6.2.2.3 Zone Outdoor Airflow. The zone outdoor airflow (V_{oz}), i.e., the outdoor airflow rate that must be provided to the *ventilation zone* by the supply air distribution system, shall be determined in accordance with Equation 6-2.

$$V_{oz} = V_{bz}/E_z \quad (6\text{-}2)$$

6.2.3 Single-Zone Systems. For ventilation systems wherein one or more air handlers supply a mixture of *outdoor air* and *recirculated air* to only one *ventilation zone*, the outdoor air intake flow (V_{ot}) shall be determined in accordance with Equation 6-3.

$$V_{ot} = V_{oz} \quad (6\text{-}3)$$

6.2.4 100% Outdoor Air Systems. For ventilation systems wherein one or more air handlers supply only *outdoor air* to one or more *ventilation zones*, the outdoor air intake flow (V_{ot}) shall be determined in accordance with Equation 6-4.

$$V_{ot} = \Sigma_{all\ zones} V_{oz} \quad (6\text{-}4)$$

6.2.5 Multiple-Zone Recirculating Systems. For ventilation systems wherein one or more air handlers supply a mixture of *outdoor air* and *recirculated air* to more than one *ventilation zone*, the outdoor air intake flow (V_{ot}) shall be determined in accordance with Sections 6.2.5.1 through 6.2.5.4.

6.2.5.1 Primary Outdoor Air Fraction. Primary outdoor air fraction (Z_{pz}) shall be determined for *ventilation zones* in accordance with Equation 6-5.

$$Z_{pz} = V_{oz}/V_{pz} \quad (6\text{-}5)$$

where V_{pz} is the zone primary airflow, i.e., the primary airflow rate to the *ventilation zone* from the air handler, including outdoor air and recirculated air.

Note: For VAV-system design purposes, V_{pz} is the lowest zone primary airflow value expected at the design condition analyzed.

Note: In some cases it is acceptable to determine these parameters for only selected zones as outlined in Normative Appendix A.

6.2.5.2 System Ventilation Efficiency. The system ventilation efficiency (E_v) shall be determined in accordance with Table 6-3 or Normative Appendix A.

6.2.5.3 Uncorrected Outdoor Air Intake. The uncorrected outdoor air intake (V_{ou}) flow shall be determined in accordance with Equation 6-6.

$$V_{ou} = D\Sigma_{all\ zones}(R_p \cdot P_z) + \Sigma_{all\ zones}(R_a \cdot A_z) \quad (6\text{-}6)$$

6.2.5.3.1 Occupant Diversity. The occupant diversity ratio (D) shall be determined in accordance with Equation 6-7 to account for variations in population within the *ventilation zones* served by the system.

$$D = P_s / \Sigma_{all\ zones} P_z\,, \quad (6\text{-}7)$$

where the system population (P_s) is the total population in the area served by the system.

Exception: Alternative methods to account for occupant diversity shall be permitted, provided that the resulting V_{ou} value is no less than that determined using Equation 6-6.

Note: The uncorrected outdoor air intake (V_{ou}) is adjusted for occupant diversity, but it is not corrected for system ventilation efficiency.

6.2.5.3.2 Design System Population. Design system population (P_s) shall equal the largest (peak) number of

TABLE 6-2 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. ***Note:*** For lower velocity supply air, E_z = 0.8.	1.0
Floor supply of cool air and ceiling return provided that the 150 fpm (0.8 m/s) supply jet reaches 4.5 ft (1.4 m) or more above the floor. ***Note:*** Most underfloor air distribution systems comply with this proviso.	1.0
Floor supply of cool air and ceiling return, provided low-velocity displacement ventilation achieves unidirectional flow and thermal stratification.	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 and/or return.	0.8
Makeup supply drawn in near to the exhaust and/or return location.	0.5

1. "Cool air" is air cooler than space temperature.
2. "Warm air" is air warmer than space temperature.
3. "Ceiling" includes any point above the *breathing zone.*
4. "Floor" 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 ANSI/ASHRAE Standard 129[17] for all air distribution configurations except unidirectional flow.

TABLE 6-3 System Ventilation Efficiency

Max (Z_P)	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 Appendix A

1. "Max (Z_{pz})" refers to the largest value of Z_{pz}, calculated using Equation 6-5, 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 (i.e., the ratio of the uncorrected outdoor air intake (V_{ou}) to the total zone primary airflow for all the zones served by the air handler). 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 Appendix A may yield more practical results.