Infiltration by the Crack Method (Wind and Stack)

Air infiltration through window and door cracks from crack length, a flow coefficient, wind speed and stack height, with air changes and heat load.

Method: ASHRAE Handbook—Fundamentals (2017); ch. 16 (power-law leakage Q = C·L·Δp^n; wind and stack pressures)

Input parameters

Unit system: SI

Parameter	Value	Unit
Crack length	30.000	m
Flow coefficient at 1 Pa, in L/(s·m) per Pa^n	0.15000	
Flow exponent	0.65000	
Wind speed	5.0000	m/s
Pressure coefficient difference across the building	0.80000	
Height above the neutral plane	3.0000	m
Inside temperature	20.000	°C
Outside temperature	5.0000	°C
Room volume	300.00	m³

Calculated results

Parameter	Value	Unit
Pressure difference (wind + stack)	14.601	Pa
Infiltration	92.546	m³/h
Air changes per hour	0.30849	
Infiltration heat load	492.28	W

Notes for this case

• Wind and stack pressures are added, a conservative simplification. Outside air density from the ideal gas law at standard pressure. Heat load is negative when outside is warmer (sensible gain).

Formula and method

$$\Delta p = \Delta C_p \frac{\rho v^2}{2} + \rho g h \frac{|T_i - T_o|}{T_i}, \quad \dot{V} = C L \Delta p^n$$

Variables

L	Crack length	m
C	Flow coefficient at 1 Pa, in L/(s·m) per Pa^n	-
n	Flow exponent	-
v	Wind speed	m/s
ΔC_p	Pressure coefficient difference across the building	-
h	Height above the neutral plane	m
t_i	Inside temperature	K
t_o	Outside temperature	K
V	Room volume	m³
Δp	Pressure difference (wind + stack)	Pa
$\dot{V}$	Infiltration	m³/s

ACH	Air changes per hour	-
Q	Infiltration heat load	W

Method and standards

Power-law leakage.

Assumptions and limits

- Steady wind; uniform cracks.
- C is in L/(s·m) at 1 Pa in every unit system; convert a US figure (cfm per ft at 0.3 in WC) first.
- Outside air density at 101 325 Pa with M = 28.9647 kg/kmol; heat load with c_p = 1006 J/(kg·K).

References

• ASHRAE Handbook—Fundamentals (2017)
• ch. 16 (power-law leakage Q = C·L·Δp^n; wind and stack pressures)

Report details

Report reference	FCC-G4GR-JX6Z (the same inputs always give the same reference)
Generated	17 November 2026, 19:44 UTC
Calculator	Infiltration by the Crack Method (Wind and Stack)
Method last reviewed	13 November 2026
Software release	FireCAD Calc, release of 17 November 2026
Release checks	2 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-crack-method

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.