TABLE 6.2.2.2 Zone Air Distribution Effectiveness

Air Distribution Configuration	E_z
Ceiling supply of cool air	1.0
Ceiling supply of warm air and floor return	1.0
Ceiling supply of warm air 15°F (8°C) or more above space temperature and ceiling return	0.8
Ceiling supply of warm air less than 15°F (8°C) above space temperature and ceiling return provided that the 150 fpm (0.8 m/s) supply air jet reaches to within 4.5 ft (1.4 m) of floor level (See Note 6)	1.0
Floor supply of cool air and ceiling return, provided that the vertical throw is greater than 50 fpm (0.25 m/s) at a height of 4.5 ft (1.4 m) or more above the floor	1.0
Floor supply of cool air and ceiling return, provided low-velocity displacement ventilation achieves unidirectional flow and thermal stratification, or underfloor air distribution systems where the vertical throw is less than or equal to 50 fpm (0.25 m/s) at a height of 4.5 ft (1.4 m) above the floor	1.2
Floor supply of warm air and floor return	1.0
Floor supply of warm air and ceiling return	0.7
Makeup supply drawn in on the opposite side of the room from the exhaust, return, or both.	0.8
Makeup supply drawn in near to the exhaust, return, or both locations.	0.5

NOTES:
1. "Cool air" is air cooler than space temperature.
2. "Warm air" is air warmer than space temperature.
3. "Ceiling supply" includes any point above the breathing zone.
4. "Floor supply" includes any point below the breathing zone.
5. As an alternative to using the above values, E_z may be regarded as equal to air-change effectiveness determined in accordance with ASHRAE Standard 129 [16] for air distribution configurations except unidirectional flow.
6. For lower velocity supply air, $E_z = 0.8$.

6.2.5.3.2 Design System Population. Design system population (P_s) shall equal the largest (peak) number of people expected to occupy all ventilation zones served by the ventilation system during use.

Informative Note: Design system population is always equal to or less than the sum of design zone population for all zones in the area served by the system because all zones may not be simultaneously occupied at design population.

6.2.5.4 Outdoor Air Intake. The design outdoor air intake flow (V_{ot}) shall be determined in accordance with Equation 6.2.5.4.

$$V_{ot} = V_{ou}/E_v \qquad (6.2.5.4)$$

6.2.6 Design for Varying Operating Conditions

6.2.6.1 Variable Load Conditions. Ventilation systems shall be designed to be capable of providing not less than the minimum ventilation rates required in the breathing zone where the zones served by the system are occupied, including all full- and part-load conditions.

Informative Note: The minimum outdoor air intake flow may be less than the design value at part-load conditions.

TABLE 6.2.5.2 System Ventilation Efficiency

Max (Z_{pz})	E_v
≤0.15	1.0
≤0.25	0.9
≤0.35	0.8
≤0.45	0.7
≤0.55	0.6
>0.55	Use Normative Appendix A

NOTES:
1. "Max (Z_{pz})" refers to the largest value of Z_{pz}, calculated using Equation 6.2.5.1, among all the ventilation zones served by the system.
2. For values of Max (Z_{pz}) between 0.15 and 0.55, the corresponding value of E_v may be determined by interpolating the values in the table.
3. The values of E_v in this table are based on a 0.15 average outdoor air fraction for the system. For systems with higher values of the average outdoor air fraction, this table may result in unrealistically low values of E_v and the use of Normative Appendix A may yield more practical results.

6.2.6.2 Short-Term Conditions. Where it is known that peak occupancy will be of short duration, ventilation will be varied or interrupted for a short period of time, or both, the design shall be permitted to be based on the average conditions over a time period (T) determined by Equation 6.2.6.2-1 or Equation 6.2.6.2-2.

$$T = 3v/V_{bz} \qquad \text{(I-P)} \qquad (6.2.6.2\text{-}1)$$

$$T = 50v/V_{bz} \qquad \text{(SI)} \qquad (6.2.6.2\text{-}2)$$

where

T = averaging time period, min

v = the volume of the ventilation zone where averaging is being applied, ft^3 (m^3)

V_{bz} = the breathing zone outdoor airflow calculated using Equation 6.2.2.1 and the design value of the zone population (P_z), cfm (L/s)

Acceptable design adjustments based on this optional provision include the following:

a. Zones with fluctuating occupancy: The zone population (P_z) shall be permitted to be averaged over time (T).
b. Zones with intermittent interruption of supply air: The average outdoor airflow supplied to the breathing zone over time (T) shall be not less than the breathing zone outdoor airflow (V_{bz}) calculated using Equation 6.2.2.1.
c. Systems with intermittent closure of the outdoor air intake: The average outdoor air intake over time (T) shall be not less than the minimum outdoor air intake (V_{ot}) calculated using Equation 6.2.3, 6.2.4, or 6.2.5.4 as appropriate.

6.2.7 Dynamic Reset. The system shall be permitted to be designed to reset the outdoor air intake flow (V_{ot}), the space or ventilation zone airflow (V_{oz}) as operating conditions change, or both.

6.2.7.1 Demand Control Ventilation (DCV). DCV shall be permitted as an optional means of dynamic reset.

Exception: CO_2-based DCV shall not be applied in zones with indoor sources of CO_2 other than occupants or with CO_2 removal mechanisms, such as gaseous air cleaners.