Outdoor Air Rate for People and Floor Area

Breathing-zone outdoor air from a per-person and a per-area rate, corrected for air distribution effectiveness, with the outdoor-air fraction of the supply.

Method: Ventilation rate procedure (people plus area components); ASHRAE Handbook of Fundamentals (ASHRAE)

Input parameters

Unit system: SI

Parameter	Value	Unit
Occupants	40.000	
Outdoor air per person	2.5000	L/s
Floor area	200.00	m²
Outdoor air per m² of floor	0.30000	mm/s
Air distribution effectiveness	80.000	%
Supply air flow	2,000.0	L/s

Calculated results

Parameter	Value	Unit
Breathing-zone outdoor air	160.00	L/s
Zone outdoor air	200.00	L/s
Outdoor air per person	5.0000	L/s
Outdoor-air fraction of supply	10.0000	%

Notes for this case

- V_bz = R_p·P_z + R_a·A_z; V_oz = V_bz/E_z. Take R_p, R_a and E_z for the space type from the ventilation standard that applies; the defaults are typical office values.

Formula and method

$$\dot{V}_{bz} = R_p P_z + R_a A_z, \quad \dot{V}_{oz} = \frac{\dot{V}_{bz}}{E_z}$$

Variables

P_z	Occupants	-
R_p	Outdoor air per person	m³/s
A_z	Floor area	m²
R_a	Outdoor air per m² of floor	m/s
E_z	Air distribution effectiveness	-
$\dot{V}_s$	Supply air flow	m³/s
$\dot{V}_{bz}$	Breathing-zone outdoor air	m³/s
$\dot{V}_{oz}$	Zone outdoor air	m³/s
$\dot{V}_{oz}/P_z$	Outdoor air per person	m³/s
$\dot{V}_{oz}/\dot{V}_s$	Outdoor-air fraction of supply	-

Method and standards

Ventilation rate.

Assumptions and limits

- Steady occupancy; single zone.

References

Ventilation rate procedure (people plus area components), ASHRAE Handbook of Fundamentals (ASHRAE)

Report details

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Release checks	3 reference cases of this calculator, computed independently, are checked on every release

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/hvac/loads/ventilation-rate-people-area

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.