Blower Door Test: ACH50, Air Permeability and Leakage Area

Air changes at 50 Pa, air permeability, an estimate of natural air change rate and the equivalent leakage area at 4 Pa from a blower door test result.

Method: Fan pressurisation test interpretation; ASHRAE Handbook of Fundamentals (ASHRAE); ...

Input parameters

Unit system: SI

Parameter	Value	Unit
Leakage flow at 50 Pa	1,500.0	m³/h
Building internal volume	400.00	m³
Envelope area	330.00	m²
Flow exponent	0.65000	
ACH50 to natural ACH divisor	20.000	
Air density	1.2000	kg/m³

Calculated results

Parameter	Value	Unit
Air changes at 50 Pa	3.7500	1/h
Air permeability	4.5455	m³/(h·m²)
Estimated natural air change rate	0.18750	1/h
Leakage at 4 Pa	290.47	m³/h
Equivalent leakage area at 4 Pa	312.49	cm²

Notes for this case

• Q = C·Δpⁿ scales the 50 Pa flow to 4 Pa; ELA = $Q_4\sqrt{(\rho/2\Delta p)}$ (discharge coefficient 1). The divisor N (about 10–30) depends on climate, height and shielding; it gives only a rough seasonal average infiltration.

Formula and method

$$n_{50} = \frac{\dot{V}_{50}}{V}, \quad \dot{V}_4 = \dot{V}_{50}\left(\frac{4}{50}\right)^{n}, \quad ELA = \dot{V}_4\sqrt{\frac{\rho}{2 \cdot 4\,\mathrm{Pa}}}$$

Variables

$\dot{V}_{50}$	Leakage flow at 50 Pa	m³/s
V	Building internal volume	m³
A_E	Envelope area	m²
n	Flow exponent	-
N	ACH50 to natural ACH divisor	-
ρ	Air density	kg/m³
n_{50}	Air changes at 50 Pa	1/s
q_{50}	Air permeability	m/s
n_{nat}	Estimated natural air change rate	1/s
$\dot{V}_4$	Leakage at 4 Pa	m³/s
ELA_4	Equivalent leakage area at 4 Pa	m²

Method and standards

Pressurisation test.

Assumptions and limits

- Power-law leakage; single-zone building.

References

Fan pressurisation test interpretation, ASHRAE Handbook of Fundamentals (ASHRAE), ch. 16

Report details

Report reference	FCC-586F-YH7Q (the same inputs always give the same reference)
Generated	23 November 2026, 17:50 UTC
Calculator	Blower Door Test: ACH50, Air Permeability and Leakage Area
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/blower-door-ach50

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.