

must be provided to the zone by the supply air distribution system, shall be determined in accordance with Equation 4-2. [ASHRAE 62.1:6.2.2.3]

$$Voz = Vbz/Ez \quad (\text{Equation 4-2})$$

403.2 Single-Zone Systems. When one air handler supplies a mixture of outdoor air and recirculated air to only one zone, the *outdoor air intake flow* (Vot) shall be determined in accordance with Equation 4-3. [ASHRAE 62.1:6.3]

$$Vot = Voz \quad (\text{Equation 4-3})$$

403.3 100% Outdoor Air Systems. When one air handler supplies only outdoor air to one or more zones, the *outdoor air intake flow* (Vot) shall be determined in accordance with Equation 4-4. [ASHRAE 62.1:6.2.4]

$$Vot = \text{all zones} Voz \quad (\text{Equation 4-4})$$

403.4 Multiple-Zone Recirculating Systems. When one air handler supplies a mixture of outdoor air and recirculated return air to more than one zone, the *outdoor air intake flow* (Vot) shall be determined in accordance with Sections 403.4.1 through 403.4.4. [ASHRAE 62.1:6.2.5]

403.4.1 Primary Outdoor Air Fraction. When Table 4-3 is used to determine system ventilation efficiency, the *zone primary outdoor air fraction* (Zp) shall be determined in accordance with Equation 4-5. [ASHRAE 62.1:6.2.5.1]

$$Zp = Voz/Vpz \quad (\text{Equation 4-5})$$

Vpz is the primary airflow to the zone from the air handler, including outdoor air and recirculated return air. [ASHRAE 62.1:6.2.5.1]

403.4.2 System Ventilation Efficiency. The *system ventilation efficiency* (Ev) shall be determined using Table 4-3 or Appendix A of ASHRAE 62.1. [ASHRAE 62.1:6.2.5.2]

403.4.3 Uncorrected Outdoor Air Intake. The design *uncorrected outdoor air intake* (Vou) shall be determined in accordance with Equation 4-6. [ASHRAE 62.1:6.2.5.3]

$$Vou = D \text{ all zones } RpPz + \text{ all zones } RaAz \quad (\text{Equation 4-6})$$

The *occupant diversity*, D , shall be permitted to be used to account for variations in occupancy within the zones served by the system. [ASHRAE 62.1:6.2.5.3]

The *occupancy diversity* is defined as:

$$D = Ps/\text{all zones } Pz \quad (\text{Equation 4-7})$$

where the *system population* (Ps) is the total population in the area served by the system. Alternative methods shall be permitted to be used to account for population diversity when calculating Vou , provided that the resulting value is no less than that determined by Equation 4-6. [ASHRAE 62.1:6.2.5.3]

403.4.4 Outdoor Air Intake. The design *outdoor air intake flow* (Vot) shall be determined in accordance with Equation 4-8. [ASHRAE 62.1:6.2.5.4]

$$Vot = Vou/Ev \quad (\text{Equation 4-8})$$

403.5 Design for Varying Operating Conditions.

403.5.1 Variable Load Conditions. Ventilation systems shall be designed to be capable of providing the required ventilation rates in the breathing zone whenever the zones served by the system are occupied, including all full and part-load conditions. [ASHRAE 62.1:6.2.6.1]

403.5.2 Short-Term Conditions. If it is known that peak occupancy will be of short duration or the ventilation rate will be varied or interrupted for a short period of time, the design shall be permitted to be based on the average conditions over a time period T determined by Equation 4-9. [ASHRAE 62: Section 6.2.6.2]:

$$T = 3 v / Vbz \quad (4-9) \text{ IP} \quad (\text{Equation 4-9})$$

where:

T = averaging time period, (min)

v = the volume of the zone for which averaging is being applied, ft^3 (m^3).

Vbz = the *breathing zone outdoor airflow* calculated using Equation 4-1 and the design value of the *zone population* Pz , cfm (L/s).

403.6 Dynamic Reset. The system shall be permitted to be designed to vary the design *outdoor air intake flow* (Vot), or the space or zone airflow as operating conditions change.

403.7 Exhaust Ventilation. Exhaust airflow shall be provided in accordance with the requirements in Table 4-4. Exhaust makeup air shall be permitted to be any combination of outdoor air, recirculated air, and transfer air.

404.0 Makeup Air.

Makeup-air requirements for direct gas-fired heaters, industrial air heaters, and miscellaneous heaters are found in Chapters 5 and 9.