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CHAPTER 14

RADIATORS, CONVECTORS, BASEBOARD AND FINNED-TUBE UNITS

Definitions, Heat Emission, Radiators, Convectors, Baseboard, Finned-Tube, Ratings, Corrections for Non-Standard Conditions, Enclosed Radiators

RADIATORS, convectors, baseboard, and finned-tube are the types of heat-distributing units used in steam and hot water heating systems to supply heat to a room by radiation and convection. The function of these devices is the maintenance of the desired mean radiant and air temperatures in the area. Since heat losses through the various parts of the structure constantly tend to lower these temperatures, heat distributing units should be so placed and regulated that their output will replace the losses when and where they occur. If 80 percent of the room heat loss occurs through a cold wall or window area, then 80 percent of the input should be introduced in or directed toward that area.

The term *radiator* is generally confined to sectional cast-iron radiation. Cast-iron radiator types may be column, large-tube, small-tube, or wall.

The term *convector* refers to a heat-distributing unit that operates with gravity-recirculated room air, is surrounded on all sides by an enclosure having an air-inlet opening below the heating element, and an air-outlet opening above the heating element.

The terms *baseboard* and *baseboard radiation* refer to steam or water heat-distributing units designed for installation along the bottom of the walls replacing the conventional baseboard. They operate with gravity-recirculated room air, and have a substantial portion of their frontal face surface directly exposed to the room.

The term *finned-tube* refers to steam or water heat-distributing units fabricated from metallic tubing with metallic fins bonded to the tube. They operate with gravity-recirculated room air and are designed for installation without enclosure, or with open-type grilles or covers, or with enclosures having top, front, or inclined outlets.

HEAT EMISSION

Steam or water heat-distributing units emit heat by radiation and convection. These heat-transfer processes and the factors that affect them are discussed in detail in Chapter 5. In general, those units having a large portion of their heated surface exposed emit a larger portion of heat by radiation than do units having their heating surfaces completely or partly concealed from view.

The output of a heat-distributing unit is expressed in units of Btu per hr (Btuh), 1000 Btu per hr (Mbh), or in square feet equivalent direct radiation (EDR) (e.g., 240 Btuh for steam = 1 sq ft EDR).

RADIATORS

Column and large-tube radiators are no longer manufactured, but since many of these units are still in use, Tables 1 and 2 are included to provide principal dimensions and average ratings.

The *small-tube type radiators*, with a spacing of 1¾ in. per section, occupy less space than the older column and large-tube radiators, and are particularly suited for installation in recesses.

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 Practice Recommendation* R174-47, *Cast Iron Radiators*, for small-tube cast-iron radiators. Table 3 shows the size and dimensions now being manufactured.

Wall radiators are hung from wall brackets and are well adapted to use in factory buildings. Tests have shown that the heat emitted from a wall-type radiator may be reduced from 5 to 10 percent if the radiator is placed near the ceiling with the bars horizontal and in an air temperature exceeding 70 F. Installation of wall radiators at the ceiling is not recommended because the resulting large temperature gradients between floor and ceiling make it difficult to heat the living zone satisfactorily. Dimensions and heat emission rates of wall radiators for normal wall installations are given in Table 4.

Pipe Coils

Pipe coils are sometimes used in factory buildings and are usually placed under windows or along heavily-exposed walls. The heat emission of such pipe coils may be obtained from Table 5.

CONVECTORS

Convectors are made in a wide variety of depths, sizes, lengths, and enclosure or cabinet types. The basic sizes and types are listed in *Simplified Practice Recommendation* 238-50, *Convectors*. The heating elements are available in fabricated ferrous and non-ferrous metals as well as cast iron. The air enters the enclosure below the heating element, is heated in passing through the element, and leaves the enclosure through the outlet grille located above the heating element. Factory-assembled units comprised of a heating element and enclosure are widely used. These may be free standing, wall hung, or recessed, (Fig. 1) and may have outlet grilles and arched inlets or inlet grilles as desired.

In cases where cabinets or enclosures are to be used but are not furnished by the manufacturer, it is important that the proportions of the cabinets or enclosures and the grilles be so designed that they will not impair the performance of the assembled convector. It is desirable that the cabinet or