



NATIONAL PETROCHEMICAL COMPANY STANDARDS

MATERIAL STANDARD FOR FIELD ERECTED WATER TUBE BOILERS

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CONTENTS

1	<u>GENERAL INFORMATION</u>
2	<u>SCOPE</u>
3	<u>STANDARDS, CODES AND SPECIFICATIONS</u>
4	<u>SPECIFIC DESIGN CONDITIONS</u>
5	<u>MATERIALS</u>
6	<u>MECHANICAL DESIGN</u>
6.1	TUBES
6.2	DRUMS AND HEADERS
6.3	SUPERHEATERS
6.4	FURNACE
6.5	REFRACTORY INSULATION AND CASING.
6.6	STRUCTURAL STEEL, PLATFORMS AND LADDERS
6.7	BURNERS
6.8	DUCTS AND STACK
6.9	FANS AND DRIVERS
6.10	SOOT BLOWERS
6.11	ECONOMIZER
6.12	SAMPLE COOLERS

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7	<u>TOOLS</u>
8	<u>VALVES. FITTINGS AND INSTRUMENTATION CONNECTIONS</u>
9	<u>FLAMEOUT PROTECTION</u>
10	<u>LOCAL PANEL AND INSTRUMENTATION</u>
11	<u>FABRICATION</u>
12	<u>INSPECTION</u>
13	<u>PREPARATION FOR SHIPMENT</u>
14	<u>FIELD TESTING</u>
15	<u>GUARANTEES</u>

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1 GENERAL INFORMATION

1.1 This standard covers the minimum requirements for Field Erected Water Tube Boilers.

1.2 In case of any conflict between this standard and the requisition, data sheet or purchase order, the order of precedence shall be as follows:

a) purchase order.

b) data sheet and inquiry or purchase order requisition.

c) this standard .

d) other engineering specification referred to.

1.3 Compliance by the manufacturer with the provisions of this standard does not relieve him of the responsibility of furnishing unit of proper design, mechanically suited to meet operating guarantees at the specified operating conditions. Such deviations from this standard which the vendor may consider advisable, shall be submitted in writing to Purchaser, together with his quotation, Purchaser may approve or reject such deviations. Exceptions other than those included in the above mentioned document shall not be considered.

1.4 Vendor shall only supply equipment of proven design and construction, of which satisfactory operation can be proven in similar service and operating conditions at least for three years in continuous operation.

1.5 All documentation shall be in accordance with, NPCS-ES-GN-03, for system of units. The English language shall be used for all correspondence, catalogues, documents, drawings and nameplates.



2 SCOPE

2.1 The scope shall include; but shall not be limited to:

2.1.1 Complete self-supporting boiler for outdoor installation including boiler drums, tubes, drum supports, internals drum and header connections, waterwall tubes, waterwall headers and drum, waterwall circulator tubes, stack and duct design and structural steel.

2.1.2 Complete superheater assembly including inlet and outlet headers, connecting tubes between boiler drum and saturated steam header and necessary support for heaters and elements.

2.1.3 Burner assembly consisting of steam or air atomizing burners, pilot assemblies, and air register for the combustion of gas oil and gas. Vendor to quote his standard type.

2.1.4 Dual driven forced draft fan with steam turbine driver and electric motor, including speed reducers, clutches, couplings, guards and all related accessories.

2.1.5 Automatic soot blowers with electrical accessories, pipes, valves, pipe hangers and guides and fittings, if required.

2.1.6 All ductwork between forced draft fan and boiler and burner windboxes.

2.1.7 Boiler valves, piping and accessories in the extent shown in the requisition and/or attached documents.

2.1.8 A sealing air system shall be provided from the forced draft fan discharge duct or air plant line for the observation ports, etc.

2.1.9 Outdoor setting, insulation, refractories and 14 gauge, or 2mm, minimum ribbed outer casing shall be provided with necessary seals, expansion joints, door lining, to complete the setting.

2.1.10 Integral economizer with inlet connections and any additional connection as described in the requisition and/or attached documents.

2.1.11 Miscellaneous roof steel, buckstays and lower header supports.

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- 2.1.12 Stack and ducting from expansion joint after flue gas outlet damper to stack.
- 2.1.13 Ladders, platform, stairways and all structural work needed for maintenance and safety.
- 2.1.14 Flue gas outlet damper at boiler outlet.
- 2.1.15 All instrumentation and panels in the extent requested in this standard, the requisition and/or attached documents, including safety and interlocking system for boiler safeguard, with control and instruments for burners control, with regard to **selected** vendors as will be specified in the requisition.
- 2.1.16 All necessary instruments, **devices** and provisions in the installation of the boiler to carry out the performance guarantee test to be considered. These instruments, devices, etc., shall remain in vendor's property.
- 2.1.17 All refractory and insulation, including stack lining.
- 2.1.18 All foundation anchor bolts.
- 2.1.19 Attenuation device (piping, instruments, automatic valve and coil in the steam drum) required to control the steam outlet temperature before the superheating outlet;
- 2.1.20 Special tools required for erection and maintenance.
- 2.1.21 Testing and facilities for inspection at shop.
- 2.1.22 Installation, erection? operation and maintenance manuals, and other relevant documents.
- 2.1.23 Packing for marine transportation.
- 2.1.24 Supervision for erection and commissioning.
- 2.1.25 Recommended equipment maintenance schedules.
- 2.1.26 Drawings and information in the extent requested in the requisition and/or attached documents.
- 2.1.27 Spare parts for erection, testing, precommissioning and operation as specified in the requisition and/or attached documents.



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- 2.1.28 Information and documents requested by local authorities, if required.
- 2.1.29 Silencers for start-up, furnished as a separate item.
- 2.1.30 Painting shall be done as per requisition.
- 2.2 ITEMS NOT INCLUDED IN THE SCOPE OF SUPPLY
- 2.2.1 Field Erection
- Vendor must, however, supply supervision, erection schedule and procedure.
- 2.2.2 Concrete foundations.
- 2.2.3 Final paint.

3 STANDARDS, CODES AND SPECIFICATIONS

- 3.1 It shall be the responsibility of the vendor that all aspects of design, fabrication, inspection and testing, conforms to the requirements of the specified codes and project engineering specifications (latest editions).
- 3.2 STANDARDS AND CODES
- a) ASME, Boiler and pressure vessel code, section I, IX and VIII (where applicable), latest edition.
- b) ASME Section II material specifications.
- c) Flanges and flanged fittings shall be in accordance with ANSI B16.5, latest edition.
- d) Piping shall be in accordance with ANSI/ASME B31.1 latest edition within the limits established in this code. Other piping as per ANSI B 31.3.
- e) ABMA (American Boiler Manufacturer's Association) standard, latest edition.
- f) AISC standard specification for the design, fabrication and erection of structural steel for buildings.



- g) Uniform Building Code, (for earthquake design).
- h) AGMA (American Gear Manufacturer's Association) standard for Helical and herringbone gear speed reducers and increasers 420.
- i) AGMA standard for high speed helical and herringbone gear units 421.
- j) AGMA standard rating Thermal capacity of helical, herringbone and combination-spiral Bevel and speed reducers 423.
- k) NEMA (National Electrical Manufacturers Association) standard for mechanical drive steam turbines SM-20.
- l) National Association of Fan Manufacturers, bulletin, No.110 latest edition.
- m) Welding for pressure parts as per ASME Boiler and Pressure Vessel Code Section IX.
- n) For structural steel welding specs. (AWS) standard AWS D1.1.
- o) NFPA 85B -Prevention of furnace explosions in Natural Gas Fired Multiple Burner Boiler/Furnace.
- p) NFPA 85D -Ditto for oil fired.

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- 4 SPECIFIC DESIGN CONDITIONS
- 4.1 The basic design data are specified on the 'boilers data sheet and/or attached documents.
- 4.2 Maximum degree of shop fabrication compatible with shipping limitations is preferred. Shipping limitation will be furnished in requisition.
- 4.3 The boiler and its auxiliary elements such as burners, instruments, fan and driver shall be able to operate in automatic at any one rate of load.
- 4.4 The superheater shall have same overload capacity as the boiler regarding quantity of steam to be superheated. Extra installed superheater tubes shall be considered for reserve (tube failure).
- 4.5 The boiler shall be able to maintain the steam pressure constant (within capability of the combustion control system) for any load change occurring within a 3 minutes interval between 25% and 110% of the maximum continuous rating (MCR) . The MCR is the maximum rate of steam generation which can be maintained continuously.
- 4.6 For boiler design, vendor will use all Fuel characteristics established on data sheets. Vendor shall specify which is the maximum hydrogen content in the 'fuel gas that could be admitted by his burners,.
- 4.7 Boiler and ancillaries shall be capable of continuous 24 hr a day operation between a 26 month statutory shut down period.
- 4.8 The furnace dimensions and design shall be such that complete combustion of the fuel takes place within the furnace units with no flame impingement on sidewalls, roof or target wall.

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- 4.9 The Proportion of heat actually absorbed by furnace walls shall be as uniform as possible and the residence time required for the flame to reach furnace outlet is the criterion upon which the furnace performance will be assessed. The length of gas travel should be sufficient to ensure complete combustion before arriving at the bank of boiler tubes and the furnace shall be designed to fit the flame shape. Flames shall not be allowed to impinge heavily on furnace walls. Flame or hot gases must not be able to bypass part of furnace and leak through the boiler screen tubes overheating the superheater tubes and reducing the unit efficiency. Another criterion for assessment of the furnace efficiency shall be the ratio of the maximum heat flux to the average heat flux. The maximum heat flux in the furnace shall be limited to approximately 407 kw/m^2 and shall be based on the furnace area around the burners. This is to ensure trouble free operation, reduced maintenance cost and reduced outage, even when the feed water quality occasionally is below the design figures. Furnace rating to be expressed in total heat input per m^2 of water wall surface.
- 4.10 The continuous boiler blowdown shall be a maximum of 3% of steam production. Total continuous and intermittent blowdowns will be no more than 5% of steam generated.
- 4.11 The maximum continuous rating specified, shall be considered after having excluded all blowdown heat losses and all steam used for boiler auxiliaries such as fans, soot blowers, burners, etc.
- 4.12 Boilers shall be designed for the lifetime of 100,000 hours with satisfactory operation.
- 4 . 1 3 Vendor shall guarantee the values specifically requested in the data sheet. The guarantee shall be based on specified ambient conditions at plant site.
- 4.14 Connections shall be provided for acid cleaning of the boiler.
- 4.15 SITE INFORMATION
- Site characteristics will described on purchase order.