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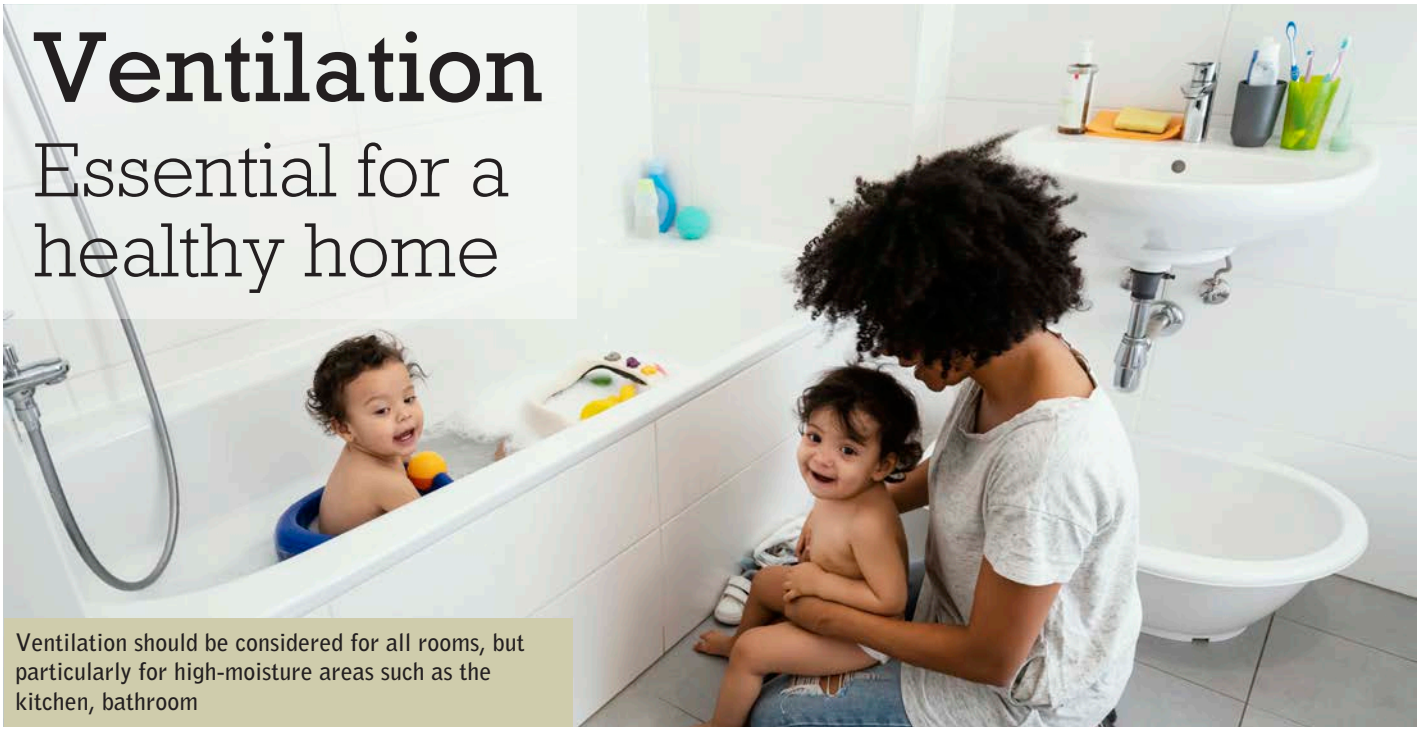
centre for sustainable energy

Ventilation

Essential for a healthy home



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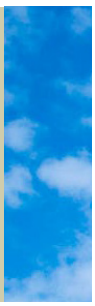
Ventilation is the planned exchange of air between the external and internal environment in order to provide fresh air, remove pollutants and regulate temperature. This is different to air infiltration (draughts), which is unplanned air movement through gaps in the building fabric.

We spend most of our time (80-90%) inside buildings, so ensuring that the interior environment is a healthy place to live and work is very important. Adequate ventilation helps ensure good indoor air quality by removing potentially harmful pollutants such as cooking fumes, particulate matter, allergens such as pollen, carbon monoxide and chemicals such as those often found in paints, carpets, furniture and other household items.

Ventilation also regulates internal moisture levels. Water vapour within buildings is mostly produced by human activities such as breathing, washing, cooking and drying clothes, and in some instances moisture may also enter through the building fabric. When moisture in the air comes into contact with cold surfaces such as single-glazed window panes, it condenses and forms water droplets (condensation).

Condensation can lead to the appearance of black mould, which produces spores harmful to our lungs. Damp and condensation can cause structural damage such as wood rot and cause plaster to disfigure. (See our Damp & Condensation factsheet for advice on tackling this issue.)

The level of moisture in the air is measured by relative humidity, which describes how saturated with water vapour the air is as a percentage. It is affected by the air temperature (hot air can hold more moisture). Ideally, internal relative humidity should be between 40-60%.



Ventilation also helps prevent overheating, which is more likely to occur in cities, in top-floor flats or in well insulated but poorly ventilated buildings. Overheating is becoming an increasingly significant problem due to the effects of climate change.

A draughty home is not necessarily a well-ventilated and healthy one

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Which rooms needs ventilating?

As we make our buildings more energy efficient we also make them more air-tight. This includes reducing draughts, installing insulation and in older homes introducing less-traditional and less-breathable building materials. In such buildings, ventilation is particularly important. But all buildings, young or old, need ventilation to provide fresh air, to remove stale air and to regulate moisture.

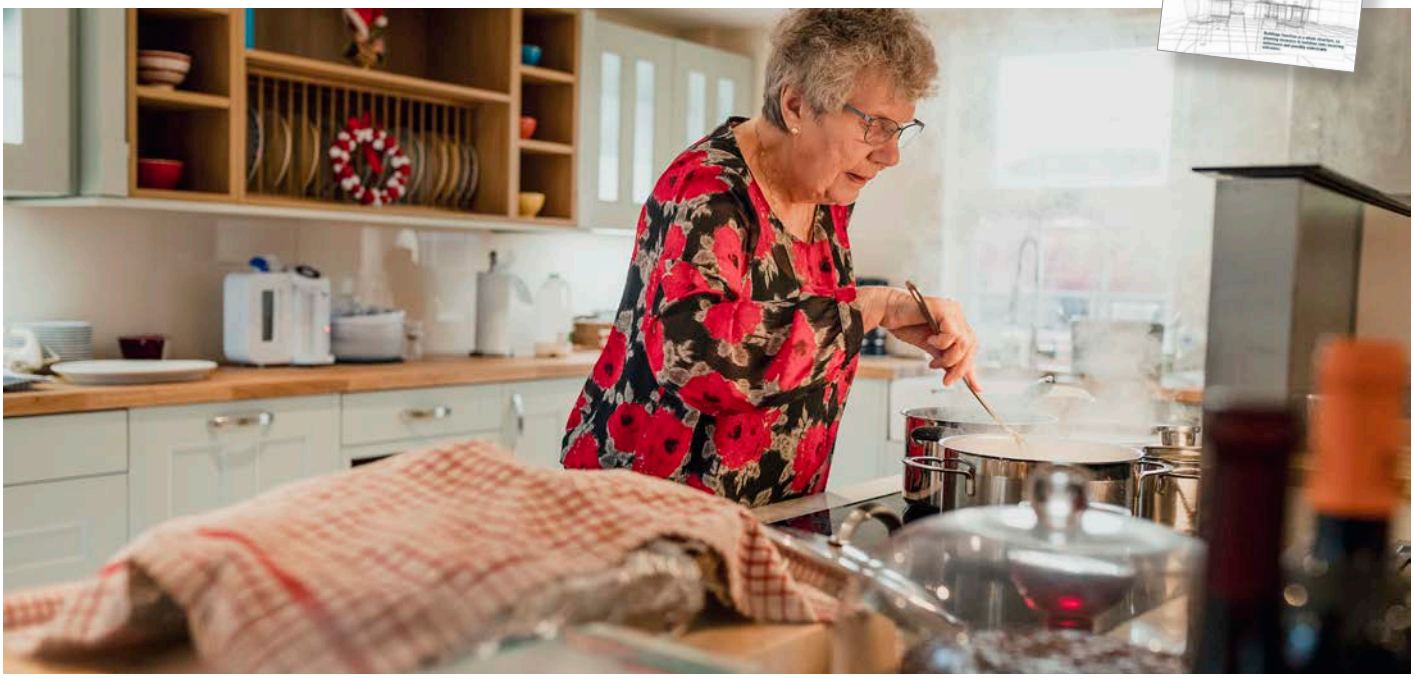
Ventilation should be considered for all rooms, but particularly for high-moisture areas such as the kitchen, bathroom or utility room. Removing moisture at its source in these rooms using extractor fans and opening windows will help stop it spreading to other areas of the house where it may condense on any cold surfaces. Closing the door to these rooms while they are in use (and after) will also help.

Drier areas like bedrooms and living rooms can be ventilated by leaving doors and trickle vents on window units (if applicable) open.

And bear in mind that all homes have some spaces that may not experience a good air flow and where damp can build up. So where necessary, pull furniture away from the walls by a few inches to allow passage of air, or drill ventilation holes into cupboards and wardrobes and avoid overfilling them with clothing.

Additional ventilation is required for certain types of room heaters. Gas and solid fuel heaters often require either a direct air feed or an air brick in the exterior wall to prevent the build-up of carbon monoxide. Ideally a carbon monoxide monitor and alarm should be installed if you have one of these heaters.

Ensuring the walls, loft and sub-floor spaces are properly ventilated is another important consideration, particularly if insulation is being added which may block existing ventilation points, reduce breathability or trap moisture in. See our factsheet on low-carbon retrofitting (right) for more information.

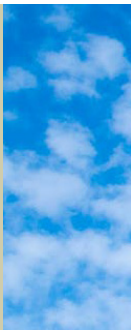


Planning home improvements?

If you're retrofitting energy efficiency improvements such as insulation and draught proofing, always consider the need for enhanced ventilation.

There are three ventilation-related building regulations to check your contractor is aware of:

1) 'Ensure adequate fresh air is provided' (Part F).
2) 'Ensure dangerous pollutants from fuel burning appliances are removed' (Part J).
3) 'Protect the structure from moisture, by adequately ventilating roof, floor and wall constructions where required' (Part C).



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What ventilation options are available?

Ventilation systems come in many shapes and sizes: they can be passive or mechanical, single room or whole house, and extract only or supply and extract. Here are six common examples ...

Natural ventilation

The simplest way of ventilating a home is to open the windows! It's an obvious solution, but it is surprisingly easy to forget, and many of us don't like to open the windows when it's raining. It can also lead to excessive heat loss and doesn't guarantee that the fresh air gets to places that need it. Security issues can be resolved by installing window restrictors.

Passive ventilation systems

Background ventilation can be provided by simple built-in features like trickle vents on windows or air bricks. These don't require power but instead use pressure differentials between the inside and outside to force stale air out and draw fresh air in. Consequently, they may not perform well on very still days and may not be sufficient to ventilate very air-tight properties. Also in this category is passive stack ventilation that uses a combination of air flow over roof vents and the natural buoyancy of warm air to remove stale, moist air up and out through ducting and existing chimneys.

Intermittent extract

Extractor fans in bathrooms, kitchens and utility rooms and controlled via a lightswitch or a timer, humidity sensor or presence sensors, are a relatively cheap and simple solution, but not always sufficient for very air-tight or damp prone properties.

Positive Input Ventilation (PIV)

In this system, a fan in the loft continually draws outside air into the home, forcing stale air out through trickle vents and building fabric.

This is a simple option but can have high running costs (electricity) and may cause comfort issues when cold air is forced into rooms. There is an additional structural risk in forcing warm and moist air into the building fabric.

Mechanical Extract Ventilation (MEV)

Centralised MEV systems use a single continuously running fan unit (often in the loft) to extract air from some or all rooms. They can be controlled at least partly by a humidity sensor. The single separate fan minimises draughts and reduces energy usage (and noise). However, the systems are complex and expensive to install, and only suitable where there is ample space for ducting pipes. *Decentralised* MEV systems are similar to an intermittent extract system, but run continuously. Hybrid systems combining MEV with passive ventilation are also available.

Mechanical Ventilation with Heat Recovery (MVHR)

These operate in a similar manner to MEV systems, but extracted air is passed through a heat exchanger which warms up the incoming fresh air. This leads to improved energy efficiency and comfort, as the air entering the house is warm. But they're not cheap as the filters require regular changing, and installation is complex because a lot of space is required (see photo). For this reason, MVHR systems are more commonly found in new builds or whole-house retrofits. Decentralised MVHR systems are also available, consisting of multiple fans with individual heat exchangers.

When choosing a system, consider your budget, the ease of retrofitting and the airtightness of the building. More air-tight homes are more likely to need continuous and mechanically assisted ventilation; if your home isn't very airtight (most old homes aren't), then a less complex system might be more suitable.

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Eight tips for good indoor air quality

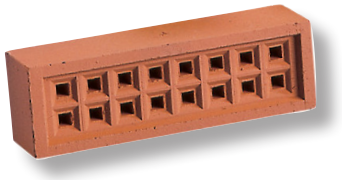
1. Check your existing extractor fans. Are they clean and working properly? Could you change the timer so they run for longer?

2. Try to buy paints and furnishings low in volatile organic compounds.

3. Tackle moisture where it's produced, by drying clothes outside (or ventilating rooms where clothes are drying) and by putting lids on pans when cooking.

4. Get a carbon monoxide alarm, especially if you have a solid fuel or gas room heater.

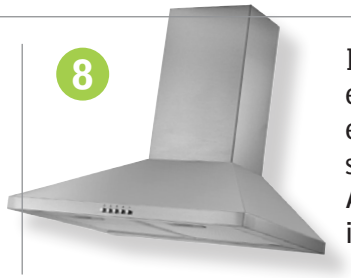
5. If you have air bricks in the walls don't cover them. If your windows have trickle vents, keep them open.



6. Check your property for signs of rising or penetrating damp, a survey may be required if you are unsure.

7. If you feel your home is too damp or too dry get a hygrometer, which will monitor air temperature and relative humidity.

8. If you have a cooker hood extractor, check whether it extracts to the outside, or simply vents near the ceiling. Also clean the filter whenever it starts getting bunged up.



See our related factsheets on:

- Condensation, damp and mould.
- Mechanical ventilation with heat recovery.
- Low-carbon retrofitting.
- Energy efficient glazing & high performance external doors.

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The Centre for Sustainable Energy is a national charity (298740) that helps people change the way they think and act on energy.

Our Home Energy Team offers free advice on domestic energy use to householders in Bristol, Somerset, North Somerset, Bath & North East Somerset, Wiltshire, South Gloucestershire and Dorset.

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