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	CLIENT:	SRGE	SHEET: 1 of 25
	PROJECT:	REFERENCE BASIC DESIGN	1001056398 0010
	UNIT:	BUZIOS	
DP&T-SRGE	TITLE: CHEMICAL INJECTION POINTS		NP-1
			ESUP

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DATE	MAR/15/19								
DESIGN	ESUP								
EXECUTION	MMARROIG								
CHECK	FABIANA								
APPROVAL	TMCAMPOS								

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1 SCOPE

This Technical Specification covers the minimum requirements for design, engineering, materials, fabrication, and commissioning of CHEMICAL INJECTION POINTS on the FPSO.

2 NORMATIVE REFERENCES AND DESIGN SPECIFICATIONS

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

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

2.1 CLASSIFICATION

PACKAGER/MANUFACTURER shall perform the work in accordance with the requirements of Classification Society. PACKAGER/MANUFACTURER is responsible for submitting to the Classification Society all documentation in compliance with stated Rules.

2.2 CODES AND STANDARDS


The latest editions of the following codes and standards shall be used as design guidelines.

- API 14 C Recommended Practice for Analysis, Design, Installation and Testing of Safety System for Offshore Production Facilities
- API 6D Specification for Pipeline and Piping Valves
- ASME B16.5 Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard
- ASME B31.3 Process Piping
- ASME PTC 19.3 TW thermowells
- IEC 61892-3 Mobile and Fixed Offshore Units – Electrical Installations – Equipment
- IEC 61892-6 Mobile and Fixed Offshore Units – Electrical Installations – Installation
- IEC 61892-7 Mobile and Fixed Offshore Units Electrical Installation –Hazardous Area
- ISO 12944-2 Paints and Varnishes - Corrosion Protection of Steel Structures by Protective Paint Systems - Part 2: Classification of Environments.

2.3 GOVERNMENTAL REGULATION

- NR 10 Segurança em Instalações e Serviços em Eletricidade (Safety in Electrical Facilities and Services)

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NR 13	Caldeiras, Vasos de Pressão e tubulações (Boilers, Pressure Vessels and Piping)		
NR 26	Sinalização de Segurança (Safety Signaling)		
NR-37	Saúde e Segurança em Plataformas		
<p>Brazilian Government regulations are mandatory and shall prevail, if more stringent, over the requirements of this specification and other references herein.</p>			
2.4 DESIGN SPECIFICATIONS			
I-ET-3010.00-1200-431-P4X-001	THERMAL INSULATION FOR MARITIME INSTALLATIONS		
I-ET-3010.00-1200-251-P4X-001	BOLT MATERIALS		
I-ET-3010.1M-1260-510-P4X-001	CHEMICAL INJECTION UNITS		
I-RL-3010.1M-1350-960-P4X-009	MOTION ANALYSIS		
I-ET-3010.00-1200-800-P4X-002	AUTOMATION, CONTROL AND INSTRUMENTATION ON PACKAGE UNITS		
I-ET-3010.1M-1200-800-P4X-014	AUTOMATION INTERFACE OF PACKAGED UNITS		
I-ET-3010.00-1200-956-P4X-002	GENERAL PAINTING		
I-DE-3010.1M-5400-94A-P4X-001	AREA CLASSIFICATION – GENERAL		
I-ET-3A36.00-1000-941-PPC-001_D	METOCEAN DATA		
I-ET-3000.00-1200-940-P4X-001	TAGGING PROCEDURE FOR PRODUCTION UNITS DESIGN		
I-ET-3010.1M-1200-200-P4X-001	PIPING SPECIFICATION FOR TOPSIDE		
I-ET-3010.00-1200-955-P4X-001	WELDING		
I-ET-3010.00-1200-955-P4X-002	REQUIREMENTS FOR WELDING INSPECTION		
I-ET-3010.1M-1200-500-P4X-001	MATERIAL SPECIFICATION FOR PRESSURE VESSELS AND TANKS		
DR-ENGP-M-I-1.3	SAFETY ENGINEERING		
DR-ENGP-I-1.15	COLOR CODING		

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3 DEFINITIONS AND ABBREVIATIONS

3.1 DEFINITIONS

PACKAGER: Company responsible for the project, assembly, construction, fabrication, test and furnishing of the Package.

MANUFACTURER: Company responsible for the fabrication of equipment or components internal to the Package.

PACKAGE: An assembly of equipment supplied interconnected, tested and operating, requiring only the available utilities from the FPSO for full operation.

PURCHASER: The Company designated as such in the contract or purchase order.


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 which includes a double block service valve, a hydraulic pump (hand pump) and a retriever tool device which 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, the attachment of which to tubing or equipment is via a welded or flanged connection, through which chemicals are injected into the stream of fluid flowing through the tubing or equipment. This device is basically 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. The chemical injection device (Figure 1) consists basically of:

- a) Access connection,
- b) Retractable device, consisting of: Plug or sealing device and fixing of the injector nozzle, and Injector nozzle,
- c) Closure cap (used when not in installation or removal of the plug),
- d) Retractable tool (used in plug installation and removal operations).

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4 DESIGN REQUIREMENTS

4.1 GENERAL DESIGN REQUIREMENTS

- 4.1.1 The chemical injection points design shall be submitted to Classification Society, when required, for comments and its approval.
- 4.1.2 The chemical injection points shall be suitable for marine environment according to class CX of ISO 12944 Part 2.
- 4.1.3 The access fitting shall be designed according to ASME B31.3. The fittings shall be as per ASME B16.11 and ASME B16.15.
- 4.1.4 All access fittings shall be specified for welded connection, unless otherwise required (see TABLE 1).
- 4.1.5 The access fittings shall be hydraulic type. Mechanical access fittings may be acceptable provided previous PETROBRAS approval.

4.2 INJECTION TUBE PLUG

- 4.2.1 The Injection tube plug (component of the retrieval access fitting) has the sealing action and the function of conducting the chemical products inside the pipe or equipment. The injection tube plug may be of these types:
- Open tube: The tube end is cut at a 90° angle;
 - 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;
 - Spray tube: The tube end as a spray nozzle that directs the chemical product parallel to the flow with the use of a right angle nozzle.

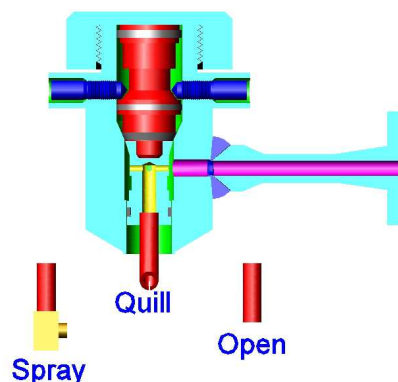


Figure 1: Injection tubes: Open tube, Quill tube and Spray tube.

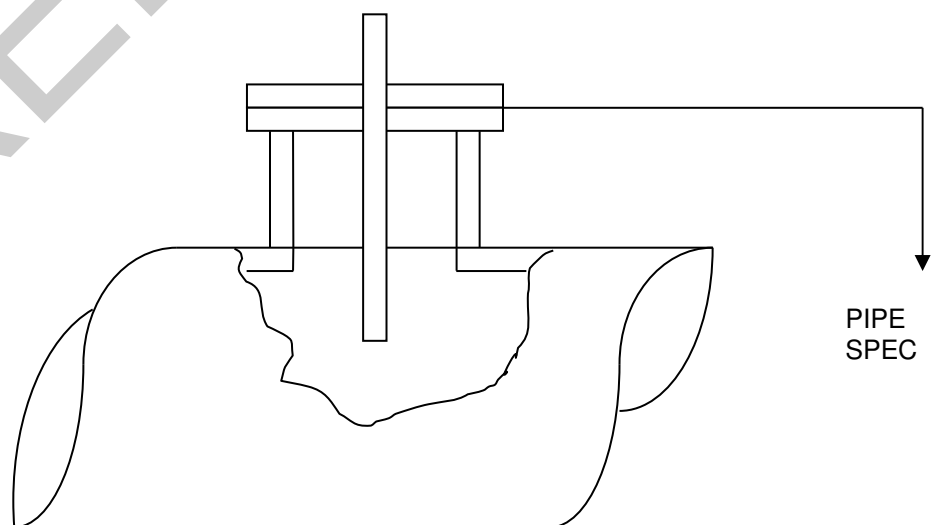
- 4.2.2 The injection tube plug type shall be according to ANNEX A or to notes in the P&IDs. In case not specified otherwise in the project Table 1 shall be followed.

Table 1: Injection Tube Plug Type.

Chemical product	Injection tube type
Defoamer / Defoamer additive	Quill
Hydrate inhibitor	Spray
Oil scale inhibitor	Quill
Asphaltene Inhibitor	Spray
Wax Inhibitor	Spray
Demulsifier / Biodisperser	Open
H ₂ S scavenger	Spray
Corrosion inhibitor	Spray (note 1)
Corrosion inhibitor	Quill (note 2)
Biocide /Biostatic	Quill (note 4)
Produced Water scale inhibitor	Quill
Oxygen scavenger	Spray
Scale disperser	Spray
Polyelectrolyte (inverted emulsion inhibitor)	Quill
Hypochlorite	Quill

NOTES:
 1-Corrosion inhibitor for gas phase.
 2-Corrosion inhibitor for water systems and biphasic systems (oil/water or oil/gas).
 3-Biocide /Biostatic for water systems and biphasic systems (oil/water).

- 4.2.3 Whenever the spray nozzle is to be used, a further injection point with a quill-type nozzle having the same injection line should be installed, so that the chemical injection can be directed to it in case of nozzle clogging, and so the chemical injection is not interrupted until the intervention to change it.
- 4.2.4 All chemical injection connections on topside umbilical connectors shall be flanged, according to Figure 2 and tube end according to TABLE 1.
- 4.2.4.1 For details about block and retention valves see P&IDs.


Figure 2 Schematic of the Chemical Injection, Flanged Type, on top side umbilical connectors.

4.2.5 The non-operational chemical injection points shall be flanged, and tube ended.

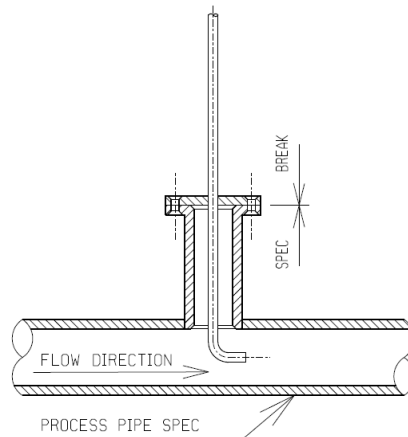


Figure 3: Schematic of the Chemical Injection, Flanged Type.

4.2.6 The chemical injection points in the vacuum deaeration column shall be flanged type (flange with 1") to use the column flange. In this case, the reference is Figure 4.

4.2.7 The injection point shall be designed to assure:

- a) Proper mixing of the corrosion inhibitor / oxygen scavenger;
- b) Selected material shall be suitable for corrosion inhibitor / oxygen scavenger;
- c) Injection on the liquid phase, avoiding impingement on the pressure vessel's shell.

4.3 ACCESS POINT

4.3.1 The connection for access fitting to chemical injection tubing (Figure 2 and 3) may be of two types:

4.3.1.1 Flanged type: The connection to chemical injection tubing is by a flanged connection;

4.3.1.2 Nipple type: The connection to chemical injection tubing is by a nipple (welded or screwed) connection.

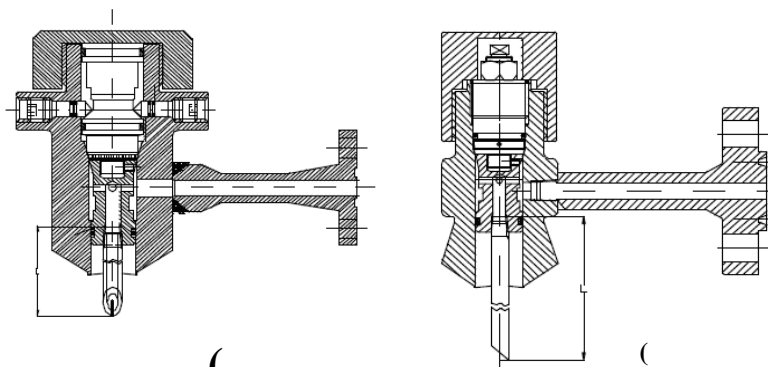


Figure 4 Hydraulic (1) and Mechanical (2) access fittings (Flanged type).

Socket weld

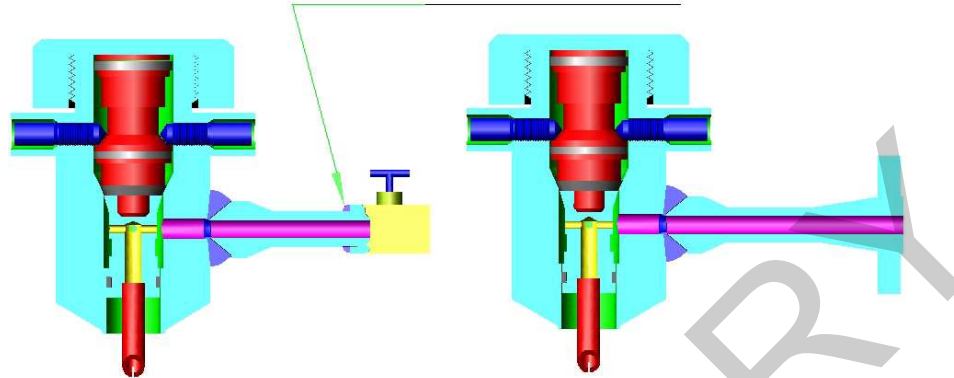


Figure 5 Hydraulic access fitting: (1) Nipple type and (2) Flanged type.

- 4.3.1 Screwed nipple connections shall not be used due the risk of fatigue cracking.
- 4.3.2 The connection between the device and the main piping shall be according to the derivation table of the spec used
- 4.3.3 Verification of the fatigue resistance of the vibration access device induced by vortex formation shall be provided.
- 4.3.4 A verification of the vortex-induced vibration nozzle fatigue strength shall be made following the analysis line in ASME PTC 19.3 for vortex-induced vibration in the flow direction and in the transverse direction in the direction of flow.
- 4.3.5 The supplier of the chemical injection system must provide the natural frequency of the access device.
- 4.3.6 Injection points of chemicals in pipes with internal coating shall be flanged according to Figure 6.

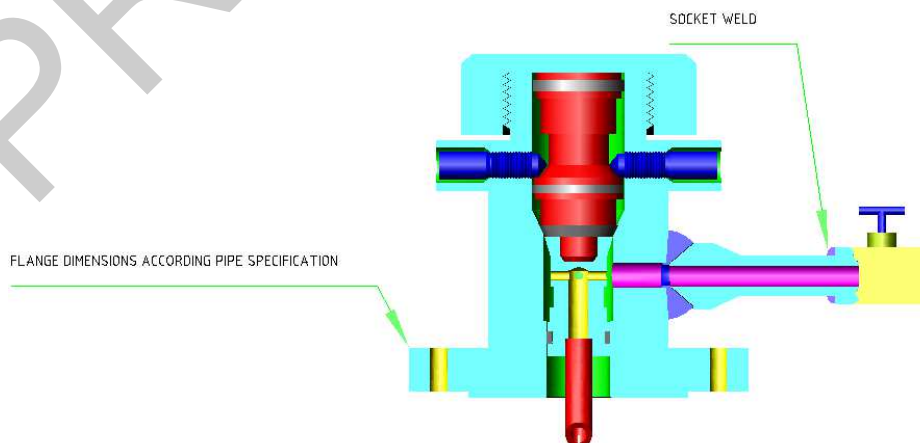


Figure 6- Access Fittings for Internal Painted Piping Systems.

4.3.7 All chemical injection connections of sodium hypochlorite shall be flanged at the injection points according to Figure 7.

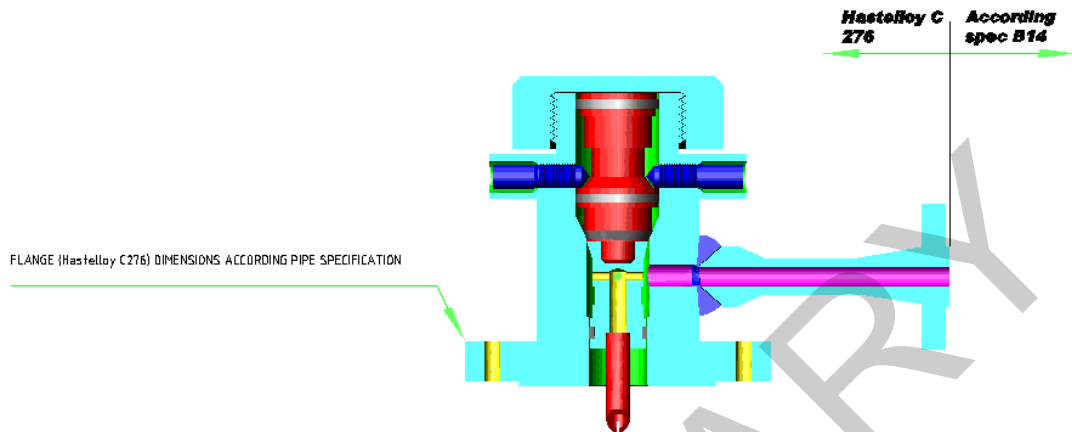


Figure 7 - Access connection for chemical injection of sodium hypochlorite in pipe systems type B14

4.3.7.1 The flanged connections shall be in accordance with the specification of the line. Flanged connection shall be suitable for the pipe specification.

4.3.7.2 Electrical insulation shall be used to prevent galvanic corrosion between the access connection and the piping. Electrical insulation shall be provided to avoid galvanic corrosion between the fitting and pipe.

4.3.7.3 Hastelloy C276 must be used until shall be used up to 26 ° C. For higher temperatures use TITANIUM Grade 2.

4.4 SHUT-OFF VALVES

4.4.1 The chemical injection points and the shut-off valves shall be from only one supplier. The shut-off valves shall be scope of supply of the chemical injection device supplier.

4.4.2 The shut-off valves shall be suitable for connecting the chemical product tubing.

4.4.3 The shut-off valves shall be double block for high pressure service and single block for low pressure service.

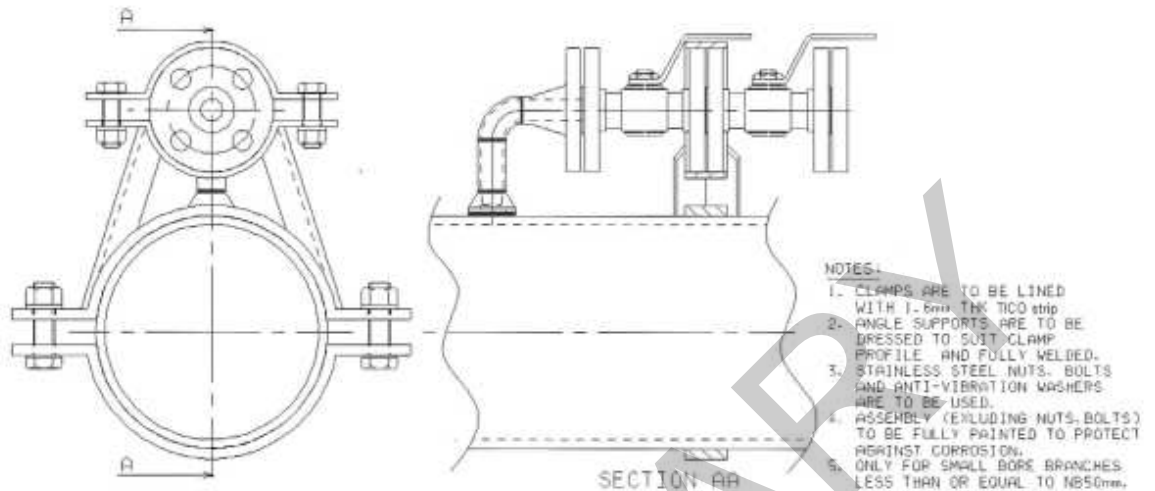
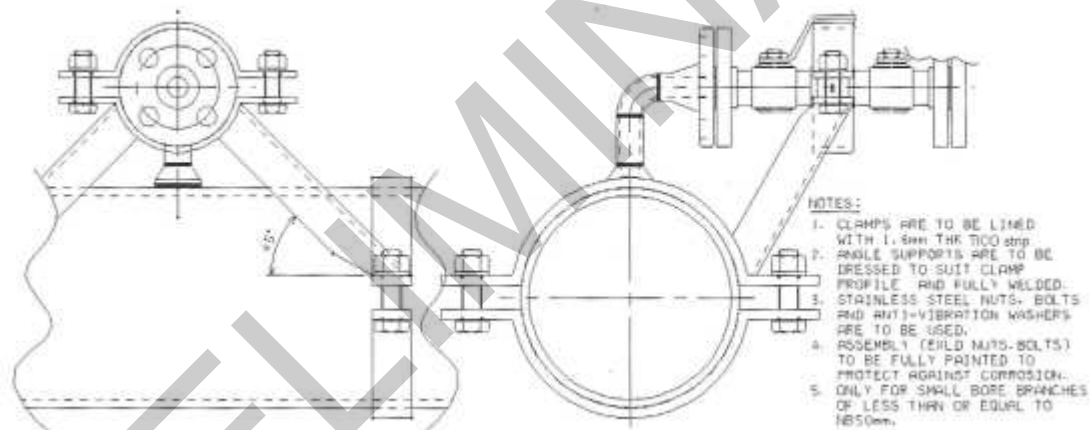
4.4.3.1 Ball valves shall not be used for hypochlorite service. Ball valves may explode due to excess gas buildup in the interstitial space of the ball valve while in the closed position.

4.4.4 When using double locking, the two shut-off valves shall be supported on the piping to avoid vibration fatigue problems due to the large mass (see supporting details recommended in Figure 8 and Figure 9).

4.4.5 Every shut-off valve shall be supported on the piping where the chemical will be injected to avoid vibration fatigue problems due to the mass of the rocking valve.

4.4.6 For details about retention valves see P&IDs.

4.4.7 When outside scope of supplier the block valves will be shown in the P&IDs.


Figure 8 - Preferential support scheme

Figure 9 - Secondary support scheme


4.4.8 Chemical injection connections for subsea installations shown at P&IDs: from I-DE-3010.1M-1210-944-P4X-001- WAG INJECTION AND SATELLITE PRODUCTION WELL "A" to I-DE-3010.1M-1210-944-P4X-017 - PIG RECEIVERS (SATELLITE WELLS "J" TO "Q"), are out of the scope of this Technical Specification and shall be detailed during the Detail Engineering stage.

4.5 SPECIFIC TUBING DESIGN REQUIREMENTS

4.5.1 The standard tubing diameter shall be ¾". Other tubing diameters may be used and the vendor shall verify the TABLE 1 for those different diameters;

4.5.2 The design of tubing transporting chemical shall consider adequate flexibility to prevent differential movement and / or vibration of the line where the product will be injected to cause damage to the tubing transporting the chemical

4.5.3 Tubing support system:

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4.5.3.1 Supporting systems that can create crevice corrosion points shall not be used, like tubing strips or clamp supports. Tubing supporting systems shall be designed to minimize the points of contact between tubing and the support system in order to avoid crevice corrosion points.

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

4.5.3.3 It shall not be used tubing supporting systems that can create crevice corrosion points, like tube support strips or clamp supports. Tubing supporting systems shall be designed to minimize the points of contact between tubing and the support system in order to avoid crevice corrosion points;

4.5.3.4 If it's 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 minimizes the crevice at the pipe and tubing and allows no water accumulation. The metallic rods between tubing allow the correct separation and also minimizes 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;

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

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

4.5.4 Tubing fittings shall not be used to support instruments, which shall be independently mounted;

4.5.5 Design pressures equal to or higher than 600# shall be considered as high pressure service.

4.6 WELDING


4.6.1 The welding shall be in accordance with I-ET-3010.00-1200-955-P4X-001- WELDING. All welds shall be categorized as inspection class IV and shall be inspected as required in I-ET-3010.00-1200-955-P4X-002 – WELDING INSPECTION.

4.6.2 The welding of the access fitting shall precede the drilling of the hole on the sampling point.

4.6.3 After the access fitting welding, a hydrostatic test shall be done and the last thing shall be the hole drilling on the sampling point. Alternatively the weld shall be tested during the hydrostatic test of the pipe system or equipment and, in this case, the hole shall be done previously to the hydrostatic test.

4.6.4 The drilling shall be done using a HTM (Hot Tap Machine) with drilling bit of diameter 35 mm to guarantee a hole without burrs, weld spatter or any kind of obstructions in the plug access.

4.6.5 All welds of access fitting to piping/equipment shall be full strength weld.

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- 4.6.6 Fillet welds shall not be used to weld the access fitting body to pipe or equipment. Fillet welds in other parts of access fitting may be acceptable, provided that receive Toe gridding or TIG dressing to avoid fatigue cracks.
- 4.6.7 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;
- 4.6.8 During the installation process, the contamination by iron oxide (Fe) caused by welding or grinding shall be avoided;
- 4.6.9 Any weld splatter on stainless tubing shall be removed. In severe cases, the tubing shall be replaced;
- 4.6.10 All lot size shall be analyzed by Positive Material Identification according to API RP 578;


4.7 MATERIALS SPECIFICATION:

- 4.7.1 When not specified at ANNEX A or in the P&IDs, the materials selection shall be according Table 2.

Table 2: Materials Selection.

Equipment or component	Material specification
Access fitting (body)	Stainless steel 316 L or according to pipe specification, when the pipe material is not carbon steel. ¹
Injection tube Plug	Stainless steel 316 L (up to 50°C) ² or 625 alloy ⁷ .
Shut-off valve	Stainless steel 316 L (up to 50°C) ² or 625 alloy ⁷ .
Access fitting (body) and injection tube Plug for hypochlorite injection	Hastelloy C 276 ³ or Titanium Grade 2 ^{4,5} .
NOTES: 1- Since Scale inhibitors may have low pH, more corrosion resistant materials (AISI 316, for example) shall be selected. The risk of stress corrosion cracking of austenitic stainless steels over 60°C shall be considered during the selection stage. 2- The risk of stress corrosion cracking shall be considered during the selection. For operational temperatures from 50°C to 90°C, consider the use of UNS 32750 or 32760. 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). 7- For carbon steel coated internally with 625 alloy piping.	

- 4.7.2 The access fittings shall be in accordance with the I-ET-3010.1M-1200-200-P4X-001-PIPING SPECIFICATION FOR TOPSIDE.
- 4.7.3 The access fitting cannot limit the piping system pressure, so its material and design temperature and pressure shall be compatible with the piping being welded at.
- 4.7.4 The tubing specification shall be in accordance with I-ET-3010.1M-1200-200-P4X-001-PIPING SPECIFICATION FOR TOPSIDE.
- 4.7.5 Tubing connections shall have the same chemical composition of tubing material. The connections shall use double ferrule technology;
- 4.7.6 Any circumferential weld in coiled tubing shall be fully radiographed as a minimum;

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- 4.7.7 Coiled tubing requires prior approval of PETROBRAS;
- 4.7.8 Only seamless stainless steel tubing shall be used;
- 4.7.9 Connections shall use double ferrule technology. Connections materials shall be chosen so as not to generate potential difference high enough to cause galvanic corrosion due to surface contact with tubing.
- 4.7.10 Tubing rods shall be provided with a standard 6-meter length. Coiled tubing are not acceptable. For tubing straight lengths longer than 15 meters, tubing rods longer than 6 meters can be used to reduce the required number of connections.
- 4.7.11 Only seamless stainless steel tubing shall be used.
- 4.7.12 When connections are implemented by the use of unions, project shall forecast room for connection changes in the intermediate tubing with angles between 30 and 45 degrees.


4.8 PAINTING

- 4.8.1 Paint system for external coating shall be according to I-ET-3010.00-1200-956-P4X-002 – GENERAL PAINTING.
- 4.8.2 Color code shall comply with DR-ENGP-I-1.15 – COLOR CODING.

5 ARRANGMENT OF CHEMICAL INJECTION POINTS

5.1 LOCATION OF CHEMICAL INJECTION POINTS:

- 5.1.1 The access fitting should be installed in the 12 o'clock position on horizontal pipes.
- 5.1.2 The injection tube plug length shall be enough to inject the chemical products at the center of the pipe.
- 5.1.3 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.
- 5.1.4 The chemical injection point shall be located at a minimum distance of 5 times the piping diameter from any piping stagnation area.
- 5.1.5 The corrosion monitoring points shall be installed downstream of chemical injection points
- 5.1.6 Every chemical injection point shall have adequate clearance the operation of the recovery tool. The clearance shall be at least one free cylindrical area of 50,0 cm radius and 2.0 m in length with respect to the connection of the monitoring point, according to Figure 10 and Figure 11.

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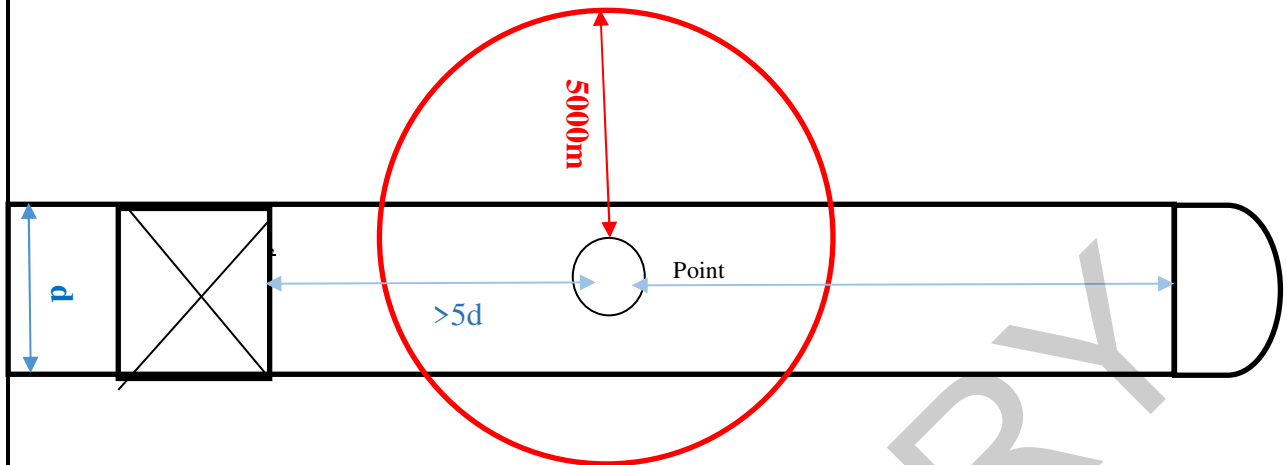


Figure 10- Superior view

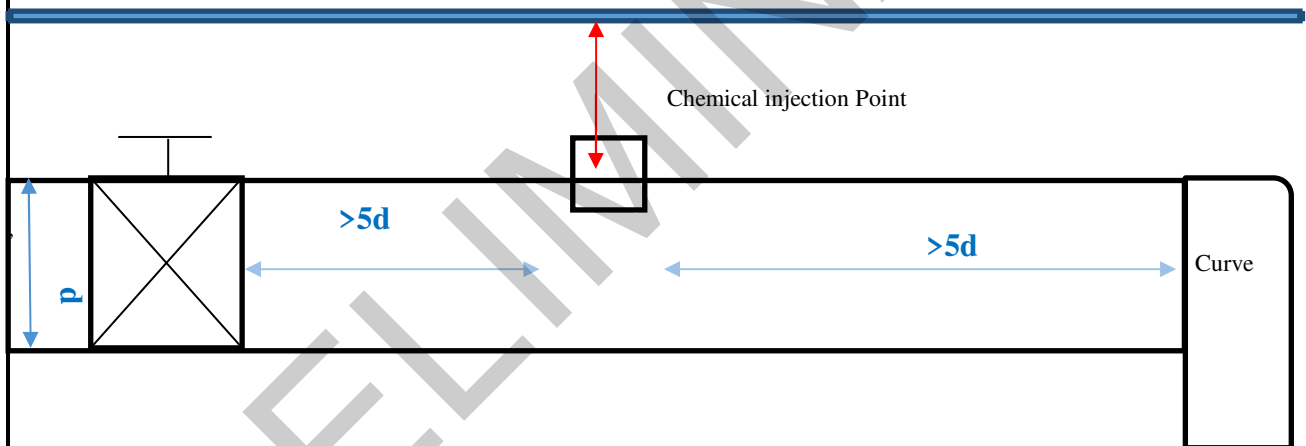


Figure 11- Lateral view

5.1.7 Chemical injection points shall have access provided in the design through access structures (ladders and platforms). Where this is not possible, the monitoring points shall be at a maximum floor height of 3.5 m in order to facilitate access via scaffolding or ladders.

5.1.8 No chemical injection point shall be positioned over the sea.

5.2 TYPE OF INSTALATION FOR CHEMICAL INJECTION POINTS

5.2.1 The type of installation of access point shall be in accordance with TABLE 3.



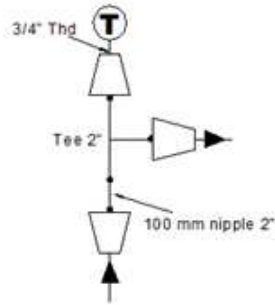
Table 3 - TYPICAL ARRANGEMENT FOR CHEMICAL INJECTION POINTS (NOTE 3)

SPEC	Pipe Diameter	Type of Instalation					
		Curved			Vertical/Horizontal		
		¾" NPT Threaded	1 ½" Flanged	2" Flanged	¾" NPT Threaded	1 ½" Flanged	2" Flanged
CLASS 125	¾" to 1 ½"	Type 1A			Type 1C		
	2"	Type 1B					
	3" to 4"	Type 1E			Type 1D		
CLASS 150 up to 600 (note 1 and 2)	¾" to 1 ½"		Type 2A			Type 2D	
	2"		Type 2B				
	3" and above		Type 2C			Type 2E	
CLASS 900 up to 10000	¾" to 1 ½"			Type 2A			Type 2C
	2"			Type 2B			
	3" and above			Type 2E			Type 2D
Non-metallic piping	All		Not Applicable				

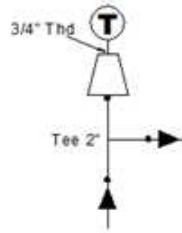
Notes:

- 1 – If pipe thickness for NPS 1 ½ is SCH XXS, it shall be used NPS 2 flanged connection.
- 2 – For piping specifications without NPS 1 ½, it shall be used NPS 2 flanged connection.
- 3 – The flange diameters shown on table 1 are typical diameters, but it must be confirmed in detailed design phase with instrumentation team.

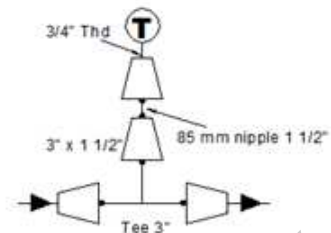
PRELIMINARY



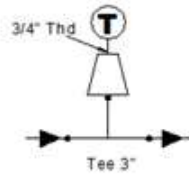
1A - Preferred arrangement
NPS 3/4 up to 1 1/2



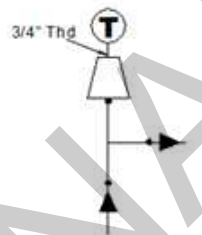
1B - Preferred arrangement
NPS 2



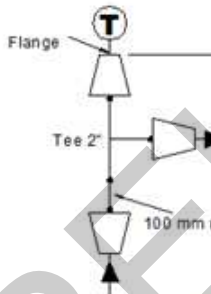
1C - Use only when 1A and
1B are not possible



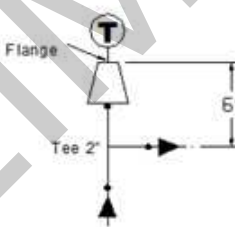
1D - Preferred arrangement
NPS 3 and 4



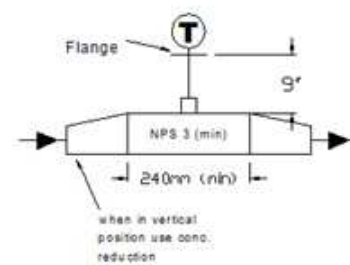
1E - Use only when 1D is
not possible



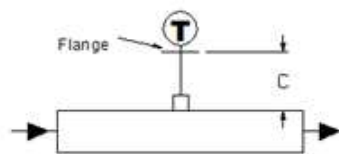
2A - Preferred arrangement
NPS 3/4 up to 1 1/2
(shall be in vertical position)



2B - Preferred arrangement
NPS 2
(shall be in vertical position)

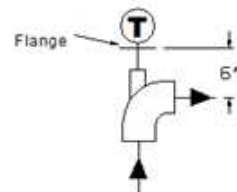


2C - Use only when 2A and
2B are not possible




2D - Preferred arrangement
NPS equal and greater than 3

C = 5" for NPS 3
C = 6" for NPS equal and greater than 4



2E - Use only when 2D is
not possible


	TECHNICAL SPECIFICATION	Nº: I-ET-3010.1M-1200-940-P4X-003	REV. 0
	UNIT: BUZIOS	SHEET 18 of 25	
	TITLE: CHEMICAL INJECTION POINTS	NP-1 ESUP	

6 CHEMICAL INJECTION VESSELS

- 6.1 Buzios water systems are equipped with Chemical Injection Vessels (Pots), which may be used for corrosion inhibitor. When no informed at I-ET-3010.1M-1200-500-P4X-001 - MATERIAL SPECIFICATION FOR PRESSURE VESSELS AND TANKS, the materials of those vessels shall be stainless steel (AISI 316L) when operating temperature does not exceed 50°C. For higher temperatures, suitable materials shall be selected.
- 6.2 Chemical Injection Vessels for hypochlorine, DBNPA or chlorine service shall be FRP (if accepted by the Classification Society), Hastelloy C276 (Temp < 26°C) or Titanium.
- 6.3 Titanium shall not be selected for dry chlorine.

7 SCOPE OF SUPPLY AND SERVICES

- 7.1 The number of chemical injection points, the P&IDs and all relevant information about the corrosion monitoring system are shown in ANNEX A.
- 7.2 The access fittings shall be hydraulic type. Mechanical access fittings may be acceptable provided previous PETROBRAS approval.
- 7.3 A complete retrieval tool kit is in the scope of supply.
- 7.4 The chemical injection points shall be supplied in accordance with ANNEX A.
- 7.5 The scope of supply includes, but is not limited to:
- Executive procedures of installation and commissioning
 - Datasheets of equipment
 - Material certificates
 - Welding documentation
 - Drawings for each equipment
 - Installation drawings including general arrangement, electrical diagrams, wiring diagrams, cable list, material list, equipment list
 - Supply of equipment, materials and accessories required to carry out the construction, installation and pre-operation of the system, as well as spare parts required for two years of operation.
 - Installation and commissioning of the chemical injection point


	TECHNICAL SPECIFICATION	Nº: I-ET-3010.1M-1200-940-P4X-003	REV. 0
	UNIT:	BUZIOS	SHEET 19 of 25
	TITLE:	CHEMICAL INJECTION POINTS	NP-1
			ESUP


ANNEX A


Chemical product	Pipe information		Chemical injection point design				Material specification	
			Type			High pressure	Access fitting	Plug
	PI&D	TAG	Open	Quill	Spray			
Defoamer	I-DE-3010.1M-1223-944-P4X-001	24"-PC-C12-204-HC		X		NO	SSDS	316L
Defoamer	I-DE-3010.1M-1223-944-P4X-008	12"-PC-C12-228-HC		x		NO	SSDS	316L
Defoamer	I-DE-3010.1M-1223-944-P4X-002	16"-PC-C16-498-HC		x		NO	SSDS	316L
Defoamer	I-DE-3010.1M-1223-944-P4X-006	14"-PC-B16-529-HC		x		NO	SSDS	316L
Demulsifier / Biodisperser	I-DE-3010.1M-1223-944-P4X-001	24"-PC-C12-204-HC	x			NO	SSDS	316L
Demulsifier / Biodisperser	I-DE-3010.1M-1223-944-P4X-008	12"-PC-C12-228-HC	x			NO	SSDS	316L
Oil scale inhibitor	I-DE-3010.1M-1223-944-P4X-001	24"-PC-C12-204-HC		x		NO	SSDS	316L
Oil scale inhibitor	I-DE-3010.1M-1223-944-P4X-008	12"-PC-C12-228-HC		x		NO	SSDS	316L
Oil scale inhibitor	I-DE-3010.1M-1223-944-P4X-003	16"-PC-B16-257-HC		x		NO	SSDS	316L
Oil scale inhibitor	I-DE-3010.1M-1223-944-P4X-006	14"-PC-B16-529-HC		x		NO	SSDS	316L
H2S scavenger	I-DE-3010.1M-1223-944-P4X-012	HOLD		x		NO	-	-
Acidifying agent	I-DE-3010.1M-1223-944-P4X-001	HOLD		x		NO	SSDS	625 alloy
Acidifying agent	I-DE-3010.1M-1223-944-P4X-008	HOLD		x		NO	SSDS	625 alloy
Acidifying agent	I-DE-3010.1M-1223-944-P4X-005	HOLD		x		NO	625 alloy	625 alloy
Oil scale inhibitor	I-DE-3010.1M-1210-944-P4X-002	DOWNHOLE		x		YES	-	-
Oil scale inhibitor	I-DE-3010.1M-1210-944-P4X-003	DOWNHOLE		x		YES	-	-
Oil scale inhibitor	I-DE-3010.1M-1210-944-P4X-004	DOWNHOLE		x		YES	-	-
Oil scale inhibitor	I-DE-3010.1M-1210-944-P4X-010	DOWNHOLE		x		YES	-	-
Oil scale inhibitor	I-DE-3010.1M-1210-944-P4X-011	DOWNHOLE		x		YES	-	-
Oil scale inhibitor	I-DE-3010.1M-1210-944-P4X-012	DOWNHOLE		x		YES	-	-
Oil scale inhibitor	I-DE-3010.1M-1210-944-P4X-013	DOWNHOLE		x		YES	-	-

	TECHNICAL SPECIFICATION		Nº: I-ET-3010.1M-1200-940-P4X-003				REV. 0	
	UNIT: BUZIOS						SHEET 20 of 25	
	TITLE: CHEMICAL INJECTION POINTS						NP-1	
							ESUP	
Chemical product	Pipe information		Chemical injection point design				Material specification	
	PI&D	TAG	Type			High pressure	Access fitting	Plug
Open			Quill	Spray				
Oil scale inhibitor	I-DE-3010.1M-1210-944-P4X-014	DOWNHOLE		x		YES	-	-
Oil scale inhibitor	I-DE-3010.1M-1210-944-P4X-015	DOWNHOLE		x		YES	-	-
Oil scale inhibitor	I-DE-3010.1M-1210-944-P4X-001	DOWNHOLE		x		YES	-	-
Oil scale inhibitor	I-DE-3010.1M-1210-944-P4X-009	DOWNHOLE		x		YES	-	-
Oil scale inhibitor	HOLD	HOLD		x		YES	-	-
Wax inhibitor	I-DE-3010.1M-1210-944-P4X-002	DOWNHOLE		X		YES	-	-
Wax inhibitor	I-DE-3010.1M-1210-944-P4X-003	DOWNHOLE		X		YES	-	-
Wax inhibitor	I-DE-3010.1M-1210-944-P4X-004	DOWNHOLE		X		YES	-	-
Wax inhibitor	I-DE-3010.1M-1210-944-P4X-010	DOWNHOLE		X		YES	-	-
Wax inhibitor	I-DE-3010.1M-1210-944-P4X-011	DOWNHOLE		X		YES	-	-
Wax inhibitor	I-DE-3010.1M-1210-944-P4X-012	DOWNHOLE		X		YES	-	-
Wax inhibitor	I-DE-3010.1M-1210-944-P4X-013	DOWNHOLE		X		YES	-	-
Wax inhibitor	I-DE-3010.1M-1210-944-P4X-014	DOWNHOLE		X		YES	-	-
Wax inhibitor	I-DE-3010.1M-1210-944-P4X-015	DOWNHOLE		X		YES	-	-
Wax inhibitor	I-DE-3010.1M-1210-944-P4X-001	DOWNHOLE		X		YES	-	-
Wax inhibitor	I-DE-3010.1M-1210-944-P4X-009	DOWNHOLE		X		YES	-	-
Hydrate inhibitor	I-DE-3010.1M-1210-944-P4X-002	DOWNHOLE			X	YES	-	-
Hydrate inhibitor	I-DE-3010.1M-1210-944-P4X-003	DOWNHOLE			X	YES	-	-
Hydrate inhibitor	I-DE-3010.1M-1210-944-P4X-004	DOWNHOLE			X	YES	-	-
Hydrate inhibitor	I-DE-3010.1M-1210-944-P4X-006	DOWNHOLE			X	YES	-	-
Hydrate inhibitor	I-DE-3010.1M-1210-944-P4X-007	DOWNHOLE			X	YES	-	-
Hydrate inhibitor	I-DE-3010.1M-1210-944-P4X-008	DOWNHOLE			X	YES	-	-
Hydrate inhibitor	I-DE-3010.1M-1210-944-P4X-010	DOWNHOLE			X	YES	-	-
Hydrate inhibitor	I-DE-3010.1M-1210-944-P4X-011	DOWNHOLE			X	YES	-	-

	TECHNICAL SPECIFICATION		Nº: I-ET-3010.1M-1200-940-P4X-003				REV. 0	
	UNIT: BUZIOS					SHEET 21 of 25		
	TITLE: CHEMICAL INJECTION POINTS					NP-1		
						ESUP		
Chemical product	Pipe information		Chemical injection point design				Material specification	
	PI&D	TAG	Type			High pressure	Access fitting	Plug
Open			Quill	Spray				
Hydrate inhibitor	I-DE-3010.1M-1210-944-P4X-012	DOWNHOLE			X	YES	-	-
Hydrate inhibitor	I-DE-3010.1M-1210-944-P4X-013	DOWNHOLE			X	YES	-	-
Hydrate inhibitor	I-DE-3010.1M-1210-944-P4X-014	DOWNHOLE			X	YES	-	-
Hydrate inhibitor	I-DE-3010.1M-1210-944-P4X-015	DOWNHOLE			X	YES	-	-
Hydrate inhibitor	I-DE-3010.1M-1210-944-P4X-005	DOWNHOLE			X	YES	-	-
Hydrate inhibitor	I-DE-3010.1M-1210-944-P4X-001	DOWNHOLE			X	YES	-	-
Hydrate inhibitor	I-DE-3010.1M-1210-944-P4X-009	DOWNHOLE			X	YES	-	-
Asphaltene inhibitor	I-DE-3010.1M-1210-944-P4X-002	DOWNHOLE		x		YES	-	-
Asphaltene inhibitor	I-DE-3010.1M-1210-944-P4X-003	DOWNHOLE		x		YES	-	-
Asphaltene inhibitor	I-DE-3010.1M-1210-944-P4X-004	DOWNHOLE		x		YES	-	-
Asphaltene inhibitor	I-DE-3010.1M-1210-944-P4X-010	DOWNHOLE		x		YES	-	-
Asphaltene inhibitor	I-DE-3010.1M-1210-944-P4X-011	DOWNHOLE		x		YES	-	-
Asphaltene inhibitor	I-DE-3010.1M-1210-944-P4X-012	DOWNHOLE		x		YES	-	-
Asphaltene inhibitor	I-DE-3010.1M-1210-944-P4X-013	DOWNHOLE		x		YES	-	-
Asphaltene inhibitor	I-DE-3010.1M-1210-944-P4X-014	DOWNHOLE		x		YES	-	-
Asphaltene inhibitor	I-DE-3010.1M-1210-944-P4X-015	DOWNHOLE		x		YES	-	-
Asphaltene inhibitor	I-DE-3010.1M-1210-944-P4X-001	DOWNHOLE		x		YES	-	-
Asphaltene inhibitor	I-DE-3010.1M-1210-944-P4X-009	DOWNHOLE		x		YES	-	-
Asphaltene inhibitor	HOLD	HOLD		x		YES	-	-
H2S scavenger	I-DE-3010.1M-1210-944-P4X-002	DOWNHOLE		x		YES	-	-
H2S scavenger	I-DE-3010.1M-1210-944-P4X-003	DOWNHOLE		x		YES	-	-
H2S scavenger	I-DE-3010.1M-1210-944-P4X-010	DOWNHOLE		x		YES	-	-
H2S scavenger	I-DE-3010.1M-1210-944-P4X-011	DOWNHOLE		x		YES	-	-
H2S scavenger	I-DE-3010.1M-1210-944-P4X-012	DOWNHOLE		x		YES	-	-

	TECHNICAL SPECIFICATION		Nº: I-ET-3010.1M-1200-940-P4X-003				REV. 0	
	UNIT: BUZIOS						SHEET 22 of 25	
	TITLE: CHEMICAL INJECTION POINTS						NP-1	
							ESUP	
Chemical product	Pipe information		Chemical injection point design				Material specification	
	PI&D	TAG	Type			High pressure	Access fitting	Plug
Open			Quill	Spray				
H2S scavenger	I-DE-3010.1M-1210-944-P4X-013	DOWNHOLE		x		YES	-	-
H2S scavenger	I-DE-3010.1M-1210-944-P4X-014	DOWNHOLE		x		YES	-	-
H2S scavenger	I-DE-3010.1M-1210-944-P4X-015	DOWNHOLE		x		YES	-	-
H2S scavenger	I-DE-3010.1M-1210-944-P4X-001	DOWNHOLE		x				
H2S scavenger	I-DE-3010.1M-1210-944-P4X-009	DOWNHOLE		x				
H2S scavenger	HOLD	HOLD		x				
H2S scavenger	HOLD	HOLD		x				
Hydrate inhibitor	Linha de saída de condensado do vaso de gás combustível de alta pressão	HOLD			X	YES		
Hydrate inhibitor	Linha de entrada no vaso de gás combustível a montante da válvula de controle de pressão de gás combustível	HOLD			X	YES		
Hydrate inhibitor	Linha de entrada no vaso Cold Separator a montante do trocador de fluido refrigerante (I-DE-3010.1M-1238-944-P4X-001)	HOLD			X	NO		
Hydrate inhibitor	Linha de saída de condensado do vaso Cold Separator a montante da LV (I-DE-3010.1M-1238-944-P4X-001)	HOLD			X	NO		
Hydrate inhibitor	Linha de saída de gás do vaso Cold Separator (I-DE-3010.1M-1238-944-P4X-001)	HOLD			X	NO		
Hydrate inhibitor	I-DE-3010.1M-1244-944-P4X-001	4"-P-H6-227 (HOLD)			X	YES	316L	316L
Hydrate inhibitor	I-DE-3010.1M-1244-944-P4X-001	4"-P-H6-226- (HOLD)			X	YES	316L	316L
Hydrate inhibitor	I-DE-3010.1M-1233-944-P4X-002	4"-PC-E16-496-(hold)			X	NO	316L	316L
Hydrate inhibitor	I-DE-3010.1M-1233-944-P4X-002	3"-PC-E16-037 (hold)			X	NO	316L	316L
Hydrate inhibitor	I-DE-3010.1M-1244-944-P4X-002	HOLD			X	YES	316L	316L
Hydrate inhibitor	I-DE-3010.1M-1244-944-P4X-002	HOLD			X	YES	316L	316L

	TECHNICAL SPECIFICATION		Nº: I-ET-3010.1M-1200-940-P4X-003				REV. 0	
	UNIT: BUZIOS						SHEET 23 of 25	
	TITLE: CHEMICAL INJECTION POINTS						NP-1	
							ESUP	
Chemical product	Pipe information		Chemical injection point design				Material specification	
	PI&D	TAG	Type			High pressure	Access fitting	Plug
Open			Quill	Spray				
Hydrate inhibitor	I-DE-3010.1M-1244-944-P4X-003	HOLD			X	YES	316L	316L
Hydrate inhibitor	I-DE-3010.1M-1244-944-P4X-003	HOLD			X	YES	316L	316L
Hydrate inhibitor	I-DE-3010.1M-1244-944-P4X-004	HOLD			X	YES	316L	316L
Hydrate inhibitor	I-DE-3010.1M-1244-944-P4X-004	HOLD			X	YES	316L	316L
Hydrate inhibitor	I-DE-3010.1M-1244-944-P4X-005	HOLD			X	YES	316L	316L
Hydrate inhibitor	I-DE-3010.1M-1244-944-P4X-005	HOLD			X	YES	316L	316L
Hydrate inhibitor	I-DE-3010.1M-1244-944-P4X-006	HOLD			X	YES	316L	316L
Hydrate inhibitor	I-DE-3010.1M-1244-944-P4X-006	HOLD			X	YES	316L	316L
Hydrate inhibitor	I-DE-3010.1M-1244-944-P4X-007	HOLD			X	YES	316L	316L
Hydrate inhibitor	I-DE-3010.1M-1244-944-P4X-007	HOLD			X	YES	316L	316L
Hydrate inhibitor	I-DE-3010.1M-1244-944-P4X-008	HOLD			X	YES	316L	316L
Hydrate inhibitor	I-DE-3010.1M-1244-944-P4X-008	HOLD			X	YES	316L	316L
Hydrate inhibitor	I-DE-3010.1M-1244-944-P4X-009	HOLD			X	YES	316L	316L
Hydrate inhibitor	I-DE-3010.1M-1244-944-P4X-009	HOLD			X	YES	316L	316L
Hydrate inhibitor	I-DE-3010.1M-1244-944-P4X-010	HOLD			X	YES	316L	316L
Hydrate inhibitor	I-DE-3010.1M-1244-944-P4X-010	HOLD			X	YES	316L	316L
Hydrate inhibitor	Linha de injeção de gás lift (antes de cada Pig Launcher) ⁽⁵⁾ e Header de exportação de gás	HOLD			X	YES	316L	316L
H2S scavenger	I-DE-3010.1M-1223-944-P4X-002	24"-PC-C16-286-PP		x		NO	SSDS	316L
H2S scavenger	I-DE-3010.1M-1223-944-P4X-009	2"-PC-C16-288-PP		x		NO	SSDS	316L
Corrosion inhibitor	Linha de saída de condensado do vaso de gás combustível de alta pressão	HOLD		x	x	YES	316L	316L
Corrosion inhibitor	Linha de entrada no vaso de gás combustível a montante da válvula de controle de pressão de gás	HOLD		x	x	YES	316L	316L

	TECHNICAL SPECIFICATION		Nº: I-ET-3010.1M-1200-940-P4X-003				REV. 0	
	UNIT: BUZIOS						SHEET 24 of 25	
	TITLE: CHEMICAL INJECTION POINTS						NP-1	
							ESUP	
Chemical product	Pipe information		Chemical injection point design				Material specification	
	PI&D	TAG	Type			High pressure	Access fitting	Plug
		Open	Quill	Spray				
	combustível							
Gas Corrosion Inhibitor	I-DE-3010.1M-1231-944-P4X-011	12"-P-H6-204- (HOLD)		X	X	YES	316 L	316L
Polyelectrolyte	Linha de entrada do flotador (A jusante do ponto de amostragem)	HOLD		X		NO	ITEM 4.3.6	316L
Dilution water	Linha de entrada do flotador (A jusante do ponto de amostragem)	HOLD	x			NO	SSDS	316L
Polyelectrolyte	Linha de entrada do flotador (A jusante do ponto de amostragem)	HOLD		X		NO	ITEM 4.3.6	316L
Produced water scale inhibitor	I-DE-3010.1M-1223-944-P4X-002	12"-PCW-B11-004-PP		X			ITEM 4.3.6	316L
Produced water scale inhibitor	I-DE-3010.1M-1223-944-P4X-009	6"-PCW-B11-013-PP		X			ITEM 4.3.6	316L
Produced water scale inhibitor	I-DE-3010.1M-1223-944-P4X-005	14"-PCW-B11-026-HC		X			ITEM 4.3.6	316L
Produced water scale inhibitor	I-DE-3010.1M-1223-944-P4X-006	6"-PCW-B11-017-HC		X			ITEM 4.3.6	316L
Biocide	Slop tank	HOLD		x		NO	316L	316L
Biocide	Tanque de sedimentação de água produzida	HOLD		x		NO	316L	316L
Biostatic	Slop tank	HOLD		x		NO	316L	316L
Biostatic	Tanque de sedimentação de água produzida	HOLD		x		NO	316L	316L
O2 scavenger	Vaso da desaeradora	HOLD		X		NO	SSDS	316L
O2 scavenger	A jusante da linha de by-pass da desaeradora	HOLD		X		NO	ITEM 4.3.6	316L
O2 scavenger	Vaso da desaeradora	HOLD		X		NO	SSDS	316L
O2 scavenger chock	A jusante da linha de by-pass da desaeradora	HOLD		X		NO	ITEM 4.3.6	316L
Produced Water Scale Inhibitor	I-DE-3010.1M-1223-944-P4X-005	14"-PCW-B11-026-HC		X			ITEM 4.3.6	316L
Scale inhibitor	A montante da URS	HOLD		X		NO	ITEM 4.3.6	316L
biodisperser	A jusante da linha de by-pass da desaeradora	HOLD		x		NO	ITEM 4.3.6	316L
Biocide chock	A montante e a jusante da desaeradora (mas não ao mesmo tempo)	HOLD		x		NO	ITEM 4.3.6	316L

**TECHNICAL SPECIFICATION**

Nº: I-ET-3010.1M-1200-940-P4X-003

REV. 0

UNIT: BUZIOS

SHEET 25 of 25

TITLE: **CHEMICAL INJECTION POINTS**

NP-1

ESUP

Chemical product	Pipe information		Chemical injection point design				Material specification	
			Type			High pressure	Access fitting	Plug
	PI&D	TAG	Open	Quill	Spray			
Sodium hypochlorite	HOLD	HOLD		X		NO	HOLD	HOLD

PRELIMINARY