

**CONTEC**Comissão de Normalização  
Técnica**SC-04**

Civil Construction

**General Design Criteria for Structural  
Calculation of Pipe Rack and Pipe-Way****1<sup>st</sup> Amendment**

This is the 1<sup>st</sup> Amendment to PETROBRAS N-2891 and it is used to alter the text of the Standard in the parts indicated below:

NOTE 1 The news pages with the performed amendments are placed in its corresponding positions.

NOTE 2 The amended pages, indicated the date of the amendment, are placed at the end of this standard, in chronological order, and shall not be used.

**CONTENTS OF THE 1<sup>st</sup> AMENDMENT - 12/2014**

- Section 2:

Exclusion of PETROBRAS N-46, N-105 and N1673.

- Subsection 4.2:

Exclusion of PETROBRAS N-46, N-105 and N1673.

## General Design Criteria for Structural Calculation of Pipe Rack and Pipe-Way

### Procedure

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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### 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.*

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## Foreword

This Standard is the English version (issued in 06/2012) of PETROBRAS N-2891 08/2011. In case of doubt, the Portuguese version, which is the valid document for all intents and purposes, shall be used.

## 1 Scope

1.1 The purpose of this Standard is to define minimum criteria for loading to implement the structural design of pipe racks and pipe-ways, in the stage prior to definition of the detailed arrangement of piping.

1.2 This Standard does not define the joint types and nature of structural behavior of pipe racks and pipe-ways. This decision is attribution of the designer.

1.3 Load The loading defined in this Standard simulates operating loads and shall not be attributed to hydrostatic testing.

1.4 The loads evaluated by this standard shall be confirmed after determining the piping layout and flexibility analysis.

1.5 This standard does not cover the hydraulic transient loads.

1.6 This Standard is applicable to procedures started after the date of issuance.

1.7 This Standard contains 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-57](#) - Projeto Mecânico de Tubulações Industriais;

PETROBRAS [N-1674](#) - Projeto de Arranjo de Projeto de Arranjo de Instalações Industriais Terrestres de Petróleo, Derivados, Gás Natural e Álcool;

PETROBRAS [N-1756](#) - Projeto e Aplicação de Proteção Contra Fogo em Instalações Terrestres;

PETROBRAS [N-1692](#) - Apresentação de Projetos de Detalhamento de Tubulação;

ABNT [NBR 6123](#) - Forças devidas ao Vento em Edificações.

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 document, the following terms and definitions apply.

**3.1****pipe-way**

a way where the elevation of pipes is lower or equal to or up to 1 m above the grades of adjacent areas (as per PETROBRAS N-1674). As a general rule, pipe-ways are used out-side battery limits

**3.2****pipe rack**

a way where the elevation of pipes is 1 m higher than grades of adjacent areas (as per PETROBRAS N-1674). As a general rule, pipe racks are used in-side battery limits

**NOTE** Piers and structures for piping support out-side battery limits shall be treated according to the same criteria used for pipe-ways.

**3.3****distributed loads (uniform loads)**

every force, or set of forces, from the weight of piping, to be considered as uniform loads distributed along the beam where it is supported. Uniform loads are those from piping with nominal diameter smaller than 14"

**3.4****concentrated loads**

every individual force from piping, fittings, bends and insulation, acting at a specific point of the beam supporting it. Concentrated loads are those from piping with nominal diameter larger than or equal to 14"

**3.5****average diameter**

calculation of the average diameter shall be done using the following formula:

$$\varphi_{med} = \sqrt{\frac{\sum n_i \varphi_i^2}{n_t}}$$

Where

- $\varphi_i$  is the diameter of the line in inches;
- $n_i$  is the number of lines with diameter  $\varphi_i$ ;
- $n_t$  is the total number of lines.

**3.6****categories of piping**

The loads for these categories of piping shall be defined, according to the following parameters for diameters smaller than 14" and diameters larger than or equal to 14"

**3.6.1**

diameters smaller than 14"

- Category I  $\varphi_{med} < 5"$ ;
- Category II  $5" \leq \varphi_{med} < 7,5"$ ;
- Category III  $7.5" \leq \varphi_{med} < 9"$ ;
- Category IV  $9" \leq \varphi_{med} < 12"$ ;
- Category V  $12" \leq \varphi_{med} < 14"$ .

**NOTE** Piping in these categories will be considered as uniform loading.