

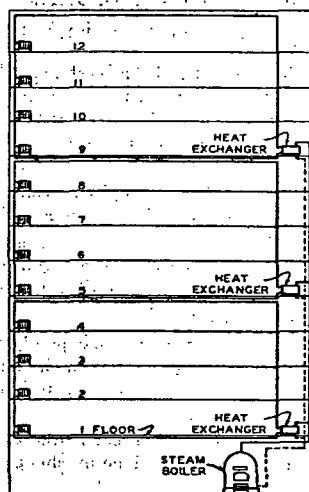


FIG. 17. VERTICAL ZONING OF HOT WATER HEATING SYSTEM IN A 12-STORY BUILDING

the building, solar heat, weather conditions, heat from processes, type of occupancy, building chimney effect, etc., can readily be compensated for when heat can be supplied only where needed.

In tall buildings, vertical zoning such as shown in Fig. 17 not only provides the advantages of control and economy, but also reduces the water pressure in the system to that caused only by the number of floors served by each section. As shown in Fig. 17 a steam boiler can conveniently be used to supply steam to the heat exchangers supplying heated water to each zone.

## CHAPTER 25

### RADIATORS, CONVECTORS, COILS

Heat Emission of Radiators and Convectors, Types of Radiators, Convectors, Radiator and Convector Ratings, Effect of Operating Conditions, Heating Effect, Heating Up the Radiator and Convector, Enclosed Radiators, Coils, Coil Construction and Arrangement, Steam Coils, Water Coils, Direct-Expansion Coils, Flow Arrangement, Applications, Heat Transfer and Air Flow Resistance, Coil Selection

**R**ADIATORS and convectors are primarily used for heating and since their performance is affected by many of the same conditions, they will be considered together. Coils for heating and cooling when used in a fan system will be treated separately later in this chapter.

#### HEAT EMISSION OF RADIATORS AND CONVECTORS

Most heating units emit heat by *radiation* and *convection*. An exposed radiator emits roughly half of its heat by radiation, the amount depending upon the size and number of sections. When the radiator is enclosed or shielded, the proportion of heat emitted by radiation is reduced. The balance of the emission occurs by conduction to the air in contact with the heating surface, and this heated air rises and causes circulation by convection transmitting this warm air to the space which is to be heated.

The output of a radiator can be measured only by the heat it emits and is generally expressed in units of: Btu per hr; *Mbh* (1000 Btu per hour); or in equivalent direct radiation (240 Btu per hour for steam or 150 for water radiation).

#### TYPES OF RADIATORS

Present day radiators are usually of tubular type and are generally made of cast-iron. The small-tube type of tubular radiators with a spacing of  $1\frac{1}{4}$  in. per section are about the only available radiating surface for homes and office buildings. Small-tube radiators occupy less space and are particularly suited for installation in recesses.

*Baseboard radiation* consists of long, low units which are made to resemble conventional baseboards and are installed along the outside walls of rooms in place of the usual wooden baseboard. Units are made either of hollow cast-iron panels (with, or without fins on the back) or of ferrous or non-ferrous finned tubing installed behind a metal enclosure. They are primarily used in hot water systems, but may also be used on two-pipe steam systems.

Advantages claimed for baseboard radiators are: They are inconspicuous; they are clean in operation; they offer a minimum of interference with furniture placement, and, they distribute the heat near the floor. This reduces the floor to ceiling temperature gradient to about 2 deg F and tends to produce uniform temperatures throughout the room.

After a study of the demand for various sizes of radiators, the *Institute of Boiler and Radiator Manufacturers*, in cooperation with the Division of Simplified Practice, *National Bureau of Standards*, established Simplified