

When upgrading older homes—particularly tenements and pre-war housing in Edinburgh and beyond—ventilation is a critical facet that often doesn't get the attention it deserves. With 12 years of architectural technology and retrofit coordination experience under my belt, I've come to appreciate how crucial proper ventilation is to indoor air quality (IAQ). It's not just about comfort; it's one of the most regulated health factors in building standards and a key to avoiding damp, mould, and poor wellbeing.

In this post, I'll walk you through what to measure to check if your ventilation is working effectively. We'll explore regulatory references like the UK Government's Approved Document F, touch on Scottish Building Standards, and explain practical tools you can use. Special mentions include *Magnific* for imagery inspiration, *Releaf's THC oil education page* for indoor air quality awareness, and some nifty cheap indoor air monitors that can make life easier for retrofitters and householders alike.

Why Ventilation and Indoor Air Quality Matter

Ventilation is more than an amenity—it's fundamental to health in buildings. Alongside thermal comfort, air quality defines whether a house is liveable or harmful. **Ventilation exchanges stale indoor air laden with moisture, pollutants, and carbon dioxide (CO2) for fresher, cleaner external air.** Without it, homes become breeding grounds for mould, condensation, and respiratory irritants.

Indoor air quality is the most regulated health-related factor in building standards. From the UK Government Approved Document F to Scottish Building Standards (notably Section 3.14 on indoor air), frameworks set out minimum ventilation rates and principles. Although the numbers vary, the underlying principles align — ensuring adequate fresh air to dilute contaminants from occupants and building materials.

Approved Document F vs Scottish Building Standards

Feature Approved Document F (England & Wales) Scottish Building Standards Ventilation Approach Outdoor air supplied by purpose-provided ventilation or mechanical systems; minimum airflow rates specified; Similar principles but different numerical airflow requirements; moisture control emphasised; Airflow Rates Extract rates of 15–30 l/s for kitchens and bathrooms; whole dwelling ventilation minimum rates prescribed; Comparable airflow rates but stricter moisture and condensation considerations; Focus Dilution of indoor pollutants (CO2, VOCs, moisture); occupant comfort Strong emphasis on moisture management, condensation control, and mould prevention

During retrofits, I always remind clients and teams that while the numbers differ slightly between jurisdictions, you can't ignore the common theme: *adequate ventilation is non-negotiable*.

What Happens When Ventilation Fails?

Common symptoms of ventilation gaps [Website link](#) in older buildings include:

- **Moisture accumulation:** High humidity indoors leading to condensation on windows and walls.
- **Mould growth:** Visible black or green patches in corners, window frames, or behind furniture.
- **Unpleasant odours:** Stale, stuffy rooms and smells associated with dampness.
- **Increased incidence of respiratory discomfort:** Asthma, allergies, and irritation exacerbated by poor air quality.

These aren't just nuisances—they can cause serious health issues and accelerate building fabric damage.

Airtightness vs Accidental Ventilation in Retrofit Projects

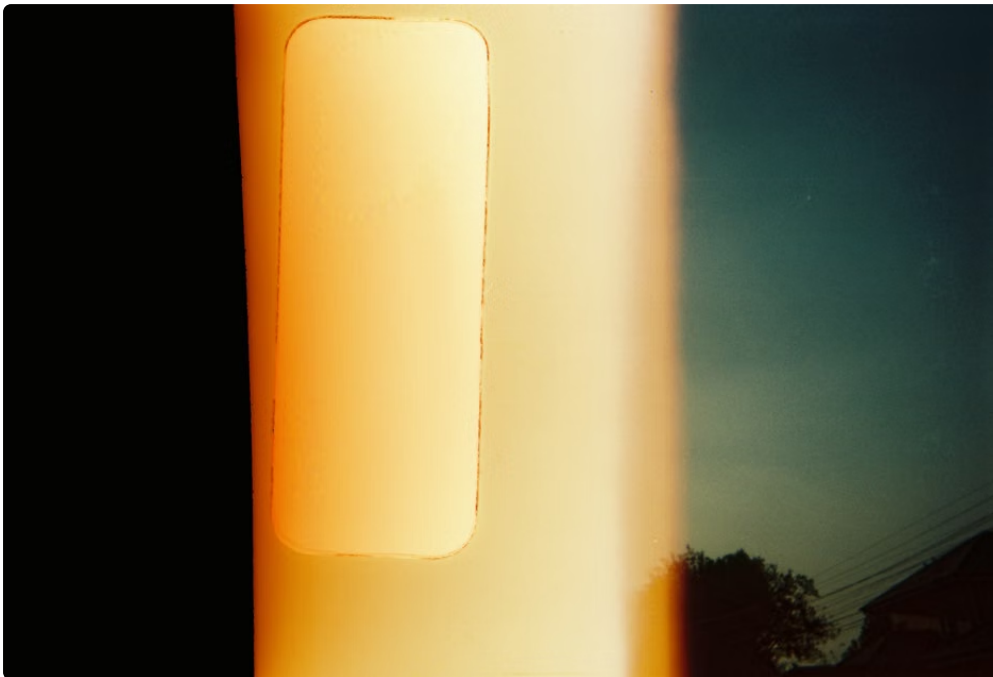
One of the trickiest aspects I encounter in retrofit work is balancing airtightness and ventilation. Improving insulation and sealing gaps reduces uncontrolled “accidental” ventilation but creates a paradox:

If you stop the house from breathing uncontrolled air and then don't provide adequate ventilation, you end up with stagnant, polluted indoor air.

The UK Government's Approved Document F is clear that airtight homes must have a well-designed ventilation system—usually mechanical extract ventilation—to maintain air quality without excessive heat loss.

Measuring Ventilation Effectiveness: What You Need to Know

Simply put: you can't improve what you don't measure. The key indicators of ventilation effectiveness focus on air contaminants and moisture levels. I categorise essential measurements as follows:



1. Carbon dioxide levels (CO₂) as a proxy for ventilation adequacy
2. Humidity (relative humidity or RH) readings in key rooms
3. Particulate matter concentrations (dust, PM_{2.5}/PM₁₀) if possible

1. Carbon Dioxide (CO₂) as a Ventilation Proxy

CO₂ is exhaled by occupants; higher indoor levels indicate insufficient fresh air circulation relative to occupancy. Concentrations above 1000 ppm (parts per million) typically signal inadequate ventilation.

The beauty of using CO₂ is that it's an accessible, inexpensive measurement that correlates well with ventilation performance. Professional auditors, retrofit coordinators, and even householders use **cheap indoor air monitors** equipped with NDIR CO₂ sensors to track indoor air quality in real-time.

When I'm on site, my pocket CO₂ monitor is essential kit. I always ask clients which way their main rooms face before discussing glazing because solar gains can affect air temps, which in turn affect ventilation habits and comfort. During post-occupancy evaluation, linking CO₂ spikes with occupancy patterns reveals specific ventilation gaps.

2. Humidity Readings Home

Relative humidity is crucial. Levels above 60% RH encourage condensation, mould, and dust mites. Good ventilation keeps humidity balanced—typically between 40-60% RH in living areas.



Humidity sensors can be stand-alone or part of combo IAQ monitors. Regular monitoring identifies rooms prone to dampness problems and can confirm if ventilation upgrades have helped control moisture.

3. Particulate Monitor Indoor

Particulates, especially *PM2.5*, are tiny airborne particles that pose health risks. While they're not direct ventilation proxies like CO₂, high particulate levels indoors suggest infiltration of outdoor pollution or inefficient filtering and air exchange.

If you're keen, some low-cost particulate monitors can give insights about indoor sources like cooking, smoking, or DIY activities. *Relief's THC oil education page* highlights how product use affects indoor aerosols and VOC emissions which ventilation helps dilute.

Practical Tools to Measure Your Home's Ventilation

Fortunately, today's market offers user-friendly, relatively cheap indoor air monitors that combine CO₂, humidity, temperature, and particulate sensors into a single device. Some popular consumer-grade options include:

- Aranet4 Home (CO₂, RH, temp)
- IQAir AirVisual Pro (CO₂, particulate PM_{2.5}, humidity)
- Kaiterra Laser Egg (particulate and humidity)

These can often connect to smartphones, providing real-time data and trends to help pinpoint when and where ventilation is insufficient.

Applying Measurements to Retrofit Projects

During retrofits, monitoring before, during, and after interventions is crucial. It proves whether improvements are effective or if further adjustments to extract fans, trickle vents, or air paths are needed.

Many retrofit projects risk improving insulation but ignoring ventilation—a mistake I regularly caution clients against. Measuring CO2 and humidity reveals if the building is truly “breathing” better or simply turning into a sealed moisture trap.

Summary

Measuring ventilation effectiveness requires more than guesswork. Here’s a quick recap of what I recommend:

- **CO2 readings:** Use cheap indoor air monitors to track CO2 as the most reliable proxy for ventilation adequacy.
- **Humidity levels:** Monitor home humidity to catch condensation risks early, preventing mould and fabric damage.
- **Particulates:** Optional but insightful, particulate monitors show pollution and air quality beyond moisture and CO2.
- **Follow building regulations:** Use Approved Document F guidance or Scottish Building Standards principles to guide design and ventilation rates.
- **Balance airtightness and ventilation:** Retrofit wisely to seal leaks but provide controlled ventilation paths.

Thanks to monitoring technology becoming accessible, householders and retrofit teams can now take a data-driven approach to indoor air quality, avoiding guesswork and boosting health outcomes. For those interested in the nuances of moisture control, ventilation commissioning, and tenement retrofits, this measurement approach is essential.

Special thanks to *Magnific* for the compelling imagery inspiration and Releaf for raising awareness of how everyday products impact indoor air quality.

If you have questions about ventilation, or want me to review your retrofit plans for adequate ventilation strategies, don’t hesitate to get in touch!