	TECHNICAL SPECIFICATION		Nº: I-ET-XXXX.XX-1200-600-P4X-X25		
	CLIENT: MASTER DOCUMENT			SHEET 1 of 10	
	JOB:			--	
	AREA:				
SRGE	TITLE: PIG FACILITIES			NP-1	
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PIG FACILITIES

NP-1

ESUP

SUMMARY

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1 OBJETIVES

1.1 GENERAL

- 1.1.1 This Specification covers the minimum technical requirements and design criteria, manufacture and installation for pigging facilities, for NAME OF FPSO PROJECT, which includes FPSO topside pipping and pig launchers and receivers.
- 1.1.2 All the recommendations mentioned in this document shall be followed. This specification shall be evaluated/revise by PETROBRAS with each change generated in Table 15.1.4. Risers Details in the GTD, the Subsea lay-out, Riser Balcony Lay-out and in the Operational Philosophy especifications.

2 DEFINITION

2.1 GENERAL

- 2.1.1 "PIG" shall be considered as an apparatus to be passed inside a pipe in order to keep the normal pipeline flow characteristics or integrity monitoring of subsea rigid pipelines.
- 2.1.2 Cleaning "PIG": foam, solid cast and/or multi-size rigid PIGs.
- 2.1.3 Instrumented "PIG": bidirectional monosize or one direction multi-size intrumented PIGs for caliper, metal loss or crack detection.
- 2.1.4 The "PIG" Barrels shall be considered as pressure vessel. Note that in other documents "Barrel" can be named as "Chamber" or "Scrapper Trap".

3 COMPLEMENTARY DOCUMENTS

3.1 GENERAL

- 3.1.1 The following documents are considered complementary and shall be taken into account:
- ABNT NBR 16.381 – Onshore and Offshore Pipelines – Scrapper Trap
 - I-ET-XXXX.XX-1200-941-P4X-001- GENERAL TECHNICAL DESCRIPTION
 - I-DE-XXXXX – SUBSEA LAY-OUT
 - I-DE-3000.00-1500-941-P56-002 - Riser Supports Arrangement Conceptual Design - FPSO Balcony
 - I-ET-3000.00-1200-940-PR4-001 - PRELIMINARY SUBSEA OPERATION PHILOSOPHY

4 PIG FACILITIES

4.1 GENERAL

4.1.1 The topside pig arrangement shall be compatible with the use Cleaning and Instrumented PIGs (Instrumented scrapping PIGs).

4.2 PIPING REQUERIMENTS (TOPSIDE PIGALBLE PIPELINES)

4.2.1 Topsides Valves shall be fullbore full opening; its internal diameter shall be the same as the internal pipeline diameter.

4.2.2 For any internal diameter changes, the maximum slope allowed shall be 1:5, in accordance with Figure 4.2.2.

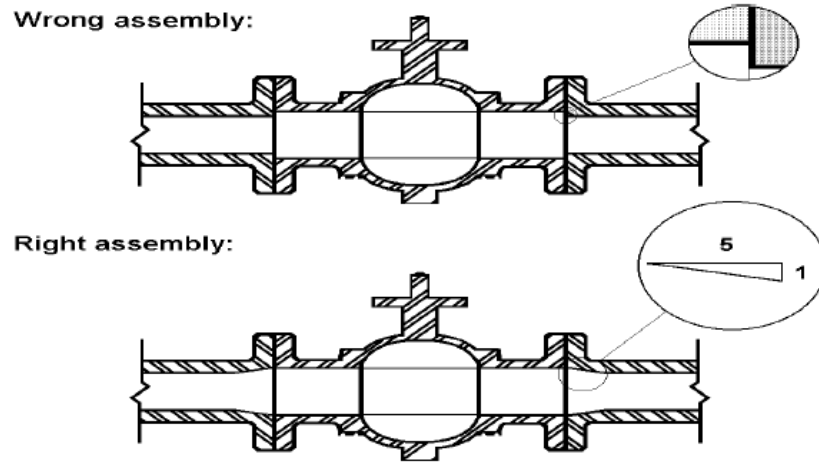


Figure 4.2.2: Internal Diameter Changes

4.2.3 All Wye shall be Piggable. Piggable Wye, can be either symmetric or not, but shall be 30° and convergent type, 2 pipeline arriving in one, in accordance with figure 4.2.3.

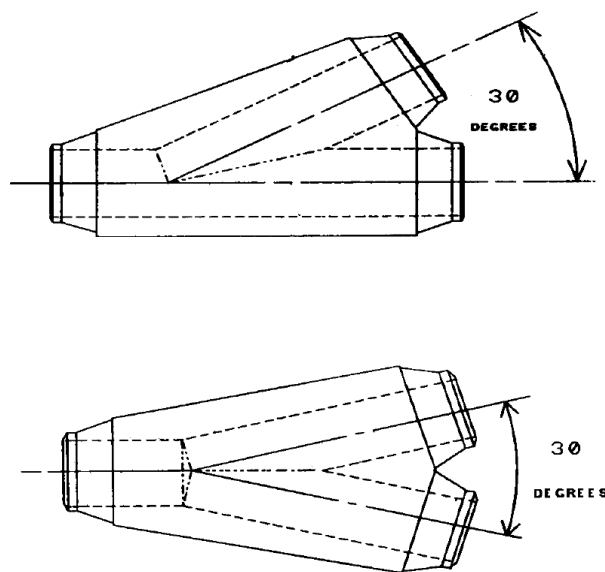


Figure 4.2.3: Piggable Wye

4.2.4 Adjoining bends or any two components or features like Tees, Wyes shall be separated by straight spool pieces of pipe with the same O.D and I.D and at least 18" (eighteen inches) long each, in accordance with figure 4.2.4.

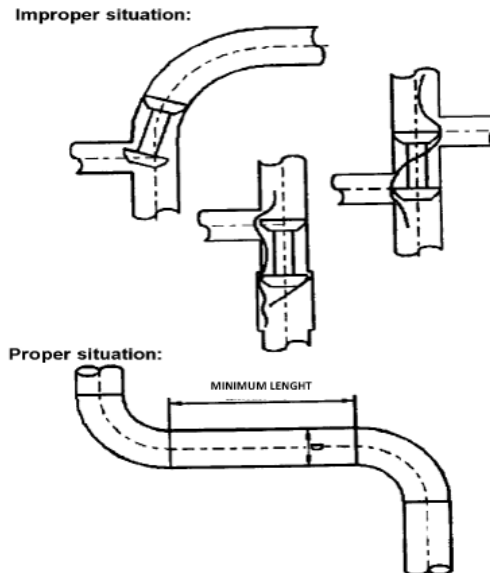


Figure 4.2.4: Minimum Straight Length

4.2.5 All bend radius shall be 18" (eighteen inches), minimum, referenced to the piping centerline.

4.2.6 CONTRACTOR shall take care during the design and construction phase to avoid any pigging problems such as protruding welds inside piping or other arrangement that cause risk to the pigging operation.

4.2.7 The allowable internal diameter variations shall be in accordance with the following items, in order to allow compatibility with Table 15.1.4. Risers Details in the GTD:

- i) With regard to P2 to P11 wells, topside piping for the service risers, including pig launcher, shall have their internal diameter minimum 6,00" to maximum 8,00".
- ii) With regard to P2 to P11 wells, topside piping for the production risers, including pig receivers, shall have their internal diameter minimum 6,00" to maximum 8,00".
- iii) With regard to I1 to I5 wells, topside piping for the water / gas injection riser lines, including pig launcher, shall have their internal diameter of 6,00" to maximum 6,50".

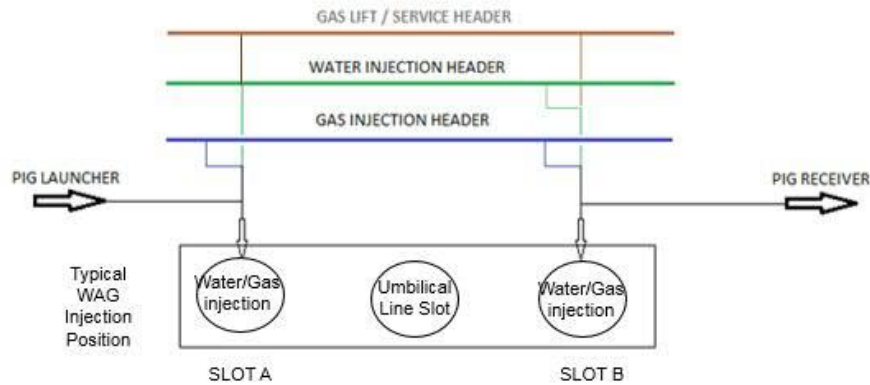


Figure 4.2.7.III: WAG injection positions (I1 to I5) typical arrangement

iv) With regard to **I6 well and HISEPT™ Service Line**, topsides piping for service risers, including pig launcher, shall have their internal diameter **minimum 6.00" to maximum 6.50"**.

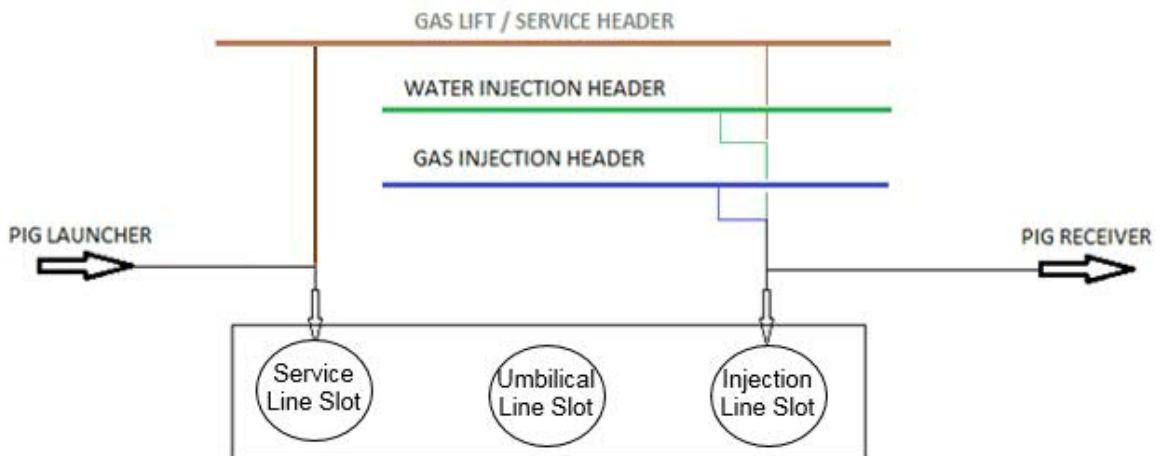


Figure 4.2.7.IV: Standalone injection position I6 arrangement

v) With regard to **I1 to I6 wells**, topsides piping for water/ gas riser injection lines, including pig receiver, shall have their internal diameter of **6.00" or 6.50"**.

vi) Positions **P1 and I7** shall be provided with pig launcher/receiver. Topsides piping, including pig launcher/receiver, shall have their internal diameter **minimum 6.00" to maximum 8.00"**.

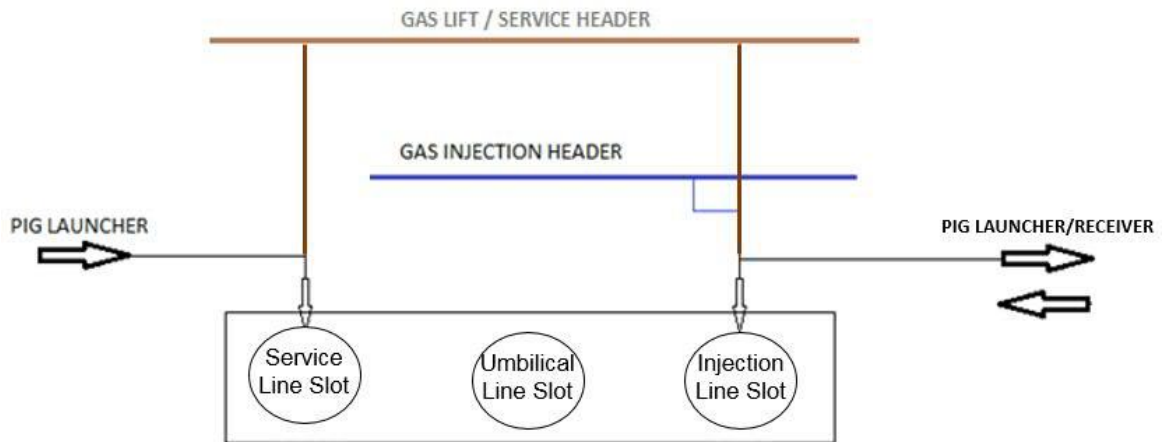


Figure 4.2.7.VI: Standalone injection position I7 arrangement

vii) In addition, CONTRACTOR may be required to perform a pig test in the yard to demonstrate that the pig can freely (without any damage) pass through each piping of the service and production pipeline systems. PETROBRAS will supply such a pig, including those to be used during the operation lifetime.

4.2.8 CONTRACTOR shall also consider topside piping sizing (internal diameter) to handle flow rates required.

4.2.9 One pig launcher shall be provided for each gas lift / service riser and for HISEPTM Service Line. One pig launcher shall be provided for each water / gas injection riser (Slot A) of positions I1 to I5 and service riser of I6 and I7.

4.2.10 One pig launcher/receiver shall be provided for production/gas injection riser P1 and one for gas injection riser I7.

4.2.11 Pig receivers shall be provided for a set of production risers (P2 to P11). Pig receivers shall be provided for a set of water / gas injection risers for positions I1 to I5 (Slot B) and I6.

4.3 REQUIREMENTS FOR LAUNCHER, RECEIVER AND LAUNCHER/RECEIVER (SCRAPPER TRAP)

4.3.1 For offshore scrapper trap, CONTRACTOR shall comply with the all requirements of the NBR 16381, for instrumented pigging all wells.

4.3.2 The design may consider the depressurization through the pig receiver.

4.3.3 The pig receiver and pig launcher/receivers of the wells shall be installed in horizontal direction.

4.3.4 The pig launchers shall be preferably installed in horizontal direction.

4.3.5 The pig launcher/receiver and pig receiver shall have adequate basket inside for proper pigging operation.

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- 4.3.6 A system for collecting drainage from receivers, launcher and launcher/receivers shall be provided.
- 4.3.7 Space, trolleys, carts or any device suitable for PIG handling shall be part of the CONTRACTOR scope.
- 4.3.8 Pigging system shall consider pressure indicators in different scale ranges to guarantee accuracy in lower pressure measurements.
- 4.3.9 CONTRACTOR shall provide safety interlock device for pigging operations, such as key interlock.
- 4.3.10 All topsides piping, free access areas, launcher and launcher/receiver nominal/internal diameter and length shall comply with the requirements of the NBR 16381 and shall be submitted to PETROBRAS comments/information before placing orders.
- 4.3.11 A Preliminary General Arrangements representing the required free access areas shall be also submitted to PETROBRAS comments/information
- 4.3.12 All pig receivers and pig launcher/receiver shall have line to test separator in order to allow receiving fluids from risers after flushing during commissioning and WAG operations.
- 4.3.13 All the pig launcher/receivers, pig launchers and pig receivers installation implies in providing facilities to inject lift-gas to push the pigs, as well as other fluids required. It means that the topside manifolds shall allow to leak test the risers with water, circulate diesel with or without pigs and push pigs using lift gas also.
- 4.3.14 All of those subsea service operations (diesel circulation, leak test, pigging, etc.) shall be done using facilities onboard. CONTRACTOR shall take into account the requirements of those operations, for example, volume control, pressure control, etc.).
- 4.3.15 The unit shall have facilities and space to allow the injection of nitrogen in risers/subsea system. The NGU (Nitrogen Generator Unit) will be supplied by PETROBRAS (approximately 3 skids of 2.6 x 6.3m demanding air, water and electricity).
- 4.3.16 TEMPORARY PIG LAUNCHER/RECEIVER FOR RIGID RISERS
- 4.3.16.1 For production and injection rigid risers positions CONTRACTOR shall provide a connection flange (NOTE 1) and free access area in order to allow the mounting and operate (CONTRACTOR scope) a temporary vertical PIG Launcher/Receiver

(PETROBRAS supply scope) just in case an in-line inspection service be needed, with umbilical and/or bidirectional instrumented PIG.

- 4.3.16.2 For production and injection rigid risers positions CONTRACTOR shall use a bend radius for the piping from the upper riser balcony until the spool piece connected to the rigid riser of **18" (eighteen inches)**.
- 4.3.16.3 For such operations, access for opening/closing the Launcher/Receiver barrel shall be provided, as well as a connection point and space for assembling a temporary pipping for N2/water/diesel supply.
- 4.3.16.4 CONTRACTOR shall provide free access area according to the Figure 4.3.16.4 and Table 4.3.16.4. The dimensions and other requirements shall be confirmed during project execution phase.

NOTE 1: The connection flange must be located between riser and "topside convergent wye".

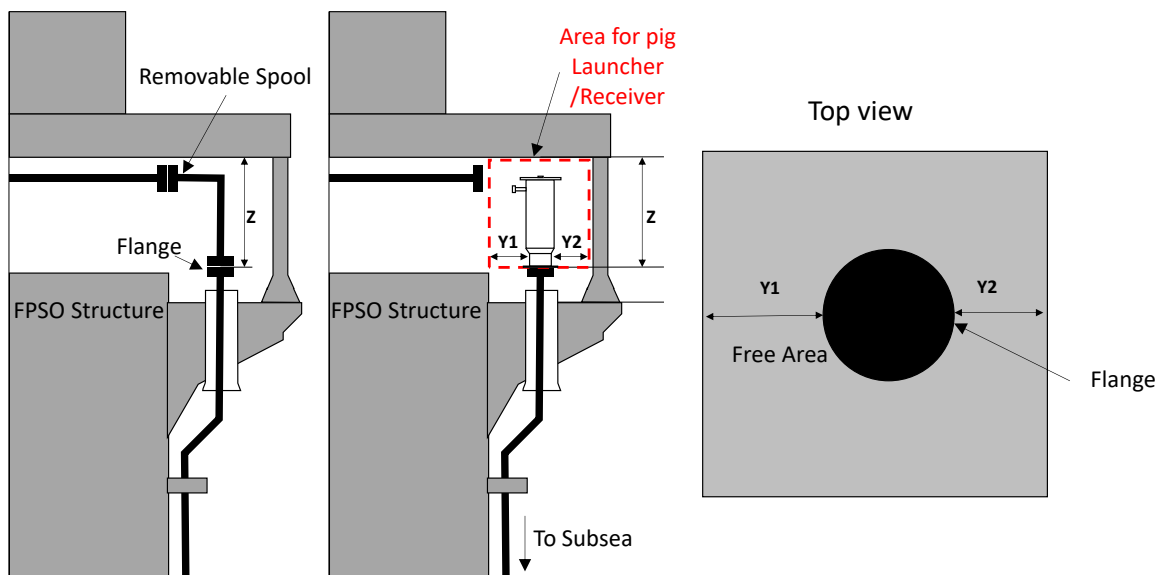


Figure 4.3.16.4: Free area for temporary PIG Launcher/Receiver mounting for production rigid risers

Minimum Free Area for PIG temporary Launcher/Receiver for production SLWR (note 2)		
Y1 (Side clearance)	Y2 (Side clearance)	Z (Vertical distance from flange to upper obstacle)
1 m	1 m	3.8 m

Table 4.3.16.4: Access area sizing for temporary PIG Launcher/Receiver for production rigid risers

NOTE: Distances in Table 4.3.16.4 are the minimum requirement and must be confirmed by PETROBRAS during execution phase.

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4.3.16.5 Temporary pig Launcher and Receiver will have the following basic dimensions:

- Maximum weight: 3,000 kg.
- Maximum dimensions:
 - Length: 3.5 m;
 - Barrel External Diameter: 675 mm.

NOTE: Temporary pig Launcher and Receiver will be taylor made for each case, for this reason, information such as drawings and P&IDs are not available. If a special connection is required, it will be part of the design of temporary pig launcher / receiver. The connection on the temporary pig launcher/receiver will be flanged to corresponding topside piping class.