

Vents and Drains for Piping and Equipment

Standardization

This Standard replaces and cancels its previous revision.

The CONTEC - Authoring Subcommittee provides guidance on the interpretation of this Standard when questions arise regarding its contents. The Department of PETROBRAS that uses this Standard is responsible for adopting and applying the sections, subsections and enumerates thereof.

Technical Requirement: A provision established as the most adequate and which shall be used strictly in accordance with this Standard. If a decision is taken not to follow the requirement ("non-conformity" to this Standard) it shall be based on well-founded economic and management reasons, and be approved and registered by the Department of PETROBRAS that uses this Standard. It is characterized by imperative nature.

Recommended Practice: A provision that may be adopted under the conditions of this Standard, but which admits (and draws attention to) the possibility of there being a more adequate alternative (not written in this Standard) to the particular application. The alternative adopted shall be approved and registered by the Department of PETROBRAS that uses this Standard. It is characterized by verbs of a nonmandatory nature. It is indicated by the expression: **[Recommended Practice]**.

Copies of the registered "non-conformities" to this Standard that may contribute to the improvement thereof shall be submitted to the CONTEC - Authoring Subcommittee.

Proposed revisions to this Standard shall be submitted to the CONTEC - Authoring Subcommittee, indicating the alphanumeric identification and revision of the Standard, the section, subsection and enumerate to be revised, the proposed text, and technical/economic justification for revision. The proposals are evaluated during the work for alteration of this Standard.

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CONTEC

Comissão de Normalização
Técnica

SC - 17

Piping

Introduction

PETROBRAS Technical Standards are prepared by Working Groups - WG (consisting specialized of Technical Collaborators from Company and its Subsidiaries), are commented by Company Units and its Subsidiaries, are approved by the Authoring Subcommittees - SCs (consisting of technicians from the same specialty, representing the various Company Units and its Subsidiaries), and ratified by the Executive Nucleus (consisting of representatives of the Company Units and its Subsidiaries). A PETROBRAS Technical Standard is subject to revision at any time by its Authoring Subcommittee and shall be reviewed every 5 years to be revalidated, revised or cancelled. PETROBRAS Technical Standards are prepared in accordance with PETROBRAS Technical Standard [N-1](#). For complete information about PETROBRAS Technical Standards see PETROBRAS Technical Standards Catalog.

Foreword

This Standard is the English version (issued in 12/2014) of PETROBRAS N-108 REV. E 11/2014. In case of doubt, the Portuguese version, which is the valid document for all intents and purposes, shall be used.

1 Scope

1.1 This Standard standardizes and describes the typical layouts and types of vents and drains to be used in industrial piping and equipment belonging to PETROBRAS. For operational drains and vents of LPG tank farms see also PETROBRAS [N-1645](#).

1.2 This Standard does not apply to liquefied natural gas facilities to drains and vents in manifolds instrumentation, instrumentation pipes with OD tubings or ring connections.

1.3 This Standard applies to facilities designed and built after its date of issuance.

1.4 This Standard contains only Technical Requirements and Recommended Practices.

2 Normative References

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document applies.

PETROBRAS [N-38](#) - Criterion for Design of Drainage, Segregation, Flow Preliminary Treatment of Liquid Effluents of Onshore Installations;

PETROBRAS [N-76](#) - Piping Materials for Refining and Transportation Plants;

PETROBRAS [N-1645](#) - Safety Criteria to Project of Liquefied Petroleum Gas Storage Fixed Facilities;

PETROBRAS [N-1758](#) - Suporte, Apoio e Restrição para Tubulação;

API [RP 520 Part II](#) - Sizing, Selection, and Installation of Pressure-Relieving Devices in Refineries; Part II - Installation;

ASME [B31.3](#) - Process Piping.

NOTE For documents referred in this Standard and for which only the Portuguese version is available, the PETROBRAS department that uses this Standard should be consulted for any information required for the specific application.

3 Terms and Definitions

For the purposes of this Standard, the terms and definitions indicated in 3.1 to 3.5 are adopted.

3.1

hydrogen service

piping in hydrogen service is considered to be any piping where the partial pressure of hydrogen is equal to or higher than 0,45 MPa (4,49 kgf/cm²), regardless of the temperature.

3.2**safe location**

region where it is permissible discharge flammable, corrosive or toxic fluids, so it does not cause significant environmental impact or effect fluid movement in local people.

3.3**hot products**

fluids at temperatures above 60 °C.

3.4**cold products**

fluids at a temperature of 60 °C or below.

3.5**pump out**

piping for draining equipment and lines in process units.

3.6**low frequent use**

drains and vents that are only in general maintenance shutdowns.

3.7**frequent use**

drains and vents that are used in daily operations of the unit during the campaign.

4 General Conditions

4.1 All drains and vents shall be at least 3/4" in diameter.

4.2 Drains and vents shall be positioned in easily accessible locations. When necessary, access to drains and vents shall be provided.

4.3 In drains and vents of pumps a pair of flanges shall be installed as close as possible to the casing (to allow equipment removal for maintenance), see Figures B.1, B.2 and B.3.

4.4 All extensions for instruments, pump out, flares, etc. shall contain the line number and material standardization in accordance with PETROBRAS [N-76](#).

4.5 Drains of level gauges and sampling units shall be directed to the oily drainage network and not to the floor.

4.6 The position of drains and vents shall take into account the thermal expansion of the trunk pipe avoiding interference, especially with supports and columns.

4.7 Drains shall be installed at the bottom of all lowermost part of the piping. Additionally, drains shall be installed right above the check valves installed in vertical position.

4.8 Vents shall be installed at the top of all uppermost parts of the pipe.

4.9 Vent and drain materials shall comply with the material standardization of the main piping line.

4.10 For drains and vents with flammable liquefied gases (such as LPG, propane and ethylene), which are expected to transfer steam above 180 °C, gate valves shall be used instead of ball valves. This requirement is not applicable to liquefied natural gas (see 1.2).

4.11 Vents and drains for equipment, whose layouts are shown in Annex B, shall have the same diameters and types of connections, indicated for piping, as per Annex A.

4.12 Drain and vent systems shall be in accordance with the criteria set out in PETROBRAS [N-38](#).

4.13 The cap threaded at the end of drain or vent shall be kept installed whenever the line is in operation.

4.14 The screw cap shall be fitted with chain or wire rope, handle, and swivel clamp, according to the model shown in Figure C.1 or Figure C.2. All this set (except wire rope) should be painted in the color yellow safety Munsell 8Y5 / 12.

4.15 Drain and vent systems shall be properly supported considering:

- a) vibrations of the facilities even if the vent is not in use;
- b) occasional overloads;
- c) to avoid damage to the threadolet or to the half-coupling.

4.16 In the drain piping of gasps and hydrocarbon liquid (except liquefied gases such as LPG, Propane and Ethane) for water and steam pipes using only the corresponding gate valve equipment standardization PETROBRAS [N-76](#).

4.17 Drains and pipes with sighs of liquefied gases such as LPG, Propane and Ethylene, use ball valves of the corresponding material standardization of PETROBRAS [N-76](#).

4.18 Drains and vents sighs with liquid or gaseous fluids with operating temperatures above 120 °C using only gate valves of the corresponding material standardization of the PETROBRAS [N-76](#).

5 Standard Types of Vents and Drains for Piping

5.1 Table 1 shows the figures type for vents and drains for piping for several services, pressures class and frequency of use.

5.2 Figure A.1 shows the typical detail of vents and drains with simple block as stated in Table 1.

5.3 Figure A.2 shows the typical detail of vents and drains with double block as stated in Table 1.

Table 1 - Figures Type for Vents and Drains for Piping for Several Services, Pressures Class and Frequency of Use

Service	Low frequent use		Frequent use
	Pressure class 300 and below	Pressure class 600 and above	All classes
GLP, proylene, liquefied gases	Figure A.1	Figure A.2	
Steam, Hydrogen			
H ₂ S			
Service category M of ASME B31.3			
Liquefied natural gas			
General utilities			
General hydrocarbon			

6 Typical Arrangements for Vents and Drains of Equipment and Systems

6.1 Towers and Vessels

6.1.1 Drains

Equipment with closed drains shall have double blocking arrangements with “figure 8” spectacle blinds or intermediate spacer rings (see Figure B.6).

6.1.2 Vents

Sighs must be installed on the flange of the equipment as arrangement of Figure B.6.

6.2 Pumps

6.2.1 Drains and vents of LPG pumps according to Figure B.1.

6.2.2 Drains and vents of hydrocarbon pumps:

- cold hydrocarbons according to Figure B.2;
- hot hydrocarbons according to Figure B.3.

6.2.3 Drains and vents of DEA, MEA and acid water pumps according to Figure B.2.

6.2.4 Corrosive Naphtha Systems

Install flare vent as close as possible to the blocking arrangements downstream of the equipment and arrange for nitrogen injection as close as possible to the blocking arrangements upstream of the equipment. Both lines shall be 3/4” with a block valve, check valve, and “figure 8” spectacle blind (see Figure B.4).

6.3 Heat Exchangers

6.3.1 Drains and vents shall be provided for all heat exchangers both on the shell side and on the tube side.

6.3.2 For exchangers draining to the hydrocarbon pump out system, consider Figure B.5.

6.4 Turbines

6.4.1 Feed Steam Line

Provide a drain to the atmosphere and steam trap upstream from the general blocking arrangements, in accordance with Figure B.7.

6.4.2 Exhaust Steam Line

Provide a drain to atmosphere and steam trap upstream from general blocking arrangements, according to Figure B.7.

NOTE Turbine casing drains shall only have blocking arrangements (no steam traps).

6.5 Compressors

6.5.1 Suction Lines

- a) provide a vent with double blocking arrangements and extension to the floor, on the downward section upstream from the suction blocking;
- b) provide a 1" drain upstream from the suction blocking, with a 1 1/2" quick coupler nozzle;
- c) provide a 1" drain with a single blocking arrangement downstream from the suction blocking (see Figure B.8).

6.5.2 Discharge Lines

- a) provide a vent with a single blocking arrangement and extension to floor on upward section, downstream from discharge blocking;
- b) provide a 1" drain downstream from discharge blocking, with a 1 1/2" quick coupler nozzle;
- c) provide a 1" drain with a single blocking arrangement upstream from discharge blocking (see Figure B.8).

6.5.3 First- and Second-Stage Casing

Provision shall be made for 1" vents with double blocking arrangements and a check valve interconnected to the flare line (see Figure B.8).

6.5.4 Provision shall be made for nitrogen injection upstream and downstream from the equipment.

6.6 Support Cradles for Control Valves

6.6.1 Control Valves

Provision shall be made, on the horizontal section of the support cradle, for a drain between the blocking arrangements upstream and the control valve and a drain between the control valve and the blocking arrangement downstream (see Figure B.9).

6.6.2 LPG or Fuel Gas or Hydrocarbons in Services with H₂S, H₂ or Category M Fluids of ASME B31.3

According to Figure B.10.

6.7 Piping

6.7.1 Low Points

Provide drains at all low points of piping.

6.7.2 High Points

Provide vents at all high points of piping.

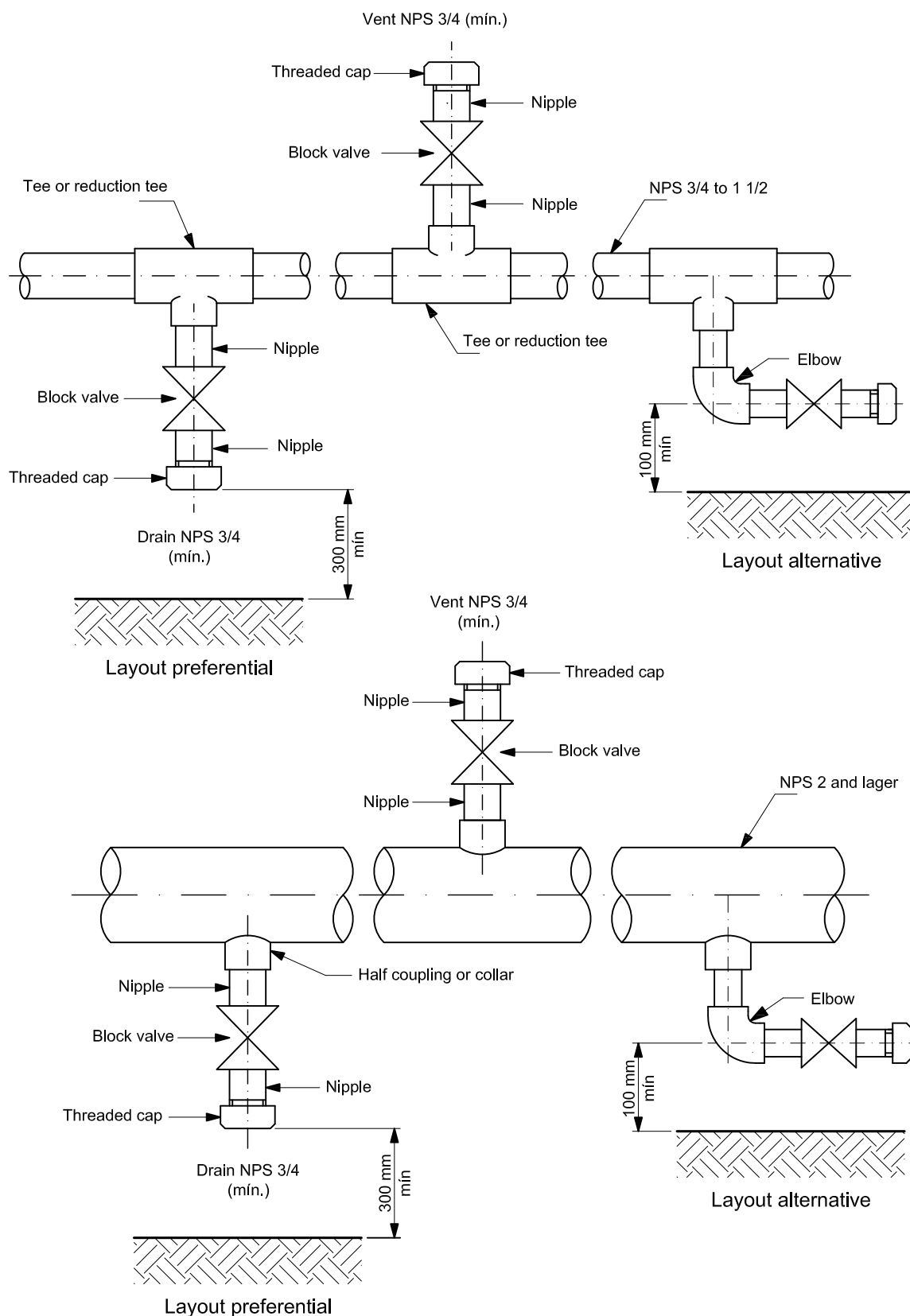
6.7.4 Pipe Ends

Provide drains at the ends of piping with sufficient diameter for cleaning and commissioning of lines.

6.8 Safety and Relief Valves with Upstream and Downstream Block Valves

Provide vents between safety and relief valves and the respective blocking arrangements downstream and upstream as necessary for maintenance of safety and relief valves according to API [RP 520 Part II](#).

Annex A - Types of Vents and Drains for Piping

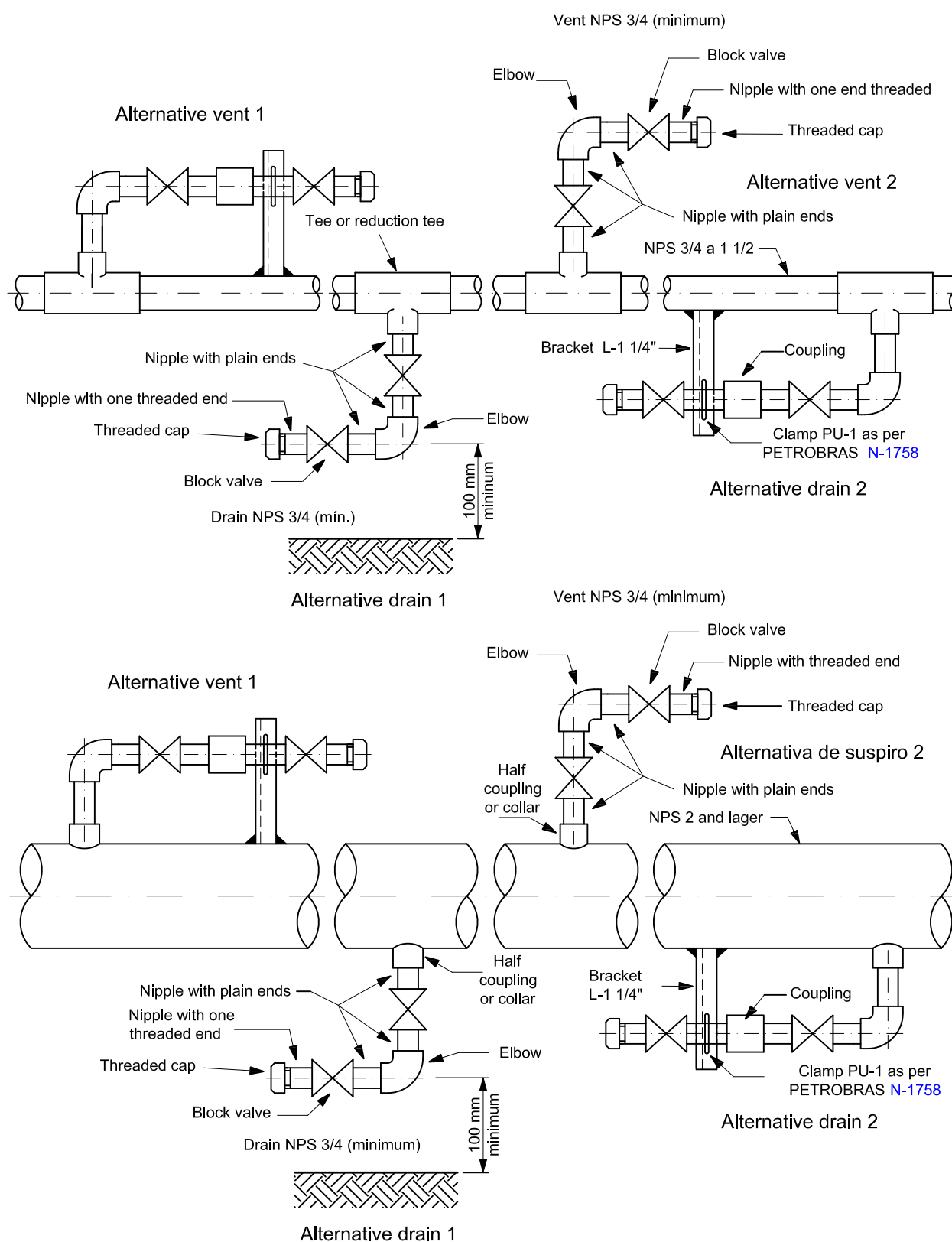


NOTE 1 Valve type should be as defined in the P&ID.

NOTE 2 Materials, ends and thicknesses must be according to the piping specification material.

NOTE 3 The screw cap with chain or steel cable as defined in the model of Figure C.1 or Figure C.2.

Figure A.1 - Drains and Vents With Simple Block



NOTE 1 Valve type should be as defined in the P&ID.

NOTE 2 Materials, ends and thicknesses must be according to the piping specification material.

NOTE 3 The screw cap with chain or steel cable as defined in the model of Figure C.1 or Figure C.2.

Figure A.2 - Drains and Vents with Double Block

Annex B - Typical Arrangements for Vents and Drains of Equipment and Systems

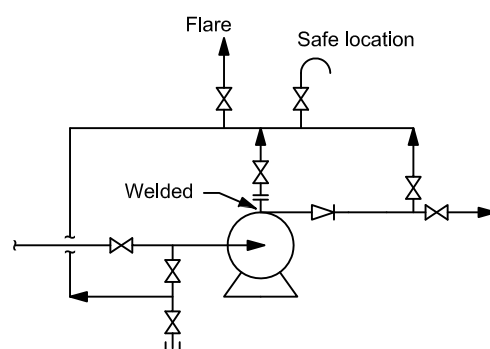


Figure B.1 - LPG Pump

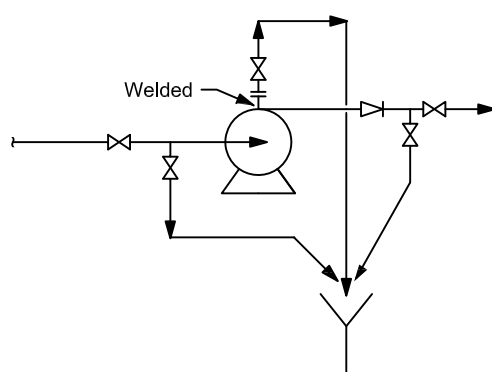


Figure B.2 - Cold Hydrocarbon, MEA, DEA and Sour Water Pump

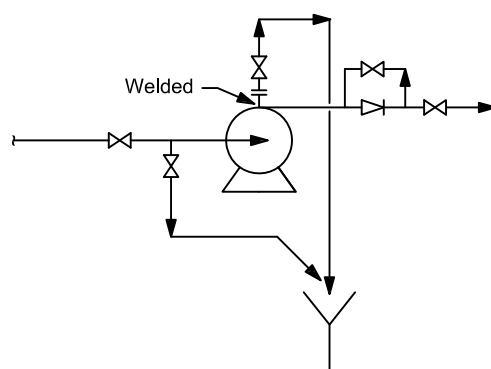


Figure B.3 - Hot Hydrocarbon Pump

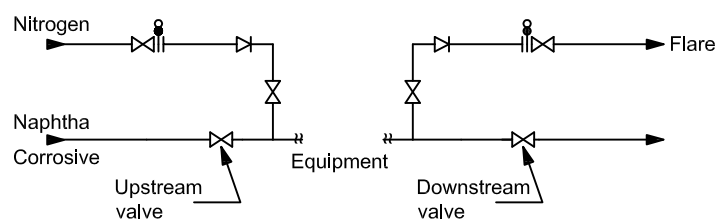


Figure B.4 - Corrosive Naphtha

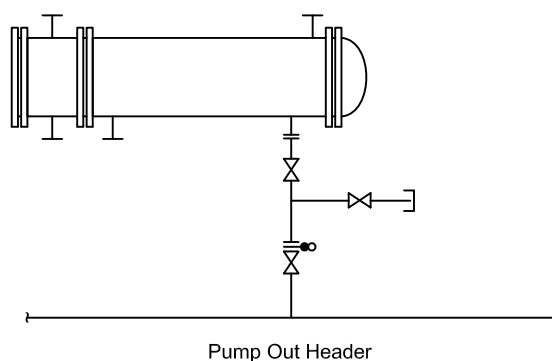


Figure B.5 - Heat Exchangers

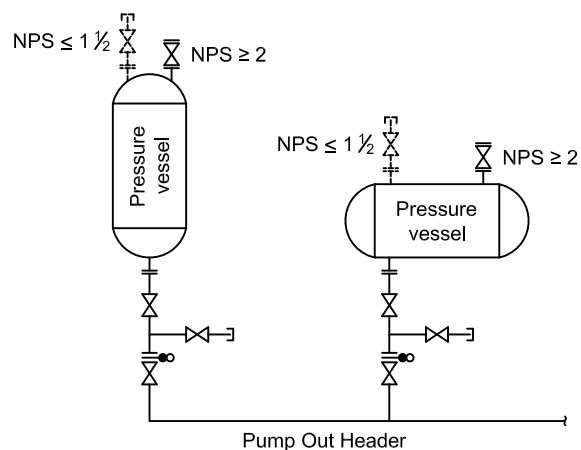


Figure B.6 - Pressure Vessels (Horizontal and Vertical)

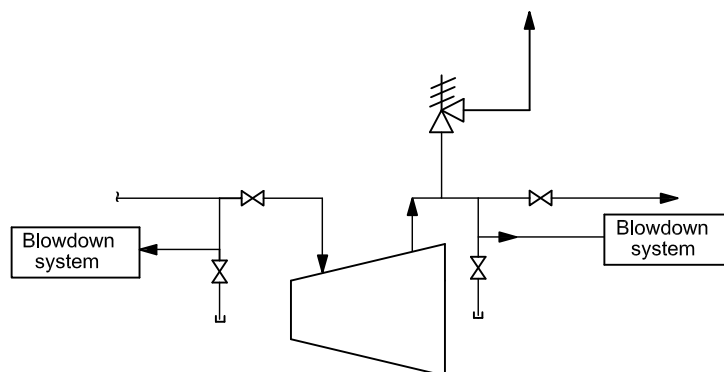


Figure B.7 - Turbines

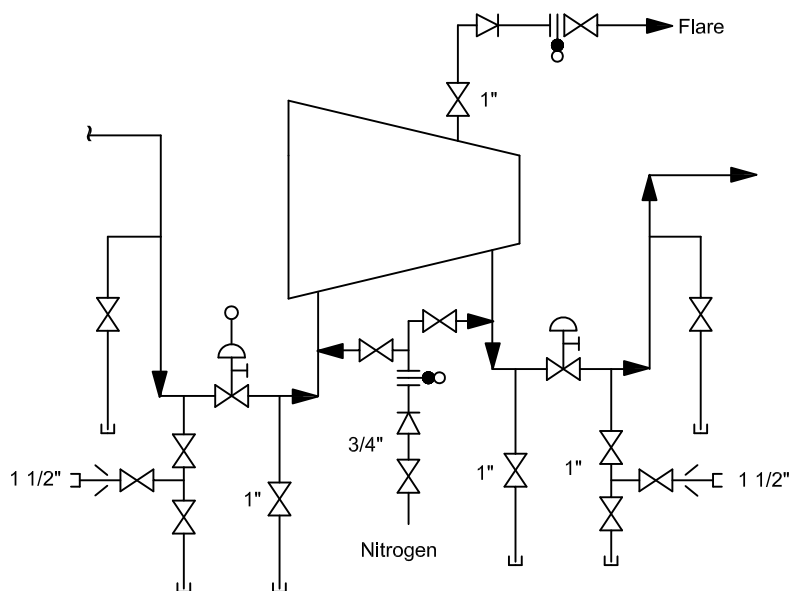


Figure B.8 - Compressors

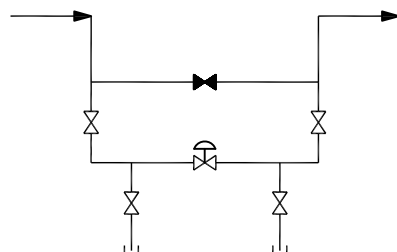
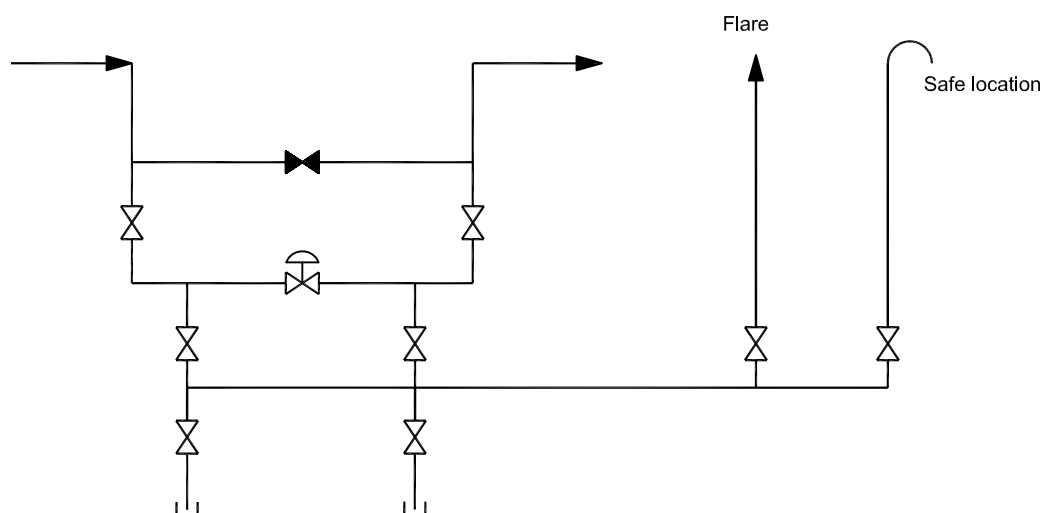


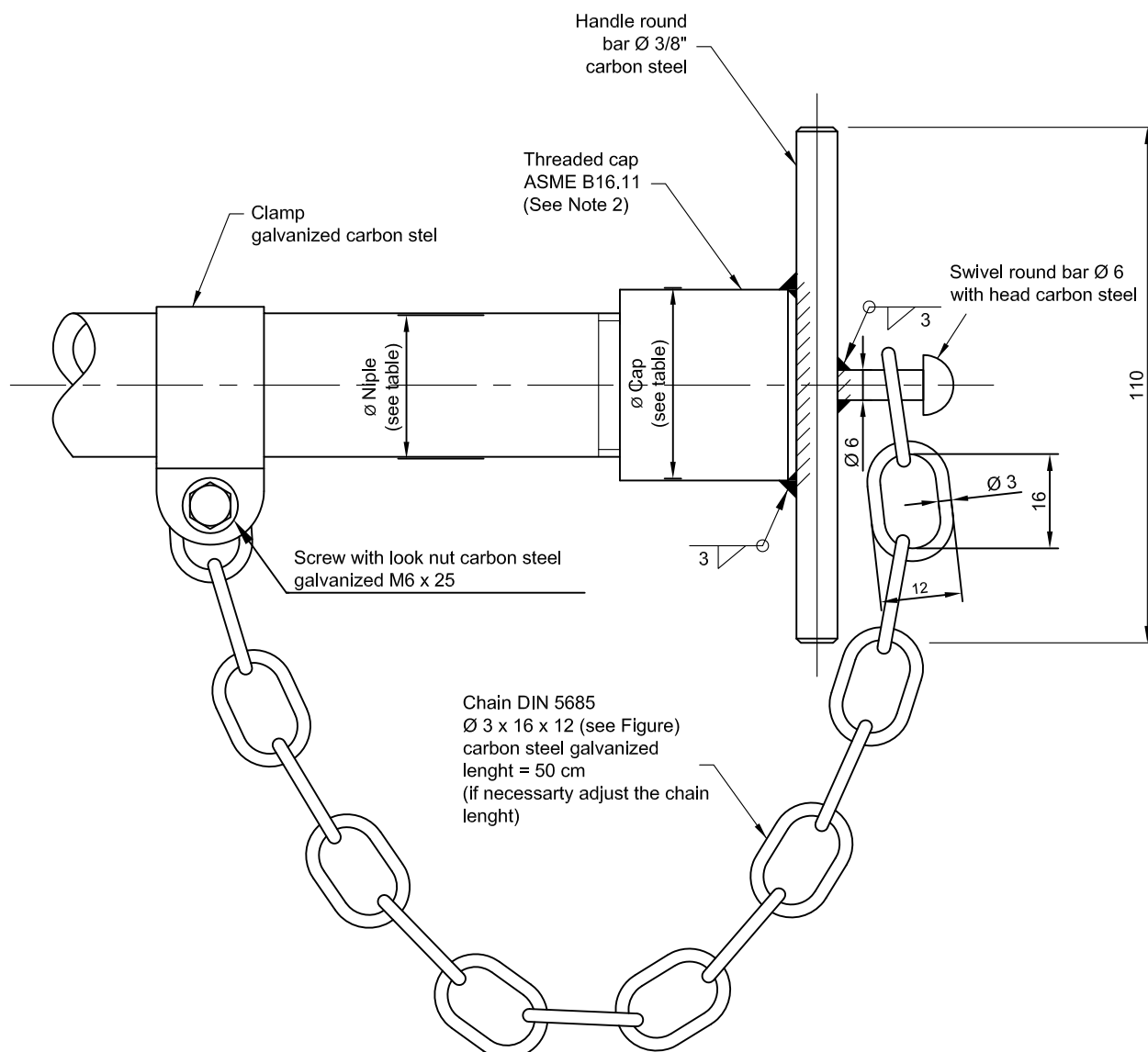
Figure B.9 - Control Valve



NOTE In case the control valve is of the fail open type one of the drain branches may be eliminated.

Figure B.10 - Control Valves for LPG or Fuel Gas or Hydrocarbon System in Services with H_2S , H_2 ou Category M of ASME B31.3

Annex C - Figure



Dimensional table only for reference			
NPS	\varnothing Niple	\varnothing Cap	
		# 3 000	# 6 000
1/2	21,3	28,5	38,1
3/4	26,7	35,1	44,5
1	33,4	44,5	57,2
1 1/2	48,3	63,5	76,2

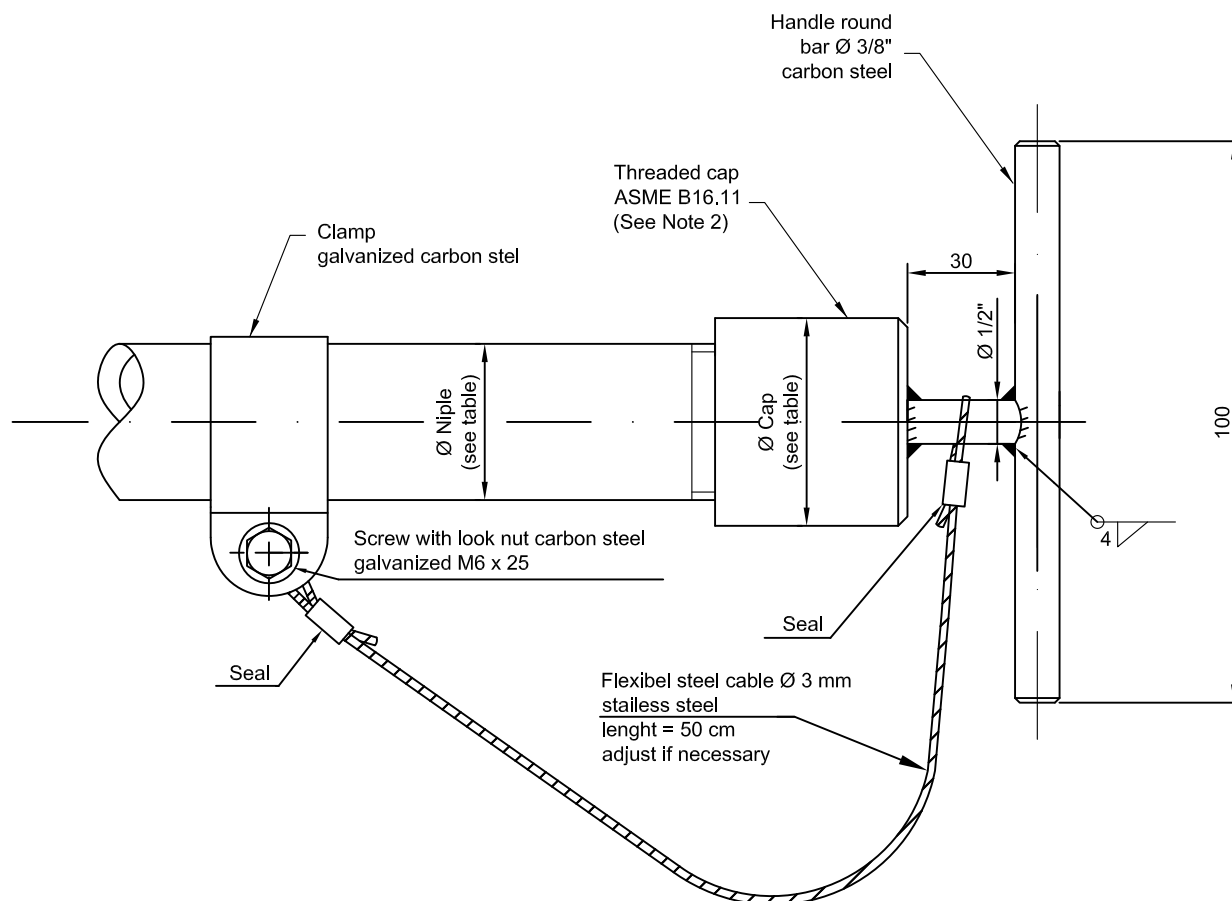
NOTE 1 Dimensions in mm unless otherwise specified.

NOTE 2 Cap material as pipe material standardization PETROBRAS N-76, the pressure and corresponding service class.

NOTE 3 Handle materials, swivel, chain and clamp, as shown in Figure C.1.

NOTE 4 Paint all parts with epoxy paint in yellow safety Munsell BY5 / 12.

Figure C.1 - Cap with Chain



Dimensional table only for reference			
NPS	Ø Niple	Ø Cap	
		# 3 000	# 6 000
1/2	21,3	28,5	38,1
3/4	26,7	35,1	44,5
1	33,4	44,5	57,2
1 1/2	48,3	63,5	76,2

NOTE 1 Dimensions in mm unless otherwise specified.

NOTE 2 Cap material as pipe material standardization PETROBRAS N-76, the pressure and corresponding service class.

NOTE 3 Handle materials, steel cable and clamp, as shown in Figure C.2.

NOTE 4 Paint all parts with epoxy paint in yellow safety Munsell BY5 / 12.

Figura C.2 - Cap with Steel Cable (Alternative)

INDEX OF REVISIONS	
REV. A and B	
There is no index of revisions.	
REV. C	
Affected Parts	Description of Alteration
1	Revised
2	Revised
4.1	Revised
4.3	Included
4.13	Included
4.14	Revised
5.1	Revised
5.2	Revised
5.3	Revised
5.4	Included
FIGURE A-1	Revised
FIGURE A-2	Revised
FIGURE A-3	Revised
FIGURE A-4	Included
FIGURE B-4	Revised
REV. D	
Affected Parts	Description of Alteration
1	Revised
2	Revised
3.1 e 3.2	Revised
4.1 e 4.3	Revised
4.5 a 4.13	Revised
5.1, 5.2 e 5.3	Revised
5.4	Removed
Table 1	Included
4.15	Included
5.5 e 5.6	Included

REV. D	
Affected Parts	Description of Alteration
6.1	Revised
6.2.1 a 6.2.4	Revised
6.3.2	Revised
6.6.1, 6.6.2 e 6.6.3	Revised
6.7.1, 6.7.2 e 6.7.3	Revised and renumbered
6.8	Included
Figures A.1 e A.2	Revised
Figures B.1, B.2, B.3 e B.9	Revised
Figure B.10	Included
REV. E	
Affected Parts	Description of Alteration
1.2	Alteration
3.2	Alteration
3.6	Included
3.7	Included
4.1	Revised
4.14	Included
4.14	Renumbered to 4.15
4.15	Renumbered to 4.16
4.17	Included
4.18	Included
Table 1	Revised
6.1.2	Revised
6.2.4	Revised
6.5.1	Revised
6.5.2	Revised
6.5.3	Revised
Annex A - Figures	Revised
Annex B - Figures	Revised
Annex C – Figure C.1	Revised
Annex C – Figure C.2	Included