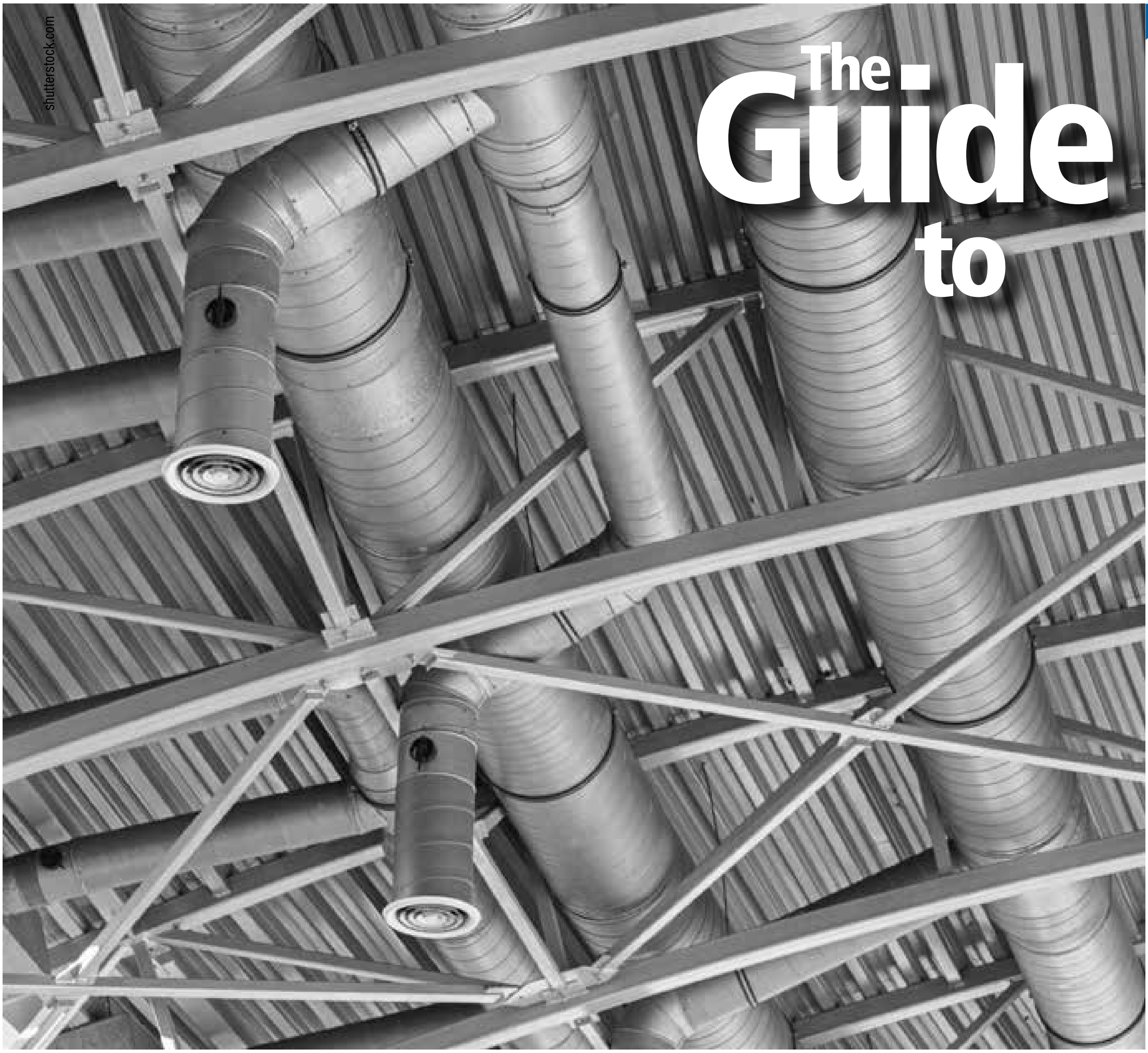



# The Guide to Building Ventilation

**Nearly 80 percent of our lives we spend inside- in our houses, flats, offices, therefore comfort, health and safety should be the priority of modern design. The quality of air has a significant influence on our well-being. The quality of air inside residential buildings varies, and often we can talk about so-called sick buildings. It also refers to residential buildings. The sick building syndrome describes a range of symptoms thought to be linked to spending time in a particular building; often it is a workplace, but not only.**

Sick Building Syndrome is a phenomenon that has been identified recently. The term Sick Building Syndrome (SBS) was introduced by World Health Organization, which in this way defined a combination of non-specific health symptoms, the occurrence of which is connected with staying in a given interior and which disappear after leaving it. These ailments include, among others: a headache and dizziness, fatigue, irritation, nausea, blocked or running nose and skin symptoms such as over-drying or skin rashes.

So far the problem is poorly identified, and it is relatively rare that the above-mentioned symptoms are linked with the influence of a building's design and the quality of applied materials and technologies. A given person's response to particular factors depends on their intensity, the time of staying in a building or finally, individual sensitivity to physical discomfort. New builds are nowadays significantly more warm and airtight, while old buildings are often damped. In both scenarios quality of air inside the building does not create a safe living environment. SBS are mostly connected with offices, open plan modern buildings with mechanical air ventilation or air conditioning system.

Generally, inappropriate ventilation can be seen as the main "wrongdoer" of the low quality of air inside buildings. The present pressure on the more energy efficient buildings leads to increased air-tightness of walls what means that new buildings require a better system of fresh air inflow. Ventilation designed in an inappropraite way is insufficient.

Apart from supplying the interior with fresh air, rooms ventilation also aims at removing the excess of water vapour. It is estimated that optimal air humidity for a human oscillates within 40-60%. In the environment that is too dry, we suffer from breathing problems, in the environment that is too humid – the risk of moulds and fungi development increases. Thicker insulation of walls or attics can help to reduce the energy bills, but in the case of improper installation, it conduces to the formation of dampness in the places of thermal bridges.

## Yes for energy efficiency, but not at the cost of ventilation

To cut operating costs of buildings, designers and contractors are doing their best to ensure the adequate insulation of buildings, air-tightness of windows and installation of more efficient heating systems. However, at the same time, it is necessary to ensure the proper ventilation system is installed. Intelligent solutions are worth investing:

- energy efficient rotary heat exchanger
- windows with air vents
- thermal bridge free structure

## Building Regulations

Approved Document F (The Building Regulations 2010) gives guidance for compliance with the Building Regulations for ventilation in buildings in England. For more information visit also planningportal.co.uk.

According to Part F, ventilation is the removal of indoor air from a building and its replacement with 'fresh' outside air. The ventilation system should be able to limit the moisture accumulation especially from bathrooms, kitchens and utility rooms. It should provide fresh air for breathing and control the excess humidity. Ventilation systems in buildings result in energy being used to heat fresh air taken in from outside and, in mechanical ventilation systems, to move air into, out of and/or around the building. Energy effciency is dealt with under Part L of Schedule 1 and Regulation 40 of the Building Regulations but consideration should be given to mitigation of ventilation energy use, where applicable, by employing heat recovery devices, effcient types of fan motor and/or energy-saving control devices in the ventilation system.

What we have to know about the building ventilation:

- ventilation rate – the performance of the ventilation system- the amount of outdoor air that is provided into the building.
- airflow direction – the overall airflow direction in a building, which should be from clean zones to dirty zones
- air distribution or airflow pattern – the external air should be delivered to each part of the building efficiently and any airborne pollutants generated inside should also be efficiently removed.

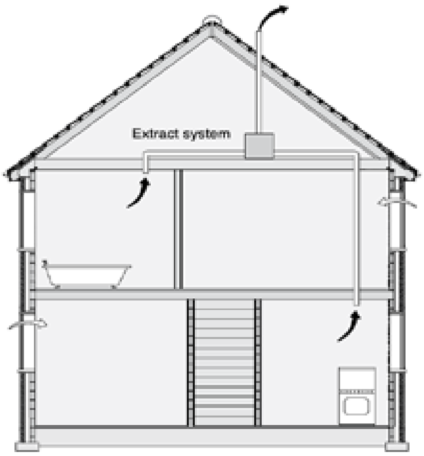
We can distinguish between three types of ventilation systems that should be implemented within the building- extract ventilation, whole building ventilation and purge ventilation. Extract ventilation- is from rooms where moisture is common like bathrooms, kitchens, laundry rooms. It is used to reduce the vapour spread to other rooms of the building. Whole building ventilation- provides continuous air exchange in the whole building. Purge ventilation-is intermittent and used to remove built-up pollutants, or in case of vapour from occasional activities, might be used also for thermal control. Ventilation with the above systems can be achieved thanks to natural, mechanical or hybrid (mixed) ventilation.

***Passive Stack Ventilation (PSV)*** natural ventilation is delivered with intermittent extract fans, trickle ventilators or windows.

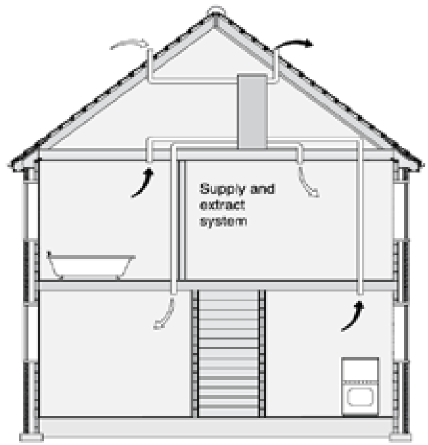
***Mechanical extract ventilation (MEV)*** in form of mechanical extract fan should be fitted in any kitchen, utility room, bath/shower room or WC with no openable window. The necessary performance of these extract fans is normally measured in litres per second (l/s).

***Mechanical ventilation with heat recovery (MVHR)*** by means of heat exchangers is more complex to install but provides controlled ventilation and air filtration and recovers heat from extracted air. It differs from other ventilation systems as the fresh air supply is provided by the one mechanical source. Here the warm moist air is extracted from the wet rooms via ducting and passes through a heat exchanger where the heat is passed to the incoming fresh air that is ducted back to the dry rooms.

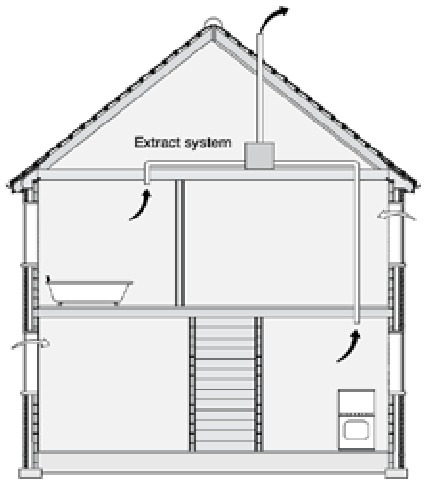
**Continuous mechanical extract**



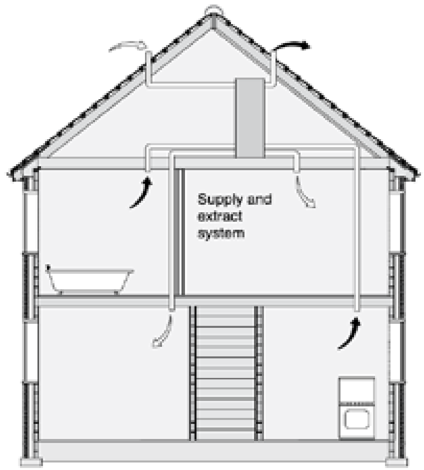

**Continuous mechanical supply and extract with heat recovery**




**Continuous mechanical extract**




**Continuous mechanical supply and extract with heat recovery**




source: Extract from Approved Document F, The Building Regulations 2010 p. 19

### Table 5.1a **Extract ventilation rates**

| Room | Intermittent extract | Continuous extract | |
|---|---|---|---|
| | Minimum rate | Minimum high rate | Minimum low rate |
| Kitchen | 30 l/s adjacent to hob; or 60 l/s elsewhere | 13 l/s | Total extract rate should be at least the ***whole dwelling ventilation*** rate given in Table 5.1b |
| Utility room | 30 l/s | 8 l/s | |
| Bathroom | 15 l/s | 8 l/s | |
| Sanitary accommodation | 6 l/s | 6 l/s | |

### Table 5.1b **Whole dwelling ventilation rates**

| | Number of bedrooms in dwelling | | | | |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 |
| Whole dwelling ventilation rate [a, b] (l/s) | 13 | 17 | 21 | 25 | 29 |

**Notes:**

a. In addition, the minimum ventilation rate should be not less than 0.3 l/s per $m^2$ of internal floor area. (This includes all floors, e.g. for a two-storey building add the ground and first floor areas.)

b. This is based on two occupants in the main bedroom and a single occupant in all other bedrooms. This should be used as the default value. If a greater level of occupancy is expected add 4 l/s per occupant.

source: Extract from Approved Document F, The Building Regulations 2010 p. 19

## Ductwork installation tips

1. Always follow manufacturer installation manuals
2. Ducts should be installed with minimum air resistance and leakages
3. Ducts bends should be kept to minimum what allows for non obstructed air flow
4. Rigid plastic ducting is recommended over the flexible one (use only for short lengths and ensure there is no peaks or troughs.
5. The inner radius of any bend should be greater or equal to the diameter of the ducting being used.
6. Ducts (both cold air and warm air) should be insulated with the equivalent of at least 25mm of insulating material with a thermal conductivity of 0.04W/mK. This will minimise the possibility of condensation. In cases of vertically installed ducts the condensation trap should be fitted.
7. All the duct joints should be sealed with duct tape or silicon.

For the installation guide of various ventilation systems refer to Domestic Ventilation Compliance Guide, www.planningportal.gov.uk

*This is an introductory guide and for in depth information refer to the Building Regulations or contact your local planning authority.*

**Diagram 1: Duct installations**

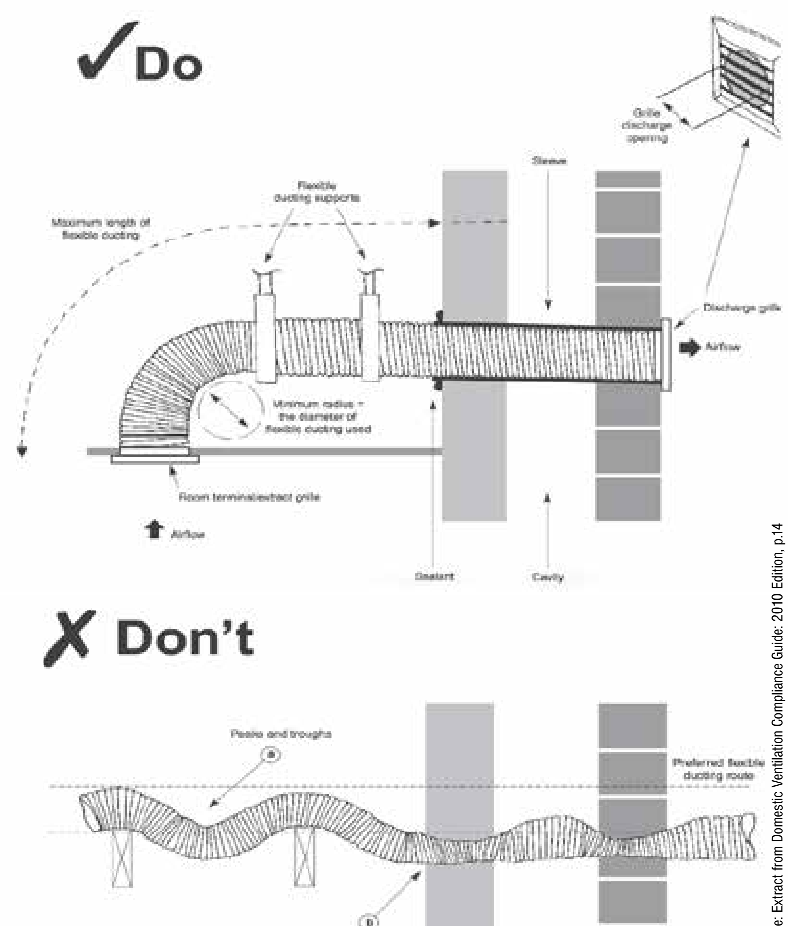



Diagram 1: Duct installations

Source: Extract from Domestic Ventilation Compliance Guide: 2010 Edition, p.14