PETROBRAS	TECHNICAL SPECIFICATION	No. I-ET-3010.00-1200-295-P4X-001	
	CLIENT: -		SHEET 1 of 30
	JOB: -		-
	AREA: -		
SRGE	TITLE: **REQUIREMENTS FOR PIG LAUNCHER AND RECEIVER DESIGN**		INTERNAL
			ESUP

MICROSOFT WORD / V.2010 / I-ET-3010.00-1200-295-P4X-001_D

INDEX OF REVISIONS

REV.	DESCRIPTION AND/OR REVISED SHEETS
0	ORIGINAL ISSUE.
A	ITEM 5.1. ADDED.
B	GENERAL REVISIONGENERAL REVISION
C	ITEMS ADDED: 5.5.5, 5.13.3, and 8.1.2; ITEM REVIEWED: 5.1.2, and 5.5.2.ITEMS ADDED: 5.5.5, 5.13.3, and 8.1.2; ITEM REVIEWED: 5.1.2, and 5.5.2.
D	GENERAL REVISION FOR PACXE.

	REV. 0	REV. A	REV. B	REV. C	REV. D	REV. E	REV. F	REV. G	REV. H0
DATE	AGO/18/18	OCT/17/19	APR/22/21	JAN/20/22	NOV/08/22				
DESIGN	EEA/EBET	EEA/EBET	EEA	EEA	EEA				
EXECUTION	PONTE	PONTE	CJV5	HR7W	HR7W				
CHECK	WALBER	WALBER	CXDI	CXDI	CXDI				
APPROVAL	JUVENTINO	GONZALEZ	U32N	U32N	U32N				

SUMMARY

1 INTRODUCTION

This specification establishes the technical requirements for Pigable lines, Pig Launcher, Pig Receiver and Pig Launcher/Receiver for **BUYER** offshore facilities.

This technical specification establishes complementary requirements to be met on design, material acquisition, manufacturing, construction and assembling for Pigable lines, Pig Launcher, Pig Receiver and Pig Launcher/Receiver in **BUYER** units.

For pigable lines the physical limits are according to piping spec informed on P&ID.

This technical specification is based on the following normative/codes: ASME BPVC Sec. VIII Division 1 and 2, ASME B31.3, ASME B31.4, ASME B31.8, ABNT NBR 12712, ABNT NBR 15280-1, DNV OS F101 and ABNT NBR16381.

2 TERMS AND DEFINITIONS

For the effects of this specification, the following terms and definitions are applied.

- **Automatic Launcher:** device that allows the automatic launching of pigs into a pipeline, provided with specific piping arrangements, in accordance with the service or manufacturer.
- **Converging "Y":** fitting connecting two pipelines to a third one and which allows the passage of pigs through the point of intersection among the pipelines.
- **Explosive Decompression:** increase in volume presented by plastic materials when rapidly exposed to atmospheric pressure after a long period of contact with high pressure vapor liquids or pressurized gases. The expansion occurs by the vaporization of the liquid or decompression of the gas absorbed by these materials.
- **Foam Pig:** pig manufactured of polyurethane foam, with the capability of passing through severe obstructions in the pipeline.
- **Full Bore Valve:** valve that permits an unobstructed passage, and with the same inside diameter along its entire length.
- **Launcher Trap (Launcher):** device that allows the launching of pigs.
- **Launcher/Receiver Trap (Launcher/Receiver):** device that allows both pig launching and pig receiving.
- **Major Barrel:** portion of the pig barrel that has the greatest diameter, from where the pig is inserted or removed.
- **Minor Barrel:** portion of the pig barrel that has the smallest diameter.
- **SELLER:** all players performing related activities within the scope of supply, it includes manufacturer, packager, main contractor, subcontractors, suppliers, sub suppliers, integrators, constructors, and all technical personnel involved within the scope of this document, they are all referred to as being a **SELLER**.
- **Pig Diverter:** fitting connecting a pipeline to other pipelines, and which allows the selective passage of pigs, allowing them to be directed to the selected pipeline.

- **Pig Trap:** device connected to the ends of a pipeline or sections of pipeline for launching or receiving a pig, composed by: major barrel, minor barrel, quick opening closure, kicker branch, bypass branch and other branches for instruments, drains, vents, etc.
- **Shared Launcher:** device intended to launch pigs in pipelines connected by means of a pig diverter or a similar fitting.
- **Receiver Trap (Receiver):** device that allows the receiving of pigs.
- **Receiving Basket:** removable cylindrical device used in receiver traps or launcher/receiver trap to keep the foam pig retained in the major barrel to facilitate its removal.
- **Recommended Practice:** an item that matches the good practices of engineering, but it is not mandatory by international codes.
- **Shared Receiver:** device intended to receive pigs from pipelines connected through a converging “Y” or similar fittings.
- **Through Conduit Valve:** full bore valve with an unobstructed and continuous cylindrical opening.
- **Treated Gas:** natural gas treated after heavier components removal process. This gas is composed basically of methane.

3 NORMATIVE REFERENCES

3.1 INTERNATIONAL STANDARDS

3.1.1 ANSI/NACE MR0175/ISO 15156 - Petroleum, petrochemical, and natural gas industries — Materials for use in H2S-containing environments in oil and gas production

3.1.2 ASME Boiler and Pressure Vessel Code - Section VIII - Division 1

3.1.3 ASME Boiler and Pressure Vessel Code - Section VIII - Division 2 - Alternative Rules for Design & Fabrication of Pressure Vessels;

3.1.4 ASME B16.9 – Factory-Made Wrought Buttwelding Fittings (maximum slope angle according to item **Figure 1**);

3.1.5 ASME B16 47 – Large Diameter Steel Flanges;

3.1.6 ASME B31.3 – Process Piping;

3.1.7 ASME B31.4 – Pipeline Transportation Systems for Liquid Hydrocarbons and Other Liquids;

3.1.8 ASME B31.8 – Gas Transmission and Distribution Piping Systems;

3.1.9 MSS SP-44 – Steel Pipeline Flanges;

3.1.10 MSS SP-75 – Specification for High-Test, Wrought, Butt-Welding Fittings.

3.1.11 NACE SP-0286 – Electrical Isolation of Cathodically Protected Pipelines.

3.2 BRAZILIAN STANDARDS

3.2.1 ABNT NBR 12712 - *Projeto de sistemas de transmissão e distribuição de gás combustível*;

3.2.2 ABNT NBR 15280-1 – *Dutos Terrestres – Parte I: Projeto*;

3.2.3 ABNT NBR 15280-2 – *Dutos Terrestres – Parte II: Construção e Montagem*;

3.2.4 ABNT NBR 15827 - *Válvulas industriais para instalações de exploração, produção, refino e ABNT ABNT transporte de produtos de petróleo — Requisitos de projeto e ensaio de protótipo*;

3.2.5 ABNT NBR 16381 – Onshore and offshore pipelines — Pig-trap.

3.3 BRAZILIAN LEGISLATION

3.3.1 NR - *Normas Regulamentadoras Brasileiras*.

3.3.2 ANP RTDT – *Regulamento Técnico de Dutos Terrestres*

3.3.3 ANP SGSO – *Regulamento técnico do sistema de Gerenciamento da Segurança Operacional das instalações marítimas de perfuração e produção de petróleo e gás natural*.

3.3.4 SGSS – *Regulamento técnico do sistema de Gerenciamento da Segurança Operacional de sistemas submarinos*.

3.4 DESIGN DOCUMENTS

3.4.1 I-ET-3010.00-1200-800-P4X-013 – GENERAL CRITERIA FOR INSTRUMENTATION PROJECTS

4 REQUIREMENTS FOR PIGABLE LINES

4.1 GENERAL

4.1.1 If inner diameter variation occurs, the transition region shall have a slope of 1:5 ratio.

4.1.2 If the pipeline have two consecutive derivations (or branches), the minimum distance between them shall be observed in order to avoid the pig stuck into the pipe, as show in **Figure 9**. The minimum distance recommended between them is three times the nominal diameter of the main pipe.

4.1.3 For pigable systems, the inside diameter of pipes and fittings located between the barrel reduction and pipeline derivation shall not be smaller than the smallest pipeline inside diameter.

4.1.4 If the inside diameter of pipes and fittings located between the barrel reduction and main pipe derivation are different, shall be provided a conical diameter transition, maximum inclination 1:4 (30 degrees of the pipe wall).

4.2 PIPE BENDING

Pipe bending shall be according to the respective piping specification.

4.3 DERIVATIONS

4.3.1 For pig traps, the bypass and main branches shall be assembled horizontally (3 or 9 o'clock positions) or on the top of pipe (12 o'clock position). The branches cannot be located on the bottom of pipe (6 o'clock position) or in any descending position.

4.3.2 Pipe branches shall have pig guide bars installed to avoid pig passage.

a) The branches with diameter equal or larger to half pipeline nominal diameter shall be provided with guide bars according to **Figure 11**of **ANNEX 1**.

b) For pipelines with variable diameters the nominal diameter is considered the smaller diameter of the pipeline.

5 PIG LAUNCHER AND RECEIVER

5.1 SCOPE OF SUPPLY AND RESPONSIBILITY

5.1.1 **SELLER** is responsible to furnish to **BUYER** pig traps and pig system with all accessories for their proper operation. Pig traps physical limits are shown on **ANNEX 1,** see **Figure 5**, **Figure 6** and **Figure 7**.

5.1.2 **SELLER** is responsible for pig traps and pig system operability and safety.

5.1.3 It is included in the **SELLER** scope of supply at least the following items:

- Pig traps: provided with closure, major barrel, reduction, minor barrel, nozzles, and flanges,
- Pig system and its accessories,
- Interface connection between pig trap and pig system,
- Maintenance and handling access,
- Supports and saddles,
- Pad eyes,
- Leakage basin,
- Manometers,
- Quick opening closure (suitable to safety interlocking system);
- Basket (for receivers),
- All required nozzles and flanges.
- Special tools (if applicable)
- Installation
- By-pass line,
- Valves, pig indicators and Instruments
- Grated tees,

5.1.4 **SELLER** is responsible to furnish pig traps with the classification society certification.

5.1.5 **SELLER** is responsible to furnish to **BUYER** approval at least the following design documents:

- Calculation reports
- Equipment datasheets
- Closure datasheet
- Valves datasheet and drawings (for block valve, throttling valve and thermal relief valve);

- General Arrangement Drawings;
- Fabrication drawing containing: list of materials, constructive details and identification plate;
- Receive basket drawing
- Installation Drawings.
- Rigging procedure
- Material requisitions
- Spare part list and special tools list
- Maintenance and Operation Handbooks
- Equipment Databook
- 3D model according to **BUYER** digital engineering documents.

5.1.6 It is **SELLER** responsibility to predict a safety interlocking sequence for valves operation. This sequency shall be consolidate and submitted to **BUYER** approval.

5.1.7 **SELLER** is also responsible to furnish to **BUYER** valves datasheets and the safety interlocking sequence

5.2 GENERAL ARRANGEMENT

5.2.1 General arrangement for pig traps (Launchers, Receivers, and Launcher/receiver) shall be according to **Figure 5**, **Figure 6** and **Figure 7** presented on **ANNEX 1**.

5.2.2 For main dimensions see **Table 2** and **Table 3** presented on **ANNEX 1**.

5.2.3 Design allowable tolerance for dimensions L_1 and L_2 shall not exceed $\pm$3 millimeters.

5.3 GENERAL REQUIREMENTS FOR DESIGN AND INSTALLATION

5.3.1 It is recommended that the elevation of the bottom of the major barrel to be 1 m (one meter) above the operation floor. **[Recommended Practice]**

Note: The access area between the bottom of the barrel and the operation floor shall be sufficient for the installation of the fittings for drainage connections or basin and other accessories.

5.3.2 The design code and internal diameter of minor barrel shall be the same of its connected pipeline. To avoid pig damage, no gap between equipment and pipeline is permitted. The design code for major barrel may be the same of the minor barrel except otherwise previous defined by classification society.

5.3.3 **SELLER** may provide ancillaries handling devices and their supports to make easy the pig introduction/removal. **[Recommended Practice]**

5.3.4 The installation of pig traps parallel to the floor (no slope) shall be preferred. For installations with space restrictions, the arrangement of the pig traps overlapping or vertically is admitted. **[Recommended Practice]**

5.3.5 The type of pig traps supports shall be defined after the pipeline system flexibility calculation report. In case of ASME B31.8 has been used, the anchor saddles shall be welded in a full encirclement pad as requested by the code.

5.3.6 Pig traps shall be flanged connected with the pipe. The flange type shall be the same as its connected pipe specification defined in the respective P&ID.

5.3.7 The inside diameter of the major barrel shall have a minimum clearance in relation to the smaller inside diameter of the pipeline, corresponding to the smallest of the following values: 25% of the outside diameter of the pipeline or 89 mm (3 1/2 in).

5.3.8 The intelligent launcher and launcher-receiver trap of a pipeline with a nominal diameter starting at 150 mm (6 in), shall have a flanged nozzle, according to item 18 of **Table 4** (see **Figure 5** and **Figure 7** in **ANNEX 1)**, with a nominal diameter of 50 mm (2 in), to facilitate the pig insertion into the minor barrel, with the help of a pulling cable. This nozzle shall be installed horizontally (3 or 9 o'clock positions), sloped at 45°.

5.3.9 A sampling outlet with nominal diameter of 25 mm (1") shall be installed on the drain branch, next to the closure according to **Figure 8**.

5.3.10 Pig trap nozzles shall be made in accordance with the requirements of the respective pipe specification branch connection. The use of set-in nozzle type (and reinforcement pad) is also allowed. **SELLER** shall avoid in all circumstances the use of set-on type.

5.4 MATERIAL SELECTION

5.4.1 Whenever applicable the material selection for pig traps shall be according to MATERIAL SPECIFICATION, which is a document supplied by **BUYER** during the basic design. However, if material selection was not previously defined in any documentation, **SELLER** shall use for pig traps the same material of its connected pipeline (see the respective PIPING SPECIFICATION provided by **BUYER**). In this case, **SELLER** may consult **BUYER** for clarification.

5.4.2 When sour service is expected the material selection shall be in accordance with the requirements of ISO 15156.

5.5 ERGONOMIC REQUIREMENTS

5.5.1 **SELLER** shall comply with ERGONOMICS REQUIREMENTS, which is a document issued by **BUYER** during the basic design.

5.6 BARREL REDUCTION

5.6.1 The barrel reduction for pig launcher and launcher/receiver shall be eccentric.

5.6.2 The barrel reduction for pig receivers shall be concentric.

5.6.3 For pig launcher installed in vertical position, the barrel reducer shall be concentric

5.6.4 The maximum slope angle of the reducers shall be 11° (see **Figure 1**).

5.6.5 Reduction fabrication shall be according to the following standards: ASME B16.9, MSS SP-75 or another equivalent normative.

5.6.6 If the reduction is fabricated by rolled plate, the longitudinal weld shall have traceable quality and the weld certificate shall be in the Databook.

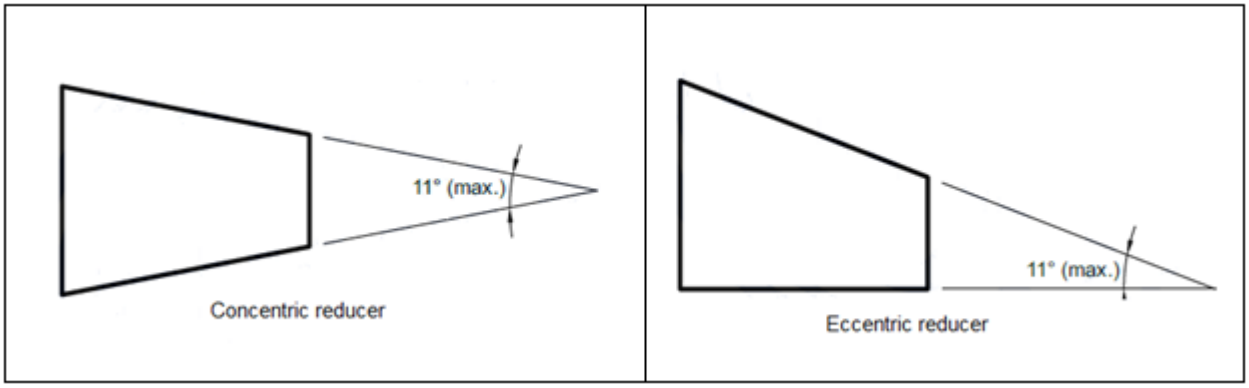


Figure 1 – Maximum included angle of the reducers

5.7 RECEIVING BASKET

5.7.1 **SELLER** is responsible to furnish a receive basket for each pig receiver and pig launcher/receiver for their proper operability.

5.7.2 Pig receiving basket for launcher/receiver shall be designed considering the use of an eccentric reducer.

5.7.3 The receiving basket dimensions describe in **Figure 12** shall be used for receiving foam pigs.

5.7.4 The receiving basket shall be installed in the receiver trap before the foam pig is placed in the launcher trap.

5.8 CLOSURE

5.8.1 Closure design shall be according to ASME BPVC Section VIII division 1 or alternatively using ASME BPVC Section VIII division 2.

5.8.2 The closure drive system shall be provided with a pressure warning device which prevents closure opening when the barrel is pressurized.

5.8.3 Closure shall be designed considering the safety interlocking system.

5.8.4 The closure drive system shall be quick opening/ quick closing type, provided with hinge or other mechanism capable to support the moving part during the opening and closing operation.

5.8.5 The closure drive system shall be designed and tested considering the maximum period of two minutes for the opening and closing operation, that shall be performed by only one person with no additional tools other than the specified and provided by **SELLER**.

5.8.6 Closure sealing material and closure safety system shall be designed to be resistant to the specified process fluid at both operational and design conditions (temperature, pressure, pressurization rate and depressurization).

5.8.7 The Closure locking system shall be uniformly distributed along the entire sealing regions.

5.8.8 For pipelines containing gaseous product, the sealing material specification shall be designed for explosive decompression resistant.

5.8.9 Hydrostatic and leak tests shall be performed.

5.8.10 **SELLER** shall provide the minimum number of operations for seal system change.

5.8.11 Closure opening criteria: clockwise, 180 degrees.

5.8.12 Closure and major barrel are connected; therefore, closure dimensions shall be matching with the major barrel diameter.

5.8.13 Safety system for closure operation.

5.8.14 Supports, fixing and installation plan.

5.8.15 Weld procedure specification (WPS) and weld procedure qualification record (WPQR).

5.8.16 The type of finishing and coating used at sealing areas shall be specified, e.g. Inconel 625 overlay at sealing ring contact area.

5.8.17 **SELLER** shall provide the maintenance plan, including spare part list and reference codes (part numbers). Spare parts shall be provided considering one operation per month for two years, including preventive and corrective maintenances.

5.9 PRESSURE EQUALIZATION SYSTEM

5.9.1 A pressure equalization line of the pig trap shall be installed equipped with a block valve and a throttling valve.

5.9.2 The pipe nominal diameter shall be 25 mm (1 in) for pipelines with a nominal diameter up to 150 mm (6 in) and 50 mm (2 in) for the other nominal pipeline diameters.

5.9.3 The throttling valve shall be a needle type valve with ¾ inches diameter (NPS ¾). Reducers shall be used in order to the needle valve diameter coincide with the equalization line diameter.

5.9.4 Pipelines with possible scaling shall be provided with flanges to facilitate disassembly and internal cleaning. The equalization line shall be installed as close as possible to the barrel and bypass line duly supported.

5.9.5 The by-pass and main branches shall be installed horizontal (3 h or 9 h positions) or on the top of pipe (12 o'clock position). The branches cannot be located on the bottom of pipe (6 o'clock position) or in any descending position.

5.10 ACCESS AREA FOR HANDLING

5.10.1 **SELLER** shall comply with the requirements of HANDLING PROCEDURES, which is a technical specification issued by **BUYER** during the basic design.

5.10.2 An access area shall be provided directly behind the barrel (see **Figure 2**).

5.10.3 The minimum area dimensions indicated to installations for operation with intelligent pigs is presented in **Table 1**.

5.10.4 For exclusive use of non-intelligent pigs, the area dimensions may be reduced as shown in the notes of **Table 1.**

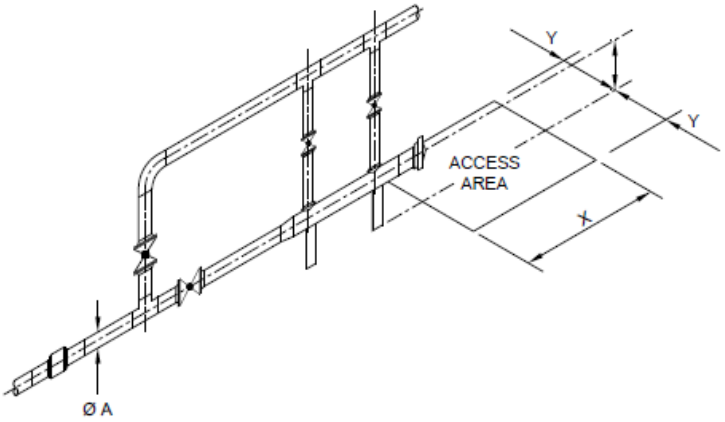


Figure 2 – Definition of access area

Table 1 – Access area for intelligent pig traps

Nominal Diameter ΦA [mm]	Access Area	
	"X" [mm]	"Y" [mm]
100 a 350 (4" a 14")	L_1 +1000	1000
400 a 750 (16" a 30")	L_1 +1000	1400
800 a 1100 (32" a 42")	L_1 +1000	1750

NOTES:

1) the access area for launchers e receivers (for non-intelligent pig operation), shall be considered dimension “X” equal to 1500 mm for nominal diameters up to 12 inches (NPS12) and 2000 mm for nominal diameters of 14 inches (NPS14) and 16 inches (NPS16), and dimension “Y” equal to 750 mm;
2) dimension L_1 is referring to **Table 2** and **Table 3** of **ANNEX 1**.

5.11 DRAINAGE SYSTEM

5.11.1 For offshore facilities the drainage system shall be using a closed type drainage circuit, i.e., the drainage product collected in drainage basin shall be conducted by pipe to a closed reservoir /tank.

5.11.2 A drainage basin shall be provided with a capacity equal to 1.2 times the total volume of the launcher or receiver.

5.11.3 The basin shall be positioned beneath the barrel according to **Figure 3** and be covered with a removable grating. The depth of the basin shall be at least 150 mm.

5.11.4 Drains standardization shall be according to the pipe specification document provided by **BUYER**.

5.11.5 For inclined or vertical launchers drain (item 7) shall be installed as close as possible to valve (item 5), items according **Table 4**.

5.11.6 Pipes with possible scaling shall be provided with flanges to facilitate disassembly and internal cleaning.

5.11.7 For drainage of high viscosity liquids shall be predicted a system in order to facilitate the fluid flow through the drain pipe, e.g.: an electrical heating system.

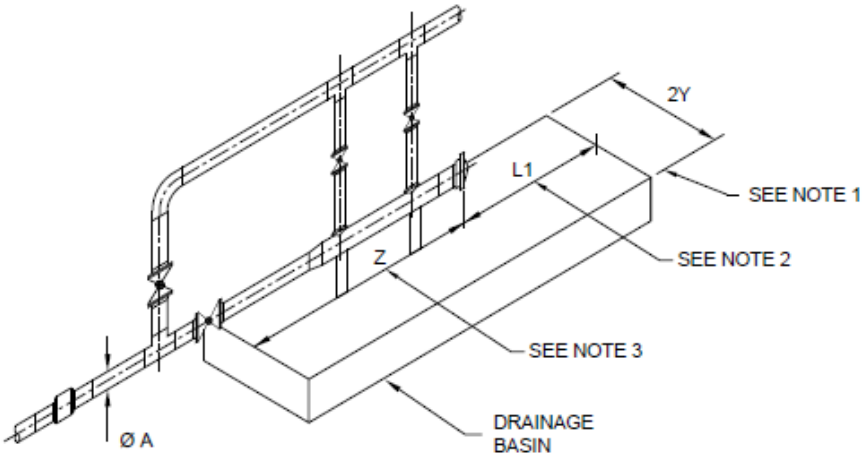


Figure 3 – Locating of drainage basin for launchers, receivers, and launchers/receivers

Notes:

1) dimension Y according to **Table 1**.
2) dimension L_1 according to **Table 2** and **Table 3** of **ANNEX 1**;
3) minimum dimension for “Z” is 1 m (one meter).

5.12 MANOMETERS

5.12.1 Two pressure indicators shall be installed in the pig trap. First one shall be installed before reducer (near the closure) and the second one shall be installed after the reducer (between reducer and block valve). These both pressure indicators shall be capable to indicate the barrel operating pressure in the middle third of the scale range.

5.12.2 The installation of a third pressure gauge on the barrel is recommended provided with block and drain or vent valves. This third pressure gauge of the barrel shall be a “pressure and vacuum” one with measurement scale of 760 mmHg (vacuum) - zero - 2.0kgf/cm^2. The safety interlocking system shall encompass the valve of this pressure gauge for overpressure protection. **[Recommended Practice]**

5.12.3 The “pressure and vacuum” gauge shall be installed with overpressure protection (set at 2.2 kgf/cm^2) and the assembly of pressure and vacuum gauge and protection kit shall be sealed with clean and appropriate liquid (ethylene glycol or glycerin).

5.12.4 The connections of pressure indicators shall be flanged and provided with a blind flange. The diameter of these connections shall be according to I-ET-3010.00-1200-800-P4X-013 – GENERAL CRITERIA FOR INSTRUMENTATION PROJECTS.

5.12.5 Item **5.12.2** is a mandatory requirement if previously mentioned in any document or process and instrumentation drawings submitted by **BUYER**.

5.13 VENTS

5.13.1 Two vents shall be installed; one upstream and another downstream from the reducer, to make possible the adequate filling or depressurizing of the pig trap.

5.13.2 When the passage of an intelligent pig is expected, a branch shall be installed in the pig trap, with a block valve, for nitrogen injection, positioned upstream from the atmospheric vent block valve which is installed closest to the closure; according **Figure 10**. The nitrogen injection branch shall have a check valve to avoid that the product being transported by the pipeline return to the nitrogen system (see **Figure 10**).

5.13.3 In additional to the atmospheric vents, barrel pressure relief shall be executed first using a closed system directed to the FPSO flare.

5.13.4 In installations that require closed system vents, there shall be vents additional to the atmospheric ones.

5.14 VALVES

5.14.1 Valves with a nominal diameter greater than or equal to 300 mm (12 in) should be motorized, driven by electromechanical, hydraulic or pneumatic systems.

5.14.2 The valves (**Table 4** items 5, 12 and 13) shall be trunnion mounting and full-bore type according to API SPEC 6D.

5.14.3 The pig trap block valve (**Table 4** item 5) shall be “Through-Conduit” type, full bore according to API SPEC 6D.

5.14.4 For any variation between the inside diameter of the valve and the pipe, the sharp edges shall be beveled with maximum slope of 1:4 (30° with the piping wall).

5.15 THERMAL RELIEF VALVE

5.15.1 A thermal relief valve shall be installed in the barrel, preferably connected to the pipeline, for pipelines transporting products with a liquid phase (**ANNEX 1Table 4** item 3).

5.15.2 Pig traps working with a liquid phase fluid shall have a relief valve for in case of fluid´s temperature increase inside the barrel.

5.16 PIG PASSAGE INDICATOR

5.16.1 Pig passage indicators (item 4 of **Table 4**) shall be installed at a minimum distance from the trap´s block valve, in accordance with dimension L_2 of the **Table 2** and **Table 3** of **ANNEX 1**.

5.16.2 Pig passage indicators shall be capable of detecting the passage of foam pigs, located at the following position:

a) at the top of the pipe or side surface;
b) within the limit of dimension L_2.

5.16.3 The ultrasonic type indicators shall be installed on the 3 or 9 o’clock positions. The ultrasonic transducers of the intrusive type shall face the inside wall thickness of the pipe, so as to not damage or be damaged by the pig.

5.16.4 For pipelines conveying only liquid, the pig passage indicator shall be an active ultrasonic non-intrusive.

5.16.5 For pipelines conveying treated gas, with no presence of condensed liquid, the pig passage indicator shall be intrusive active ultrasonic type.

5.16.6 For pipelines conveying non-treated gas, with the possibility of condensing or liquid, the pig passage indicator shall be the acoustic non-intrusive type.

5.16.7 Intrusive sensors shall be installed face to face with the inner pipe wall, in order to not suffer damage during the pig passage.

5.16.8 Each facility shall be evaluated in order to define if classified area indicators are applicable.

5.16.9 For offshore facilities with control room, pig indicators shall have both local and remote indications.

5.17 DATABOOK

5.17.1 **SELLER** is responsible to furnish a data book containing at least the following documents:

a) detailed drawing of the pig trap;
b) pig trap mechanical calculation report;
c) list of materials, containing a complete specification of all materials used in the manufacture of the pig trap, such as: pipes, plates, fittings and gaskets;
d) materials certificates;
e) weld maps;
f) weld procedure specification (WPS) and weld procedure qualification record (WPQR);
g) spreadsheet containing the identification of the welded joints, with their respective required procedures and testing;
h) procedures for nondestructive testing, stress relieving (when applicable), for hydrostatic tests and painting or coating;
i) visual and dimensional inspection and weld size reports;
j) reports for the nondestructive testing executed on the welded joints;
k) post weld heat treatment report, when applicable;
l) hydrostatic test report;
m) painting or coating report;

5.18 NAMEPLATE

5.18.1 Pig launcher, receiver and launcher/receiver shall have an identification plate made of aluminum or stainless steel AISI 316, with at least the following information written in Portuguese:

a) designer;
b) manufacturer;
c) manufacture year or assembly year;

d) design code;
e) design pressure; hydrostatic pressure test and, date of the hydrostatic test execution;
f) design Temperature; maximum and minimum operation temperature;
g) body material and corrosion allowance;
h) fluid;
i) capacity and dry weight and full weight;
j) TAG: **XX-YYYY.YYZZ**.

where: **XX** = pig trap type; e.g.: LP =Pig Launcher; **YYYY.YY** = facility identification; **ZZ** = sequential number for the installation of pig launcher or receiver.

5.19 FLANGES

5.19.1 Flanges shall be designed according to the following standardization ASME B16.5, ASME B16.47, API 6A, ISO 27509 or ASME BPVC section VIII, Division 1 or 2. Flanges shall be compatible with piping flange interface connections (see PIPING SPECIFICATION), attention for material and piping class.

5.19.2 Flange and pipe shall have the same inside diameter.

5.19.3 Flange materials shall have better, or at least the same, pipe mechanical resistance.

5.19.4 If the use of flanges of high strength is necessary, the standard MSS SP-44 may be used.

5.19.5 Overlapped flanges or rolled plate flanges will not be accepted.

5.19.6 Clamp type connections (e.g.: grayloc) are not accepted.

5.20 LIFTING SYSTEM

Supplier shall provide the pig trap with pad eyes (lifting lugs) devices according **Figure 4**.

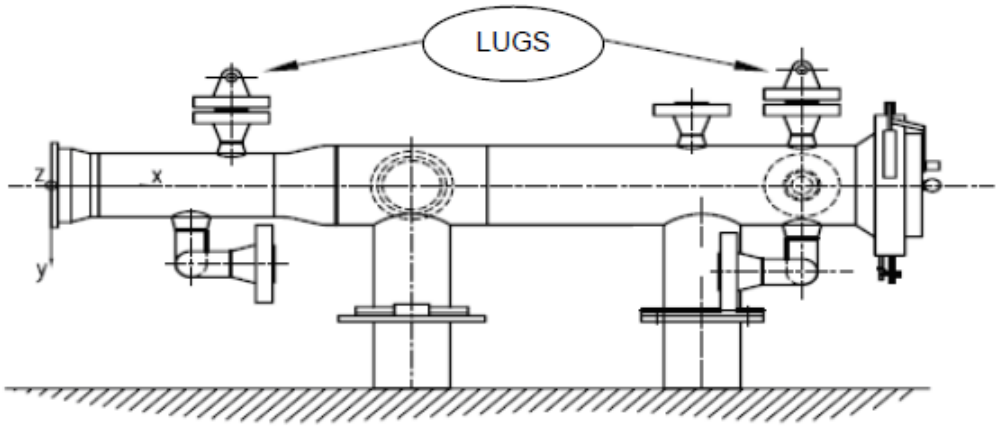


Figure 4 – Lifting lugs position

5.21 FABRICATION AND SUPPLY REQUIREMENTS

5.21.1 Minimum requirements for packing and transportation.

5.21.2 The flanged ends shall be blanked off with wood or plastic protective covers for the protection of the faces of the flanges.

5.21.3 Closure detailed operation, maintenance and inspection plan shall be supplied by **SELLER**.

5.21.4 Contact surfaces of flanges shall be protected against corrosion by applying non water-soluble anti-corrosion grease or removable vinyl resin varnish.

5.21.5 The flanges shall be stored indoors, on shelves or wooden pallets, separated by diameter, wall thickness, pressure class and other characteristics. The flanges with a nominal diameter above 150 mm (6 in) shall be stored and handled only on wooden pallets.

5.21.6 Welding neck flanges bevels shall be protected by removable vinyl resin varnish.

5.21.7 Closure's sealing ring shall be protected with Vaseline. The spare ring shall be stored in a plastic package.

5.22 WELDING, INSPECTION AND FINISHING

5.22.1 Pig trap inside surface shall not have irregularities and not contain deposits; otherwise this could damage or restrict pig passage.

5.22.2 During the welding process, the root pass shall be executed in order to reduce penetration excess, as reference the penetration excess limit shall be according to the riser pipeline design code. The internal piping diameter shall be keep smooth even on welding.

5.22.3 For large diameters is acceptable to grind the internal welding reinforcement.

5.22.4 100% full visual and penetrant test in all welds.

5.22.5 100% full radiographic or ultrasonic examination in all circumferential welds.

5.23 HYDROSTATIC TEST

5.23.1 Pig traps shall be hydrostatically tested according to the previously defined design code.

5.23.2 Hydrostatic test shall be performed with industrial water added corrosion inhibitor. The maximum chlorines content shall be 25 ppm.

5.23.3 The minimum test pressure and test duration shall be according to equipment design code.

5.24 PRESERVATION

5.24.1 Pig trap shall be completely dried after hydrostatic test.

5.24.2 All mechanisms and hinges shall be lubricated according to manufacturer's procedure.

5.24.3 Pig trap internal surfaces shall be protected against corrosion by applying non water-soluble anti-corrosion grease or removable vinyl resin varnish.

5.24.4 Contact surfaces of flanges shall be protected against mechanical damage, using wooden or plastic discs attached with galvanized wire or nylon clamps.

5.25 SAFETY INTERLOCKING SYSTEM

5.25.1 Pig trap shall be provided with a safety interlock system (e.g.: key interlock), for valves and closure operation.

5.25.2 During the detailed design phase, **SELLER** and **BUYER** shall discuss and define together the final operational sequency of all valves which the key interlocking system is necessary.

ANNEX 1

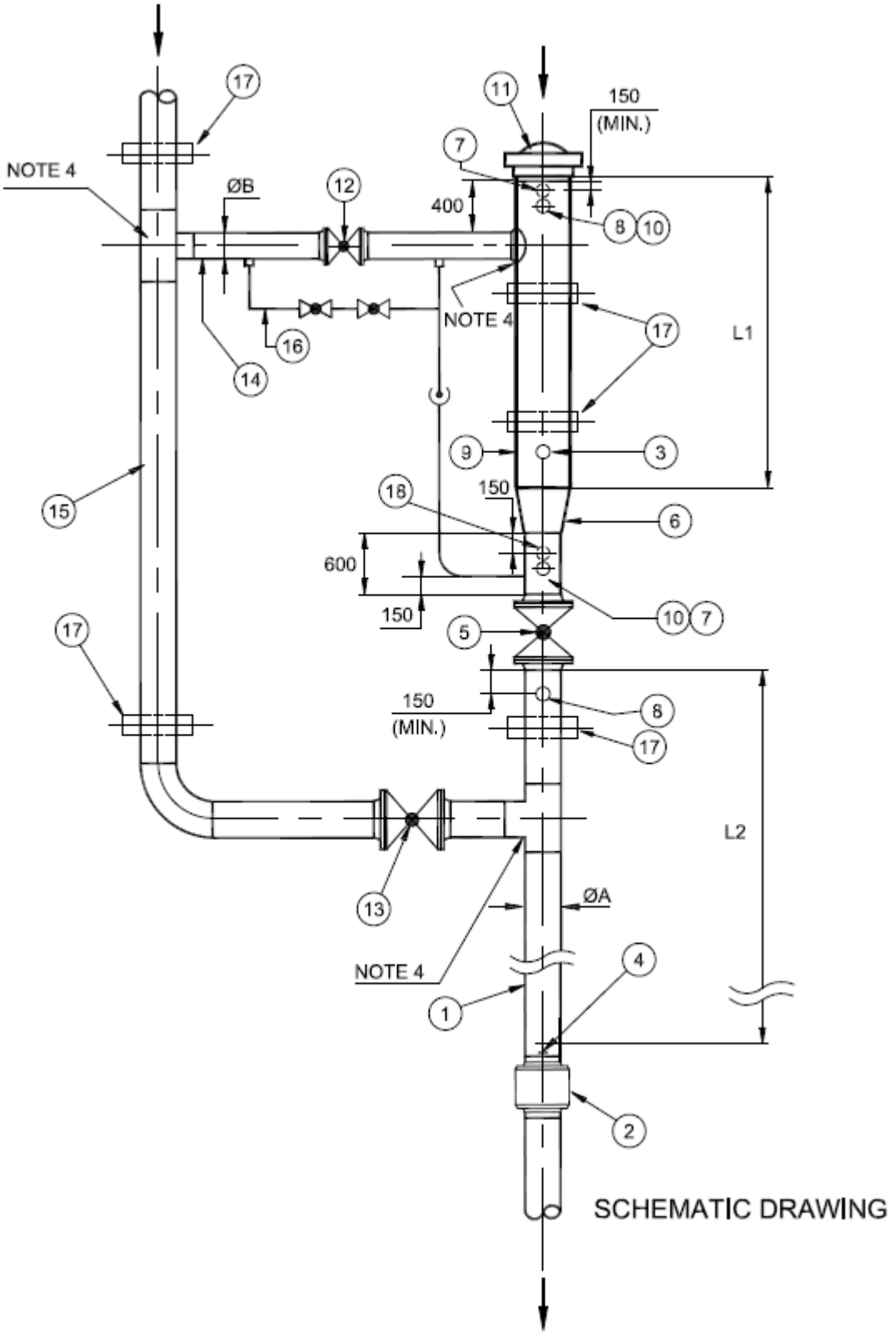


Figure 5 – Launcher Trap Schematic Drawing

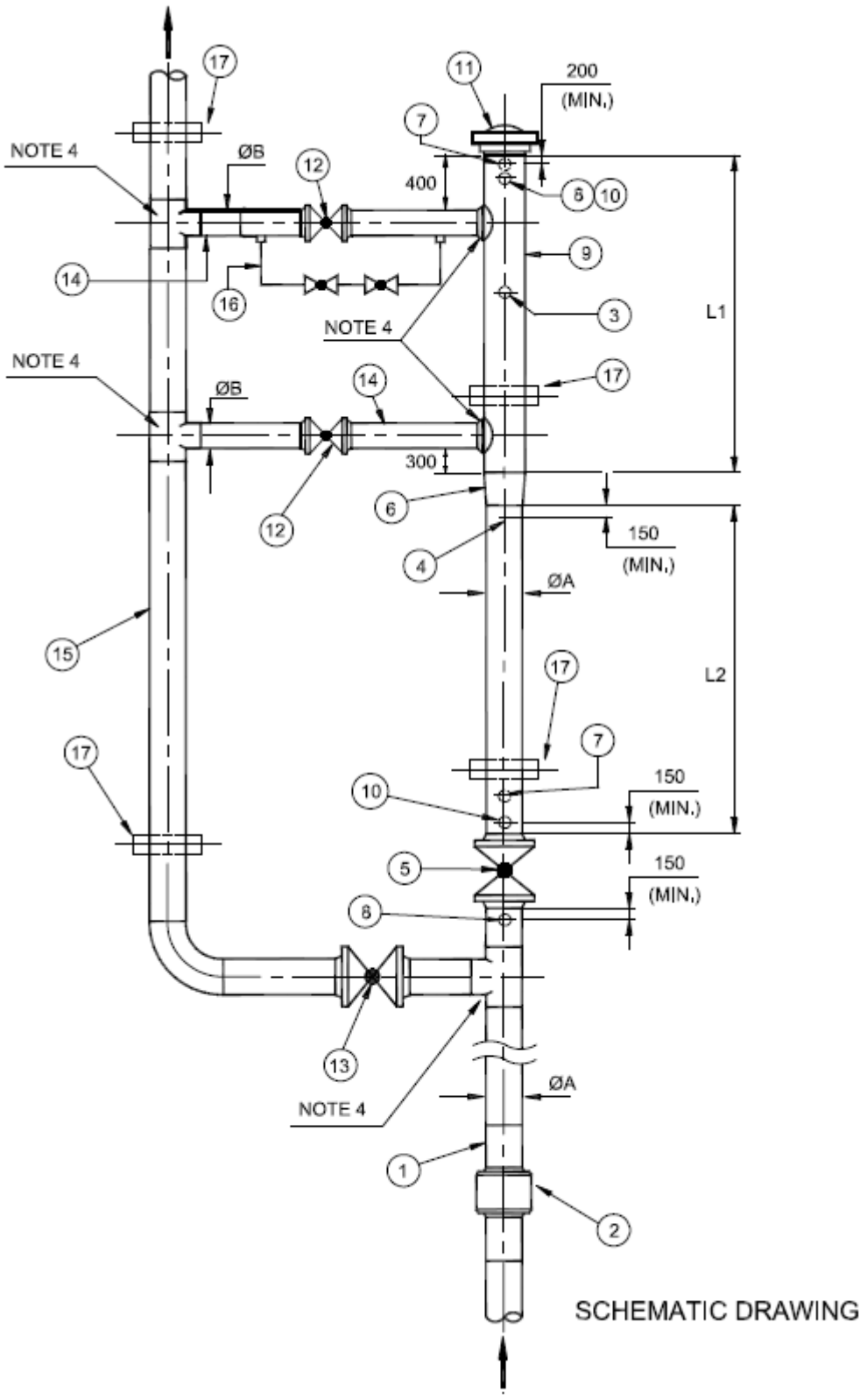


Figure 6 – Receiver Trap Schematic Drawing

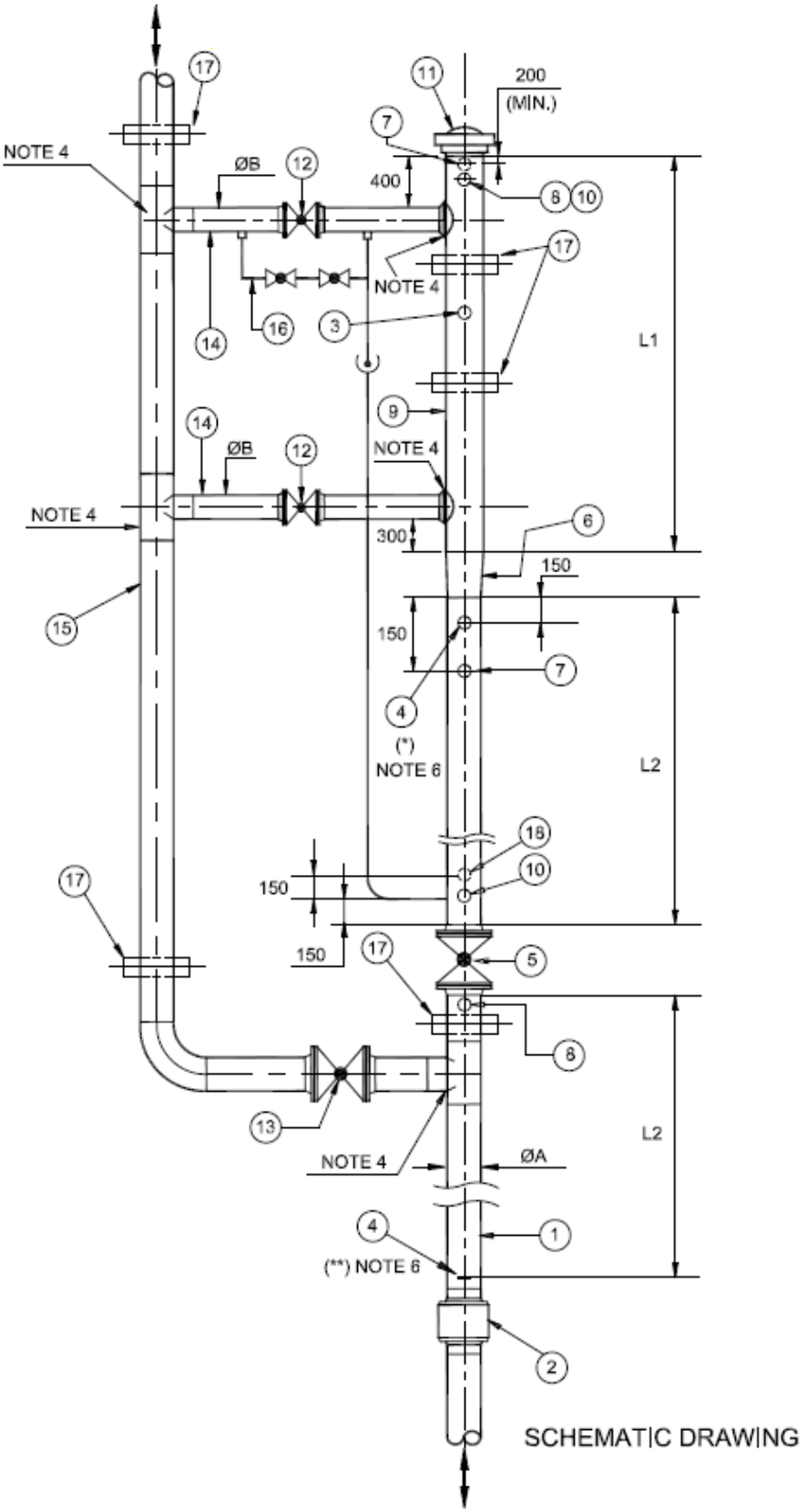


Figure 7 - Launcher/ReceiverTrap Schematic Drawing

NOTES: for **Figure 5**, **Figure 6**, **Figure 7**, **Table 2**, and **Table 3**

1) dimensions in millimeters, for dimensions in inches are used parenthesis.
2) dimension ØA corresponds to the nominal diameter of the pipeline. For pipelines with variable nominal diameter consider as ØA the larger nominal diameter of the pipeline.
3) for installations with shared launchers or receivers, adopt as ØA the larger nominal diameter of the pipes interconnected to these installations.

Table 2 – Dimensions for non-intelligent pig trap

Nominal Diameter ΦA	Dimensions for: Figure 5, Figure 6 and Figure 7				Φ Drain
	L_1 – Launcher	L_2	L_1 - Receiver	ΦB	
80 (3)	1000	1000	1150	80 (3)	50 (2)
100 (4)	1000	1000	1400	80 (3)	50 (2)
150 (6)	1100	1100	1500	100 (4)	50 (2)
200 (8)	1350	1350	1700	150 (6)	50 (2)
250 (10)	1600	1600	1700	200 (8)	80 (3)
300 (12)	1800	1600	1800	200 (8)	80 (3)
350 (14)	1800	1600	1800	200 (8)	80 (3)
400 (16)	2000	1600	2000	250 (10)	80 (3)

Table 3 – Dimensions for intelligent pig traps.

Nominal Diameter ΦA	Dimensions for: Figure 5, Figure 6 and Figure 7				Φ Drain	Φ Equalization Line
	L_1 - Launcher	L_2	L_1 - Receiver	ΦB		
100 (4)	2350	2400	2350	80 (3)	50 (2)	25 (1)
150 (6)	2000	1950	2000	100 (4)	50 (2)	25 (1)
200 (8)	3050	3000	3050	150 (6)	50 (2)	50 (2)
250 (10)	2900	2750	2900	150 (6)	80 (3)	50 (2)
300 (12)	3600	3400	3600	200 (8)	80 (3)	50 (2)
350 (14)	3700	3450	3700	200 (8)	80 (3)	50 (2)
400 (16)	3300	3050	3300	250 (10)	80 (3)	50 (2)
450 (18)	3600	3250	3600	300 (12)	80 (3)	50 (2)
500 (20)	2000	1650	3000	300 (12)	100 (4)	50 (2)
550 (22)	2100	1650	3350	350 (14)	100 (4)	50 (2)
600 (24)	2000	1550	3700	400 (16)	100 (4)	50 (2)
650 (26)	3200	1550	4100	400 (16)	100 (4)	50 (2)
700 (28)	3600	2950	4500	450 (18)	100 (4)	50 (2)
750 (30)	3100	2450	4900	500 (20)	100 (4)	50 (2)
800 (32)	2600	1850	4000	500 (20)	100 (4)	50 (2)
850 (34)	3100	2300	4300	550 (22)	150 (6)	50 (2)
900 (36)	3200	2370	4850	600 (24)	150 (6)	50 (2)
950 (38)	3200	2370	4850	600 (24)	150 (6)	50 (2)
1000 (40)	4200	3250	5150	650 (26)	150 (6)	50 (2)
1050 (42)	4200	3250	5450	650 (26)	150 (6)	50 (2)

Table 4 – Listed items in Figure 5, Figure 6 and Figure 7

ITEM LIST		
Item	**Description**	**Notes**
1	Pipeline (ØA).	-
2	Insulating joint	2
3	Thermal relief valve.	10
4	Pig passage indicator	5
5	Trap block valve (full bore).	-
6	Reducer.	11 and 12
7	Drain	3, 7 and 18
8	Pressure gauge (Manometer, manovacuometer or Transmitter)	19
9	Barrel	-
10	Vent	8 and 17
11	Quick opening closure	-
12	Bypass valve.	-
13	Main valve.	-
14	Bypass line (ΦB)	9
15	Main line (inlet/outlet)	6
16	Pressure equalization line with valve	9, 14 and 16
17	Supports	1 and 14
18	Flanged outlet	4 and 15

NOTES:

1) The type, quantity, and location of supports shall be determined by the detailed design.
2) For offshore facilities insulating joint is not required. The insulating joint shall be installed on a straight section, right after the pipeline buried section and before any support.
3) Drain minimum diameter shall be according to **Table 2** and **Table 3**. If the drain is directed to a drainage basin, it shall be predicted at least 300 mm of distance of the drain to the basin floor. The number of drain valves shall be as defined in the design.
4) Connection for pulling intelligent pig according to item **5.3.8** of this Standard.
5) Pig passage indicators shall be capable of detecting the passage of foam pigs, located at the following position: a) at the top of the pipe or side surface; b) within the limit of dimension L_2.
6) Pipeline diameter shall be according to detailed design.
7) Drainage products destination shall be predicted in drainage system detailed design. If a pipe is conveying the drained product to a drain box, it shall be predicted in the pipe design: the possibility of displacement and high pressure drops of solid

residuals. The use of funnel near the drain valve shall be considered, this fixation shall be flange ended with the drain box.

8) Launchers and receivers with recommended inerting with N_2, shall have a vent with outlet according to **Figure 8**. The number of vents valves shall be as defined in design phase. Vents nominal diameter shall be as defined in design, and this diameter shall not be smaller than ¾ inches.
9) Pipelines with possible scaling shall be provided with flanges to facilitate disassembly and internal cleaning. The line (item 16) shall be installed as close as possible to the barrel and bypass line duly supported.
10) Thermal relief valve shall be installed in pipelines operating with process fluid in liquid phase.
11) Launcher traps and Launcher/Receiver shall have an eccentric reduction connecting major barrel to minor barrel; this reduction shall have maximum inclination equal to 1:5.
12) Receiver traps shall have a concentric reduction connecting major barrel to minor barrel. This reduction shall have maximum inclination equal to 11 degrees related to the center line.
13) Flange and connections.
14) Supports for Equalization line shall be predicted in design.
15) Launchers and launchers/receivers with barrel size equal or over 8 inches (NPS8) shall be provided with a flanged end nozzle NPS2 (this requirement is just applicable if intelligent pig operation is predicted). This nozzle shall be installed inclined at 45° in order to introduce a cable into the nozzle and pull the intelligent pig into the barrel. Nozzle position shall not be coincident with barrel's block valve.
16) Equalization line maximum allowable diameter is NPS 2 (2 inches), according to item **5.9.2**.
17) A NPS1 (1 inch) line threaded union with drain shall be predicted. For lines with possible scaling shall be provided predicted;
18) the drain shall be installed as close as possible to valve (item 5) for inclined or vertical launchers.
19) Manometer, manovacuometer or transmitter: pressure gauges shall be flanged connected. The nominal pipe size shall be according to the latest revision of I-ET-3010.00-1200-800-P4X-013 – GENERAL CRITERIA FOR INSTRUMENTATION PROJECTS.

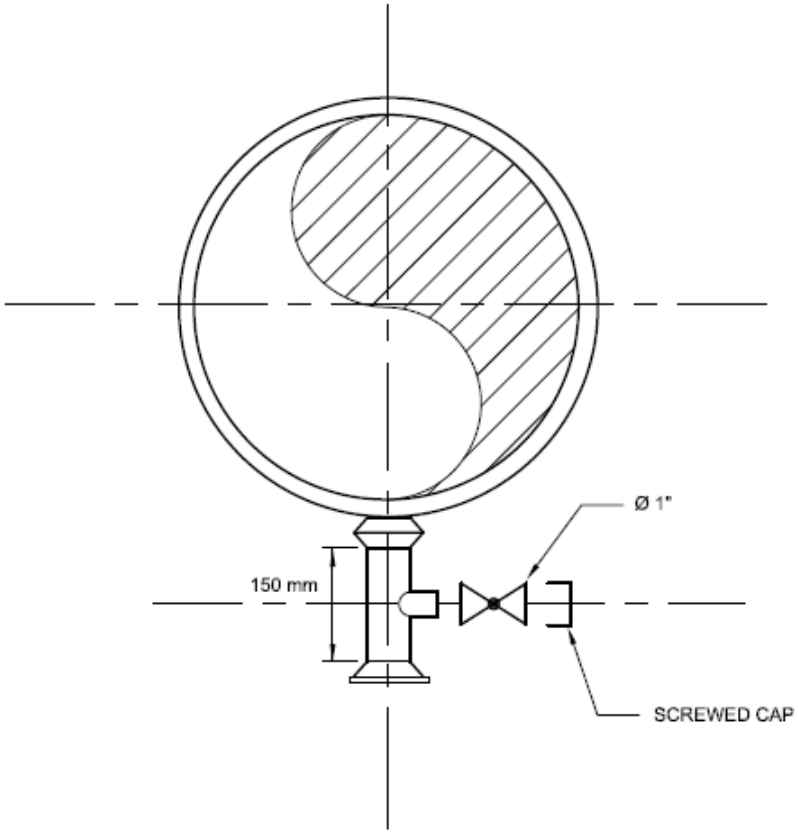


Figure 8 – Sampling Outlet

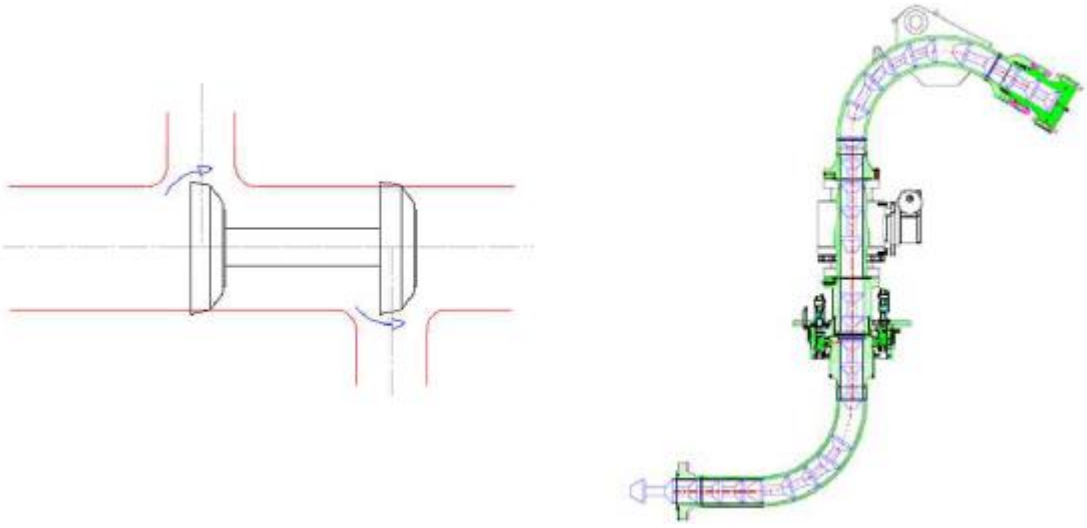


Figure 9 – Distance between two derivations

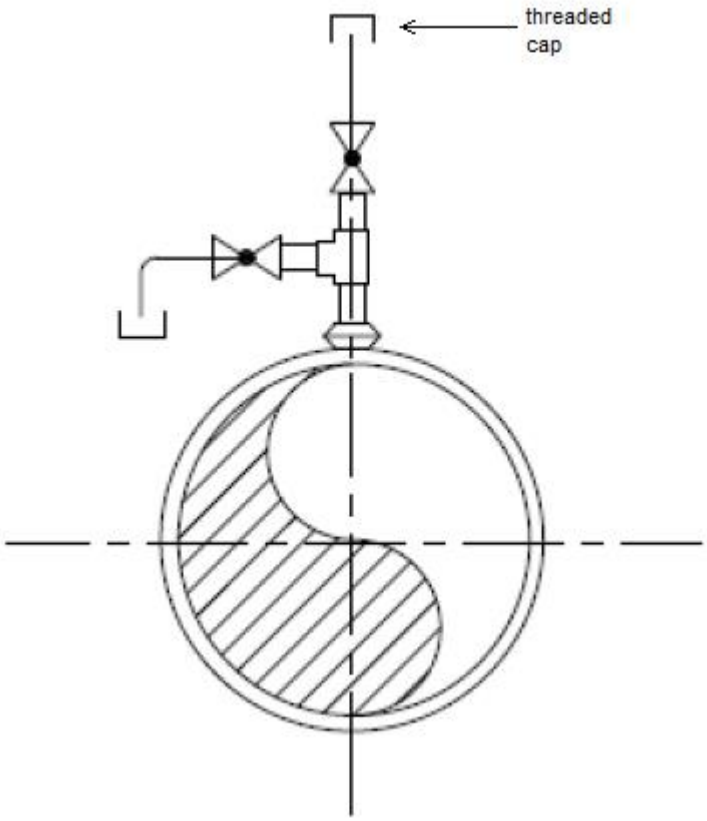


Figure 10 – Derivation with a block valve to atmosphere

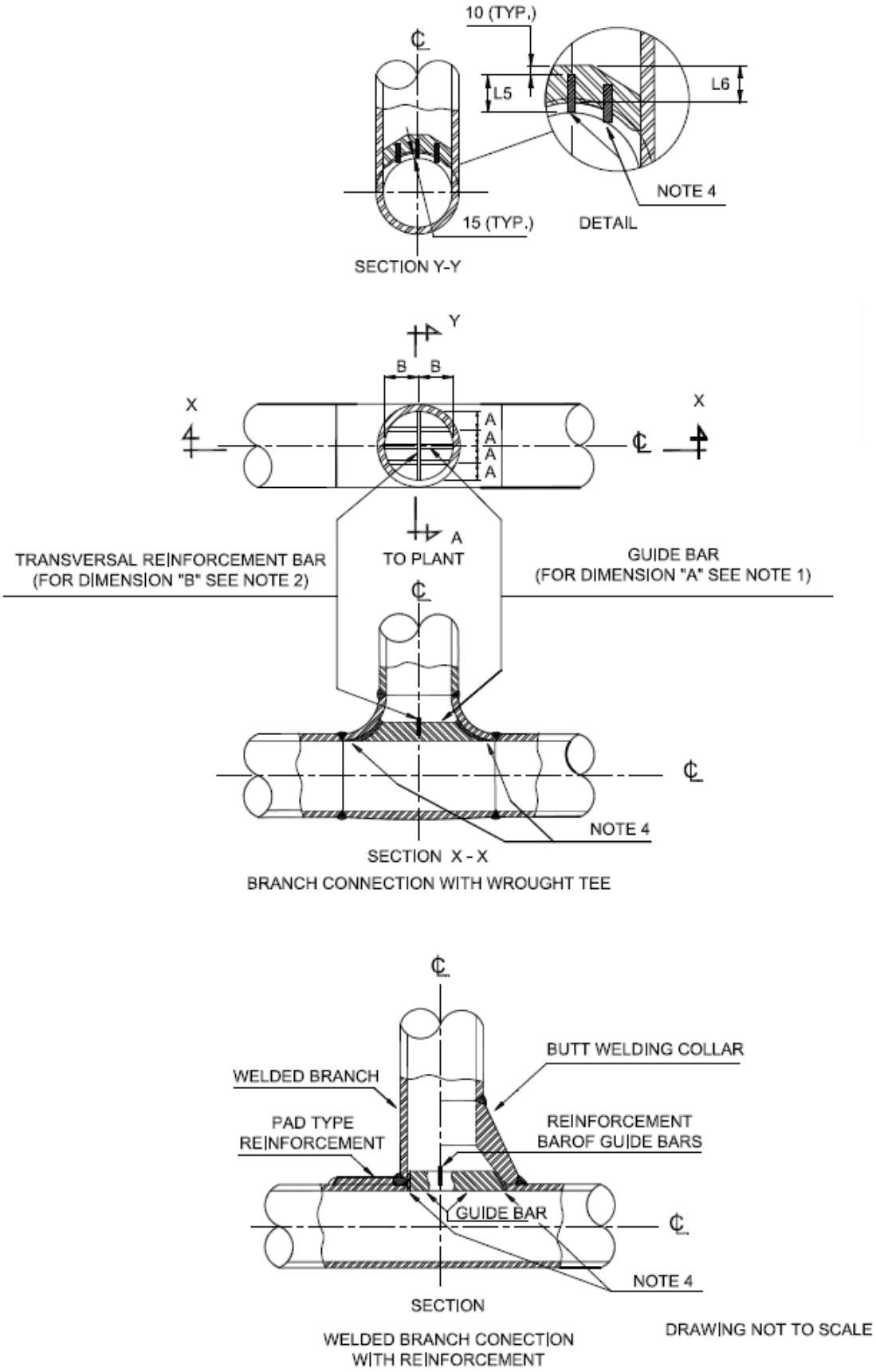


Figure 11 – Pig guide bar in branches

Notes:

1) Guide bars shall be in accordance with the following information: (dimensions in millimeters, inches in parentheses).

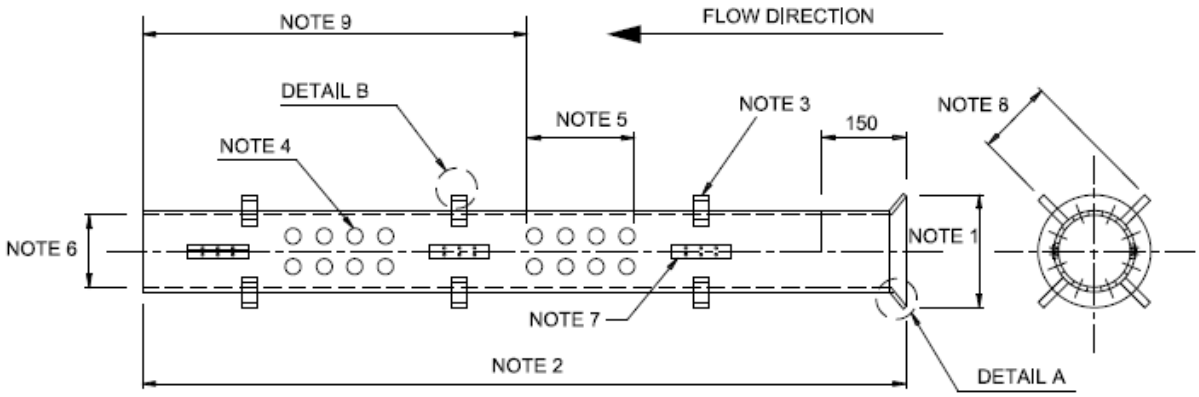
GUIDE BARS		
Φ BRANCH	**NUMBER OF BARS**	**INTERVAL "A"**
≤ 80 (≤ 3")	1	1/2 X Φ BRANCH
100 to 150 (4" to 6")	2	1/3 X Φ BRANCH
200 to 300 (8" to 12")	3	1/4 X Φ BRANCH
350 to 550 (14" to 22")	5	1/6 X Φ BRANCH
600 to 750 (24" to 30")	7	1/8 X Φ BRANCH
800 to 1050 (32" to 42")	9	1/10 X Φ BRANCH

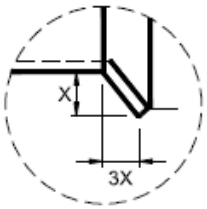
2) Transversal reinforcement bars shall be in accordance with the following information: (dimensions in millimeters, inches in parentheses).

TRANSVERSAL REINFORCEMENT BARS		
Φ BRANCH	**NUMBER OF BARS**	**INTERVAL "B"**
≤ 150 (≤ 6")	REINFORCEMENT BAR IS NOT REQUIRED	
200 to 550 (8" to 22")	1	1/2 X Φ BRANCH
600 to 750 (24" to 30")	2	1/3 X Φ BRANCH
800 to 1050 (32" to 42")	3	1/4 X Φ BRANCH

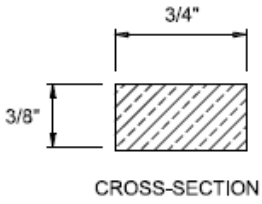
3) Bars shall be adjusted and installed on the branch connection at the pipe shop before be sent to the field for installation on pipeline.
4) The end of the guide bars which comes into contact with the pig shall be accurately adjusted to the pipeline (according to its inside diameter), in order to unobstructed passage of the pig. Sharp edges shall be eliminated in order to avoid damages in the pig.
5) Guide bars shall be made of structural material equivalent or higher in corrosion and mechanical resistance to the pipe material.
6) Guide bars shall be welded to the reinforcement bar using a fillet weld all around.
7) All bars shall be welded to the piping by a fillet weld all around.
8) Bar dimensions shall be according to the following information: (dimensions in millimeters, inches in parentheses).

BAR DIMENSIONS			
BRANCH DIAMETER	**THICKNESS**	**WIDTH**	
		GUIDE BAR (L5)	**TRANSVERSAL REINFORCEMENT BAR (L6)**
100 to 150 (4" to 6")	9.5	35	-
200 to 300 (8" to 12")	9.5	40	35
350 to 550 (14" to 22")	12.7	50	45
600 to 750 (24" to 30")	12.7	60	55
800 to 1050 (32" to 42")	12.7	70	65

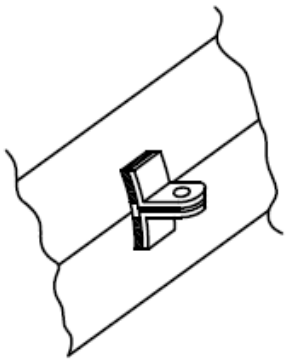




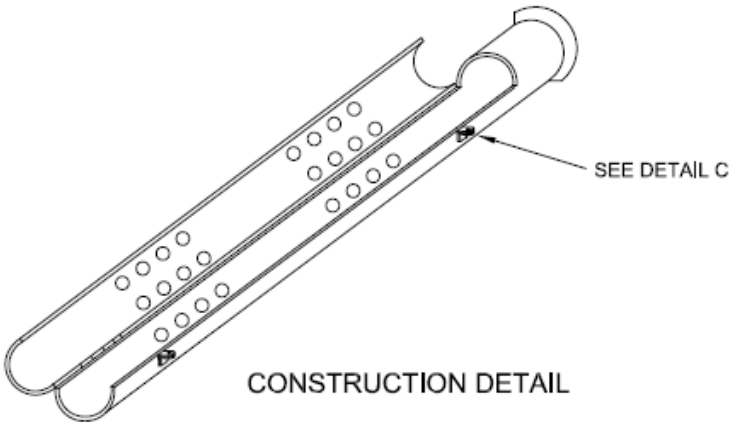
DETAIL A



DETAIL B



DETAIL C – BASKET CLOSING



CONSTRUCTION DETAIL

Figure 12 - Pig receiving basket

Notes:

1) Inside diameter of receiver barrel minus 10 mm.

Dimensions L_1 of **Table 2**NOTES: for **Figure 5, Figure 6, Figure 7, Table 2,** and **Table 3**

4) dimensions in millimeters, for dimensions in inches are used parenthesis.
5) dimension ØA corresponds to the nominal diameter of the pipeline. For pipelines with variable nominal diameter consider as ØA the larger nominal diameter of the pipeline.
6) for installations with shared launchers or receivers, adopt as ØA the larger nominal diameter of the pipes interconnected to these installations.
2) Table 2 and **Table 3**.
3) Spacers for supporting the cylindrical part and centering device, made of non-sparkling material plates or bars with dimensions compatible with the weight of the device. The baskets shall be in a non-sparkling material plate or pipe with 3 mm minimum thickness.
4) Uniformly spaced holes with diameter according to the following information:

PIPELINE DIAMETER [mm]	HOLE DIAMETER [mm]
100 a 250 (4" a 10")	19.05 (3/4")
300 a 500 (12" a 20")	22.2 (7/8")
550 a 700 (22" a 28")	25.4 (1")
750 a 1050 (30" a 42")	44.45 (1 3/4")

The 2 drilled sections length equal to 2 times the diameter A (**Table 2**NOTES: for **Figure 5, Figure 6, Figure 7, Table 2,** and **Table 3**

7) dimensions in millimeters, for dimensions in inches are used parenthesis.
8) dimension ØA corresponds to the nominal diameter of the pipeline. For pipelines with variable nominal diameter consider as ØA the larger nominal diameter of the pipeline.
9) for installations with shared launchers or receivers, adopt as ØA the larger nominal diameter of the pipes interconnected to these installations.
5) Table 2 and **Table 3**), which sum of hole areas of each one shall be, at least, 2 times the inside cross section area of a by-pass each section shall be placed with its mediatrix matches the center line of one of the bypass.

Inside diameter of the pipeline (ØA) of **Table 2**NOTES: for **Figure 5, Figure 6, Figure 7, Table 2,** and **Table 3**

10) dimensions in millimeters, for dimensions in inches are used parenthesis.
11) dimension ØA corresponds to the nominal diameter of the pipeline. For pipelines with variable nominal diameter consider as ØA the larger nominal diameter of the pipeline.
12) for installations with shared launchers or receivers, adopt as ØA the larger nominal diameter of the pipes interconnected to these installations.
6) Table 2 and **Table 3** plus 5 %.

7) The baskets shall be longitudinally split and articulated with hinges.
8) Inside diameter of the receiver barrel divided by 2. Provide clearance for moving the basket inside the barrel.
9) These dimensions are limited by the sum of the lengths of the pigs that may be received without opening the barrel.

According to dimensional L_1 (**Table 2**NOTES: for **Figure 5, Figure 6, Figure 7, Table 2,** and **Table 3**

13) dimensions in millimeters, for dimensions in inches are used parenthesis.
14) dimension ØA corresponds to the nominal diameter of the pipeline. For pipelines with variable nominal diameter consider as ØA the larger nominal diameter of the pipeline.
15) for installations with shared launchers or receivers, adopt as ØA the larger nominal diameter of the pipes interconnected to these installations.
10) Table 2 and **Table 3**), the baskets shall be made in sections, in order to facilitate transportation and handling.
11) Dimensions in millimeters, unless otherwise indicated.