotest the same valves shall be closed 50%. This will be the valve position during the hydrotest.

15.1.4 All in-line equipment branch valves shall be closed after the end of pre-commissioning activities and prior to final delivery to PETROBRAS.

15.2 CONTRACTOR shall register in a proper table for each operated valve all activities which shall be at least: valve identification, data, hour and duration of intervention, valve position before

and after intervention, torque during intervention, photos of position indication, etc.… These tables shall be supplied on data book of the hydrotest of the pipeline.

16 DISPOSAL OF TEST FLUID

16.1 CONTRACTOR might be requested to remove the treated water from the pipelines. In this case, it shall be performed in such way that no harm is done to the surrounding environment.

16.2 Water disposal procedure with chemical or not shall be in compliance with Brazilian Environmental Authorities and design requirements.

17 DOCUMENTATION

17.1 CONTRACTOR shall issue two separated procedures. One for flooding, cleaning, gauging and caliper pig operations and the other for hydrotest.

17.2 All observations shall be recorded on the appropriate forms stating clearly the event. Incomplete forms and absence of documentation should be a cause of a complete retesting.

17.3 CONTRACTOR shall supply, at least, the following documents:

17.3.1 Pipeline and heads diagram and drawings;

17.3.2 Cleaning pigs and caliper pig drawings and specification;

17.3.3 Gauge plate calculation;

17.3.4 Caliper pig function test procedure and qualification tests;

17.3.5 Caliper pig function test results report;

17.3.6 Pipeline cleaning operation;

17.3.7 Pipeline filling operation;

17.3.8 Pipeline gauging operation and acceptance of the gauging;

17.3.9 Filling, cleaning, gauging and caliper procedure;

17.3.10 Hydrostastic test procedure;

17.3.11 Estimated time calculations for pigs arrival;

17.3.12 Estimated duration calculations for each operation;

17.3.13 Pressure recording calibrations;

17.3.14 Hydrostatic test diagram;

17.3.15 24 hours hold period and log of the operation;

17.3.16 Hydrostatic test calculations;

17.3.17 Hydrostatic test evaluation and acceptance;

17.3.18 Records of failures, if applicable;

17.3.19 Pipeline sketch showing location/position of all instrument and injection connections;

17.3.20 Pressure and temperature recording charts with appropriate information spelled out;

17.3.21 Temperature data;

17.3.22 Dead-weight tester log;

17.3.23 Theoretical and hand plot pressure-volume curve;

17.3.24 Theoretical and hand plot temperature-volume curve;

17.3.25 Tide data;

17.3.26 Barometric data;

17.3.27 Instruments certificates of accuracy;

17.3.28 Calibration certificates for instruments and test equipment;

17.3.29 Calculation of pressure and temperature relationship and justification for acceptance, endorsed test acceptance certificate;

17.3.30 The hydrostatic test charts shall be commented on;

17.3.31 Data sheets of products and additives specification, supplier and amounts injected;

17.3.32 Material safety data sheets;

17.3.33 Environmental Impact Assessment, regarding to disposal of chemicals;

17.3.34 Valve settings;

17.3.35 Drawings and layout of the equipment on board of the vessel or platform or on the beach;

17.3.36 Caliper pig report;

17.3.37 Photographs of the recovered pigs and gauge plates;

17.3.38 Log of pressure and temperatures;

17.3.39 Final reports.