SEGEN
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DESIGN CRITERIA - EQUIPMENTS

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SUMMARY

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1. OBJECTIVE

This Technical Specification presents additional Design Criteria to those indicated in the PETROBRAS Standards for the Revamp of Capuava Refinery - RECAP.

2. APPLICABLE STANDARDS AND DOCUMENTS

2.1 Main Standards

2.1.1 **PETROBRAS**

2.1.1.1 ***Process Equipments***

*N-253f - Projeto Mecânico e Projeto para Fabricação de Vasos de Pressão

*N-466e - Projeto Mecânico e de Fabricação de Permutador de Calor

*N-1607 - Etapas de Projeto, Fabricação e Montagem de Equipamentos de Caldeiraria

N-1648a - Listas de Equipamentos de Caldeiraria

N-1707 - Projeto e Fabricação de Vasos de Pressão com Revestimento de Aços Inoxidáveis, Níquel e Ligas de Níquel

N-1767 - Carrinho para Torres, Vasos de Pressão e Chaminés

*N-1823 - Montagem de Caldeira Aquatubular

*N-1862 - Projeto e Fabricação de Bandejas e Outros Internos para Torre

N-1978 - Dimensionamento de Olhais

N-2012 - Detalhe de Bocais de Vasos de Pressão

N-2013b - Detalhes de Suporte de Vaso de Pressão Horizontal

*N-2014b - Detalhes de Suportes para Vaso de Pressão Vertical

N-2049a - Detalhes de Accessórios Internos de Vaso de Pressão

N-2054 - Detalhes de Accessórios Externos de Vasos de Pressão

N-2090 - Internos para Vaso de Pressão - Requisição de Material

N-2150 - Queimador

N-2213 - Filtro para Fluido de Processo - Folha de Dados

N-2214 - Recheio para Vasos e Torres - Folha de Dados

2.1.1.2 ***Welding***

N-133g - Soldagem

*N-1438b - Soldagem - Terminologia

N-1737d - Inspeção de Soldagem - Qualificação de Pessoal

*N-1738 - Descontinuidades de Juntas Soldadas, Fundidos, Forjados e Laminados

N-1859c - Consumíveis de Soldagem com Tenacidade Controlada para Aço C-Mn

2.1.1.3 ***Thermal Insulation and Refractory***

N-550d - Projeto de Isolamento Térmico a Alta Temperatura

N-1756a - Projeto de Proteção Contrafogo em Instalação Terrestre

N-1910c - Projeto de Detalhamento de Revestimentos Refratários

N-1951 - Inspeção e Reparo de Concreto Refratário

2.1.1.4 ***Painting***

N-2g - Pintura de Equipamentos Industriais

N-1018c - Pintura de Identificação de Tanques e Vasos de Pressão para Armazenagem de Petróleo e Derivados

N-1550b - Pintura de Estruturas Metálicas

2.1.1.5 ***Safety***

*N-1645b - Segurança na Armazenagem de Gás Liquefeito de Petróleo.

2.1.1.6 ***Inspection***

N-1590c - Exame Não-Destrutivo - Qualificação de Pessoal

*N-1591b - Identificação de Ligas Metálicas e Metais

N-1592b - Exame Não-Destrutivo - Teste Magnético e Teste Por Pontos

N-1593c - Exame Não-Destrutivo - Estanqueidade

N-1594c - Exame Não-Destrutivo - Ultra-Som

N-1595c - Exame Não-Destrutivo - Radiografia

N-1596c - Exame Não-Destrutivo - Líquido Penetrante

N-1597c - Exame Não-Destrutivo - Visual

N-1598c - Exame Não-Destrutivo - Partículas Magnéticas

N-2109a - Controle Dimensional - Qualificação de Pessoal

2.1.1.7 ***Steel Structures***

N-279c - Projeto de Estruturas Metálicas

N-282a - Contraventamentos Típicos

N-293c - Fabricação e Montagem de Estruturas Metálicas

2.1.1.8 ***Notes:***

2.1.1.8.1 PETROBRAS, BRAZILIAN and FOREIGN Standards mentioned by reference in the Standards listed in items 2.1.1.1 to 2.1.1.7 are also applicable.

2.1.1.8.2 Applicable Standards marked with an asterisk contain AMENDMENTS.

3. DESIGN CRITERIA

3.1 General

3.1.1 In addition to the requirements indicated in the applicable Standards, the items presented below shall be observed.

3.1.2 The requirements of the “Norma Regulamentadora NR-13 (Caldeiras e Vasos de Pressão) do Ministério do Trabalho”, shall be observed.

3.2 Towers and Vessels

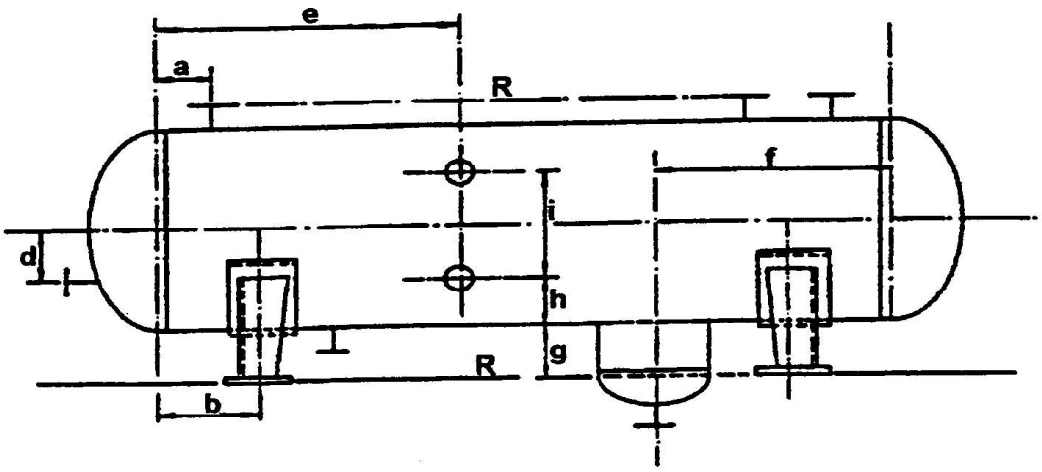
3.2.1 Identification plates of heat exchangers, vessels and towers, must bear Fluid "Classe" and "Categoria" accordance with "Norma Regulamentadora NR-13 (Caldeiras e Vasos de Pressão) do Ministério do Trabalho".

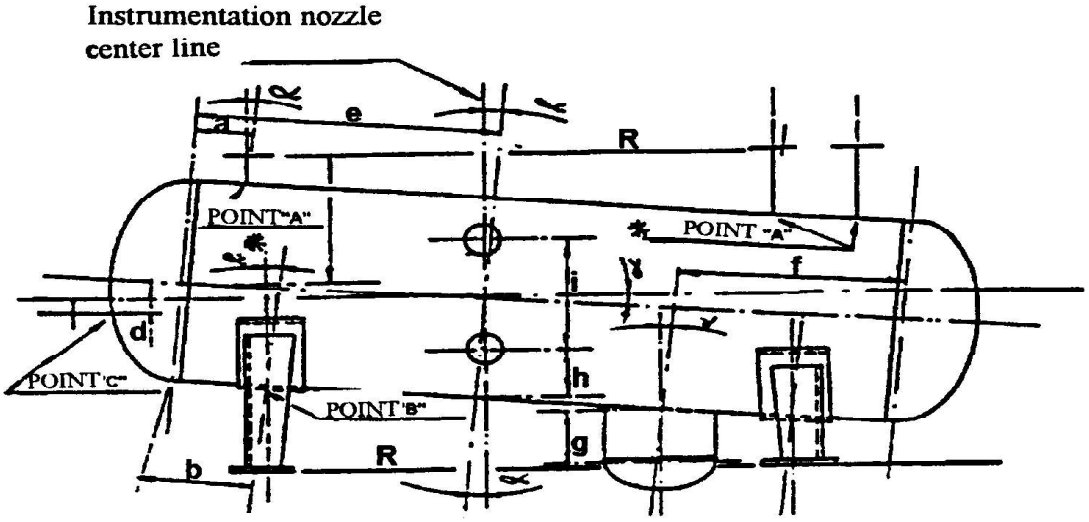
3.2.2 Facilities must be provided for the removal of the packing in towers, catalyst and appurtenances (manholes, plataforms, etc.) for maintenance purpose.

3.2.3 Whenever possible, the internal parts of towers (bubble caps, valves, unions, etc.) shall be standardized.

3.2.4 A davit shall be provided of PSVs on equipments of difficult access.

3.2.5 For horizontal vessels with slope the nozzles location must comply with the following sketch:





A - Reference point for location of nozzles.

B - Reference point for location of saddles.

C - Reference point for location of nozzles in the head or cover.

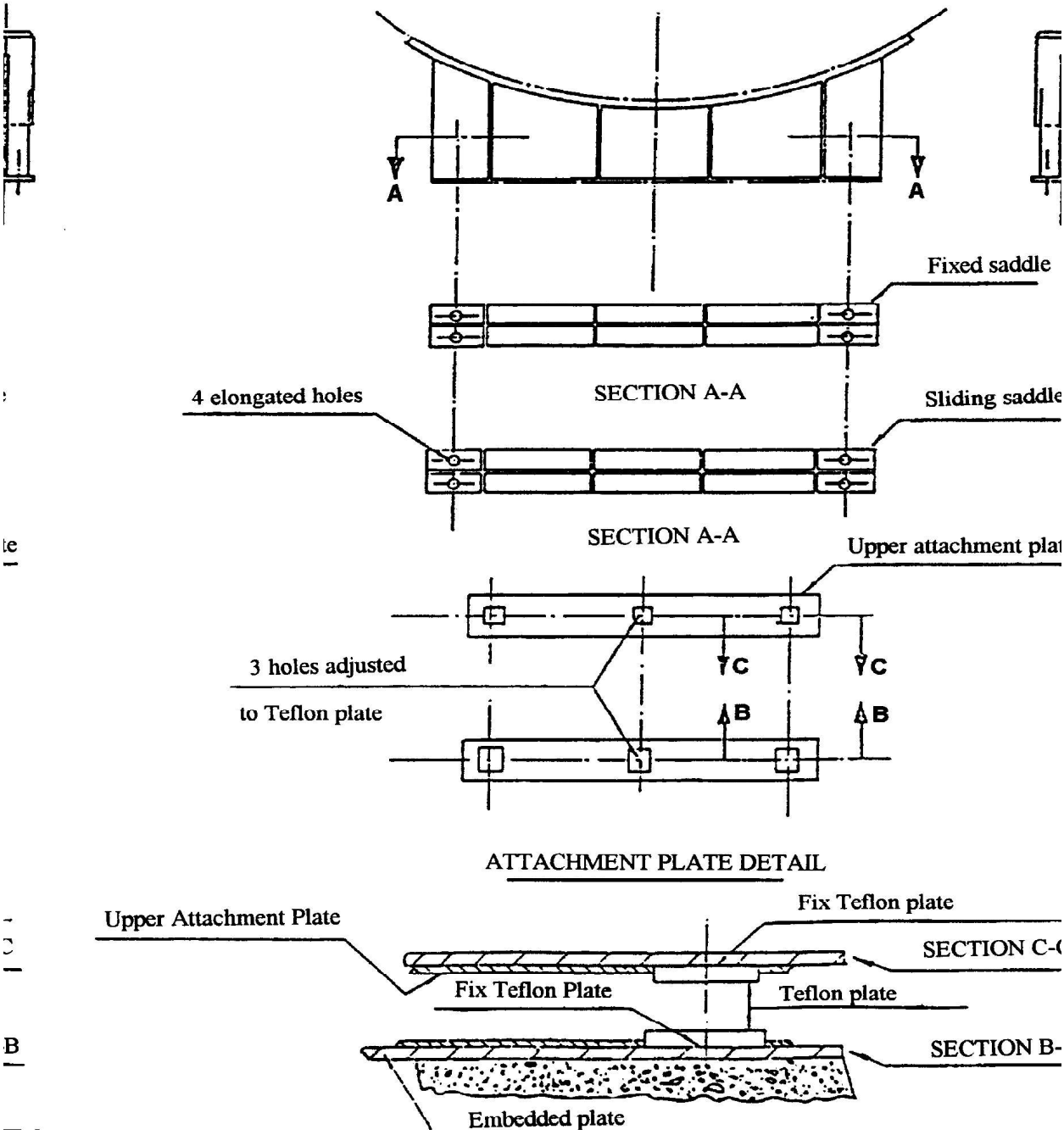
R - Horizontal reference line.

a - Level for nozzles.

b - Level for saddles.
d - Level for nozzles in head or cover.
e, h, i - Level for instrument nozzles.
f, g - Level for mouth of vessel.
μ - Slope of vessel.
***** - Refers to all points of nozzles.

DIAGRAM SHOWING LOCATION OF NOZZLES ON VESSELS WITH SLOPE

3.2.6 For horizontal vessels and heat exchangers, with operating weight exceeding 20 tons, Teflon plates must be provided in the sliding saddle according to the following drawing:



DETAILS OF SADDLES, SUPPORT MEMBERS AND SLIDING PLATES

3.3 Heat Exchangers

3.3.1 Tube bundles shall be identified in the back area of fixed tubesheet, by three mark spaced 120 degrees apart.

a) ***Heat exchangers with one tube bundle***:

FP-2001-1 - tube bundle of P-2001

FP-2001-2 - spare tube bundle of P-2001

b) ***Heat exchangers with interchangeable tube bundles:***

FP-2002-1 and FP-2002-2 - interchangeable tube bundles of P-2002 A/B

FP-2003-3 - spare tube bundles of P-2002 A/B

c) ***Heat exchangers with interchangeable two at two tube bundles:***

FP-2003 A/B-1 and FP-2003 A/B-2 - interchangeable tube bundles of P-2003 A/B

FP-2003 A/B-3 - spare tube bundle of P-2003 A/B

FP-2003 C/D-1 and FP-2003 C/D-2 - interchangeable tube bundles of P-2003 C/D

FP-2003 C/D-3 - spare tube bundle of P-2003 C/D

All parts of heat exchangers shall also be identified by the respective equipment tags.

3.3.2 The instalation of identification plates on covers channels or any other removable parts shall be avoided. Preference shall be given to a visible place on the shell.

3.3.3 All heat exchangers shall be supplied with a test ring. For those operating in parallel (interchangeable units), a number of one test ring shall be supplied for each set with less than 4 (four) heat exchangers, and for greater set, two test rings for each set with 4 (four) heat exchangers..

3.3.4 In the case of superimposed heat exchangers “FIGURE 8” fittings shall be provided between connected nozzles, allowing individual hydrostatic tests of equipments.

3.3.5 Two spare sets of gaskets and 10% of the bolts of the heat exchangers main flanges shall be supplied.

3.3.6 Tube bundle handling for maintenance purpose shall be taken into account in the design of the baffles.

3.4 Equipaments Subjected to H_2S Service

3.4.1 Equipments shall comply with the requirements of a Technical Spefication to be presented with Basic Engineering.

3.5 Large Dimension Filters

3.5.1 A supporting structure (cargo boom) shall be provided to facilitate the removal of components weighing more than 20 kgs, including those on filters installed on the suction side of pumps.

4. SPECIFIC CONDITIONS FOR DESIGN EXECUTION

4.1 For project execution, the CONTRACTOR shall consider the following technical categories:

a) *Engineer* with a minimum of seven years experience in process equipment design for Industrial Units, with the following qualifications:

·1 experience in at least one process equipment project for a Refinery and or a Petrochemical Plant;

·2 experience in specification of process equipment, analysis of suppliers' bids and analysis of manufacturers' drawings in one or more project for Refineries and/or Petrochemical plants;

·3 experience in supervising a team in two or more process equipments projects for Industrial Units;

·4 preferably having a Bachelor's Degree in Mechanical Enginering.

b) *Engineer* with a minimum of three years experience in process equipment design for Industrial Units, with the following qualifications:

·1 experience in at least one process equipment project for a Refinery and or a Petrochemical Plant;

·2 experience in specification of process equipment, analysis of suppliers' bids and analysis of manufacturers' drawings in one or more project for Refineries and/or Petrochemical plants;

·3 preferably having a Bachelor's Degree in Mechanical Enginering.