Infiltration from Leakage Area: Combined Stack and Wind

Air infiltration of a house from its effective leakage area with stack and wind coefficients (LBL model), the air change rate and the sensible heat loss.

Method: Effective leakage area infiltration model

Input parameters

Unit system: SI

Parameter	Value	Unit
Effective leakage area at 4 Pa (cm²)	500.00	
Stack coefficient (L/s)²/(cm⁴·K)	1.4500e-04	
Wind coefficient (L/s)²/(cm⁴·(m/s)²)	1.0400e-04	
Indoor temperature	21.000	°C
Outdoor temperature	-5.0000	°C
Wind speed at the weather station	16.200	km/h
Building volume	400.00	m³

Calculated results

Parameter	Value	Unit
Stack-only infiltration	30.700	L/s
Wind-only infiltration	22.946	L/s
Combined infiltration	38.328	L/s
Air changes per hour	0.34495	
Sensible heat loss	1.3197	kW

Notes for this case

• The Lawrence Berkeley Laboratory (Sherman–Grimsrud) model treats a house as one zone whose leaks have an effective area A_L measured by a blower-door test at 4 Pa. Stack and wind pressures add in quadrature: Q = A_L√(C_sΔT + C_wU²) with Q in L/s, A_L in cm², ΔT in K and U in m/s. C_s depends on the number of storeys (about 0.000145 for one, 0.000290 for two, 0.000435 for three) and C_w on height and shelter class; take both from the design guide. The heat loss uses outdoor air density and c_p = 1.006 kJ/kg·K.

Formula and method

$$Q = A_L\sqrt{C_s\Delta T + C_w U^2}, \quad ACH = \frac{3600\,Q}{V}$$

Variables

A_L	Effective leakage area at 4 Pa (cm²)	-
C_s	Stack coefficient (L/s)²/(cm⁴·K)	-
C_w	Wind coefficient (L/s)²/(cm⁴·(m/s)²)	-
T_i	Indoor temperature	K
T_o	Outdoor temperature	K
U	Wind speed at the weather station	m/s
V	Building volume	m³
Q_s	Stack-only infiltration	m³/s
Q_w	Wind-only infiltration	m³/s
Q	Combined infiltration	m³/s

ACH	Air changes per hour	-
$\dot{Q}_h$	Sensible heat loss	W

Method and standards

Combined infiltration.

Assumptions and limits

- Single zone; coefficients for the building's height and shelter.

References

Effective leakage area infiltration model

Report details

Report reference	FCC-D13G-4247 (the same inputs always give the same reference)
Generated	23 November 2026, 17:50 UTC
Calculator	Infiltration from Leakage Area: Combined Stack and Wind
Method last reviewed	17 November 2026
Software release	FireCAD Calc, release of 22 November 2026
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/infiltration-stack-wind-combined

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.