

Presentation of an Atmospheric Tank Design

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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CONTEC

 Comissão de Normalização
Técnica

SC - 02

Tanks and Pressure Vessels

Foreword

This Standard is the English version (issued in 07/2013) of PETROBRAS N-1958 REV. C 09/2010. 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 establishes the required conditions for the presentation of an atmospheric storage tank design, prepared according to PETROBRAS [N-270](#).

1.2 This Standard is applicable to procedures beginning as of its date of issuance.

1.3 This Standard contains only Technical Requirements.

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.

CONMETRO - Resolução nº 12, de 12 de outubro de 1988;

PETROBRAS [N-75](#) - Abreviaturas para os Projetos Industriais;

PETROBRAS [N-270](#) - Projeto de Tanque de Armazenamento Atmosférico;

PETROBRAS [N-381](#) - Execução de Desenho e Outros Documentos Técnicos em Geral;

PETROBRAS [N-1438](#) - Terminologia Soldagem;

PETROBRAS [N-1521](#) - Identificação de Equipamentos Industriais;

PETROBRAS [N-1541](#) - Tanque de Armazenamento - Folha de Dados;

PETROBRAS [N-1710](#) - Codificação de Documentos Técnicos de Engenharia;

PETROBRAS [N-2091](#) - Tanque de Armazenamento - Requisição de Material;

API [Std 650](#) - Welded Steel Tanks for Oil Storage;

ASME [B16.5](#) - Pipe Flanges and Flanged Fittings NPS 1/2 Through NPS 24 Metric/Inch Standard.

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

mechanical design

basically consists of the tank's structural mechanical sizing

3.2**fabrication design**

consists of the tank's complete detailing for its fabrication, including assembly details and all definitions and data prescribed in this Standard

3.3**designer**

is the company or organization in charge of creating the mechanical design and/or the tank's fabrication design. For when the mechanical design and the fabrication design are done separately by different organizations, the term "designer" applies to each one of these entities

3.4**Material Requisition (RM) and Descriptive Report (MD)**

are scope definition documents for tank supplying

3.5**Data Sheet (FD)**

it is a document prepared as per PETROBRAS [N-1541](#), which defines the operating, design, fabrication, assembly and test conditions of the tank

4 General Conditions

4.1 This Standard shall be mentioned and attached to all Material Requisitions or Contracts for design or purchasing of any atmospheric storage tank.

4.2 PETROBRAS [N-75](#) abbreviations and PETROBRAS [N-1438](#) terminology shall be adopted.

4.3 Drawings and other documents pertaining to the design shall be prepared according to PETROBRAS [N-381](#).

4.4 Drawings and other engineering technical documents shall be identified as in PETROBRAS [N-1710](#), except when indicated otherwise by PETROBRAS.

4.5 Brazilian legal measuring units according to CONMETRO [nº 12](#) Resolution shall be used in the entire design, allowing utilization of English units only to designate nominal diameters in pipes and piping accessories, rolled structural sections, nuts and bolts. The use of other measuring units in parenthesis, in addition to those already mentioned, is allowed.

4.6 RM shall be prepared according to the form standardized by PETROBRAS [N-2091](#). RM shall indicate the review or date of issuance of the mentioned standards. In case there is none, the issues in force at the RM's applicable review or date of issuance apply.

4.7 Approval of the mechanical and fabrication designs documents by PETROBRAS or by any company hired by PETROBRAS, do not exempt the designer of the equipment from total design responsibility, to the extent of the object of the supply.

4.8 All drawings shall be made in scale with as many details as necessary for its perfect understanding.

5 Mechanical Design and Fabrication Design Documents

5.1 For both types of tanks, the following documents shall be prepared:

- a) listing of the design documents;
- b) calculation sheet, as described below;
- c) drawing of the general tank set, which shall include:
 - tank design data and all applicable data in the data sheet;
 - location of nozzles and accessories;
 - maximum useful height (AMU) of tank (floating or fixed roof);
 - minimum operating height of the floating roof;
 - maintenance height of the floating roof.
- d) drawing of the bottom, showing utilization of sectioned and annular plates, when they existent, as well as the location of the drainage basins;
- e) the side developed drawing, which shall contain:
 - the location of nozzles, accessories and welding of the bottom annular plates;
 - the assembly starting angle, determined relatively to the NORTH of design.
- f) drawing of the roof, showing utilization of plates and the location of nozzles and accessories;
- g) drawings of all accessories such as ladders, walkways, manholes and flush-type cleanout fittings, nozzles, drains, measuring and vent accessories, suction system and others;
- h) drawing of reinforcements for mixer nozzles, if necessary;
- i) detailed drawings of welding sequence of bottom, side and roof;
- j) detailed drawings of the heating system, containing at least:
 - material listing, piping layout, details of coils, heaters, piping supports, etc., as well as requirements and ease of assembly and tests;
- k) other documents required on the RM or on the Contract.

NOTE 1 All tank parts shall be numbered and listed in a material listing in the drawings, designating the material, dimensions, unit and total weight.

NOTE 2 The NORTH of design shall be indicated, which correspond to 0° in the drawings of:

- a) set;
- b) bottom;
- c) side;
- d) roof;
- e) fixed roof supporting structure;
- f) distribution of supporting legs for the floating roof.

5.2 For the fixed roof tanks, the following documents shall also be submitted:

Drawings of the entire roof supporting structure, such as: beams and strings.

5.3 For the floating roof tanks, the following documents shall also be submitted:

- a) drawing of the entire roof structure, including floaters, reinforcements, dividing plates and others;
- b) drawing of the sealing seal;
- c) drawing of the side wind girder;
- d) drawings of all roof accessories, such as rolling ladder, walkway, supporting legs, anti-rotating device, vacuum vent, drainage system, pressure relief device, and rotating joints;
- e) drawing of the electric potential equalization system between the floating roof and the side.

5.4 Calculation Sheets

5.4.1 Calculation sheets shall contain at least the following calculations and checks:

- a) thickness of the side plates;
- b) thicknesses and dimensions of the bottom annular plates;
- c) reinforcements in openings, when they are not those from the API Std 650 tables;
- d) flanges, when they are not standardized;
- e) protection devices against internal overpressure or under pressure;
- f) heating system: mechanical and thermal calculation;
- g) collapsing of the tank;
- h) wind girder rings;
- i) sizing for support of accessories; examples: stilling tube and mixers;
- j) stress diagram on nozzles;
- k) other required calculations on the RM or the Contract.

5.4.2 In addition, for the fixed roof tanks, they shall contain the following calculations and checks:

- a) roof supporting structure (strings, beams, supports and others);
- b) reinforcement of the roof-side transition;
- c) type of roof-side connection (fragile, non fragile);
- d) maximum allowable pressure on the tank, aiming to the specification of the emergency relief device, when required;
- e) tank anchorage, whenever necessary.

5.4.3 In addition, for the floating roof tanks, they shall contain the following calculations and checks:

- a) mechanical resistance and roof floatability;
- b) intermediate wind girder rings;
- c) roof main drains;
- d) roof support structure.

5.4.4 All calculation sheets shall clearly indicate the standards, calculation criteria and adopted formulas, as well as show the calculations clearly enough in order to allow them to be checked.

5.4.5 For calculations performed by a computer through proprietary or commercial software, the following information shall be submitted:

- a) name of the software;
- b) author of the software;
- c) language in which the software is written;
- d) description of the software, indicating all calculation criteria and methods used, including its basic bibliographical references and history, if any;
- e) description of print-outs of results, including all formats used and definition of all input and output variables;
- f) input data print-outs;
- g) print-outs of results;
- h) validation report for each software used.

INDEX OF REVISIONS

REV. A

There is no index of revisions.

REV. B

Affected Parts	Description of Alteration
	Revalidacion

REV. C

[illegible]