ADDENDA

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ANSI/ASHRAE Addendum d to
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Ventilation for Acceptable Indoor Air Quality

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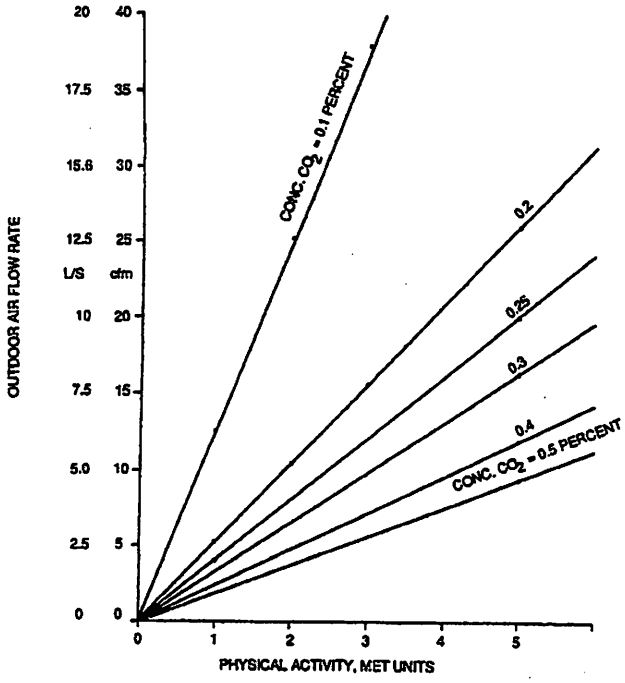

FIGURE D-3 Ventilation requirements.

ies have shown that with sedentary persons about15 cfm (7.5 L/s) per person of outdoor air will dilute odors from human bioeffluents to levels that will satisfy a substantial majority (about 80%) of unadapted persons (visitors) to a space [D-3,D-4,D-5,D-6,D-7]. If the ventilation rate is to be held to 15 cfm (7.5 L/s) per person, the resulting steady-state CO_2 concentration relative to that in the outdoor air is

$$C_s - C_o = N/V_o$$
$$= 0.31/(7.5 \times 60 \text{ s/min})$$
$$= 0.000689 \text{ L of } CO_2 \text{ per L of air}$$
$$\approx 700 \text{ ppm}$$

Thus, maintaining a steady-state CO_2 concentration in a space no greater than about 700 ppm above outdoor air levels will indicate that a substantial majority of visitors entering a space will be satisfied with respect to human bioeffluents (body odor). A more detailed discussion of this relationship between CO_2 concentrations and the perception of bioeffluents, as well as the use of indoor CO_2 to estimate building ventilation rates, is contained in ASTM Standard D6245 [D-8].

CO_2 concentrations in acceptable outdoor air typically range from 300 to 500 ppm. High CO_2 concentrations in the outdoor air can be an indicator of combustion and/or other contaminant sources.

Figure D-3 shows the outdoor airflow rate required as a function of physical activity and steady-state room concentration. If the activity level is greater than 1.2 met, the required ventilation must be increased to maintain the same CO_2 level.

Also the decrease in oxygen content of the room air can be found from Equation D-l when oxygen concentration is substituted for carbon dioxide concentration.

$$C_o - C_s = N/V_o \quad \text{(D-2)}$$

The term N now has a negative value with respect to its use in Equation D-1 because oxygen is consumed rather than generated.

$$C_s = C_o - N/V_o \quad \text{(D-3)}$$

The oxygen consumption rate is 0.0127 cfm (0.36 L/min) when the activity level is 1.2 met. For ventilation at a rate of 15 cfm (429 L/m) and an activity level of 1.2 met units, the room oxygen level will be reduced from an outdoor concentration of 20.95% to 20.85%, a percent change of 0.48% ([20.95 – 20.85]/20.95). Unlike oxygen, CO_2 is generated as a result of activity. At 1.2 met, the CO_2 indoors is raised from the outdoor background of 0.03% to 0.1%, a percent change of 230%. Thus, measuring the increase of CO_2 is clearly more significant than measuring the decrease of oxygen.

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