

Pièce A-00

La Régie dépose la figure 5 suivante extraite de

2000 ASHRAE Handbook-HVAC Systems & Equipment (SI), p.27.4

2000 ASHRAE Systems and Equipment Handbook (SI)

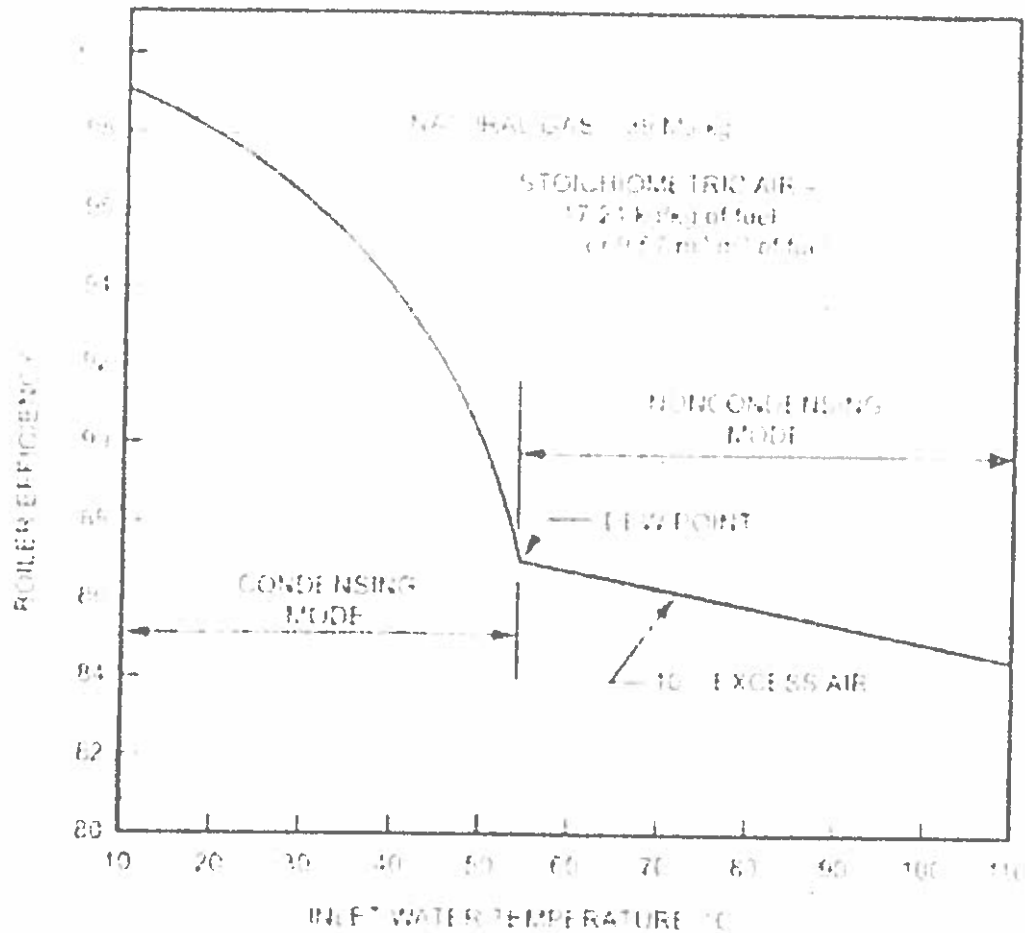


Fig. 5 Effect of Inlet Water Temperature on Efficiency of Condensing Boilers

Régie de l'énergie
DOSSIER R-3879-2014
DEPOSÉE EN AUDIENCE R. 2
Date 29/10/2014
Pièces n° A-0052

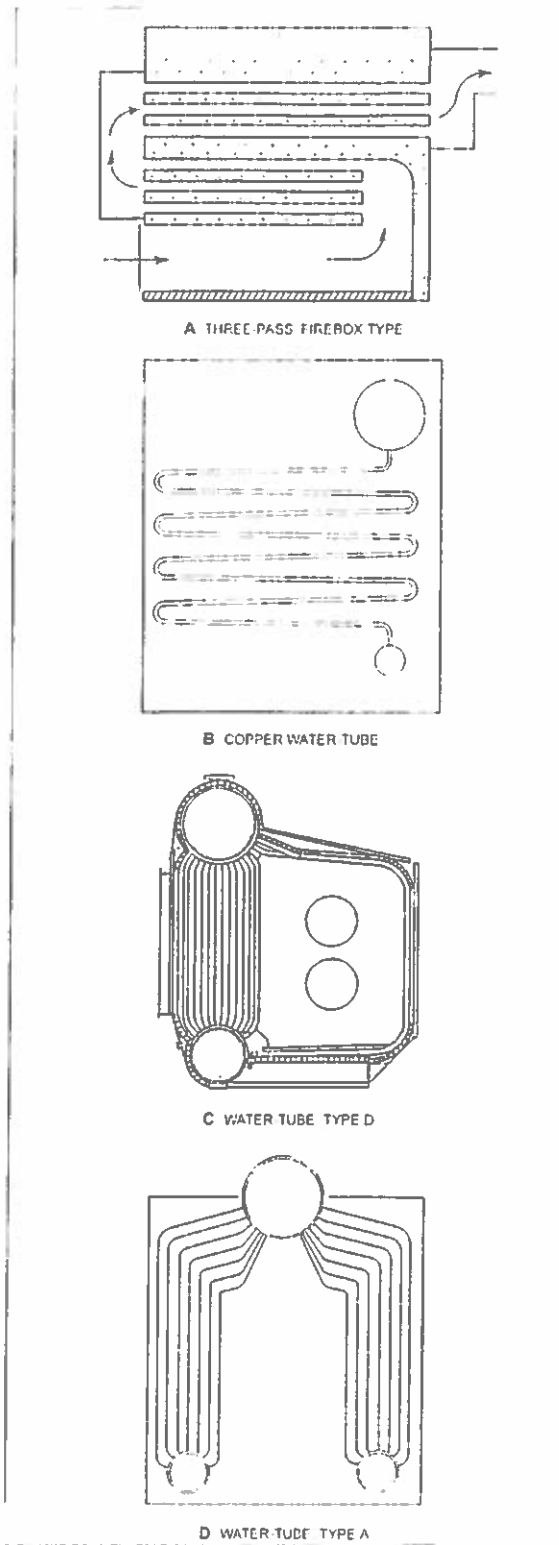


Fig. 4 Commercial Fire-Tube and Water-Tube Boilers

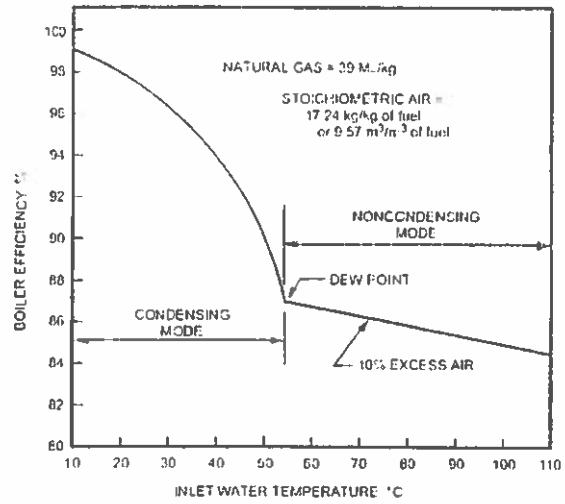


Fig. 5 Effect of Inlet Water Temperature on Efficiency of Condensing Boilers

tendency of hot gases to rise up a chimney or by the height of the boiler up to the draft control device. In a mechanical draft boiler, a fan or blower or other machinery creates the required pressure difference. These boilers may be either forced draft or induced draft. In a forced draft boiler, air is forced into the combustion chamber to maintain a positive pressure in the combustion chamber and/or the space between the tubing and the jacket (breaching). In an induced draft boiler, air is drawn into the combustion chamber to maintain a negative pressure in the combustion chamber.

Condensing or Noncondensing

Until recently, boilers were designed to operate without condensing the flue gas in the boiler. This precaution was necessary to prevent corrosion of cast-iron or steel parts. Hot water units were often operated at 60°C minimum return water temperature to prevent rusting when natural gas was used.

Because a higher boiler efficiency can be achieved with a lower water temperature, the condensing boiler allows the flue gas water vapor to condense and drain. Full condensing boilers are unique in design and may require a very low inlet water temperature, corrosion-resistant materials, chemical treatment of the condensate, and an elevated fresh water makeup for proper operation. Figure 5 shows a typical relationship of overall condensing boiler efficiency to return water temperature. The dew point of 55°C shown in the figure varies with the percentage of hydrogen in the fuel and oxygen-carbon dioxide ratio, or excess air, in the flue gases. A condensing boiler is shown in Figure 1H. Condensing boilers can be of the fire-tube, water-tube, or cast aluminum sectional design.

Condensing boilers with low return water temperatures are very efficient at part-load operation when a high water temperature is not required. For example, a natural gas water heater operating with 27°C return water has a potential overall boiler efficiency of 97% at the conditions shown in Figure 5.

Figure 6 shows how dew point varies with a change in the percentages of oxygen/carbon dioxide for natural gas. Boilers that operate with a combustion efficiency and oxygen and carbon dioxide concentrations in the flue gas such that the flue gas temperature falls between the dew point and the dew point plus 80 K should be avoided, unless the venting is designed for condensation. This temperature typically occurs with boilers operating between 83 and 87% efficiency and the flue gas has an oxygen concentration of 7 to