

CONTECComissão de Normalização
Técnica**SC-08**

Fired Heaters

Fired Heater - Material Requisition**1st Amendment**

This is the 1st Amendment to PETROBRAS N-2105 REV. F and it is used to alter the text of the Standard in the part(s) indicated below:

NOTE 1 The new(s) page(s) with the performed amendment(s) is (are) placed in its corresponding position(s).

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 1st AMENDMENT - 06/2023**- Section 2**

Alteration of NR-12 title

Alteration of NR-13 title

Replacement of Portaria ANAC Nº 1141 dated 12/08/1987 by Portaria COMAER Nº 256/GC5 dated 05/13/2011

Alteration of ABNT NBR 16137 title

Alteration of ASME B16.5 title

Alteration of ASME B16.9 title

Alteration of ASME B16.11 title

Alteration of ASME B16.20 title

Inclusion of ASME B16.25

Exclusion of ASME B16.28

Alteration of ASME B16.47 title

Replacement of AISC 325 by AISC 360

- Annex A

Alteration of NR-12 title

Alteration of NR-13 title

Replacement of Portaria ANAC Nº 1141 dated 12/08/1987 by Portaria COMAER Nº 256/GC5 dated 05/13/2011

Alteration of ABNT NBR 16137 title

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Alteration of ASME B16.9 title

Alteration of ASME B16.11 title

Alteration of ASME B16.20 title

Inclusion of ASME B16.25

Exclusion of ASME B16.28

Alteration of ASME B16.47 title

Replacement of AISC 325 by AISC 360

Fired Heater - Material Requisition

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 - 08

Fired Heaters

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 of PETROBRAS N-2105 REV. F 04/2016. 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 the Material Requisition form for Fired Heaters, Annex A, to be used for purchasing or ordering any Fired Heaters for PETROBRAS.

1.2 This Standard applies to purchases or orders from its date of issuance.

1.3 This Standard contains only Technical Requirements.

2 Normative References

The documents listed below are essential for the application of this document. For dated references, only the cited editions are applicable. For undated references, the latest editions of the mentioned documents (including amendments) apply.

[NR10](#) - Segurança em Instalações e Serviços em Eletricidade;

[NR12](#) - Segurança no Trabalho em Máquinas e Equipamentos;

[NR13](#) - Caldeiras, Vasos de Pressão, Tubulações e Tanques Metálicos de Armazenamento;

[NR14](#) - Fornos;

[NR26](#) - Sinalização de Segurança;

Comando da Aeronáutica (COMAER) - [Portaria Nº 256/GC5](#) de 13/05/2011 - Dispõe sobre as restrições relativas às implantações que possam afetar adversamente a segurança e a regularidade das operações aéreas, e dá outras providências;

CONAMA Resolução [Nº 382](#) de 26/12/2006 - Limites Máximos de Emissão de Poluentes Atmosféricos para Fontes Fixas;

INMETRO Portaria [Nº 179](#) de 18/05/2010 - Revisão dos Requisitos de Avaliação da Conformidade de Equipamentos Elétricos e Eletrônicos para Atmosferas Explosivas;

PETROBRAS [N-2](#) - Anticorrosive Coating of Industrial Equipment;

PETROBRAS [N-13](#) - Technical Requirements for Paintwork;

PETROBRAS [N-57](#) - Projeto Mecânico de Tubulações Industriais;

PETROBRAS [N-58](#) - Graphic Symbols for Process and Engineering Flow Sheets;

PETROBRAS [N-76](#) - Materiais de Tubulação para Instalações de Refino e Transporte;

PETROBRAS [N-108](#) - Vents and Drains for Piping and Equipment;

PETROBRAS [N-115](#) - Fabrication and Erection of Metallic Piping;

PETROBRAS [N-133](#) - Soldagem;

PETROBRAS [N-134](#) - Anchors for Use in Concrete;

PETROBRAS [N-250](#) - Montagem de Isolamento Térmico a Alta Temperatura;

PETROBRAS [N-253](#) - Projeto de Vaso de Pressão;

PETROBRAS [N-266](#) - Apresentação de Projeto de Vaso de Pressão;

PETROBRAS [N-268](#) - Fabrication of Pressure Vessel;

PETROBRAS [N-269](#) - Montagem de Vaso de Pressão;

PETROBRAS [N-279](#) - Design of Steel Structures;

PETROBRAS [N-293](#) - Manufacture and Assembly of Metallic Structure;

PETROBRAS [N-300](#) - Detalhes de Aterramento Empregando-se Conectores Metálicos;

PETROBRAS [N-381](#) - Execution of Drawing and other General Technical Documents;

PETROBRAS [N-442](#) - Revestimento Externo de Tubulação em Instalações Terrestres;

PETROBRAS [N-466](#) - Design of Shell-and-Tube Heat Exchanger;

PETROBRAS [N-550](#) - Projeto de Isolamento Térmico a Alta Temperatura;

PETROBRAS [N-553](#) - Centrifugal Pumps for Petroleum, Petrochemical and Natural Gas Industries;

PETROBRAS [N-858](#) - Construção, Montagem e Condicionamento de Instrumentação e Automação;

PETROBRAS [N-1500](#) - Pressure Vessel Data Sheet;

PETROBRAS [N-1521](#) - Identification of Industrial Equipment;

PETROBRAS [N-1522](#) - Identificação de Tubulações Industriais;

PETROBRAS [N-1550](#) - Pintura de Estrutura Metálica;

PETROBRAS [N-1591](#) - Metal Alloys and Metals Identification by Magnet and Spot Tests;

PETROBRAS [N-1593](#) - Non-Destructive Testing – Leak Testing;

PETROBRAS [N-1594](#) - Ensaio Não Destrutivo - Ultrassom em Solda;

PETROBRAS [N-1595](#) - Ensaio Não Destrutivo - Radiografia;

PETROBRAS [N-1596](#) - Non-Destructive Testing – Liquid Penetrant;

PETROBRAS [N-1597](#) - Non-Destructive Testing Visual Inspection;

PETROBRAS [N-1598](#) - Non-Destructive Testing – Magnetic Particles;

PETROBRAS [N-1600](#) - Construção, Montagem e Condicionamento de Redes Elétricas;

PETROBRAS [N-1614](#) - Construction, Mounting and Conditioning of Electrical Equipment;

PETROBRAS [N-1617](#) - Aplicação de Concreto Refratário;

PETROBRAS [N-1618](#) - Thermal Insulation Material;

PETROBRAS [N-1637](#) - Fired Heater Assembly;

PETROBRAS [N-1664](#) - Fired Heater - Data Sheet;

PETROBRAS [N-1665](#) - Burner - Data Sheet;

PETROBRAS [N-1671](#) - Design and Fabrication of Fired Heater;

PETROBRAS [N-1692](#) - Presentation of Piping Designs;

PETROBRAS [N-1710](#) - Coding of Technical Engineering Documents;

PETROBRAS [N-1728](#) - Concreto Refratário;

PETROBRAS [N-1735](#) - Painting of Electrical Equipment, Machines and Instruments;

PETROBRAS [N-1756](#) - Passive Fire Protection Design and Application on Onshore Facilities;

PETROBRAS [N-1882](#) - Criteria for Preparing Instrumentation Design;

PETROBRAS [N-1883](#) - Presentation of Instrumentation/Automation Design;

PETROBRAS [N-1890](#) - Ceramic Fiber Internal Linings;

PETROBRAS [N-1910](#) - Castable Lining Design;

PETROBRAS [N-1931](#) - Instrumentation Piping Materials;

PETROBRAS [N-1997](#) - Projeto de Redes Elétricas em Sistemas de Bandeamento para Cabos;

PETROBRAS [N-2006](#) - Projeto de Sistemas de Iluminação;

PETROBRAS [N-2040](#) - Elaboração, Apresentação e Gerenciamento de Documentos de Projetos de Eletricidade;

PETROBRAS [N-2054](#) - Pressure Vessel Internal and External Accessories;

PETROBRAS [N-2064](#) - Emissão e Revisão de Documentos de Projeto;

PETROBRAS [N-2301](#) - Elaboração de Documentação Técnica de Soldagem;

PETROBRAS [N-2315](#) - Execução de Ensaio Não Destrutivo - Ultrassom em Forjado;

PETROBRAS [N-2370](#) - Materiais Penetrantes;

PETROBRAS [N-2547](#) - Conversor de Frequência para Controle de Rotação de Motor Elétrico;

PETROBRAS [N-2595](#) - Criteria for Design, Operation and Maintenance of Safety Instrumented Systems in Industrial Units;

PETROBRAS [N-2802](#) - Collection of Instrumentation Datasheets;

PETROBRAS [N-2833](#) - Forms and Lists for Instrumentation Designs;

PETROBRAS [N-2919](#) - Motores Elétricos Trifásicos de Indução ou Síncronos;

ABNT [NBR 6123](#) - Forças Devidas ao Vento em Edificações;

ABNT [NBR 9688](#) - Isolantes Térmicos com Mantas de Fibra Cerâmica;

ABNT [NBR 10662](#) - Isolantes Térmicos Pré-Moldados de Silicato de Cálcio - Especificação;

ABNT [NBR 15156](#) - Pintura Industrial – Terminologia;

ABNT [NBR 15218](#) - Critérios para Qualificação e Certificação de Inspetores de Pintura Industrial;

ABNT [NBR 15523](#) - Qualificação e Certificação de Inspetor de Controle Dimensional;

ABNT [NBR 16137](#) - Ensaios Não Destrutivos - Identificação de Materiais por Teste por Pontos, Espectrometria por Fluorescência de Raios X e Espectrometria por Emissão Óptica;

ABNT [NBR 16278](#) - Inspeção de Fabricação - Qualificação e Certificação de Pessoas para o Setor de Petróleo e Gás;

ABNT [NBR 16315](#) - Instalação e Comissionamento de Máquinas;

ABNT [NBR 16577](#) - Espaço Confinado - Prevenção de Acidentes, Procedimentos e Medidas de Proteção;

ISO [8501-1](#) - Preparation of Steel Substrates before Application of Paints and Related Products;

ISO [9712](#) - Non-destructive Testing – Qualification and Certification of NDT Personnel;

API [RP 535](#) - Burners for Fired Heaters in General Refinery Service;

API [RP 556](#) - Instrumentation, Control, and Protective Systems for Gas Fired Heaters;

API [RP 941](#) - Steels for Hydrogen Service at Elevated Temperatures and Pressures in Petroleum Refineries and Petrochemical Plants;

API [STD 530](#) - Calculation of Heater-Tube Thickness in Petroleum Refinery;

API [STD 560](#) - Fired Heaters for General Refinery Services;

API [STD 936](#) - Refractory Installation Quality Control - Inspection and Testing Monolithic Refractory Linings and Materials;

ASME [B16.5](#) - Pipe Flanges and Flanged Fittings;

ASME [B16.9](#) - Factory - Made Wrought Buttweldings Fittings;

ASME [B16.11](#) - Forged Fittings, Socket – Welding and Threaded;

ASME [B16.20](#) - Metallic Gaskets for Pipe Flanges-Ring-Joints, Spiral Wound and Jacketed;

ASME [B16.25](#) - Buttwelding Ends;

ASME [B16.47](#) - Large Diameter Steel Flanges NPS 26 Through NPS 60 Metric/Inch Standard;

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

ASME [B36.10M](#) - Welded and Seamless Wrought Steel Pipe;

ASME [B36.19M](#) – Stainless Steel Pipe;

ASME [Section I](#) - Rules for Construction of Power Boilers;

ASME [Section VIII Div. 1](#) - Rules for Construction of Pressure Vessels;

ASME [Section IX](#) - Welding and Brazing Qualification;

ASME [STS-1](#) - Steel Stacks;

American Society of Testing Materials (ASTM) Specifications;

AISC [360](#) - Steel Construction Manual;

BSI [BS EN 15259](#) - Air Quality - Measurement of Stationary Source Emissions - Requirements for Measurement Sections And Sites And For The Measurement Objective, Plan And Report;

ISA [5.1](#) - Instrumentation Symbols and Identification;

NFPA [85](#) - Boiler and Combustion Systems Hazards Code.

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 General Conditions

3.1 The Material Requisition form is standardized in A4 format as per Annex A of this Standard.

3.2 For completing the header and footer of the Material Requisition, PETROBRAS [N-381](#) shall be followed.

3.3 The Fired Heater identification shall be as per PETROBRAS [N-1521](#) and inserted in the header space referring to the name of the equipment (Fired Heater).

3.4 After the Material Requisition is issued by the executor, it shall be considered the initial purchase document of the Fired Heater.

3.5 The same Material Requirement shall be used for one or more Fired Heaters, since they are equal.

3.6 The Fired Heater Material Requisition has two annexes.

3.6.1 Annex 1 - DESIGN REFERENCE DOCUMENTS - is a previously fulfilled form with examples that shall be replaced by the executor with the Fired Heater's specific design documents.

3.6.2 Annex 2 – FIRED HEATER BATTERY LIMITS - are examples of drawings that shall be replaced, by the executor, with drawings of the Battery Limits inserted in the P&ID (Process and Instrumentation Diagram) and Plot Plan of the Unit (Unit Arrangement), of the specific Fired Heater project.

No.	
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CLIENT:

SHEET

01 OF 39

JOB:

AREA:

TITLE:	
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FIRED HEATER

INDEX OF REVISIONS


REV.

DESCRIPTION AND/OR REVISED SHEETS

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DATE									
DESIGN									
EXECUTION									
CHECK									
APPROVAL									

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FORM OWNED TO PETROBRAS N-2105 REV. F 1ST AMMENDMENT ANNEX A - SHEET 01/39.


	MATERIAL REQUISITION	Nº	REV.
			SHEET 02 OF 39
	TITLE: FIRED HEATER		

SUMMARY

1. OBJECTIVE OF REQUISITION
2. SCOPE OF SUPPLY
3. LIST OF COMPONENTS AND AUXILIARY EQUIPMENT
4. LIST OF INSTRUMENTS, ACCESSORIES AND AUXILIARY SYSTEMS
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12. ANNEXES

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FORM OWNED TO PETROBRAS N-2105 REV. F 1ST AMMENDMENT ANNEX A - SHEET 02/39.

	MATERIAL REQUISITION	Nº	REV.
			SHEET 03 OF 39
	TITLE:		
FIRE HEATER			

1. OBJECTIVE OF REQUISITION

1.1 This Material Requisition is intended for the supply of the following Fired Heater(s):

EQUIPMENT TAG	SERVICE

1.2 The supply will only be considered complete if all the technical required documentation is provided.

2. SCOPE OF SUPPLY


The equipment manufacturer shall supply the items listed below:

2.1 Design

- ☐ Analytical design (Process and thermal design).
- ☐ Thermal and process design validation.
- ☐ Material selection (where not specified in the documents listed in Item 6).
- ☐ Mechanical design (where not specified in the documents listed in Item 6).
- ☐ Fabrication design.
- ☐ Stress analysis study and calculations of coils, skin points tubings, ducts and piping inside battery limits.
- ☐ Design of combustion control system.
- ☐ Design of the interlock system logical diagram/block diagram.
- ☐ Instrumentation and control design inside the battery limits.
- ☐ Fieldbus network Design within battery limits.
- ☐ Electrical design inside the battery limits of the Fired Heater package, including the power and control distribution, the normal and emergency (critical and no critical) lighting distribution, electrical grounding lugs, welding receptacles and general use receptacle with distribution.
- ☐ Steam Air Decoking System, including Coke Knock-Out Drum, piping, instrumentation and automation.
- ☐ Operation procedure of the Steam Air Decoking System.
- ☐ Pig Decoking System including all facilities, providing appropriate space (piping, spools, fittings etc) at platforms and any required installation for system operation.
- ☐ Operation procedure of the On Line Spalling Decoking System.
- ☐ Fuel system including the equipment, piping, accessories and instrumentation to the pilots and main burners.
- ☐ Snuffing Steam System including piping, accessories and instrumentation.
- ☐ Refractory and insulating lining, including material specification and thicknesses, where not indicated in the documents in Item 6.

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	TITLE FIRED HEATER		

2.1 Design (cont.)

- ☐ Installation design of insulation and refractory materials.
- ☐ Mechanical and detail designs of dampers, including theirs actuators.
- ☐ Manual Damper Control System Design (wire ropes, sheaves, damper position indication etc.).
- ☐ Combustion Air Preheating System.
- ☐ 3D Electronic Model of the Fired Heater package using the PDMS software, considering the scope of supply defined in this Material Requisition and in accordance with the applicable documents listed in Item 6.
The 3D Electronic Model shall show all Fired Heaters components considering the internal and external details including structural steel, platforms and ladders, stack, ducts, burners, piping, coils, supports, refractory materials, auxiliary equipment, valves, instruments, electrical equipment, trays, accessories, etc.
During the Electronic Model execution shall take place meetings between PETROBRAS and SUPPLIER to discuss technically and to approval the parts of the Electronic Model.
The final version of the approved complete Electronic Model shall be ready before the Fired Heater package erection activities. SUPPLIER shall provide that the Fired Heater 3D Electronic Model to be incorporated in a consistent way to the Unit 3D Eletronic Model and must be sent progressively with all kinds of access, information and allowing handling.
- ☐ Erection Model including a video with the erection sequence of the Fired Heater components/parts and auxiliary equipment.
- ☐ Concrete foundation design.


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FORM OWNED TO PETROBRAS N-2105 REV.: F 1ST AMMENDMENT ANNEX A - SHEET 04/39.

	MATERIAL REQUISITION	Nº	REV.
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	TITLE:		
FIRED HEATER			

2.2 Materials and Services

- ☐ Supply of all materials required for fabrication.
- ☐ Materials inspection.
- ☐ Fabrication at shop.
- ☐ Tests of all materials at shop (including sub-vendors supplies).
- ☐ Performance tests of instrumentation panel, at shop.
- ☐ Performance tests for Burner, pilot and igniter, at burner manufacturer facilities. The tests procedures shall be provided by SUPPLIER and approved by PETROBRAS. The test shall be done using a fuel gas with the same or closer composition defined in the documents listed at Item 6. The SUPPLIER shall inform PETROBRAS the date of the tests 60 days earlier to allow the witness by a PETROBRAS representative.
- ☐ Nondestructive tests.
- ☐ Supply of internal thermal insulation and/or refractory materials.
- ☐ Supply of external thermal insulation materials.
- ☐ Supply of all furnace components (see also Annex 2), listed below:
 - Supporting columns, beams and braces.
 - Casing panels.
 - Ducts.
 - Stack.
 - Dampers with their actuators.
 - Platforms with handrails, including the sampling platform and nozzles at the stack.
 - Stairways and ladders with safety cage and gate.
 - Nozzles, auxiliary connections, peep doors, access doors and, explosion doors.
 - Refractory and insulation with anchors and/or supports.
 - Other appurtenances shown on the equipment drawings.
 - Coils and piping (including crossovers).
 - Radiant and convection tube supports.
 - Burners.
 - Air preheater system (if applicable).
 - Blowers (if applicable).
 - Other Fired Heater components/parts not listed above.
- ☐ Installation of refractory materials and/or internal thermal insulation of the Fired Heater components/parts assembled at shop.
- ☐ Dry-out of the refractory concrete at shop.
- ☐ Dry-out of the refractory concrete at site.
- ☐ Dry-out procedure of the refractory concrete.
- ☐ Supply of the Steam Air Decoking System including: Coke Knock-Out Drum, piping, accessories and instrumentation.
- ☐ Supply of the Pig Decoking System facilities (piping, "spools", connections, etc), platforms and any other required facilities to allow its operation.


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2.2 Materials and Services (cont.)

- ☐ Supply of the fuel system including equipment, piping, accessories and instrumentation to the pilots and main burners. (see Annex 2)
- ☐ Supply of Electrical cabling for the followings items, with cable glands, infrastructure and facilities (according to the Fired Heater technical specification):
 - Between igniter and transformer;
 - Between flame detector and local panel;
 - Between instruments and junction boxes;
 - Between instruments and Panels;
 - For Illumination system;
 - For grounding system;
 - Others shown on the Fired Heater technical specification.
- ☐ The following premises shall be taken into account for the supply of the electrical equipment and materials inside the battery limits of the Fired Heater package:
 - SUPPLIER shall provide the infrastructure and facilities planned for the power cables of the welding receptacles, as for the cable trays, exposed metallic conduits and any other facilities necessary to the cable routing, starting from the junction box located at the Fired Heater base until the welding receptacles located at the structure.
 - SUPPLIER shall provide the design infrastructure and facilities for the normal and emergency (critical and no critical) lighting distribution, as the cable trays, exposed metallic conduits and any other facilities necessary to the cables routing, starting from the junction box located at the Fired Heater base, until the lighting devices and general use receptacles.
 - SUPPLIER shall provide the electrical grounding lugs.
 - SUPPLIER shall provide aviation safety lights for obstacles, which shall be a continuous light device, to be installed at the highest point (stack) of the Fired Heater.
 - SUPPLIER shall provide the means to obtain any different voltage from the available voltage supplied at battery limit.
- ☐ Fieldbus network supply within battery limits.
- ☐ Supply of the specific junction boxes for each instrument signal type.
- ☐ Painting of Fired Heater, auxiliary equipment and accessories.
- ☐ Supply of the nameplates with saddles. The nameplates shall be manufactured with stainless steel plate (minimum thickness equals to 3 mm).
- ☐ Packing and preparation of the Fired Heater components/parts, auxiliary equipment and accessories, for transportation.
- ☐ Loading of the Fired Heater components/parts, auxiliary equipment and accessories onto transportation vehicle.
- ☐ Transportation and conditioning of the Fired Heater components/parts, auxiliary equipment and accessories from the shop to the Process Unit site.
- ☐ Unloading of the Fired Heater components/parts, auxiliary equipment and accessories at Process Unit site.
- ☐ Supply of special tools required for furnace maintenance, if necessary.


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FORM OWNED TO PETROBRAS N-2105 REV. F 1ST AMMENDMENT ANNEX A - SHEET 06/39.

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	FIRE HEATER		

2.2 Materials and Services (cont.)

- ☐ Field assembly, including all erection, required inspection, conditioning and tests. Supply of all the materials for field assembly, including all temporary devices such as lifting lugs, reinforcement spiders, structural alignment devices, etc.
- ☐ Foundations construction for Fired Heater and auxiliary equipment.
- ☐ Pre-operation, start-up, assisted operation and performance test.
- ☐ Field assembly procedure.
- ☐ Fired Heater field conditioning procedure.
- ☐ Supervision for the field assembly (Fired Heater components/parts, auxiliary equipment and accessories), conditioning, tests, pre-operation, start-up, assisted operation and performance test.
- ☐ Fired Heaters field smoke test.
- ☐ Fired Heaters field smoke test procedure.
- ☐ Fired Heater coils field hydrostatic tests.
- ☐ Fired Heater coils field hydrostatic tests procedure.
- ☐ Supply of blind flanges, gaskets, bolts, and all facilities for field hydrostatic tests.
- ☐ Training program considering, at least, the following subjects: Fired Heater operation (start-up, shutdowns, emergencies and security), main components and auxiliary equipment maintenance; burner types, installation, operation and maintenance; and ignition and flame monitoring systems (40 hours at least). Supplier shall provide all training material.
- ☐ Supply of all auxiliary equipment and components (as per Item 3).
- ☐ Supply of instruments, accessories and auxiliary systems (as per Item 4).
- ☐ Supply of spare parts (as per Item 5).
- ☐ Supply of template of main equipment in advance.


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<p>3. LIST OF COMPONENTS AND AUXILIARY EQUIPMENT</p> <ul style="list-style-type: none"> <input type="checkbox"/> Burners. <input type="checkbox"/> Pilots. <input type="checkbox"/> Igniters. <input type="checkbox"/> Noise suppressor, if necessary to comply with noise level requirements. <input type="checkbox"/> Sootblowers. <input type="checkbox"/> Forced draft fan, drivers and accessories. <input type="checkbox"/> Induced draft fan, drivers and accessories. <input type="checkbox"/> Instrumentation Local Panel (one for each Fired Heater). <input type="checkbox"/> HMI for Local Panel. <input type="checkbox"/> Regenerative Air Preheater. <input type="checkbox"/> Recuperative Air Preheater. <input type="checkbox"/> Steam Air Preheater. <input type="checkbox"/> Blocking Guillotines. <input type="checkbox"/> Waste Heat Boiler, Steam Drum and accessories. <input type="checkbox"/> Catalyst Loading and Removal Systems equipment. <input type="checkbox"/> Pressure drop measurement tool for air pressure drop test on catalyst tubes. <input type="checkbox"/> Programmable Logic Controller (PLC). <input type="checkbox"/> Peep Doors with tempered transparent colorless glass as per PETROBRAS N-1671. <input type="checkbox"/> Expansion Joints. <input type="checkbox"/> Illumination Panels (normal and emergency). <input type="checkbox"/> Transformers (illumination and others). <input type="checkbox"/> Electrical Distribution Panels. <input type="checkbox"/> Frequency Converters. <input type="checkbox"/> SCR (NOx Selective Catalytic Reduction). 			
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4. LIST OF INSTRUMENTS, ACCESSORIES AND AUXILIARY SYSTEMS

4.1. The SUPPLIER shall provide all the instruments within the battery limits (see Annex 2) and selected bellow, including accessories and auxiliary systems:

- ☐ Skin points.
- ☐ Electrical igniters with transformers.
- ☐ O2 Analyzer.
- ☐ NOx Analyzer.
- ☐ SOx Analyzer.
- ☐ CEMS (Continuous Emission Monitoring System).
- ☐ Nozzles for CEMS (Continuous Emission Monitoring System). The SUPPLIER shall also provide ladders and platforms to allow the system maintenance.
- ☐ Flue gas pressure and differential pressure measurement, transmission and indication devices.
- ☐ Flue gas temperature measurement, transmission and indication devices.
- ☐ Process fluid pressure and differential pressure measurement, transmission and indication devices.
- ☐ Process fluid temperature measurement, transmission and indication devices.
- ☐ Combustion air pressure and differential pressure measurement, transmission and indication devices.
- ☐ Combustion air temperature measurement, transmission and indication devices.
- ☐ Combustion air flow measurement, transmission and indication devices.
- ☐ Fuel pressure measurement, transmission and indication devices.
- ☐ Fuel temperature measurement, transmission and indication devices.
- ☐ Fuel flow measurement, transmission and indication devices.
- ☐ Control Valves.
- ☐ Shut Off Valves.
- ☐ Flame Detectors for each pilot.
- ☐ Flame Detectors for each main burner.
- ☐ Manual Dampers.
- ☐ Automatic dampers (with actuators and instrumentation).
- ☐ TV Camera.
- ☐ TV Camera Nozzles.

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5. LIST OF SPARE PARTS

5.1. The SUPPLIER shall provide all spare parts needed during the assembly, conditioning, tests, pre-operation, startup, and assisted operation.

5.2. Spare parts for two years of continuous operation are not included in the scope of supply of the Fired Heater.

5.3. The SUPPLIER shall provide a list of spare parts with all items considered necessary for two years of operation, considering all auxiliary equipment items included in the scope of supply of the Fired Heater. The supplier shall present with the bid, the list of spare parts, including the recommended quantity and the unit price of each item.

5.4. The following items and quantities shall be considered as a minimum:

Burner tile:	5% (min. 1 set for each type)
Burner tip:	5% (min. 1 piece for each type)
Pilot tip:	5% (min. 1 piece for each type)
Ignition transformers:	100%
Burner:	1 set for each type

5.5. Spare parts shall be identified in accordance with the drawings and/or documents supplied (this also applies to spare parts provided by third parties).

5.6. Spare parts shall be packed separately from the equipment.

6. DESIGN REFERENCE DOCUMENTS

6.1. Proposals shall comply precisely and in full with the whole of the requirements included in the documents listed in the Annex 1.

7. STANDARDS, CODES AND LAWS


7.1. Proposals shall comply precisely and in full with the whole of the requirements included in the documents mentioned below, which are an integral part of this Material Requisition (where applicable).

International Codes and Standards

- ☒ API STD 560 - Fired Heaters for General Refinery Service;
- ☒ API STD 530 - Calculation of Heater-Tube Thickness in Petroleum Refinery;
- ☒ API RP 535 – Burners for Fired Heaters in General Refinery Services;
- ☐ API RP 556 – Instrumentation, Control, and Protective Systems for Gas Fired Heaters;


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International Codes and Standards (cont.)

- ☒ API STD 936 - Refractory Installation Quality Control - Inspection and Testing Monolithic Refractory Linings and Materials;
- ☐ API RP 941- Steels for Hydrogen Service at Elevated Temperatures and Pressures in Petroleum Refineries and Petrochemical Plants;
- ☒ ASME B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24;
- ☒ ASME B16.11 – Forged Fittings, Socket-Welding and Threaded;
- ☒ ASME B16.20 – Metallic Gaskets for Pipe Flanges;
- ☒ ASME B16.9 – Factory-Made Wrought Steel Buttwelding Fittings;
- ☒ ASME B16.25 – Buttwelding Ends
- ☒ ASME B16.47 – Large Diameter Steel Flanges NPS 26 Through NPS 60;
- ☒ ASME B31.3 – Process Piping;
- ☒ ASME B36.10M – Welded and Seamless Wrought Steel Pipe;
- ☒ ASME B36.19M – Stainless Steel Pipe;
- ☐ ASME BPVC SECTION I – Rules for Construction of Power Boilers;
- ☐ ASME BPVC SECTION VIII – Rules for Construction of Pressure Vessels; (See Note B)
- ☒ ASME BPVC SECTION IX – Welding, Brazing and Fusing Qualifications;
- ☒ ASME STS-1 – Steel Stacks;
- ☒ American Society of Testing Materials (ASTM) Specifications;
- ☒ ANSI/AISC 360 - Specification for Structural Steel Buildings;
- ☒ BSI BS EN 15259 - Air Quality - Measurement of Stationary Source Emissions - Requirements for Measurement Sections and Sites and for the Measurement Objective, Plan and Report;
- ☒ ANSI/ISA 5.1 - Instrumentation Symbols and Identification;
- ☒ ISO 8501-1- Preparation of Steel Substrates before Application of Paints and Related Products;
- ☒ ISO 9712 – Non-destructive Testing – Qualification and Certification of NDT Personnel;
- ☒ NFPA 85 – Boiler and Combustion Systems Hazards Code.

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<p>PETROBRAS Standards</p> <ul style="list-style-type: none"> <input type="checkbox"/> N-2 – Anticorrosive Coating of Industrial Equipment; <input type="checkbox"/> N-13 – Technical Requirements for Paintwork; <input type="checkbox"/> N-57 – Mechanical Design of Industrial Piping; (See Note A) <input type="checkbox"/> N-58 – Graphic Symbols for Process and Engineering Flow Sheets; <input type="checkbox"/> N-76 – Piping Materials for Refining and Transportation Plants; (See Note A) <input checked="" type="checkbox"/> N-108 – Vents and Drains for Piping and Equipment; <input type="checkbox"/> N-115 – Fabrication and Erection of Metallic Piping; (See Note A) <input checked="" type="checkbox"/> N-133 – Welding; <input type="checkbox"/> N-134 – Anchors for Use in Concrete; <input type="checkbox"/> N-250 – Installation of High Temperature Thermal Insulation; <input type="checkbox"/> N-253 – Pressure Vessel Design; (See Note B) <input type="checkbox"/> N-266 – Presentation of Pressure Vessel Design; (See Note B) <input type="checkbox"/> N-268 – Fabrication of Pressure Vessel; (See Note B) <input type="checkbox"/> N-269 – Pressure Vessel Assembly; (See Note B) <input checked="" type="checkbox"/> N-279 – Design of Steel Structures; <input type="checkbox"/> N-293 – Manufacture and Assembly of Metallic Structure; <input type="checkbox"/> N-300 – Grounding Details Using Mechanical Connectors; <input type="checkbox"/> N-381 – Execution of Drawing and other General Technical Documents; <input type="checkbox"/> N-442 – External Painting of Pipe for Onshore Facilities; (See Note A) <input type="checkbox"/> N-466 – Design of Shell-and-Tube Heat Exchanger; (See Note B) <input type="checkbox"/> N-550 – Design of High Temperature Thermal Insulation; <input type="checkbox"/> N-553 – Centrifugal Pumps for Petroleum, Petrochemical and Natural Gas Industries; <input type="checkbox"/> N-858 – Construction, Assembly and Conditioning of Instrumentation; (See Note C) <input type="checkbox"/> N-1500 – Pressure Vessel Data Sheet; (See Note B) <input type="checkbox"/> N-1521 – Identification of Industrial Equipment; <input type="checkbox"/> N-1522 – Identification of Industrial Piping; (See Note A) <input type="checkbox"/> N-1550 – Metallic Structure Painting; <input checked="" type="checkbox"/> N-1591 – Metal Alloys and Metals Identification by Magnet and Spot Tests; 			
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<p>PETROBRAS Standards (cont.)</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> N-1593 – Non-Destructive Testing – Leak Testing; <input checked="" type="checkbox"/> N-1594 – Non-Destructive Test – Ultrasonic; <input checked="" type="checkbox"/> N-1595 – Non-Destructive Testing – Radiography; <input checked="" type="checkbox"/> N-1596 – Non-Destructive Testing – Liquid Penetrant; <input checked="" type="checkbox"/> N-1597 – Non-Destructive Testing Visual Inspection; <input checked="" type="checkbox"/> N-1598 – Non-Destructive Testing – Magnetic Particles; <input type="checkbox"/> N-1600 – Construction, Assembly and Pre-Commissioning of Electrical Networks; <input type="checkbox"/> N-1614 – Construction, Mounting and Conditioning of Electrical Equipment; <input checked="" type="checkbox"/> N-1617 – Application of Refractory Castable; <input type="checkbox"/> N-1618 – Thermal Insulation Material; <input type="checkbox"/> N-1637 – Fired Heater Assembly; <input type="checkbox"/> N-1664 – Fired Heater – Data Sheet; <input type="checkbox"/> N-1665 – Burner – Data Sheet; <input checked="" type="checkbox"/> N-1671 – Design and Fabrication of Furnace; <input type="checkbox"/> N-1692 – Presentation of Piping Designs; <input type="checkbox"/> N-1710 – Coding of Technical Engineering Documents; <input type="checkbox"/> N-1728 – Castable Refractory; <input type="checkbox"/> N-1735 – Painting of Electrical Equipment, Machines and Instruments; <input checked="" type="checkbox"/> N-1756 – Passive Fire Protection Design and Application on Onshore Facilities; <input type="checkbox"/> N-1882 – Criteria for Preparing Instrumentation Design; (See Note C) <input type="checkbox"/> N-1883 – Presentation of Instrumentation/Automation Design; (See Note C) <input checked="" type="checkbox"/> N-1890 – Ceramic Fiber Internal Linings; <input type="checkbox"/> N-1910 – Castable Lining Design; <input type="checkbox"/> N-1931 – Instrumentation Piping Materials; (See Note C) <input type="checkbox"/> N-1997 – Electrical Networks in Cable Tray Systems – Design, Installation and Inspection; <input type="checkbox"/> N-2006 – Lighting Systems Design; <input type="checkbox"/> N-2040 – Preparation, Presentation and Management of Electrical Design Documents; <input type="checkbox"/> N-2054 – Pressure Vessel Internal and External Accessories; (See Note B) 			
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PETROBRAS Standards (cont.)

- ☒ N-2064 – Issuance and Revision of Design Documents;
- ☐ N-2301 – Preparation of the Welding Technical Documentation;
- ☐ N-2315 – Performance of Non-Destructive Test - Ultrasound in Steel Forgings;
- ☐ N-2370 – Penetrant Materials;
- ☐ N-2547 – Frequency Converter for Speed Control of Electric Motor up to 660 VAC;
- ☐ N-2595 – Criteria for Design, Operation and Maintenance of Safety Instrumented Systems in Industrial Units; (See Note C)
- ☐ N-2802 – Collection of Instrumentation Datasheets; (See Note C)
- ☐ N-2833 – Forms and Lists for Instrumentation Designs; (See Note C)
- ☐ N-2919 – Three-Phase Induction or Synchronous Electrical Motors.

Brazilian Standards

- ☐ ABNT NBR 10662 – Isolantes Térmicos Pré-Moldados de Silicato de Cálcio – Especificação;
- ☐ ABNT NBR 9688 – Isolantes Térmicos com Mantas de Fibra Cerâmica - Especificação;
- ☒ ABNT NBR 6123 - Forças Devidas ao Vento em Edificações;
- ☐ ABNT NBR 15156 – Pintura Industrial – Terminologia;
- ☐ ABNT NBR 15218 – Critérios para Qualificação e Certificação de Inspetores de Pintura Industrial;
- ☒ ABNT NBR 15523 – Qualificação e Certificação de Inspetor de Controle Dimensional;
- ☒ ABNT NBR 16577 – Espaço Confinado - Prevenção de Acidentes, Procedimentos e Medidas de Proteção;
- ☐ ABNT NBR 16137 - Ensaios Não Destrutivos - Identificação de Materiais por Teste por Pontos, Espectrometria por Fluorescência de Raios X e Espectrometria por Emissão Óptica;
- ☐ ABNT NBR 16315 – Instalação e Comissionamento de Máquinas;
- ☐ ABNT NBR 16278 - Inspeção de fabricação — Qualificação e certificação de pessoas para o setor de Petróleo e Gás.


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<p>Brazilian Laws</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> NR10 - Segurança em Instalações e Serviços em Eletricidade; <input checked="" type="checkbox"/> NR12 - Segurança no Trabalho em Máquinas e Equipamentos; <input checked="" type="checkbox"/> NR13 - Caldeiras, Vasos de Pressão, Tubulações e Tanques Metálicos de Armazenamento; <input checked="" type="checkbox"/> NR14 - Fornos; <input checked="" type="checkbox"/> NR26 - Sinalização de Segurança; <input checked="" type="checkbox"/> CONAMA - Resolução N° 382 dated 12/26/2006; <input checked="" type="checkbox"/> Local Environmental Control Legislations; <input checked="" type="checkbox"/> INMETRO - Portaria N° 179 dated 05/18/2010; <input checked="" type="checkbox"/> Comando da Aeronáutica (COMAER) - Portaria N° 256/GC5 dated 05/13/2011. <p>Notes:</p> <p>Note A – Not applicable to the Fired Heater coils.</p> <p>Note B – Applicable when Fired Heater supply includes any pressure vessels.</p> <p>Note C - Applicable when Fired Heater supply includes instrumentation.</p> <p>8. COMMENTS AND APPROVAL OF DOCUMENTS</p> <p>8.1. All Fired Heater's documents shall be presented for comments and approval.</p> <p>8.2. The fabrication of each part of the Fired Heater shall only start after the drawings and other documents regarding the part considered have been returned approved without or with comments, since the comments were attended.</p> <p>8.3. All documents shall contain the Fired Heater identification.</p> <p>8.4. All documents shall contain the Purchase Order number corresponding to the Material Requisition.</p>			
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9. REQUIRED DOCUMENTS

The quantities and presentation deadlines of the documents shall be in accordance with the following table, where:
C- hard copy; E- electronic copy.


ITEM	DESCRIPTION	QUANTITIES			DEADLINES (NOTE 11)			
		WITH THE PROPOSAL	FOR COMMENTS	ORIGINALS CERTIFIED	PRESENTATION (DAYS AFTER THE PURCHASE)	COMMENTS (DAYS AFTER RECEIVING)	REVISION (DAYS AFTER RECEIVING)	ORIGINALS DELIVERY (DAYS AFTER RECEIVING)
MANDATORY ITEMS								
9.1.	Agreement Statement (See Note 8)	1E						
9.2.	List of Sub-suppliers and Purchased Material (See Notes 9)	1E						
9.3.	Detailed Supply, Fabrication and Assembly Schedules (See Note 9)	1E	1E					
9.4.	List of Documents (See Note 9)	1E	1E	2C+1E	30	15	15	10
9.5.	List of Spare Parts (See Note 9)	1E	1E	2C+1E	30	15	15	10
9.6.	Heater components/parts supply spreadsheet (Item 10.6) (See Note 9)	1E	1E	2C+1E	30	15	15	10
9.7.	Technical Assistance and Technical Support Spreadsheet (Item 10.7) (See Note 9)	1E						
9.8.	Foundation Loading Diagram (as per API-560)		1E	2C+1E	30	15	15	10
9.9.	Data Sheets (Fired Heater, Burners, Instruments, Auxiliary Equipment etc)		1E	2C+1E	60	15	15	10
9.10.	Fired Heater General Arrangement and Details Drawings (as per API-560)		1E	2C+1E	30	15	15	10
9.11.	Structural Framework and Casing Assembly Drawing.		1E	2C+1E	45	15	15	10
9.12.	Loading Plan Drawings		1E	2C+1E	90	15	15	10
9.13.	Structural Steel Fabrication Drawings; Details of Stack, Ducts and Dampers, and Structural Framework and Casing.		1E	2C+1E	60	20	15	10
9.14.	Pressure Containing Parts Fabrication Drawings (Coils, Headers and Crossovers)		1E	2C+1E	60	20	15	10

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ITEM	DESCRIPTION	QUANTITIES			DEADLINES (NOTE 11)			
		WITH THE PROPOSAL	FOR COMMENTS	ORIGINALS CERTIFIED	PRESENTATION (DAYS AFTER THE PURCHASE)	COMMENTS (DAYS AFTER RECEIVING)	REVISION (DAYS AFTER RECEIVING)	ORIGINALS DELIVERY (DAYS AFTER RECEIVING)
9.15.	Inspection and Test Plan (See Note 1)		1E	2C+1E	45	15	15	10
9.16.	Detailed Damper Drawings with Operating Devices		1E	2C+1E	90	15	15	10
9.17.	Radiant and Convection Tube Supports and Guides Drawings		1E	2C+1E	30	15	15	10
9.18.	Arrangements and Details of Stairways, Platforms, Ladders and Piping Supports		1E	2C+1E	60	20	15	10
9.19.	Detailed Drawings of Connections, Doors, Ports and External Appurtenances		1E	2C+1E	30	15	15	10
9.20.	Detail Drawing of Refractory Anchors		1E	2C+1E	45	15	15	10
9.21.	Refractory and Insulation Installation and Assembly Drawings		1E	2C+1E	45	15	15	10
9.22.	Burners Drawings		1E	2C+1E	60	20	15	10
9.23.	Burners' Performance Curves		1E	2C+1E	90	15	15	10
9.24.	<ul style="list-style-type: none"> - Local Panel Drawings; - Wiring Diagram; - Logical Diagram; - Loop Diagram; - Process and Instrumentation Diagrams; - Instrument Details; - Tube Skin Thermocouple including Terminal Head; - Flame Detectors; - Input / Output List; - Set-Points List; - Installation, Calibration and Test Instructions. 		1E	2C+1E	90	20	15	10
9.25.	Name plate Drawings, including the supports		1E	2C+1E	90	15	15	10
9.26.	Allowable Movement and Loads in Coils Nozzles and Flexibility Calculations of Coils		1E	2C+1E	60	20	15	10
9.27.	Strength Calculations of Pressure Containing Parts; Structural Framework; Tube Supports, Hangers and Tube Sheets		1E	2C+1E	120	20	15	10
9.28.	Fabrication Documents (Item 10.9)		1E	2C+1E	120	30	15	10


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ITEM	DESCRIPTION	QUANTITIES			DEADLINES (Note 11)			
		WITH THE PROPOSAL	FOR COMMENTS	ORIGINALS CERTIFIED	PRESENTATION (DAYS AFTER THE PURCHASE)	COMMENTS (DAYS AFTER RECEIVING)	REVISION (DAYS AFTER RECEIVING)	ORIGINALS DELIVERY (DAYS AFTER RECEIVING)
9.29.	Inspection Technical Documents (Item 10.10)		1E	2C+1E	120	30	15	10
9.30.	Refractory Application and Dry-Out Procedure		1E	2C+1E	60	15	15	10
9.31.	Painting Application Procedures		1E	2C+1E	60	15	15	10
9.32.	Field Assembly Procedure		1E	2C+1E	120	20	15	10
9.33.	Fired Heater field conditioning procedures		1E	2C+1E	120	20	15	10
9.34.	Fired Heaters field smoke test procedure		1E	2C+1E	120	20	15	10
9.35.	Fired Heater coils field hydrostatic tests procedure		1E	2C+1E	120	20	15	10
9.36.	Training program material		1E	2C+1E	120	20	15	10
9.37.	Operation and Maintenance Instructions Manuals		1E	2C+1E				
9.38.	Technical Fabrication Data Book (Item 10.11)		1E	2C+1E				
9.39.	Detail Data Sheets of all instruments included in the scope, including List of Instruments and Calculation Sheets		1E	2C+1E	90	20	15	10

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ITEM	SELECTION BOX	DESCRIPTION	QUANTITIES			DEADLINES (NOTE 11)			
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OPTIONAL ITEMS									
9.40.	<input type="checkbox"/>	Sootblowers' Data Sheet, and Assembly Drawings, including Local Panel, Valves and Wiring Diagram		1E	2C+1E	60	20	15	10
9.41.	<input type="checkbox"/>	Piping Plans, Isometric Drawings, Stress Analysis Calculations		1E	2C+1E	90	20	15	10
9.42.	<input type="checkbox"/>	- Electrical Data Sheets and Drawings: Motors, Frequency Converters; - Certificate of Conformity required by INMETRO Resolutions of the Electrical Components.		1E	2C+1E	120	20	15	10
9.43.	<input type="checkbox"/>	Operation procedure of the Pig Decoking System and/or Steam Air Decoking System and/or On Line Spalling Decoking System		1E	2C+1E	120	20	15	10
9.44.	<input type="checkbox"/>	Assembly, Installation, and Construction Data Book		1E	2C+1E				
9.45.	<input type="checkbox"/>	NR-13 Pressure Vessel Documentation (See Note 4)		1E	2C+1E				
9.46.	<input type="checkbox"/>	Material Requisitions of Fired Heater components and Auxiliary Equipment		1E	2C+1E	45	15	15	10
9.47.	<input type="checkbox"/>	Thermal and process design validation Report (See Note 12)		1E	2C+1E	20	10	10	10
	<input type="checkbox"/>								
	<input type="checkbox"/>								
	<input type="checkbox"/>								
	<input type="checkbox"/>								
	<input type="checkbox"/>								
	<input type="checkbox"/>								

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<p>Notes:</p> <ol style="list-style-type: none"> (1) Inspection and Test Plan, Welding Map and other Fabrication Documents, according to PETROBRAS Standard N-2301, shall be submitted to approval together with the manufacturing drawings. (2) Technical Inspection Documents, according to PETROBRAS Standard N-2301, shall be submitted to the inspector for examination at the factory before the beginning of the corresponding activity. (3) The Technical Fabrication Data Book, must be delivered together with the equipment. (4) Mandatory if any pressure vessel is required. (5) Field and Shop Procedures for Application of Refractory, according to PETROBRAS Standard N-1617, shall be submitted for approval together with the manufacturing drawings. (6) Procedure for Application of Painting, according to PETROBRAS Standard N-13, shall be submitted for approval together with the manufacturing drawings. (7) Field Assembly Procedure, according to PETROBRAS Standard N-1637, shall be submitted for approval together with the manufacturing drawings. (8) The technical proposal must have an explicit statement that meets the requirements of all items of the respective Material Requisition (number and revision quoted) and its Annexes, complemented by the Technical Clarification Circular Letters (number quoted) of the referred Bid, including the scope of supply, without any technical deviation. (9) TECHNICAL PROPOSAL shall only include the following document(s) listed on items 9.2, 9.3, 9.4, 9.5, 9.6 and 9.7. (10) The final as built issue of the design documentation shall be delivered to PETROBRAS in electronic media and non-compressed files. (11) The deadlines times specified shall be considered as calendar days. (12) SUPPLIER shall calculate and confirm all specifications in the documents listed in Item 6. SUPPLIER shall propose modification in the specifications not confirmed for PETROBRAS approval. The Report shall be the first document to be issue. 				
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10. COMPLEMENTARY REQUIREMENTS

10.1. Dimensions and specifications presented in the Item 6 of this Material Requisition shall be followed by the manufacturer. Any change shall be submitted and approved by PETROBRAS.

10.2. All conflicts between the technical specifications, codes, standards, laws and requirements listed in the Items 6 and 7 of this Material Requisition shall be reported to PETROBRAS for clarification before proceeding with the services.

10.3. Wind loads shall be calculated by using Brazilian Standard NBR 6123.

10.4. The final location of the peep doors is a responsibility of the SUPPLIER. SUPPLIER shall provide a sight view study for the peep doors showing that it will be possible to see burners' flames, radiant tubes, supports and to do thermographic inspection.

10.5. The final location of the explosion doors shall guarantee the safety of the heater's operators.


10.6. SUPPLIER shall design the Fired Heater in modules in order to minimize field work. The number of modules shall be minimized. Modules shall be trial-assembled at shop and proper marked. SUPPLIER shall consider transportation limitations and the requirements specified in the applicable documents and/or standards. Fired Heater's components/parts spreadsheet shall indicate the number, dimensions and estimated weight of each Fired Heater's components/parts that will be manufactured at the shop and sent to the field (for example: number and dimensions of the radiant, convection and stack section modules).

10.7. SUPPLIER shall provide all required technical assistance, technical support and procedures for erection, conditioning, tests, performance tests, pre-operation, start-up and assisted operation. SUPPLIER shall provide:

- Proposal spreadsheet containing number of men, total man hours and total cost for each speciality required for the technical assistance and support;
- Reception technical assistance at the site for all Fired Heater components, parts, auxiliary equipment and accessories, and confirmation that all services are being executed correctly;
- All spare parts required during the execution of Fired Heater erection, conditioning, commissioning, performance tests, pre-operation, start-up and assisted operation activities;
- Weekly report of technical assistance and technical support service.

10.8. Electric Equipment and Materials for use in Hazardous Atmospheres.

- Equipment and materials to be used in a hazardous area, which cannot be for general use (according to IEC Standards), shall have a Certificate of Conformity, in accordance with INMETRO.
- This certificate shall be issued by a Product Certification Organization (OCP), that is an entity accredited by INMETRO responsible by the issue of the conformity certificates and by the inspections of the certified products, attesting the similarity of the analyzed requirements.
- SUPPLIER shall provide equipment for proper hazardous area.
- Lighting fixtures for use in Zone 2 shall be certified by OCP accredited by INMETRO. In case of imported lighting fixtures, with certification obtained abroad, an analysis will need to be carried out by an OCP accredited by INMETRO, which shall establish the necessary procedures based on current legislation.

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10 COMPLEMENTARY REQUIREMENTS (cont.)

10.9. Fabrication Documents

The fabrication shall involve at least the following items (when applicable):

- a) type and scope of inspection of welded joints;
- b) care to be taken with temporary welds, including method to be used for their removal;
- c) welding plans in accordance with standard PETROBRAS N-2301;
- d) non-destructive testing procedures;
- e) inspection and test plan;
- f) procedure for performance of each test required, including equipment to be used;
- g) register of non-destructive test results, of welded joints, indicating welders involved;
- h) register of dimensional examination;
- i) heat treatment procedure, including position of thermocouples, type of heating, insulation attachment details, heating and cooling rates and holding time;
- j) hydrostatic test procedure, including water quality and temperature, details of attachments for filling and draining, location of pressure gages and holding time at test pressure;
- k) clean-up and drying procedure for the equipment after the hydrostatic test;
- l) repair procedure, including type of removal of defect, type of repair and types of examinations to be made after the repair has been executed;
- m) marking transfer procedure.


10.10. Inspection Technical Documents

Documents specified below shall be submitted to the inspector for examination before the beginning of the corresponding activity:

- a) certified fabrication drawings;
- b) material quality certificates;
- c) certificates of consumable quality with guaranteed property, as required;
- d) welding procedure qualification records;
- e) welders/welding operators qualification records;
- f) report indicating procedures and inspectors and/or qualified non-destructive testing operators.

INFORMATION IN THIS DOCUMENT IS PROPERTY OF PETROBRAS, BEING PROHIBITED OUTSIDE OF THEIR PURPOSE.

FORM OWNED TO PETROBRAS N-2105 REV. F 1ST AMMENDMENT ANNEX A - SHEET 22/39.

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10. COMPLEMENTARY REQUIREMENTS (cont.)


10.11. Technical Fabrication Data Book

The manufacturer shall supply the technical fabrication data book containing at least the following documents:

- a) certified fabrication drawings;
- b) technical specifications;
- c) data sheets;
- d) calculation;
- e) welding plan;
- f) welding procedure qualification records;
- g) non-destructive examination procedures report;
- h) report indicating inspectors and/or non-destructive examination operators;
- i) inspection and test plan;
- j) non-destructive examination certificates;
- k) production test certificates (when required);
- l) material quality certificates of pressure parts, internals (except carbon steel) and equipment supporting parts (where applicable);
- m) quality certificates of consumables with guaranteed property (when required);
- n) radiograph location drawing;
- o) field assembly specifications (when required);
- p) map of repaired defects;
- q) welding map;
- r) heat treatment charts;
- s) hydrostatic test certificate;
- t) report of nonconformities, if any;
- u) inspection acceptance certificate;
- v) transportation procedure;
- w) hibernation procedure;
- x) procedure for installation in the operation site;
- y) procedure for the dry-out of refractory concrete.

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FORM OWNED TO PETROBRAS N-2105 REV. F 1ST AMMENDMENT ANNEX A - SHEET 23/39.

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10. COMPLEMENTARY REQUIREMENTS (cont.)

10.12. Sub-Suppliers

- All equipment, material, services, documents, etc supplied by sub-suppliers shall comply with the requirements of this Material Requisition, including its attached and referenced documents.
- Only sub-suppliers of PETROBRAS Vendor List can supply items within the scope of this Material Requisition. Sub-Suppliers not in the Vendor List need to be approved by PETROBRAS.

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FORM OWNED TO PETROBRAS N-2105 REV. F 1ST AMMENDMENT ANNEX A - SHEET 24/39.

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11. SUPPLIER RESPONSABILITIES

SUPPLIER shall be responsible for the performance of the following Items:

- Mechanical design of the Fired Heater structural steel, stack, auxiliary systems and all other components not defined in the documents listed in Item 6;
- Manufacturing, construction and fabrication of all components;
- Performance of burners and other auxiliary equipment considering all the technical requirements specified in Data Sheets;
- Performance of all instruments included in the Fired Heater scope of supply;
- Thermal and process design, when required the execution or validation (see Item 2.1)

12. ANNEXES


12.1. The Annex 1 – DESIGN REFERENCE DOCUMENTS - is composed of data sheets, drawings, technical specifications, technical descriptions, flow diagrams, design criteria, and other furnace design documents, scope of this Material Requisition.


12.2. The Annex 2 – FIRED HEATER BATTERY LIMITS is composed of the following document:

I-RM-XXXX.XX-XXXX-420-XXX-001_ANNEX 2 Sheet 01/XX to XX/XX

INFORMATION IN THIS DOCUMENT IS PROPERTY OF PETROBRAS, BEING PROHIBITED OUTSIDE OF THEIR PURPOSE.

FORM OWNED TO PETROBRAS N-2105 REV. F 1ST AMMENDMENT ANNEX A - SHEET 25/39.

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INFORMATION IN THIS DOCUMENT IS PROPERTY OF PETROBRAS, BEING PROHIBITED OUTSIDE OF THEIR PURPOSE.			
FORM OWNED TO PETROBRAS N-2105 REV. F 1 ST AMMENDMENT ANNEX A - SHEET 26/39.			

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12.1. Annex 1 – DESIGN REFERENCE DOCUMENTS

NUMBER	REV.	TITLE
DATA SHEETS		
I-FD-XXXX.XX-XXXX-421-XXX-001		Fired Heater Data Sheet
I-FD-XXXX.XX-XXXX-492-XXX-001		Burner Data Sheet
I-FD-XXXX.XX-XXXX-800-XXX-001		Process Temperature Data Sheet
I-FD-XXXX.XX-XXXX-800-XXX-002		Process Pressure and Diferential Pressure Data Sheet
I-FD-XXXX.XX-XXXX-800-XXX-003		Process Flow Data Sheet
I-FD-XXXX.XX-XXXX-800-XXX-004		Process Level Data Sheet
I-FD-XXXX.XX-XXXX-800-XXX-005		Process Control Valves Data Sheet
I-FD-XXXX.XX-XXXX-800-XXX-006		Process Safety Relief Valves Data Sheet
I-FD-XXXX.XX-XXXX-800-XXX-007		Draft Instruments Data Sheet
I-FD-XXXX.XX-XXXX-800-XXX-008		Process Interlock Valves Data Sheet
I-FD-XXXX.XX-XXXX-852-XXX-001		Analyzer Process Data Sheet
I-FD-XXXX.XX-XXXX-852-XXX-002		Oxygen Analyzer Process Data Sheet

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12.1. Annex 1 – DESIGN REFERENCE DOCUMENTS

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 PETROBRAS	MATERIAL REQUISITION		Nº	REV.
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	TITLE: FIRED HEATER			

12.1. Annex 1 – DESIGN REFERENCE DOCUMENTS

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12.1. Annex 1 – DESIGN REFERENCE DOCUMENTS

NUMBER	REV.	TITLE
DESIGN CRITERIA SPECIFICATION		
I-ET-XXXX.XX-XXXX-140-XXX-001		Criteria for Design, Fabrication and Erection of Steel Structures
I-ET-XXXX.XX-XXXX-200-XXX-001		Piping
I-ET-XXXX.XX-XXXX-300-XXX-001		Machinery
I-ET-XXXX.XX-XXXX-420-XXX-001		Fired Heaters
I-ET-XXXX.XX-XXXX-431-XXX-001		Thermal Insulation
I-ET-XXXX.XX-XXXX-432-XXX-001		Refractory Materials
I-ET-XXXX.XX-XXXX-500-XXX-001		Static Equipment
I-ET-XXXX.XX-XXXX-500-XXX-002		Compliance with NR-13
I-ET-XXXX.XX-XXXX-700-XXX-001		Electricity
I-ET-XXXX.XX-XXXX-800-XXX-001		Instrumentation and Automation
I-ET-XXXX.XX-XXXX-940-XXX-001		Design Criteria – 3D MODEL
I-ET-XXXX.XX-XXXX-940-XXX-002		Technical Specification for Passive Protection - Fire Proofing
I-ET-XXXX.XX-XXXX-940-XXX-003		Directives for Design Engineering Services
I-ET-XXXX.XX-XXXX-940-XXX-004		Standardization of Documents in Electronic Form
I-ET-XXXX.XX-XXXX-940-XXX-005		Design Criteria – EDMS
I-ET-XXXX.XX-XXXX-955-XXX-001		Welding

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12.1. Annex 1 – DESIGN REFERENCE DOCUMENTS

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12.1. Annex 1 – DESIGN REFERENCE DOCUMENTS

NUMBER	REV.	TITLE
GENERAL DOCUMENTS		
I-ET-XXXX.XX-XXXX-200-XXX-001		Piping Material Specification
I-ET-XXXX.XX-XXXX-229-XXX-001		Isolation Valves Technical Specification
MD-XXXX.XX-XXXX-840-XXX-001		Sistema Instrumentado de Segurança
MD-XXXX.XX-XXXX-840-XXX-002		Sistema de Alarmes
I-DE-XXXX.XX-XXXX-844-XXX-001		Shutdown Matrix
I-DE-XXXX.XX-XXXX-844-XXX-002		Shutdown Matrix – Fired Heater
I-ET-XXXX.XX-XXXX-852-XXX-001		Process Analyzers System
MD-XXXX.XX-XXXX-860-XXX-001		Descrição de Malhas de Controle
I-FD-XXXX.XX-XXXX-940-XXX-001		Emergency Summary Process Data Sheet
I-FD-XXXX.XX-XXXX-941-XXX-001		Process Utilities Normal Consumption Estimation Process Data Sheet
I-LI-XXXX.XX-XXXX-942-XXX-001		Area Classification Data List

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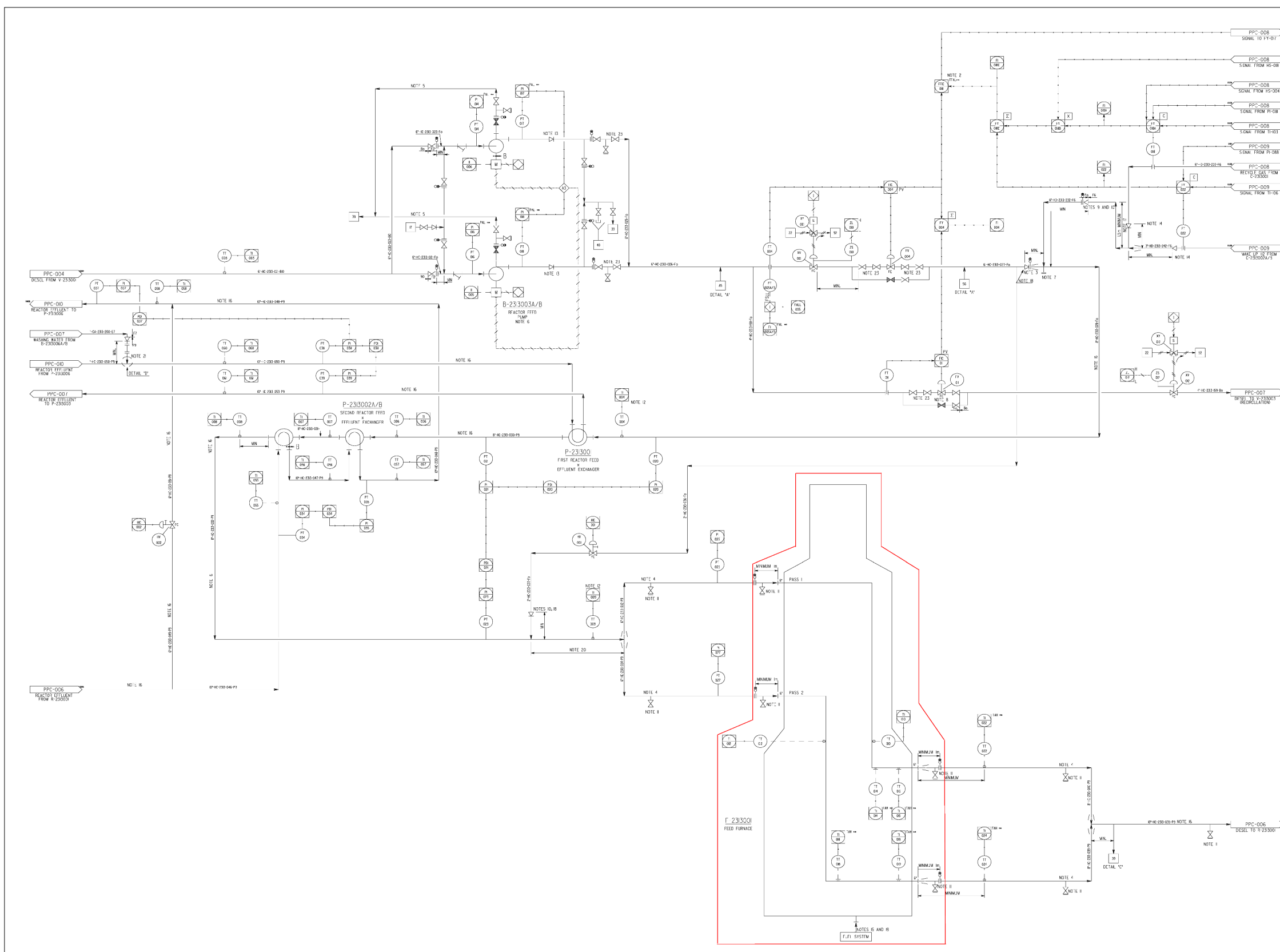
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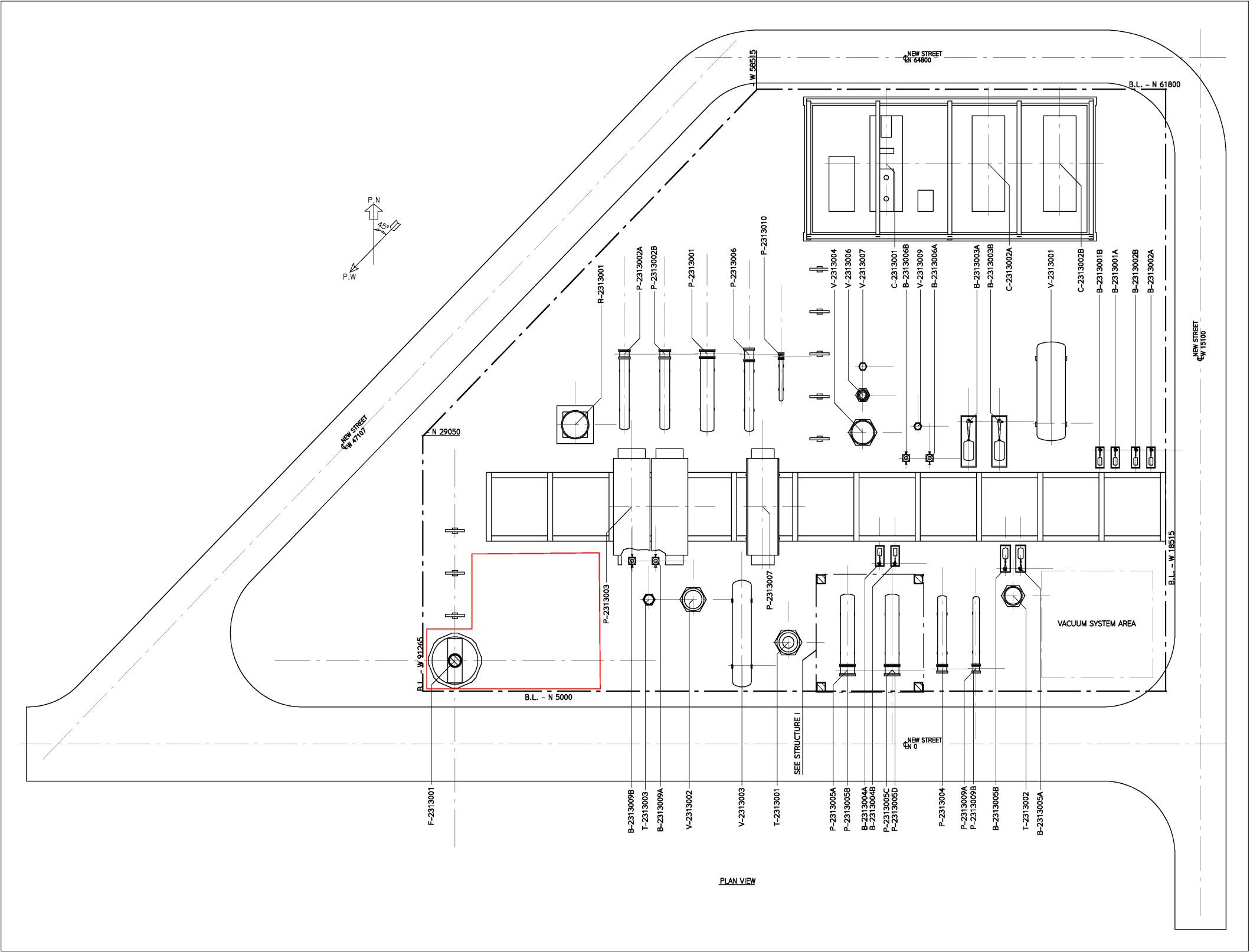



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Foreword

This Standard is the English version of PETROBRAS N-2105 REV. F 04/2016. 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 the Material Requisition form for Fired Heaters, Annex A, to be used for purchasing or ordering any Fired Heaters for PETROBRAS.

1.2 This Standard applies to purchases or orders from its date of issuance.

1.3 This Standard contains only Technical Requirements.

2 Normative References

The documents listed below are essential for the application of this document. For dated references, only the cited editions are applicable. For undated references, the latest editions of the mentioned documents (including amendments) apply.

ANAC Portaria Nº 1141 de 08/12/1987 - Zonas de Proteção;

NR10 - Segurança em Instalações e Serviços em Eletricidade;

NR12 - Máquinas e Equipamentos;

NR13 - Caldeiras, Vasos de Pressão, Tubulações e Tanques Metálicos de Armazenamento;

NR14 - Fornos;

NR26 - Sinalização de Segurança;

INMETRO Portaria Nº 179 de 18/05/2010 - Revisão dos Requisitos de Avaliação da Conformidade de Equipamentos Elétricos e Eletrônicos para Atmosferas Explosivas;

INMETRO Portaria Nº 351 de 26/11/2009 - Requisitos de Avaliação da Conformidade para Serviços Próprios de Inspeção de Equipamentos - SPIE;

CONAMA Resolução Nº 382 de 26/12/2006 - Limites Máximos de Emissão de Poluentes Atmosféricos para Fontes Fixas;

PETROBRAS N-2 - Anticorrosive Coating of Industrial Equipment;

PETROBRAS N-13 - Technical Requirements for Paintwork;

PETROBRAS N-57 - Projeto Mecânico de Tubulações Industriais;

PETROBRAS N-58 - Graphic Symbols for Process and Engineering Flow Sheets;

PETROBRAS N-76 - Materiais de Tubulação para Instalações de Refino e Transporte;

PETROBRAS N-108 - Vents and Drains for Piping and Equipment;

PETROBRAS N-115 - Fabrication and Erection of Metallic Piping;

PETROBRAS [N-133](#) - Soldagem;

PETROBRAS [N-134](#) - Anchors for Use in Concrete;

PETROBRAS [N-250](#) - Montagem de Isolamento Térmico a Alta Temperatura;

PETROBRAS [N-253](#) - Projeto de Vaso de Pressão;

PETROBRAS [N-266](#) - Apresentação de Projeto de Vaso de Pressão;

PETROBRAS [N-268](#) - Fabrication of Pressure Vessel;

PETROBRAS [N-269](#) - Montagem de Vaso de Pressão;

PETROBRAS [N-279](#) - Design of Steel Structures;

PETROBRAS [N-293](#) - Manufacture and Assembly of Metallic Structure;

PETROBRAS [N-300](#) - Detalhes de Aterramento Empregando-se Conectores Metálicos;

PETROBRAS [N-381](#) - Execution of Drawing and other General Technical Documents;

PETROBRAS [N-442](#) - Revestimento Externo de Tubulação em Instalações Terrestres;

PETROBRAS [N-466](#) - Design of Shell-and-Tube Heat Exchanger;

PETROBRAS [N-550](#) - Projeto de Isolamento Térmico a Alta Temperatura;

PETROBRAS [N-553](#) - Centrifugal Pumps for Petroleum, Petrochemical and Natural Gas Industries;

PETROBRAS [N-858](#) - Construção, Montagem e Condicionamento de Instrumentação e Automação;

PETROBRAS [N-1500](#) - Pressure Vessel Data Sheet;

PETROBRAS [N-1521](#) - Identification of Industrial Equipment;

PETROBRAS [N-1522](#) - Identificação de Tubulações Industriais;

PETROBRAS [N-1550](#) - Pintura de Estrutura Metálica;

PETROBRAS [N-1591](#) - Metal Alloys and Metals Identification by Magnet and Spot Tests;

PETROBRAS [N-1593](#) - Non-Destructive Testing – Leak Testing;

PETROBRAS [N-1594](#) - Ensaio Não Destrutivo - Ultrassom em Solda;

PETROBRAS [N-1595](#) - Ensaio Não Destrutivo - Radiografia;

PETROBRAS [N-1596](#) - Non-Destructive Testing – Liquid Penetrant;

PETROBRAS [N-1597](#) - Non-Destructive Testing Visual Inspection;

PETROBRAS [N-1598](#) - Non-Destructive Testing – Magnetic Particles;

PETROBRAS [N-1600](#) - Construção, Montagem e Condicionamento de Redes Elétricas;

PETROBRAS [N-1614](#) - Construction, Mounting and Conditioning of Electrical Equipment;

PETROBRAS [N-1617](#) - Aplicação de Concreto Refratário;

PETROBRAS [N-1618](#) - Thermal Insulation Material;

PETROBRAS [N-1637](#) - Fired Heater Assembly;

PETROBRAS [N-1664](#) - Fired Heater - Data Sheet;

PETROBRAS [N-1665](#) - Burner - Data Sheet;

PETROBRAS [N-1671](#) - Design and Fabrication of Fired Heater;

PETROBRAS [N-1692](#) - Presentation of Piping Designs;

PETROBRAS [N-1710](#) - Coding of Technical Engineering Documents;

PETROBRAS [N-1728](#) - Concreto Refratário;

PETROBRAS [N-1735](#) - Painting of Electrical Equipment, Machines and Instruments;

PETROBRAS [N-1756](#) - Passive Fire Protection Design and Application on Onshore Facilities;

PETROBRAS [N-1882](#) - Criteria for Preparing Instrumentation Design;

PETROBRAS [N-1883](#) - Presentation of Instrumentation/Automation Design;

PETROBRAS [N-1890](#) - Ceramic Fiber Internal Linings;

PETROBRAS [N-1910](#) - Castable Lining Design;

PETROBRAS [N-1931](#) - Instrumentation Piping Materials;

PETROBRAS [N-1997](#) - Projeto de Redes Elétricas em Sistemas de Bandeamento para Cabos;

PETROBRAS [N-2006](#) - Projeto de Sistemas de Iluminação;

PETROBRAS [N-2040](#) - Elaboração, Apresentação e Gerenciamento de Documentos de Projetos de Eletricidade;

PETROBRAS [N-2054](#) - Pressure Vessel Internal and External Accessories;

PETROBRAS [N-2064](#) - Emissão e Revisão de Documentos de Projeto;

PETROBRAS [N-2301](#) - Elaboração de Documentação Técnica de Soldagem;

PETROBRAS [N-2315](#) - Execução de Ensaio Não Destrutivo - Ultrassom em Forjado;

PETROBRAS [N-2370](#) - Materiais Penetrantes;

PETROBRAS [N-2429](#) - Minimum Illuminance Levels;

PETROBRAS [N-2547](#) - Conversor de Frequência para Controle de Rotação de Motor Elétrico;

PETROBRAS [N-2595](#) - Criteria for Design, Operation and Maintenance of Safety Instrumented Systems in Industrial Units;

PETROBRAS [N-2802](#) - Collection of Instrumentation Datasheets;

PETROBRAS [N-2833](#) - Forms and Lists for Instrumentation Designs;

PETROBRAS [N-2919](#) - Motores Elétricos Trifásicos de Indução ou Síncronos;

ABNT [NBR 6123](#) - Forças Devidas ao Vento em Edificações;

ABNT [NBR 9688](#) - Isolantes Térmicos com Mantas de Fibra Cerâmica;

ABNT [NBR 10662](#) - Isolantes Térmicos Pré-Moldados de Silicato de Cálcio - Especificação;

ABNT [NBR 14787](#) - Espaço Confinado - Prevenção de Acidentes, Procedimentos e Medidas de Proteção;

ABNT [NBR 15156](#) - Pintura Industrial - Terminologia;

ABNT [NBR 15218](#) - Critérios para Qualificação e Certificação de Inspetores de Pintura Industrial;

ABNT [NBR 15523](#) - Qualificação e Certificação de Inspetor de Controle Dimensional;

ABNT [NBR 16137](#) - Ensaios não destrutivos - Identificação de materiais por teste por pontos, espectrometria por fluorescência de raios X e espectrometria por emissão óptica;

[ABNT NBR 16278](#) - Inspeção de Fabricação - Qualificação e Certificação de Pessoas para o Setor de Petróleo e Gás;

ABNT [NBR 16315](#) - Instalação e Comissionamento de Máquinas;

ISO [8501-1](#) - Preparation of Steel Substrates before Application of Paints and Related Products;

ISO [9712](#) - Non-destructive Testing – Qualification and Certification of NDT Personnel;

API [RP 535](#) - Burners for Fired Heaters in General Refinery Service;

API [RP 556](#) - Instrumentation, Control, and Protective Systems for Gas Fired Heaters;

API [RP 941](#) - Steels for Hydrogen Service at Elevated Temperatures and Pressures in Petroleum Refineries and Petrochemical Plants;

API [STD 530](#) - Calculation of Heater-Tube Thickness in Petroleum Refinery;

API [STD 560](#) - Fired Heaters for General Refinery Services;

API [STD 936](#) - Refractory Installation Quality Control - Inspection and Testing Monolithic Refractory Linings and Materials;

ASME [B16.5](#) - Pipe Flanges and Flanged Fittings;

ASME [B16.9](#) - Factory - Made Wrought Buttweldings Fittings;

ASME [B16.11](#) - Forged Fittings, Socket – Welding and Threaded;

ASME [B16.20](#) - Metallic Gaskets for Pipe Flanges-Ring-Joints, Spiral Wound and Jacketed;

ASME [B16.47](#) - Large Diameter Steel Flanges NPS 26 Though NPS 60 Metric/Inch Standard;

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

ASME [B36.10M](#) - Welded and Seamless Wrought Steel Pipe;

ASME [B36.19M](#) – Stainless Steel Pipe;

ASME [Section I Div. 1](#) - Rules for Construction of Power Boilers;

ASME [Section VIII Div. 1](#) - Rules for Construction of Pressure Vessels;

ASME [Section IX](#) - Welding and Brazing Qualification;

ASME [STS-1](#) - Steel Stacks;

American Society of Testing Materials (ASTM) Specifications;

AISC [325](#) - Steel Construction Manual;

BSI [BS EN 15259](#) - Air Quality - Measurement of Stationary Source Emissions - Requirements for Measurement Sections And Sites And For The Measurement Objective, Plan And Report;

ISA [5.1](#) - Instrumentation Symbols and Identification;

NFPA [85](#) - Boiler and Combustion Systems Hazards Code.

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 General Conditions

3.1 The Material Requisition form is standardized in A4 format as per Annex A of this Standard.

3.2 For completing the header and footer of the Material Requisition, PETROBRAS [N-381](#) shall be followed.

3.3 The Fired Heater identification shall be as per PETROBRAS [N-1521](#) and inserted in the header space referring to the name of the equipment (Fired Heater).


3.4 After the Material Requisition is issued by the executor, it shall be considered the initial purchase document of the Fired Heater.

3.5 The same Material Requirement shall be used for one or more Fired Heaters, since they are equal.

3.6 The Fired Heater Material Requisition has two annexes.


3.6.1 Annex 1 - DESIGN REFERENCE DOCUMENTS - is a previously fulfilled form with examples that shall be replaced by the executor with the Fired Heater's specific design documents.

3.6.2 Annex 2 – FIRED HEATER BATTERY LIMITS - are examples of drawings that shall be replaced, by the executor, with drawings of the Battery Limits inserted in the P&ID (Process and Instrumentation Diagram) and Plot Plan of the Unit (Unit Arrangement), of the specific Fired Heater project.

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	TITLE:				
	FIRED HEATER				

International Codes and Standards (cont.)

- ☐ API RP 941- Steels for Hydrogen Service at Elevated Temperatures and Pressures in Petroleum Refineries and Petrochemical Plants;
- ☒ ASME B16.5 - Pipe Flanges and Flanged Fittings;
- ☒ ASME B16.11 – Forged Fittings, Socket – Welding and Threaded;
- ☒ ASME B16.20 – Metallic Gaskets for Pipe Flanges-Ring-Joints, Spiral Wound and Jacketed;
- ☒ ASME B16.9 - Factory-Made Wrought Buttwelding Fittings;
- ☒ ASME B16.47 – Large Diameter Steel Flanges NPS 26 Though NPS 60 Metric/Inch Standard;
- ☒ ASME B31.3 – Process Piping;
- ☒ ASME B36.10M – Welded and Seamless Wrought Steel Pipe;
- ☒ ASME B36.19M – Stainless Steel Pipe;
- ☐ ASME SECTION I Div. 1 – Rules for Construction of Power Boilers;
- ☐ ASME SECTION VIII Div. 1 – Rules for Construction of Pressure Vessels; (See Note B)
- ☒ ASME SECTION IX – Welding and Brazing Qualification; ☐
- ☒ ASME STS.1 – Steel Stacks; ☐
- ☒ American Society of Testing Materials (ASTM) Specifications;
- ☒ AISC 325 - Steel Construction Manual; ☐
- ☒ BSI BS EN 15259 - Air Quality - Measurement Of Stationary Source Emissions - Requirements For Measurement Sections And Sites And For The Measurement Objective, Plan And Report;
- ☒ ISA - 5.1 - Instrumentation Symbols and Identification; ☐
- ☒ ISO 8501-1- Preparation of Steel Substrates before Application of Paints and related Products; ☐
- ☒ ISO 9712 – Non-destructive testing – Qualification and Certification of NDT Personnel; ☐
- ☒ NFPA 85 – Boiler and Combustion Systems Hazards Code.

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PETROBRAS Standards (cont.)

- ☐ N-2315 – Performance of Non-Destructive Test-Ultrasound in Steel Forgings;
- ☐ N-2370 – Penetrant Materials;
- ☐ N-2429 – Minimum Illuminance Levels;
- ☐ N-2547 – Frequency Converter for Speed Control of Electric Motor up to 660 VAC;
- ☐ N-2595 – Criteria for Design, Operation and Maintenance of Safety Instrumented Systems in Industrial Units; (See Note C)
- ☐ N-2802 – Collection of Instrumentation Datasheets; (See Note C)
- ☐ N-2833 – Forms and Lists for Instrumentation Designs; (See Note C)
- ☐ N-2919 – Three-Phase Induction or Synchronous Electrical Motors.

Brazilian Standards

- ☐ ABNT NBR 10662 – Isolantes Térmicos Pré-Moldados de Silicato de Cálcio – Especificação;
- ☐ ABNT NBR 9688 – Isolantes Térmicos de Lã Cerâmica Mantas - Especificação;
- ☒ ABNT NBR 6123 - Forças Devidas ao Vento em Edificações;
- ☐ ABNT NBR 15156 – Pintura Industrial – Terminologia;
- ☐ ABNT NBR 15218 – Critérios para Qualificação e Certificação de Inspetores de Pintura Industrial;
- ☒ ABNT NBR 15523 – Qualificação e Certificação de Inspetor de Controle Dimensional;
- ☒ ABNT NBR 14787 – Espaço Confinado - Prevenção de Acidentes, Procedimentos e Medidas de Proteção;
- ☐ ABNT NBR 16137 - Ensaios Não Destrutivos - Teste por Pontos - Identificação de Materiais;
- ☐ ABNT NBR 16315 – Instalação e Comissionamento de Máquinas;
- ☐ ABNT NBR 16278 - Inspeção de fabricação — Qualificação e certificação de pessoas para o setor de Petróleo e Gás.

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Brazilian Laws

- ☒ NR10 – Segurança em Instalações e Serviços em Eletricidade;
- ☒ NR12 – Máquinas e Equipamentos;
- ☒ NR13 – Caldeiras e Vasos de Pressão;
- ☒ NR14 – Fornos;
- ☒ NR26 – Sinalização de Segurança;
- ☒ Resolução Conama N° 382 dated 12/26/2006;
- ☒ Local Environmental Control Legislations;
- ☒ INMETRO Resolution Number 179 dated 05/18/2010;
- ☒ INMETRO Resolution Number 351 dated 11/01/2009;
- ☒ ANAC Portaria 1141 dated 12/08/1987.

SHEET AMENDED IN 06/2023
DO NOT USE

Notes:

Note A – Not applicable to the Fired Heater coils.
 Note B – Applicable when Fired Heater supply includes any pressure vessels.
 Note C - Applicable when Fired Heater supply includes instrumentation.

8. COMMENTS AND APPROVAL OF DOCUMENTS

- 8.1 All Fired Heater's documents shall be presented for comments and approval.
- 8.2. The fabrication of each part of the Fired Heater shall only start after the drawings and other documents regarding the part considered have been returned approved without or with comments, since the comments were attended.
- 8.3. All documents shall contain the Fired Heater identification.
- 8.4. All documents shall contain the Purchase Order number corresponding to the Material Requisition.