basis of 15 sq in. of flue for each 100 cfm. Thus the vent flue area of a flue for a room equipped with one 1200 cfm unit ventilating machine would be 180 sq in. The area of vent flue opening from the room may be figured on the basis of 25 sq in. per 100 cfm.

Location of Vent

The vent opening should not be placed directly opposite the unit, since the incoming air when introduced at lower than room temperature falls to the floor and moves directly toward this vent opening, causing possible floor drafts and in any event causing failure properly to cool the occupants of the room.

In buildings provided with wardrobes or cloakrooms the vents may be so located that the air shall pass through these spaces, heating and ventilating them with air which otherwise would be passed to the outside without being used to the best advantage. Many State codes for ventilation of public buildings make this arrangement mandatory.

In rooms without wardrobes or cloakrooms the vent flue may be located diagonally opposite the unit, and two such flues generally are desirable, one near each opposite interior corner of the room. This gives the air an opportunity to mix thoroughly with the room air before dropping to the vent opening.

The individual vent flue and the corridor or central vent flue are the methods generally used with unit ventilators. The individual vent flue system (Figs. 1 and 2) provides for separate vent flues from each room. The corridor vent or central vent outlet system (Fig. 3), provides for outlets centrally located to take care of a group of classrooms, the air passing from the classrooms, wardrobe or cloakroom to the corridor, and from the corridor to the central outlets. The grilles between the wardrobes and corridors may be near the ceiling, provided the air leaves the classroom to enter the wardrobes near the floor in the classrooms. A velocity of 800 to 900 fpm may be used for the central outlet from the corridor.

Where the law and the type of building construction will premit, the escaping spent air from the building may circulate throughout the attic on its way out.

CAPACITIES

Unit ventilators are available in air capacities ranging from 450 cfm to 5000 cfm and with corresponding heat capacities (above that required for ventilation purposes based upon an outside temperature of zero and an inside temperature of 70 F) ranging from 125 to 600 sq ft of equivalent direct heating surface. Some manufacturers furnish a unit with several heating capacities for each air capacity thus enabling the engineer to select the unit best adapted to the heating and ventilating load. Typical capacities are given in Table 1.

UNIT VENTILATOR CALCULATIONS

The amount of heat to be supplied by the unit ventilator will depend on the amount of air passed through the unit and the temperature range through which the air is heated. The weight of air (W) to be circulated

per hour is fixed by the ventilating requirements and is frequently assumed to be 30 cfm per occupant (see Chapter 24).

Combined System

If no direct heating surface (radiation) is installed, the combined heating and ventilating requirements must be taken care of by the unit ventilators, and the total heat to be supplied is obtained by means of the following formulæ:

$$H_t = 0.24\ W\ (t_y - t_o) \tag{1}$$

$$W = dQ \tag{2}$$

$$t_y = \frac{H}{0.24W} + t \tag{3}$$

From equations 1, 2 and 3:

$$H_t = H + 0.24\ dQ\ (t - t_o) \tag{4}$$

Example 1. The heat loss of a certain room is 25,000 Btu per hour, and the ventilating requirements are 1000 cfm. If the room temperature is to be 70 F and all air taken from the outside at zero, what will be the total heat demand on the unit if it is required to provide for both the heating and ventilating requirements (combined system).

Solution. H = 24,000; d = 0.075 (at 70 F);
Q = 1000 x 60 = 60,000 cfh; t = 70 F; t_o = 0.

Substituting in equation 4:

$$H_t = 24{,}000 + 0.24 \times 0.075 \times 60{,}000\ (70-0) = 99{,}000 \text{ Btu } (+)$$

$$t_y = \frac{24{,}000}{0.24 \times 0.075 \times 60{,}000} + 70 = 92.3 \text{ F}$$

If all of the air is recirculated, the total heat required is of course the same as the heat loss of the room, or

$$H_t = H = 0.24\ W\ (t_y - t) \tag{5}$$

Split System

If the heat loss of the room is to be taken care of by direct heating surface, the unit ventilators will be required to warm the air introduced for the ventilating requirements. Therefore:

$$H_v = 0.24\ W\ (t_y - t_o) \tag{6}$$

TABLE 1. TYPICAL CAPACITIES OF UNIT VENTILATORS FOR AN ENTERING AIR TEMPERATURE OF ZERO.

Cubic Feet of Air per Minute	Total Capacity in Square Feet of Equivalent Direct Heating Surface (Radiation)	Capacity Available for Heating the Room in Square Feet of Equivalent Direct Heating Surface (Radiation)	Final Air Temperature (Deg. Fahr.)
600	285	95	105
750	350	115	105
1000	455	150	105
1200	565	190	105
1500	705	235	105