

Changes shown by ↕

SCOPE

- I ↕ 1.1 This practice supplements the minimum requirements on the design, fabrication, and inspection of fired process heaters (hereinafter referred to as heaters) given in API Standard 560, Fired Heaters for General Refinery Services. This practice does not cover steam cracking heaters.
- I 1.2 **An asterisk (*)** indicates that a decision by the Purchaser is required, or that additional information is furnished by the Purchaser.

SUMMARY OF ADDITIONAL REQUIREMENTS

- I 2.1 **Table 1** lists the practices and standards which shall be used with this practice.
- I * 2.2 **Table 2** lists the practices which shall be used with this practice as specified by the Purchaser.

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TABLE 1

PRACTICES			
IP 2-1-1	Plant Noise Design Criteria	IP 15-1-1	Instrumentation for Fired Heaters
IP 3-4-1	Piping for Fired Equipment	IP 15-2-1	Temperature Instruments
IP 3-16-1	Flanged Joints, Gaskets and Bolting	IP 18-3-2	Statically Cast Steel and Alloy Pressure Containing Parts, and Tube Supports for Fired Heaters
IP 3-18-1	Piping Fabrication	IP 18-7-1	Welding Procedures
IP 4-1-2	Structural Steel Design	IP 18-10-1	Additional Requirements for Materials
IP 4-1-3	Design Loads for Structures	IP 18-12-1	Positive Materials Identification
IP 4-2-1	Auxiliary Structures for Operation and Maintenance	IP 19-1-1	Paint and Protective Coatings
IP 7-4-1	Burners for Fired Heaters	IP 19-3-3	Linings for Fired Heaters
IP 7-5-1	Coils for Fired Heaters and Boilers	IP 20-1-1	Inspection of Equipment and Materials
IP 7-8-1	Dampers and Guillotines for Fired Equipment	IP 20-1-3	Quality Programs
IP 14-3-1	Fireproofing		
STANDARDS			
API Standard		ASTM Standard	
560	Fired Heaters for General Refinery Service Including Appendices	C 680	Standard Practice for Determination of Heat Gain or Loss and the Surface Temperatures of Insulated Pipe and Equipment Systems
ANSI / ASME Standard			
B1.20.1	Pipe Threads, General Purpose (Inch)		

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TABLE 2

PRACTICES			
IP 3-6-1	Piping for Instruments	IP 10-13-1	Special Purpose Centrifugal Fans
IP 4-5-1	Steel Stacks	IP 10-13-2	General Purpose Centrifugal Fans
IP 4-5-2	Reinforced Concrete Chimneys	IP 18-3-3	Centrifugally Cast High Alloy Tubes for Fired Heaters Other Than Steam Cracking Reactors
IP 4-6-1	Reinforced Concrete Foundations and Anchor Bolts	IP 19-7-1	Protection of Stainless Steel During Fabrication, Shipping, Storage and Field Construction
IP 7-3-1	Sootblowers for Fired Equipment	IP 20-1-2	Administrative Procedures for Obtaining Exxon Engineering Inspection
IP 7-9-1	Expansion Joints for Fired Equipment		

- I * 2.3 The vendor shall comply with **any local rules or regulations** specified by the Purchaser.

IP 7-1-1	Fired Heaters	 INTERNATIONAL PRACTICE
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(This practice is appropriate for attachment to Inquiry or Purchase Document)

DOCUMENTATION

POST AWARD REVIEW

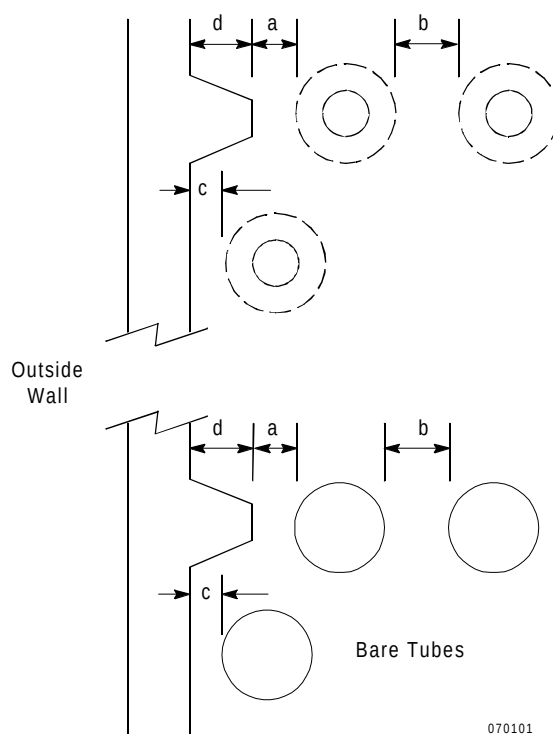
- I ♦ 3.1 The vendor shall **provide** the following heater design details for review:
- Coil anchor and thermal expansion provisions.
 - Tube casing penetration seals.
 - Combustion air plenums including any flow modeling test results.
 - Auxiliary equipment such as air preheaters, induced and forced draft fans, sootblowers, fuel filters, and local fuel piping and valves.
 - Description of field work required to complete erection in the field, including a complete description of any special erection techniques required (handling of prelined panels, etc.).

FINAL RECORDS

- I ♦ 3.2 **Mill test certificates and heat numbers** shall be provided for all tube supports.

HEATER LAYOUT DESIGN

- O ♦ 4.1 The **ratio of exposed radiant tube length to tube circle diameter**, for vertical cylindrical heaters, or vertical wall height to tube centerline for cabin heaters shall be 1.2 to 1 minimum.
- O 4.2 **Maximum height of radiant section tubes** of any heater shall be 45 ft (13.7 m).
- O 4.3 **Corbelling** shall be provided in the convection section per the configuration shown below:



LEGEND: **a** is to be approximately equal to $1/2$ **b** and
a is to be approximately equal to **c**
for brickwall construction, **d** is equal
to 4-1/2 in. (113 mm) maximum

- R 4.4 **Corbelling** shall **not be used** on the bottom shield row of the convection section.
- R 4.5 For natural draft operation with burners firing vertically or horizontally, minimum clearances shall be provided per API Standard 560 Table 12 with the following exceptions:
- a. For oil firing the burner centerline to centerline of tubes shall be increased by 6 in. (150 mm) beyond the API requirement, and
 - b. For gas firing the burner centerline to centerline of tubes shall be increased by 3 in. (75 mm) beyond the API requirement.
- M 4.6 **All-welded return bends** shall be **arranged** as follows:
- a. **Radiant section** return bends shall be located inside the heater.
 - b. **Convection section** return bends shall be located in header boxes.

TUBE SUPPORT AND TUBESHEET DESIGN

- R 5.1 The **design temperature for tube supports, guides and brackets** shall be equal to the maximum temperature of the flue gas in contact with the support at design operation of the heater.
- R 5.2 **Tube support, tubesheet, tube guide, and support bracket materials** shall meet design temperature ranges per API Table 8, Par. 6.3.1 with the following exceptions:

FLUE GAS TEMPERATURE		MATERIAL
°F	(°C)	
1500 and below	(816)	18 Cr 8 Ni (A240, A167 304H)
1800 and below	(982)	Ni-Fe-Cr (B409 Alloy 800 HT)
1900 and below	(1038)	25 Cr 20 Ni (A351 HK40)
2000 and below	(1093)	25 Cr 35 Ni + Nb (HP45 Modified)
2000 and below		21 Cr 11 Ni - 1.5 Si (A240 RA253-MA)
Above 2000		*Requires Owner's Engineer's Approval

* Alternative proposals for tube support materials shall be submitted to the Purchaser for approval by the Owner's Engineer. Meehanite HR and 25 Cr 12 Ni are not acceptable alternatives.

- R 5.3 **Bottom tube supports in compression for vertical radiant coil heaters** shall be buried in insulating floor refractory. The minimum design temperature for the support shall be the process coil outlet temperature.