

supplied and the amount of water passed through the heater. If water temperatures are maintained below 140 deg. the life of the heater will be much longer than if higher temperatures are used owing to decreased scale formation and minimized corrosion below 140 deg. Direct water heaters in some cases are designed to burn refuse and garbage.

Indirect heaters generally consist of a steam boiler in connection with a coil or tube heater which transmits the heat in the steam to the water. This type of installation costs more than a direct system but has the following advantages:

1. The boiler operates at low-pressure. Water hammer and cold water shocks are not transmitted to the boiler.
2. The boiler is protected from scale and corrosion.
3. The scale is formed in the heat exchanger in which the parts to which the scale is attached can be cleaned or replaced. The accumulation of scale does not effect efficiency although it will effect the capacity of the heat exchanger.
4. No pounding occurs in tank due to formation of steam, especially if the steam supply to the heater is under automatic control.
5. Discoloration of water may be prevented if water supply only comes in contact with non-ferrous metal.

SELECTION OF HOT WATER SUPPLY BOILERS

The size of hot-water supply boiler selected is based upon: the quantity of water used in 24 hours, the temperature rise, the peak load, the duration of peak load, and the size of storage tank used. A boiler capable of delivering per hour 1/24 of the 24-hour demand operating continuously would be sufficiently large, but it is good practice to provide 20 per cent reserve capacity in the boiler by selecting a boiler which can deliver per hour 1/20 of the 24-hour demand. The storage tank should be of such size that the water stored during off peak hours, plus the hourly output of the heater will equal the demand during the period of peak load.

If the storage tank is already installed and is too small, a larger boiler must be used, the boiler having such capacity that the stored water plus the hourly heat output of the boiler equals the demand during the peak period.

Control of tank temperature by means of tank thermostat and means for operating dampers or regulating gas or oil supply is discussed in Chapter XVI on Automatic Heat Control.

For determination of hot-water supply requirements the reader is referred to Chapter XX on Water Supply Systems and Piping.

Hot-water supply boilers are usually rated in gallons of water heated through a specified temperature rise within a given time. It is important to determine the temperature rise and the time required as there is considerable variation in the values as used by different manufacturers.

CHAPTER VI

CHIMNEYS

Functions of the Chimney; Draft, Friction Losses, Chimneys for Heating Boilers, Warm-Air Furnaces, Oil Burners, Gas Appliances, Details of Construction, Underwriters' Rules.

THE functions of a chimney are, generally speaking, twofold: (1) to produce the required draft, (2) to carry off the products of combustion and discharge them so as not to become a nuisance.

Where natural draft is employed the required draft is made up of: (a) that required to overcome the friction and to produce the velocity of the air at entrance to the furnace, (b) plus that necessary to force the air through the fuel bed (if any), (c) plus that necessary to produce the velocity and to overcome the friction of the products of combustion in their passage through the boiler, (d) plus that necessary to produce the velocity and to overcome the friction of the products of combustion in their passage through the breeching, from the boiler to the chimney, (e) plus that necessary to produce the velocity and to overcome the friction of the products of combustion in their passage through the chimney itself.

Where forced draft is employed factors (a) and (b), of the required draft, are usually taken care of by the forced draft apparatus, leaving the factors (c), (d) and (e) only, to be taken care of by the chimney.

Where induced draft is employed the entire draft required is generally taken care of by the induced draft apparatus.

In the case of either forced or induced draft any part of the required draft may be taken care of by the chimney and the remainder by the apparatus, but the exact conditions to be met in this respect should be known and the chimney should be proportioned accordingly.

This combination of natural and mechanical draft is frequently used, especially where loads are quite irregular, so that the plant may be run on natural draft during light loads and on mechanical draft during peak-loads, only. This combination also affords a factor of safety against breakdowns in the mechanical draft equipment, since at least a partial load may always be carried on natural draft.

Draft measurement is usually in inches of water by which is meant the static head of water (in inches) corresponding to the difference in pressure between any point in the boiler, breeching or chimney, at which the draft is being measured, and the pressure of the surrounding atmosphere. One inch of draft is equivalent to 5.2 lb. per square foot of pressure difference.

The theoretical draft of a chimney is the hypothetical draft that would be produced if the chimney were completely heated and filled with the

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