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Ventilation

Essential for a healthy home

Ventilation should be considered for all rooms, but particularly for high-moisture areas such as the kitchen, bathroom

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.

Why is ventilation important?

We spend most of our time (80-90%) inside buildings, so ensuring we're in a healthy environment to live and work in is very important.

Ventilation improves indoor air quality by removing potentially harmful pollutants such as cooking fumes, particulate matter, pollen and other allergens, carbon monoxide and chemicals such as those often found in some 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, known as 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 damage to plaster. CSE has more information on Condensation, Damp and Mould for advice on tackling this issue.

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 an increasingly significant problem due to the effects of climate change.

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

Which rooms needs ventilating?

Ventilation is particularly important for high-moisture areas such as the kitchen, bathroom or utility room. Using extractor fans and opening windows will help stop moisture from spreading to other areas of the house where it may condense on cold surfaces and lead to damp. Closing the doors to these rooms while they're in use (and after) will also help.

Drier areas like bedrooms and living rooms still need ventilating. Leaving doors and trickle vents on window units open can help fresh air get around the room. If you're installing a mechanical ventilation system (see ventilation types below), background vents are required. This allows air to flow around the home as extractor fans in the wet rooms can pull fresh air through the dry rooms, and out through the wet rooms.

Bear in mind that all homes have some spaces without good airflow where damp can build up. 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. See our page on low-carbon retrofitting for more information at www.cse.org.uk/advice.

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 seven common examples ...

Natural ventilation

The simplest way of ventilating a home is to open the windows! It's an obvious solution, but it's surprisingly easy to forget, and many of us don't like to open the windows when it's raining or for security – although window restrictors can solve this worry. It can also lead to excessive heat loss and doesn't guarantee that the fresh air gets to places that need it.

Passive ventilation systems

Background ventilation can be provided by simple built-in features like trickle vents on windows or air bricks in walls. These don't require power but instead, use the pressure difference between inside and outside air 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 which uses a combination of airflow 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

In this category are the common extractor fans found in bathrooms, kitchens and utility rooms and usually controlled by a light switch, a timer or humidity sensor. They're 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 and is therefore not considered best practice.

Mechanical Extract Ventilation (centralised)

Centralised mechanical extract ventilation (MEV) systems use a single fan unit (often in the loft) that runs continuously to extract air from some or all rooms. The continuous extraction ensures a good background level of ventilation and they can boost ventilation rates when humidity levels are high, thanks to inbuilt humidity sensors. 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 to transport air.

Mechanical Extract Ventilation (decentralised)

Decentralised mechanical extract ventilation is similar to intermittent extract ventilation systems (above) insofar as there are individual fans installed in spaces such as bathrooms, utility rooms and kitchens. The difference is that the fans aren't turned on or off via a light switch or similar, but provide continuous low levels of ventilation, which is boosted when humidity levels are high, similar to centralised MEV. Decentralised MEV is cheaper to install and requires less space than centralised MEV systems. Hybrid systems combining MEV with passive ventilation are also available.

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.

Mechanical Ventilation with Heat Recovery (MVHR)

These systems operate similarly to centralised 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 and the installation is complex and requires a lot of space. 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. (We have a whole page on MVHR on our website.)

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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.

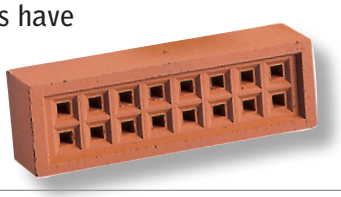
3

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

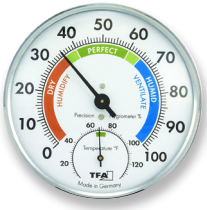
Get a carbon monoxide alarm, especially if you have a solid fuel or gas room heater.

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. Remember, relative humidity should be between 40 and 60%.

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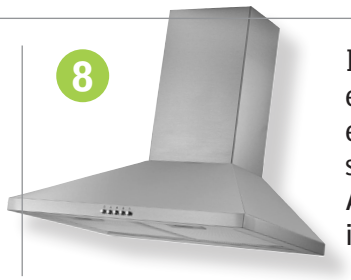

If you have a cooker hood extractor, check whether it extracts to the outside, or simply vents near the ceiling. Also clean the filter whenever it starts getting bunged up.

We have related factsheets on:

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

Download at www.cse.org.uk/advice-leaflets

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St James Court
St James Parade
Bristol BS1 3LH

0117 934 1400
cse.org.uk
info@cse.org.uk

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Contact us:

PHONE 0800 082 2234
EMAIL home.energy@cse.org.uk
WEB www.cse.org.uk
TWITTER @HelloCSE