

What is Adventitious Ventilation?

Adventitious ventilation refers to the uncontrolled ingress (or egress) of external air into (or from) a dwelling through unintended gaps, cracks, porous materials, and other non-designed openings in the building envelope—driven by wind pressures, the stack (buoyancy) effect, and pressure differentials. It is not manually controlled or deliberately provisioned.

Explanation & Key Features

1. Driving forces

- **Wind pressure:** On the windward side of a building, external air pressure forces air through leaks; on the leeward side, suction may draw air out (or draw in on negative pressure side).
- **Stack (buoyancy) effect:** Warm indoor air rises and escapes through high leaks (e.g. roof, chimneys), pulling in external air at lower-level cracks.
- **Pressure imbalances:** Mechanical systems (fans, extract ventilation) can cause negative or positive pressure that enhances uncontrolled flows.

2. Difference from “purpose-provided” ventilation

- Adventitious ventilation is **not deliberate** (i.e. not a vent, grille, duct, fan, trickle vent).
- It is unpredictable in magnitude and location.
- While it provides some fresh air exchange, its rate is variable, dependent on weather, envelope condition, usage, and temperature differentials.

3. Role in UK dwellings (existing and new builds)

- In many traditional (less airtight) UK houses, infiltration historically contributed significantly to total ventilation.
- However, as insulation, draught proofing and more airtight construction are introduced (especially in retrofit), adventitious ventilation is reduced, making the building more reliant on controlled ventilation to maintain indoor air quality (IAQ).
- Under Building Regulations (Approved Document F), when retrofitting, one must ensure

that ventilation after works is not worse than before, taking into account how infiltration may be reduced by sealing.

4. Impacts and trade-offs

- **Heat loss / energy penalty:** Adventitious air exchange brings in colder external air in winter (and warmer air in summer), increasing heating (or cooling) demand.
- **Comfort / draughting:** Uncontrolled flows may create cold draughts, uneven temperatures, or discomfort near leaks.
- **Moisture risks:** It can introduce humid air, leading to internal moisture loads, condensation, damp or mould in unsuitable places.
- **Indoor air quality (IAQ):** Some fresh air is beneficial (dilution), but because rates fluctuate and flows may be poorly distributed, reliance solely on adventitious ventilation is insufficient to meet pollutant removal and humidity control objectives.
- **Noise, dust, pollutants:** External air comes through uncontrolled channels—carrying noise, pollen, dust, and external pollution (especially in urban sites).

5. Quantification / modelling

- Typically characterised by **air leakage rate**, **air permeability** or **air change per hour (ACH)** under test pressures (e.g. at 50 Pa), then converted via empirical factors to estimate natural infiltration under typical conditions.
- In the Home Energy Model (HEM, replacing SAP), infiltration is modelled separately from controlled ventilation, based on measured airtightness and appropriate divisor factors to estimate year-average uncontrolled flow.
- Example: If a dwelling's envelope is tested at 50 Pa and yields an n_{50} (air changes per hour at 50 Pa), one can convert to a “background infiltration rate” under normal driving pressures using methods set out in HEM-TP-06.

6. Management / mitigation in retrofit / extension

- Where possible, reduce adventitious leakage through airtightness measures (sealing junctions, improving window/door detailing), while ensuring the dwelling retains adequate **designed ventilation** (e.g. background ventilators, extract systems, MVHR).
- Retrofit guidance (e.g. PAS 2035) emphasises that reducing leakage without

compensating ventilation risks under-ventilation and poor IAQ.

- In extensions or changes of use, sealing new junctions is vital; but designers must check that existing ventilation paths and required flow rates are maintained or upgraded.