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Petroleum and natural gas industries — Fired heaters for general refinery service

Industries du pétrole et du gaz naturel — Réchauffeurs à brûleurs pour usage général dans les raffineries

ICS 75.180.20

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ISO/DIS 13705

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

This International Standard was prepared by Technical Committee ISO/TC 67 *Materials, equipment and offshore structures for petroleum and natural gas industries*, Subcommittee SC 6 *Processing equipment and systems*.

Annexes A, B, C, D, F, G and H are informative. Annex E is normative.

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Introduction

This International Standard is based on API standard 560, second edition, September 1995.

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NOTE A bullet (●) at the beginning of a clause or subclause indicates that a decision by the purchaser is required. These decisions should be indicated on the data sheets (see Annex A) or stated in the enquiry or purchase order. Decisions should be indicated on the check list (see Annex B).

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Voorbeeld
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Petroleum and natural gas industries — Fired heaters for general refinery service

1 Scope

This International Standard specifies the minimum requirements and gives recommendations for the design, materials, fabrication, inspection, testing, preparation for shipment, and erection of fired heaters, air preheaters, fans, and burners for general refinery service.

In a fired heater, heat liberated by the combustion of fuels is transferred to fluids contained in tubular coils within an internally insulated enclosure.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ABMA 9, *Load ratings and fatigue life for ball bearings*

(American Bearing Manufacturing Association, 1200 19th Street NW, Suite 300, Washington, DC 20036-2412, USA)

AISC, *Specification for design, fabrication and erection of structural steel for buildings*

(American Institute for Steel Construction, 1 E Wacker Drive, Suite 3100, Chicago, Illinois 60601-2001, USA)

AMCA 99-2404-78, *Drive arrangements for centrifugal fans*

AMCA 201, *Fans and systems*

AMCA 210, *Laboratory methods of testing fans for aerodynamic performance rating*

AMCA 801-92, *Industrial process / power generation fans - specifications guidelines*

(Air Movement and Control Association, 30 West University Drive, Arlington Heights, Illinois 60004, USA)

ASCE 7, *Minimum design loads for buildings and other structures*

(American Society of Consulting Engineers, 1801 Alexander Bell Drive, Reston, Virginia 20191-4400, USA)

ASME B17.1, *Keys and keyseats*

ASME B31.3, *Process piping*

ASME Boiler and pressure vessel code:

Section V, Non-destructive examination

Section VIII, Rules for construction of pressure vessels

Section IX, Welding and brazing qualifications

(American Society of Mechanical Engineers, 3 Park Avenue, New York, NY 10017, USA)

ASTM A 36, *Standard specification for carbon structural steel*

ASTM A 105, *Standard specification for carbon steel forgings for piping applications*

ASTM A 123, *Standard specification for zinc (hot-dip galvanized) coatings on iron and steel products*

ASTM A 143, *Standard practice for safeguarding against embrittlement of hot-dip galvanized structural steel products and procedure for detecting embrittlement*

ASTM A 153, *Standard specification for zinc coating (hot-dip) on iron and steel hardware*

ASTM A 161, *Standard specification for seamless low-carbon and carbon-molybdenum steel still tubes for refinery service*

ASTM A 181, *Standard specification for carbon steel forgings, for general-purpose piping*

ASTM A 182, *Standard specification for forged or rolled alloy-steel pipe flanges, forged fittings, and valves and parts for high-temperature service*

ASTM A 192, *Standard specification for seamless carbon steel boiler tubes for high-pressure service*

ASTM A 193, *Standard specification for alloy-steel and stainless steel bolting materials for high-temperature service*

ASTM A 194, *Standard specification for carbon and alloy steel nuts for bolts for high-pressure or high-temperature service, or both*

ASTM A 209, *Standard specification for seamless carbon-molybdenum alloy-steel boiler and superheater tubes*

ASTM A 210, *Standard specification for seamless medium-carbon steel boiler and superheater tubes*

ASTM A 213, *Standard specification for seamless ferritic and austenitic alloy-steel boiler, superheater and heat-exchanger tubes*

ASTM A 216, *Standard specification for steel castings, carbon, suitable for fusion welding, for high-temperature service*

ASTM A 217, *Standard specification for steel castings, martensitic stainless and alloy, for pressure-containing parts, suitable for high-temperature service*

ASTM A 234, *Standard specification for piping fittings of wrought carbon steel and alloy steel for moderate and high temperature service*

ASTM A 240, *Standard specification for heat-resisting chromium and chromium-nickel stainless steel plate, sheet, and strip for pressure vessels*

ASTM A 242, *Standard specification for high-strength low-alloy structural steel*

ASTM A 283, *Standard specification for low and intermediate tensile strength carbon steel plates*

ASTM A 297, *Standard specification for steel castings, iron-chromium and iron-chromium-nickel, heat resistant, for general application*

ASTM A 307, *Standard specification for carbon steel bolts and studs, 60 000 psi tensile strength*

ASTM A 320, *Standard specification for alloy steel bolting materials for low-temperature service*

ASTM A 325, *Standard specification for structural bolts, steel, heat treated, 120/105 ksi minimum tensile strength*

ASTM A 351, *Standard specification for castings, austenitic, austenitic-ferritic (duplex), for pressure-containing parts*

ASTM A 384, *Standard practice for safeguarding against warpage and distortion during hot-dip galvanizing of steel assemblies*

ASTM A 385, *Standard practice for providing high-quality zinc coatings (hot-dip)*

ASTM A 387, *Standard specification for pressure vessel plates, alloy steel, chromium-molybdenum*

ASTM A 403, *Standard specification for wrought austenitic stainless steel piping fittings*

ASTM A 447, *Standard specification for steel castings, chromium-nickel-iron alloy (25-12 class), for high-temperature service*

ASTM A 560, *Standard specification for castings, chromium-nickel alloy*

ASTM A 572, *Standard specification for high-strength low-alloy columbium-vanadium structural steel*

ASTM A 608, *Standard specification for centrifugally cast iron-chromium-nickel high-alloy tubing for pressure application at high temperatures*

ASTM B 366, *Standard specification for factory-made wrought nickel and nickel alloy fittings*

ASTM B 407, *Standard specification for nickel-iron-chromium alloy seamless pipe and tube*

ASTM B 564, *Standard specification for nickel alloy forgings*

ASTM B 633, *Standard specification for electrodeposited coatings of zinc on iron and steel*

ASTM C 27, *Standard classification of fireclay and high-alumina refractory brick*

ASTM C 155, *Standard classification of insulating firebrick*

ASTM C 332, *Standard specification for lightweight aggregates for insulating concrete*

ASTM C 401, *Standard classification of alumina and alumina-silicate castable refractories*

ASTM C 612, *Standard specification for mineral fiber block and board thermal insulation*

ASTM E 94, *Standard guide for radiographic testing*

ASTM E 125, *Standard reference photographs for magnetic particle indications on ferrous castings*

ASTM E 142, *Standard method for controlling quality of radiographic testing*

ASTM E 165, *Standard test method for liquid penetrant examination*

ASTM E 186, *Standard reference radiographs for heavy-walled (2 to 4 1/2-in. (51 to 114 mm)) steel castings*

ASTM E 433, *Standard reference photographs for liquid penetrant inspection*

ASTM E 446, *Standard reference radiographs for steel castings up to 2 in. (51 mm) in thickness*

ASTM E 709, *Standard guide for magnetic particle examination*

(American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, Pennsylvania 19428-2959, USA)

AWS A5.1, *Specification for carbon steel electrodes for shielded metal arc welding*

AWS D1.1, *Structural welding code - steel*

AWS D14.6, *Specification for welding of rotating elements of equipment*

(American Welding Society, 550 NW Le Jeune Road, Miami, Florida 33126, USA)

EN 10025, *Iron and steel products, structural steels, non-alloy steel, hot rolled products, quality classes, designation, specification, chemical composition, mechanical property, mechanical test, inspection, marking*

(Comité Européen de Normalisation, Rue de Stassart 36, B-1050 Brussels, Belgium)

ICBO, *Uniform Building Code*

(International Conference of Building Officials, 5360 S Workman Mill Rd, Whittier, California 90601-2298, USA)

ISO 13704, *Petroleum and natural gas industries - Calculation of heater tube thickness in petroleum refineries*

ISO 8501-1, *Preparation of steel substrates before application of paints and related products - Visual assessment of surface cleanliness - Part 1: Rust grades and preparation grades of uncoated steel substrates and of steel substrates after overall removal of previous coatings*

MSS SP-53, *Quality standard for steel castings and forgings for valves, flanges and fittings, and other piping components - magnetic particle examination method*

MSS SP-55, *Quality standard for steel castings for valves, flanges and fittings, and other piping components - visual method*

MSS SP-93, *Quality standard for steel castings and forgings for valves, flanges and fittings and other piping components - liquid penetrant examination method*

(Manufacturers Standardization Society, 127 Park Street NE, Vienna, Virginia 22180, USA)

NFPA 70, *National electrical code*

(National Fire Protection Association, 1 Batterymarch Park, Quincy, Massachusetts 02269-9101, USA)

3 Terms and definitions

For the purposes of this International Standard, the following definitions apply:

3.1

air heater

air preheater

heat transfer apparatus through which combustion air is passed and heated by a medium of higher temperature, such as the products of combustion, steam, or other fluid

3.2

anchor

tieback

metallic or refractory device that holds the refractory or insulation in place

3.3

arch

flat or sloped portion of the heater radiant section opposite the floor

3.4

atomizer

device used to reduce liquid fuel to a fine mist

3.5

backup layer

refractory layer behind the hot face layer

3.6

balanced draught heater

heater which uses forced draught fans to supply combustion air and uses induced fans to remove flue gases

3.7**breaching**

heater section where flue gases are collected after the last convection coil for transmission to the stack or the outlet duct work

3.8**bridgewall****gravity wall**

wall which separates two adjacent heater zones

3.9**bridgewall temperature**

flue gas temperature leaving the radiant section

3.10**burner**

device which introduces fuel and air into a heater at the desired velocities, turbulence, and concentration to establish and maintain proper ignition and combustion

NOTE Burners are classified by the types of fuel fired, such as: oil, gas, or combination of gas and oil and may be designated as "dual fuel" or "combination"

3.11**butterfly damper**

single-blade damper pivoted about its centre

3.12**casing**

metal plate used to enclose the fired heater

3.13**castable**

insulating concrete poured or gunned in place to form a rigid refractory shape or structure

3.14**ceramic fibre**

fibrous refractory insulation composed primarily of silica and alumina; applicable forms include blanket, board, module, rigidized blanket, and vacuum-formed shapes

3.15**convection section**

portion of the heater in which the heat is transferred to the tubes primarily by convection

3.16**corbel**

projection from the refractory surface generally used to prevent flue gas by-passing the convection section tubes when they are on a staggered pitch

3.17**corrosion allowance**

additional material thickness added to allow for material loss due to corrosion

3.18**corrosion rate**

rate of reduction in the material thickness due to the chemical attack from the process fluid or flue gas or both

NOTE Corrosion rate is expressed in mm/y (mils/y)

3.19**crossover**

interconnecting piping between any two heater coil sections

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