
	TECHNICAL SPECIFICATION				Nº. I-ET-3010.00-1200-940-P4X-005				
	CLIENT: -				SHEET: 1 of 15				
	JOB: -								
	AREA: -								
SRGE	TITLE: CHEMICAL INJECTION POINTS				INTERNAL				
					ESUP				
MICROSOFT WORD / V.2010 / I-ET-3010.00-1200-940-P4X-005_D.DOCX									
INDEX OF REVISIONS									
REV.	DESCRIPTION AND/OR REVISED SHEETS								
0	ORIGINAL ISSUE								
A	REVISED WHERE INDICATED								
B	REVISED WHERE INDICATED								
C	REVISED WHERE INDICATED								
D	ITEMS ADDED: 6.5.4, 6.5.5, 6.6.6, 6.7.3; ITEMS REVISED: 5, 6.6.2, 6.6.5, 6.8.1, 7.1., 7.2.2, 7.2.3, 7.2.6, 7.4.5; ITEMS EXCLUDED: 6.7.6.								
	REV. 0	REV. A	REV. B	REV. C	REV. D	REV. E	REV. F	REV. G	REV. H
DATE	27/02/21	APR/16/21	OCT/30/22	DEC/08/22	MAY/10/24				
DESIGN	EEA	EEA	EEA	EEA	EEA				
EXECUTION	CJH4	CJH4	HXG3	HXG3	HR7W				
CHECK	U4T1	UPTP	CJH4	CJH4	CJH4				
APPROVAL	U32N	U32N	U32N	U32N	U32N				
INFORMATION IN THIS DOCUMENT IS PROPERTY OF BUYER, BEING PROHIBITED OUTSIDE OF THEIR PURPOSE.									
FORM OWNED TO BUYER N-0381 REV.L.									

 PETROBRAS	TECHNICAL SPECIFICATION		Nº. I-ET-3010.00-1200-940-P4X-005	REV: D
	AREA:			SHEET: 2 of 15
	TITLE:			INTERNAL
	CHEMICAL INJECTION POINTS			ESUP

SUMMARY

1	SCOPE	3
2	NORMATIVE REFERENCES	3
3	DEFINITIONS AND ABBREVIATIONS	6
4	TAG NUMBERING	7
5	SCOPE OF SUPPLY AND SERVICES	7
6	DESIGN REQUIREMENTS	7
7	FABRICATION AND ASSEMBLY REQUIREMENTS	13

 PETROBRAS	TECHNICAL SPECIFICATION		Nº. I-ET-3010.00-1200-940-P4X-005	REV: D
	AREA:			SHEET: 3 of 15
	TITLE:			INTERNAL
	CHEMICAL INJECTION POINTS			ESUP

1 SCOPE

This technical specification covers the minimum requirements for the design, engineering, materials, fabrication, and commissioning of CHEMICAL INJECTION POINTS to be supplied for BUYER's facilities. This specification also includes chemical injection lines to the well.

2 NORMATIVE REFERENCES

2.1 GENERAL REQUIREMENTS

2.1.1 The chemical injection points shall comply with the requirements of this technical specification and references herein.

2.1.2 As a general guideline, in case of requirements conflicting between this technical specification and other cited references, the most stringent shall prevail. If necessary, the SELLER may revert to BUYER for clarification.

2.2 CLASSIFICATION SOCIETY

2.2.1 SELLER shall carry out all activities in compliance with the requirements of the Classification Society.


2.2.2 SELLER is responsible for submitting to the Classification Society all documentation in compliance with the stated Rules.

2.3 CODES AND STANDARDS

The latest editions of the following codes and standards are shown in Table 1 and shall be used as design guidelines.

Table 1: Codes and Standards

API RP 14C	- Analysis, Design, Installation, and Testing of Safety Systems for Offshore Production Facilities
API RP 505	- Recommended Practice for Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Zone 0, Zone I and Zone 2
API RP 578	- Guidelines for a Material Verification Program (MVP) for New and Existing Assets
API SPEC 6D	- Specification for Valves
ASME B16.11	- Forged Fittings, Socket-Welding and Threaded
ASME B16.5	- Pipe Flanges and Flanged Fittings NPS ½ Through NPS 24 Metric/Inch Standard

 PETROBRAS	TECHNICAL SPECIFICATION		Nº. I-ET-3010.00-1200-940-P4X-005	REV: D
	AREA:			SHEET: 4 of 15
	TITLE:			INTERNAL
	CHEMICAL INJECTION POINTS			ESUP

ASME B31.3	- Process Piping
ASME PTC 19.3 TW	- Thermowells Performance Test Codes
ENERGY INSTITUTE	- Guidelines for the Avoidance of Vibration-Induced Fatigue Failure in Process Pipework
ISO 15156	- Materials for use in H ₂ S-containing environments in oil and gas production
ISO 12944	- Paints and Varnishes - Corrosion Protection of Steel Structures by Protective Paint Systems - Part 2: Classification of Environments.

2.4 GOVERNMENT REGULATION

The following Brazilian Regulatory Standards (Table 2) are mandatory and shall prevail, if more stringent, over the requirements of this specification and other references herein.

Table 2: Brazilian Regulatory Standards


NR-10	- Safety in Electrical Facilities and Services
NR-13	- Boilers, Pressure Vessels, Piping and Metallic Storage Tanks
NR-26	- Safety Signaling
NR-37	- Safety and Health in Petroleum Platforms

2.5 DESIGN SPECIFICATIONS

The latest revision for the design documents presented in Table 3 are applicable to this technical specification:

Table 3: Design Specifications

DR-ENGP-M-I-1.3	- SAFETY ENGINEERING
DR-ENGP-I-1.15	- COLOR CODING
I-ET-3010.00-1200-940-P4X-002	- GENERAL TECHNICAL TERMS.
I-ET-3000.00-1200-940-P4X-001	- TAGGING PROCEDURE FOR PRODUCTION UNITS DESIGN.

	TECHNICAL SPECIFICATION		Nº. I-ET-3010.00-1200-940-P4X-005	REV: D
	AREA:			SHEET: 5 of 15
	TITLE:			INTERNAL
	CHEMICAL INJECTION POINTS			ESUP

I-ET-3010.00-1200-955-P4X-001	- WELDING
I-ET-3010.00-1200-200-P4X-115	- REQUIREMENTS FOR PIPING FABRICATION, INSPECTION, ASSEMBLY AND COMMISSIONING
I-ET-3010.00-1200-956-P4X-002	- GENERAL PAINTING
I-ET-3010.00-1200-251-P4X-001	- REQUIREMENTS FOR BOLTING MATERIALS
I-ET-3010.00-1200-200-P4X-001	- MINIMUM REQUIREMENTS FOR PIPING MECHANICAL DESIGN AND LAYOUT
I-ET-3010.00-1200-200-P4X-002	- REQUIREMENTS FOR PIPING FLEXIBILITY AND STRESS ANALYSIS
I-ET-3010.00-1200-200-P4X-004	- REQUIREMENTS FOR PIPING SUPPORT
I-ET-3010.00-1200-431-P4X-001	- THERMAL INSULATION FOR MARITIME INSTALLATIONS
I-ET-3010.00-1200-970-P4X-003	- REQUIREMENTS FOR PERSONNEL QUALIFICATION AND CERTIFICATION
I-ET-3010.00-1200-970-P4X-004	- NON-DESTRUCTIVE TESTING REQUIREMENTS FOR METALLIC AND NON-METALLIC MATERIALS
I-ET-3010.00-1200-800-P4X-015	- REQUIREMENTS FOR TUBING AND FITTING (ALIGNED TO IOGP-JIP33 S-716).


2.6 PROJECT SPECIFICATION

The latest revision of the following project specifications [document supplied by BUYER] are also applicable:

- PIPING SPECIFICATION FOR TOPSIDE
- PIPING SPECIFICATION FOR HULL
- METOCEAN DATA
- MOTION ANALYSIS
- CHEMICAL INJECTION UNITS
- CHEMICAL INJECTION POINTS

2.7 CONFLICT REQUIREMENT

2.7.1 In case of conflicting information between this Specification and other specific BUYER's document (datasheet) the specific BUYER's document shall prevail.

 PETROBRAS	TECHNICAL SPECIFICATION		Nº. I-ET-3010.00-1200-940-P4X-005	REV: D
	AREA:			SHEET: 6 of 15
	TITLE:			INTERNAL
	CHEMICAL INJECTION POINTS			ESUP

2.7.2 In all cases of conflict between this specification and applicable documents listed herein, the more stringent requirements shall prevail. In such cases, SELLER shall inform BUYER of the conflict and seek clarification.

3 DEFINITIONS AND ABBREVIATIONS


3.1 DEFINITIONS

3.1.1 In addition to terms and definitions established in I-ET-3010.00-1200-940-P4X-002 - GENERAL TECHNICAL TERMS, the following terms are also applicable to this document:

- **HTM (Hot Tap Machine):** a tool used for making a hole in the pipe or vessel by the cutting action of a drill, even during operation.
- **CHEMICAL INJECTION POINT:** specific region in the pipe (location) or vessel where the access fitting is installed for chemical injection products purposes.
- **RETRIEVAL TOOL (KIT):** A device that includes a double block service valve, a hydraulic pump (hand pump), and a retriever tool device that acts inserting or removing the plug. The retrieval tool function is to insert or remove the plug without disturbing the full process conditions.
- **CHEMICAL INJECTION DEVICE:** A device flagged connected to the tubing and connected to the main pipe shown in Figure 1, with the purpose to chemicals are injected into the fluid stream flowing through the tubing or equipment. This device is a retractable system (the part in contact with the fluid can be inserted and removed in operation) that is connected to the tubing that carries the chemical to be injected.

3.2 ABBREVIATIONS

Alloy 625 – Inconel UNS N06625
CA – Corrosion Allowance
CRA – Corrosion Resistant Alloys
CS – Carbon Steel
DSS - Duplex Stainless Steel
FRP – Fiber Reinforced Polymers
ITP – Inspection and Test plan
LWN – Long Weld Neck Flange
NDT – Non-Destructive Testing
PMI – Positive Material Identification
SDSS - Super Duplex Stainless Steel
SS - Stainless Steel
TUTU - Topside Umbilical Termination Units

 PETROBRAS	TECHNICAL SPECIFICATION	Nº. I-ET-3010.00-1200-940-P4X-005	REV: D
	AREA:	SHEET: 7 of 15	
	TITLE: CHEMICAL INJECTION POINTS	INTERNAL	
ESUP			

4 TAG NUMBERING

4.1 GENERAL

4.1.1 Tagging of all instruments, electrical, mechanical, and piping items, including valves, shall be in accordance with latest revision of I-ET-3000.00-1200-940-P4X-001 – TAGGING PROCEDURE FOR PRODUCTION UNITS DESIGN.

4.1.2 Tag numbers for remaining ancillary equipment shall be given after purchase order placement.

5 SCOPE OF SUPPLY AND SERVICES

The scope of supply shall include, but not be limited to the following items:

- 1) The supply and installation of the complete retrieval tool kit and its connections.
- 2) The tubing connection and shut-off valves (if applicable see item **6.7**).
- 3) Any additional ancillary equipment, material, or accessory necessary for the proper operability of the chemical injection system.
- 4) Any additional ancillary equipment, material, or accessory necessary during the installation, commissioning, and pre-operation of the system.
- 5) Any special tools for maintenance (if applicable)
- 6) The list of spare parts for two years of operation.
- 7) The installation and commissioning of the chemical injection system.
- 8) Design documents including datasheets, general arrangement drawings, calculation reports, electrical diagrams, wiring diagrams, cable lists, material lists, equipment lists, etc.
- 9) Fabrication documents including material certificates, welding procedures, welding map, welding inspections NDTs, databooks, ITPs, etc.
- 10) Installation documents including hydrostatic test report, leak test report, flange tightening report, installation and commissioning procedures, etc.

6 DESIGN REQUIREMENTS

6.1 GENERAL DESIGN REQUIREMENTS

6.1.1 The chemical injection points design shall be submitted to the Classification Society, when required, for comments and approval.

6.1.2 The chemical injection points shall be suitable for marine environments according to class CX of ISO 12944 Part 2.

6.1.3 The chemical injection points are fixed or retrievable as required in the datasheet of CHEMICAL INJECTION POINTS [document supplied by BUYER].

6.1.4 The service is considered as high-pressure, if the design pressure rating is equal to or greater than 600#.

6.1.5 Fasteners (Studs, bolts, tightening bolts, and nuts) shall follow the requirements of I-



PETROBRAS

TECHNICAL SPECIFICATION

Nº. I-ET-3010.00-1200-940-P4X-005

REV: D

AREA:

SHEET: 8 of 15

TITLE:

CHEMICAL INJECTION POINTS

INTERNAL

ESUP

ET-3010.00-1200-251-P4X-001 – REQUIREMENTS FOR BOLTING MATERIALS.

6.1.6 The thermal insulation shall be according to the latest revision of I-ET-3010.00-1200-431-P4X-001 – THERMAL INSULATION FOR MARITIME INSTALLATIONS.

6.2 OPERATION ENVIRONMENT

6.2.1 The equipment supplied shall be suitable for the environment and range of ambient conditions defined in METOCEAN DATA [document supplied by BUYER].

6.3 MOTION REQUIREMENTS

6.3.1 The necessary design data and information on motion requirements are given in MOTION ANALYSIS [document supplied by BUYER].

6.4 GENERAL ASSEMBLY FOR INJECTION POINTS

Figure 1 shows an example of a typical injection assembly for injection points, the following components for assembly shall be considered:

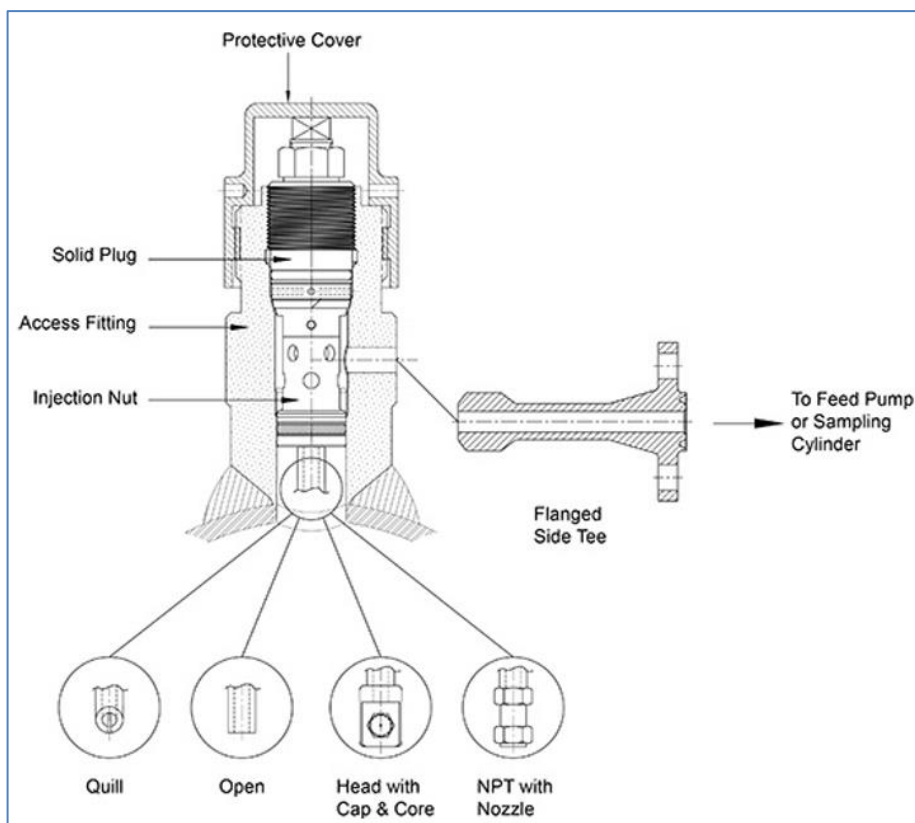



Figure 1: Example of Chemical injection Device

6.4.1 **Access Fitting:** an external body connected to both the main pipe and the side tee (tubing). The connection of the access fitting and main pipe may be welded or flanged (see item 6.6).

6.4.2 **Solid Plug:** Assembly inside the fitting body is used to carry an injection nut that has the injection tube/nozzle assembly screwed into its base.

6.4.3 **Injection nut/ Injection Tube:** is a multiple-use device that replaces the nut on the end of the solid plug. It is used to direct the injected product to the injection tube or

	TECHNICAL SPECIFICATION		Nº. I-ET-3010.00-1200-940-P4X-005	REV: D
	AREA:			SHEET: 9 of 15
	TITLE:			INTERNAL
	CHEMICAL INJECTION POINTS			ESUP

atomization device. The injection tube may be of the following types:

- **Open tube:** The tube end is cut at a 90° angle. The natural turbulence within the pipeline is used to insure even distribution. There is no pressure differential experienced at the orifice, so it is necessary to control the injection rate at the injection pump or the shut-off valve.
- **Quill tube:** Quill tube is an open-ended tube cut at a 45° angle with a slot. It utilizes the turbulence created by its unique design to achieve distribution of the injected chemical into the product flow. As with the Open Tube, injection rate must be controlled at the injection pump or shut-off valve.
- **Spray tube (NPT with nozzle):** The tube end as a spray nozzle that directs the chemical product parallel to the flow with the use of a right angle nozzle. Permit atomization of the fluid as it is injected into the product line or vessel.
- **Head with Caps, Cores, and Strainers:** with various devices that, when attached to the dispersion end of the Injection Tube, permit atomization of the fluid as it is injected into the product line or vessel.

6.5 INJECTION TUBE

6.5.1 The selection type of the injection tube shall follow Table 4, if the fluid is not specified in Table 4, the type of injection tube shall follow the requirements of datasheet CHEMICAL INJECTION POINTS [document supplied by BUYER].

6.5.2 For the injection of hydrate inhibitor, the spray-type injection tube shall be used as the main chemical injection point, and a secondary access point shall be installed with an open-type injection tube. In this case, the spray injection tube access point shall be retrievable, and the secondary access point shall be fixed type.


6.5.3 Unless otherwise stated, the chemical products injection direction shall be centralized to the pipe, and parallel to the flow.

6.5.4 The protruding length of the injection tube shall be capable of reaching the range of 25% to 50% internal diameter of the main pipe.

6.5.5 The design of injection tubes shall be carried out following the ASME PTC 19.3 TW including vortex-induced vibration analysis and fatigue strength, additionally SELLER shall verify the design evaluating the quantitative thermowell LOF assessment based on the Guidelines for the Avoidance of Vibration Induced Fatigue Failure in Process Pipework of Energy Institute.

Table 4: Injection Tube Type

CHEMICAL PRODUCT	INJECTION TUBE TYPE
Acidifying agent	Quill
Asphaltene Inhibitor	Quill
Biocide /Biostatic	Quill
Bio coagulant	Quill

	TECHNICAL SPECIFICATION		Nº. I-ET-3010.00-1200-940-P4X-005	REV: D
	AREA:			SHEET: 10 of 15
	TITLE: CHEMICAL INJECTION POINTS			INTERNAL
				ESUP

Corrosion inhibitor water systems and biphasic systems	Quill
Defoamer	Quill
Demulsifier / Biodisperser	Quill
Gas Corrosion inhibitor	Spray
H ₂ S scavenger	Quill
Hydrate inhibitor	Spray / Open ¹
Hypochlorite	Quill
Oil scale inhibitor	Quill
Oxygen scavenger	Quill
Polyelectrolyte (inverted emulsion inhibitor)	Quill
Produced Water scale inhibitor	Quill
Water Scale Inhibitor	Quill
Sodium Hydroxide Solution	Quill
Wax Inhibitor	Quill

1 The injection tube type shall be as defined in the specific document [Document Supplied by **BUYER**].

6.6 ACCESS FITTING


6.6.1 The access fitting shall be designed according to ASME B31.3. The fittings shall be as per ASME B16.11 and ASME B16.5. The access fitting material shall follow item 7.1 of this specification.

6.6.2 The preferable connection between access fittings and the main pipe is shown below:

- 1) Welded connection: for the same material and high-pressure service (rating #600 and greater)
- 2) Flanged connection: for low-pressure service (rating lower than #600), for FRP pipes, for carbon steel pipes, and for internally coated pipes.
- 3) Defined by subsea: Chemical injection related to downhole shall be connected to TUTU (Topside Umbilical Termination Units) plate by a specific connection. This shall be confirmed at the detailed engineering phase.

6.6.3 For non-operational point, the access points shall be supplied and installed. A blind flange shall be used after the block valve at chemical injection line.

6.6.4 The connection between the access fitting and the main piping shall be according to

 PETROBRAS	TECHNICAL SPECIFICATION		Nº: I-ET-3010.00-1200-940-P4X-005	REV: D
	AREA:			SHEET: 11 of 15
	TITLE: CHEMICAL INJECTION POINTS			INTERNAL
				ESUP
<p>the derivation table of the piping spec used.</p> <p>6.6.5 The flanged side tee (see Figure 1) shall be welded to the access fitting, and it shall be LWN type, made of the same access fitting material. The flange type shall comply with PIPING SPECIFICATION FOR TOPSIDE and PIPING SPECIFICATION FOR HULL [document supplied by BUYER]</p> <p>6.6.6 The use of threaded connections is not allowed.</p> <p>6.6.7 The access fitting cannot limit the piping system pressure, so its material and design conditions shall be compatible with main pipe SPEC.</p> <p>6.6.8 The requirements regarding electric isolation of PIPING SPECIFICATION FOR TOPSIDE and PIPING SPECIFICATION FOR HULL [document supplied by BUYER] shall be followed as applicable, to avoid galvanic corrosion between the fittings and pipe.</p> <p>6.6.9 The retrievable access fitting shall be hydraulic type. Mechanical access fittings may be acceptable provided previous BUYER approval.</p> <p>6.6.10 The injection point at pressure vessels shall be designed to assure:</p> <ul style="list-style-type: none">• Proper mixing of the corrosion inhibitor / oxygen scavenger.• Selected material shall be suitable for corrosion inhibitor / oxygen scavenger.• Injection on the liquid phase, avoiding impingement on the pressure vessel's shell. <p>6.7 SHUT-OFF VALVES</p> <p>6.7.1 Shut-off valves are not required for the following cases:</p> <ul style="list-style-type: none">• The chemical injection connections on the topside umbilical connectors TUTU plate.• The non-operational chemical injection points. <p>6.7.2 Shut-off valves shall have the same material selection of access fitting and the valve datasheet shall comply with the requirements of PIPING SPECIFICATION FOR TOPSIDE and PIPING SPECIFICATION FOR HULL [document supplied by BUYER]</p> <p>6.7.3 The shut-off valves shall be suitable for the service with the chemical product. They shall have a double block configuration, i.e., using two simple valves (see Figure 2) or a single valve with a double block and bleed (DBB) configuration.</p> <p>6.7.4 Every shut-off valve shall be supported on the piping (according to I-ET-3010.00-1200-200-P4X-004 - REQUIREMENTS FOR PIPING SUPPORT) to avoid vibration and fatigue problems due to the mass of the rocking valve (see Figure 2 and Figure 3).</p> <p>6.7.5 SELLER shall perform a vibration analysis to obtain the natural frequencies of the entire chemical injection system according to I-ET-3010.00-1200-200-P4X-002 - REQUIREMENTS FOR PIPING FLEXIBILITY AND STRESS ANALYSIS. This analysis shall also include the tubing and the shut-off valves. The quantitative LOF assessment for small bore connections shall be performed based on the Guidelines for the Avoidance of Vibration-Induced Fatigue Failure in Process Pipework of Energy Institute.</p>				



PETROBRAS

TECHNICAL SPECIFICATION

Nº. I-ET-3010.00-1200-940-P4X-005

REV: D

AREA:

SHEET: 12 of 15

TITLE:

CHEMICAL INJECTION POINTS

INTERNAL

ESUP

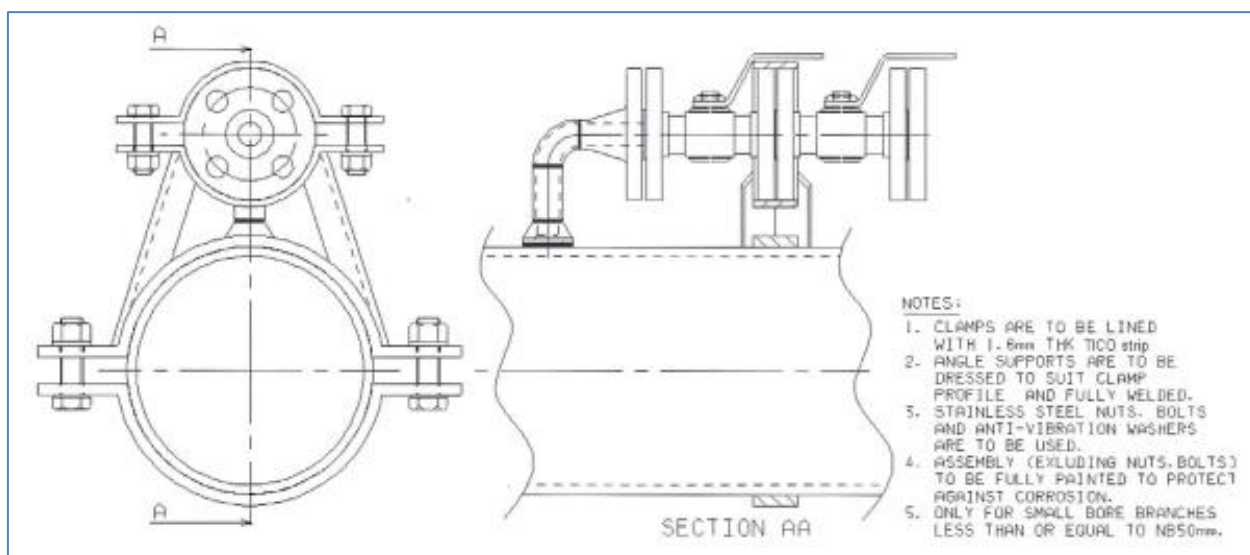


Figure 2 - Preferential support scheme

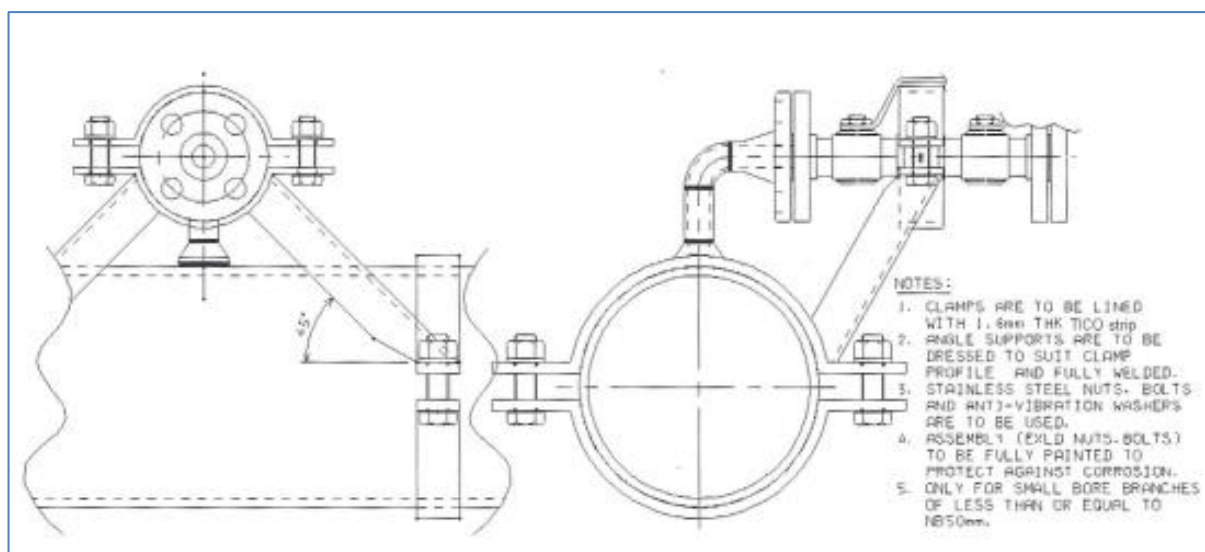


Figure 3 - Secondary support scheme

6.8 TUBING

- 6.8.1 The design of tubings shall comply with the requirements of I-ET-3010.00-1200-800-P4X-015 - REQUIREMENTS FOR TUBING AND FITTING (ALIGNED TO IOGP-JIP33 S-716).
- 6.8.2 The tubing specification shall be in accordance with of PIPING SPECIFICATION FOR TOPSIDE and PIPING SPECIFICATION FOR HULL [document supplied by BUYER].
- 6.8.3 The design of tubings for chemical transporting shall consider an adequate flexibility to prevent differential movement and vibration of the line.
- 6.8.4 The support system shall be designed to reduce the points of contact between the tubing and the support to avoid crevice corrosion points. Tubing strips or clamp supports are not indicated.

	TECHNICAL SPECIFICATION		Nº. I-ET-3010.00-1200-940-P4X-005	REV: D
	AREA:			SHEET: 13 of 15
	TITLE:			INTERNAL
	CHEMICAL INJECTION POINTS			ESUP

6.8.5 When necessary to run more than one tubing in parallel an appropriate insulation shall be designed to avoid contact between them.

6.8.6 If it is necessary to install the tubing in the same route of the pipes, the U type setting support shall be used. The U type support with its half and all round bars configurations avoid the crevice at the pipe and tubing and allows no water accumulation. The use of rods (metallic or non-metallic) between tubing allows the correct separation and also avoid crevice. The metal-to-metal contact is eliminated by using insulation material for half and all round bars and by using an insulated U Bolt and insulated metallic rods.

6.8.7 In case of installation of tubing on cable trays, water shield and water drainage shall be used to avoid water ingress and accumulation.

6.8.8 Tubing shall be electrically isolated from carbon steel supports and materials to avoid galvanic corrosion.

6.8.9 Tubing fittings shall not be used to support instruments, which shall be independently mounted.

7 FABRICATION AND ASSEMBLY REQUIREMENTS

7.1 MATERIALS SPECIFICATION:

7.1.1 When not specified, the material selection shall be according to Table 5.

Table 5: Materials Selection

COMPONENT	MATERIAL SPECIFICATION
Access fitting (body), flanged side tee, and Shut-off valves	<ul style="list-style-type: none"> - For CS main pipe: SS 316L^{1,2}; - For others main pipe: Same SPEC material of the main pipe.
Injection tube Plug	<ul style="list-style-type: none"> - SS 316L² or 625 alloy⁷.
Access fitting (body), shut-off valve, and injection tube Plug for hypochlorite injection	<ul style="list-style-type: none"> - Hastelloy C 276³ or Titanium Grade 2^{4,5,6}

NOTES:

1- Since scale inhibitors may have low pH, more CRA materials (AISI 316, for example) shall be selected. The risk of stress corrosion cracking of austenitic stainless steels over 50°C shall be considered during the selection stage.

2- The risk of stress corrosion cracking shall be considered during the selection. For operating temperatures up to 50°C consider SS 316L, from 50°C to 90°C consider the use of UNS 32750 or 32760, and greater than 90°C consider the 625 alloy.


3- For design temperature up to 26°C.

4- For design temperatures higher than 26°C.

5-Titanium SHALL NOT BE USED FOR DRY CHLORINE. Titanium is ideal for wet chlorine but catches fire on contact with dry chlorine (Burning in this case means rapid combination with chlorine, not oxygen).

6- Other materials may be accepted if in accordance with the chemical injection line pipe spec.

7- For carbon steel coated internally with 625 alloy piping.

 PETROBRAS	TECHNICAL SPECIFICATION		Nº: I-ET-3010.00-1200-940-P4X-005	REV: D
	AREA:			SHEET: 14 of 15
	TITLE:			INTERNAL
	CHEMICAL INJECTION POINTS			ESUP

7.1.2 All lot size shall be analyzed by Positive Material Identification (PMI) according to API RP 578.

7.2 WELDING

7.2.1 Welds shall comply with the requirements of I-ET-3010.00-1200-955-P4X-001-WELDING.

7.2.2 Welding shall be carried out with procedures and welders qualified in accordance with the specific design code and additional requirements stated in I-ET-3010.00-1200-970-P4X-003 – REQUIREMENTS FOR PERSONNEL QUALIFICATION AND CERTIFICATION.

7.2.3 Welding inspection shall be according to the design code and additional requirements stated in the contractual technical specification I-ET-3010.00-1200-200-P4X-115-REQUIREMENTS FOR PIPING FABRICATION, INSPECTION, ASSEMBLY AND COMMISSIONING.

7.2.4 The branch between the main pipe and access fitting may require a weldolet or a reduced tee depending on the requirement of the PIPING SPECIFICATION FOR TOPSIDE and PIPING SPECIFICATION FOR HULL [document supplied by BUYER].

7.2.5 Socket welded, intermittent fillet welds, flanged or threaded connections to run pipe are not permitted.

7.2.6 Welds connecting the access fitting to the main pipe and connecting the access fitting to the flanged side tee shall be full penetration butt weld. These welds shall be fully examined 100% volumetric and 100% superficial.

7.2.7 To avoid the possibility of Liquid Metal Embrittlement, tubing and tubing connections shall not be in direct contact or located directly under Zinc coated or galvanized components.

7.2.8 The preparation and installation of access fitting shall follow Manufacturer's procedure.

7.2.9 Final cut can be done with a reamer or with drill of a hot tap machine, care shall be taken no to damage internal threads of the access fitting.

7.2.10 NDT shall be according to the design code and I-ET-3010.00-1200-970-P4X-004 - NON-DESTRUCTIVE TESTING REQUIREMENTS FOR METALLIC AND NON-METALLIC MATERIALS.

7.2.11 Final NDTs, for acceptance purposes shall be performed after completion of any post-weld heat treatment (when applicable) and prior to paint application, hydrostatic testing, etc.

7.3 PAINTING

7.3.1 Paint system for external coating shall be according to I-ET-3010.00-1200-956-P4X-002 – GENERAL PAINTING.

7.3.2 Color code shall comply with DR-ENGP-I-1.15 – COLOR CODING.

7.4 LOCATION OF CHEMICAL INJECTION POINTS:

7.4.1 The chemical injection point shall be located at a minimum distance of 5 times the

piping diameter from any piping stagnation area as shown in Figure 4 and Figure 5.

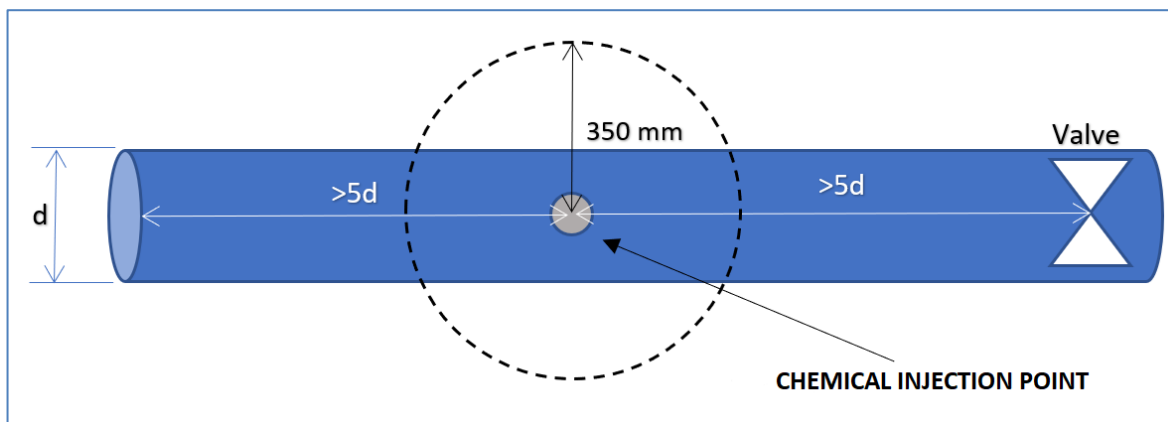


Figure 4 – Top View

- 7.4.2 For horizontal pipes, the access fitting shall be installed in the vertical position (12 o'clock) as shown in Figure 5.
- 7.4.3 The injection tube plug length shall be enough to inject the chemical products at the center of the pipe. When installed on vessels or tanks nozzles, the injection tube plug length shall direct the flow to the liquid phase, avoiding direct impingement on the walls.
- 7.4.4 Retrievable chemical injection point location shall have enough clearance for installation of retrieval kit with service valve. For pipes under NPS 16 at least a clearance of 350 mm radius and 2000 mm length shall be set up around the chemical injection point location as shown in Figure 4 and Figure 5. For NPS 16 above the manufacturer shall be consulted for proper installation requirements.

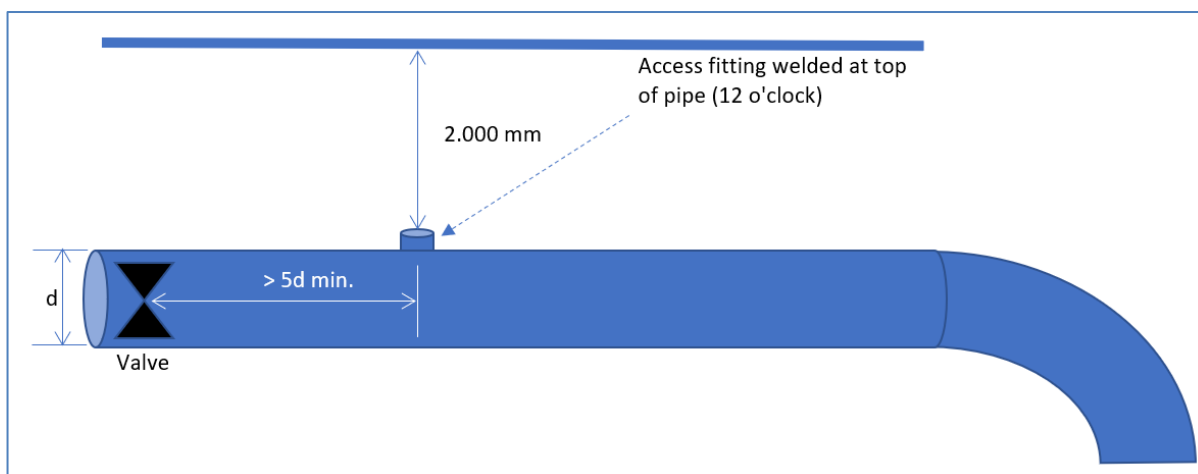


Figure 5 – Side View

- 7.4.5 Retrievable chemical injection points shall be accessible for operation and maintenance. The use of permanent access (ladders and platforms) or temporary access (temporary ladders and scaffolding) shall be defined during the detailed design and it is under BUYER approval.
- 7.4.6 No chemical injection point shall be positioned over the sea.