TABLE 3. TYPICAL CAPACITIES OF UNIT VENTILATORS FOR AN ENTERING AIR TEMPERATURE OF ZERO

Cubic Feet of Air per Minute		Total Capacity in Square Feet, Equivalent Direct Radiation	Capacity Available for Heating the Room, Square Feet Equivalent Direct Radiation	Final Air Temperature F Deg
Anemometer Rating	Condensate Rating			
750	500	214	56	95
1000	750	320	84	95
1260	1000	427	112	95
1560	1250	534	141	95

the quantity of air delivered and the temperature of the air to and from the unit. Table 3 shows the air handling capacities by the two methods of rating[5] and also the approximate heating data. In accordance with the A.S.H.V.E. Standard Code for Testing and Rating Steam Unit Ventilators the information to be supplied regarding ratings and the basis of rating is the following:

Rating Factors to Be Specified. The rating of the unit ventilator shall specify the following:

a. Final temperature at different entering air temperatures.
b. Total EDR at different entering air temperatures.
c. Air delivered by the unit in cubic feet per minute at the *standard basis of rating* with the fans operated at rated speed, with all air being blown through the heating unit and with the standard louver and grille on the outlet.

The Standard Basis of Rating shall be as follows:

a. Dry saturated steam at a temperature at the unit corresponding to an absolute pressure of 16.7 psi (218.5 F).
b. Entering air temperature of zero Fahrenheit degrees.
c. Volume delivered in cubic feet per minute converted to standard air at 70 F.

Rating Tables for unit ventilators shall contain the following data in addition to the standard rating, for entering air temperatures from −30 F to +60 F:

a. Inlet temperature, Fahrenheit degrees.
b. Final temperature, Fahrenheit degrees.
c. Total EDR at the specified entering temperature.
d. Surplus or heating EDR at the specified entering temperature.

Surplus or Heating Equivalent Direct Radiation for the purposes of this code shall be construed to mean difference between the total EDR at a specified inlet temperature and the EDR required to heat the air from that temperature to 70 F.

If no direct heating surface (radiation) is installed to take care of the normal heat transfer losses, and the unit ventilator is to be used for both heating and ventilation, then the combined requirements must be taken care of by the unit ventilator.

Heat Required for Ventilating Only

When all of the air handled by the unit is taken from the outside, the total heat to be supplied is obtained by means of Equations 1, 2, 3, and 4.

$$H = 0.24\ W\ (t_r - t) \quad (1)$$
$$H_v = 0.24\ W\ (t - t_o) \quad (2)$$
$$H_t = 0.24\ W\ (t_r - t_o) = H + H_v \quad (3)$$
$$W = d\ 60\ Q \quad (4)$$

From Equations 2, 3, and 4:

$$H_t = H + 0.24\ d\ 60\ Q\ (t - t_o). \quad (5)$$

where

d = density of air, pounds per cubic foot (0.075 lb per cu ft for Standard Air by definition).
H = heat loss of room, Btu per hour.
H_v = heat required to warm air for ventilation, Btu per hour.
H_t = total heat requirements for both heating and ventilation, Btu per hour.
Q = volume of air handled by the ventilating equipment, cubic feet per minute.
t = temperature to be maintained in the room, Fahrenheit degrees.
t_o = outside temperature, Fahrenheit degrees.
t_r = temperature of the air leaving the unit, Fahrenheit degrees.
W = weight of air circulated, pounds per hour.
0.24 = specific heat of air at constant pressure (approximate value).

Example 1. The heat loss of a certain room is 24,000 Btu per hour, and the ventilating requirements are 1000 cfm. If the room temperature is to be 70 F and all air is 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. Substituting in Equation 5:

$$H_t = 24{,}000 + 0.24 \times 0.075 \times 60 \times 1000\ (70 - 0) = 99{,}600 \text{ Btu per hour}$$

$$t_r = \frac{24{,}000}{0.24 \times 0.075 \times 60 \times 1000} + 70 = 92.2 \text{ F.}$$

Heat Required for Ventilating and Recirculating

When part of the air handled by the unit is taken from the room and the remainder from the outside,

$$H_t = 0.24 W_o\ (t_r - t_o) + 0.24\ W_i\ (t_r - t) \quad (7)$$
$$W_o = d_o\ 60\ Q_o \quad (8)$$
$$W_i = d_i\ 60\ Q_i \quad (9)$$

$$t_r = \frac{H}{0.24\ (W_o + W_i)} + t \quad (10)$$

$$H_t = H + 0.24\ d_o\ 60\ Q_o\ (t - t_o) \quad (11)$$

where

W_o = weight of air, pounds per hour taken from out-of-doors.
W_i = weight of air, pounds per hour taken from the room.
d_o = density of air, pounds per cubic foot at temperature t_o.
d_i = density of air, pounds per cubic foot at temperature t.
Q_o = volume of air taken in from the outside, cubic feet per minute.
Q_i = volume of air taken in from the room, cubic feet per minute.

Applications of Unit Ventilators

Items to be considered in the application of unit ventilators are: (1) combination with other means of heating, (2) location of units, and (3) method of venting or exhausting.

In a *split* system the unit is used primarily for ventilation. Air is delivered to the room at or slightly above room temperature, and enough radiation is installed in the room to take care of the normal heat transfer losses. Where the unit ventilator selected has a capacity more than suffi-