ADDITIONAL INFORMATION: Ventilation

How much ventilation is required?

The amount of air needed to support human life is surprisingly small, about 0.2 litres per second per person (l/s/p). Considerably more than this is provided in occupied areas to ensure a satisfactory and comfortable environment to help provide a sensation of clean, fresh air. In non-smoking areas this is usually a minimum of 8 l/s/p. In smoking areas this may need to be increased up to five times.

If your building is already mechanically ventilated, a minimum level of air-flow is recommended (particularly in areas where smoking is permitted) and this must be retained in any changes you make to your ventilation system. See the web site to identify the minimum ventilation recommendations for your type of building (See Table 1 at the end of this document for the recommended standards).

Air is also essential where there are combustion appliances in place such as open or decorative fires to ensure complete combustion takes place and there is no risk of the production of carbon monoxide which is poisonous and potentially fatal.

Table 1 Internal Comfort Conditions (Source CIBSE Environmental Design Guide A, Table 1.1)

Building type	Winter temperature (C)	Summer temperature (C)	Suggested Air supply rate (l/s/person)
Pub (bar/lounge)	20-22	22-24	8
Restaurant/dining rooms	22-24	24-25	8

Table 2 Supply rates for fresh air where occupants smoke (Source CIBSE Guide A Table 1.10)

Level of smoking	% occupants smoking	outdoor air supply (l/s/person)
Non smoking	0	8
Some smoking	25	16
Heavy smoking	45	24
Very heavy smoking	75	36

Adoption of these air supply rates will not guarantee that non-smokers will not be exposed to environmental tobacco smoke levels at levels at which they experience discomfort or possible health effects. The only way to do this is to ensure there is no transfer of smoke from an area in which smoking is permitted.

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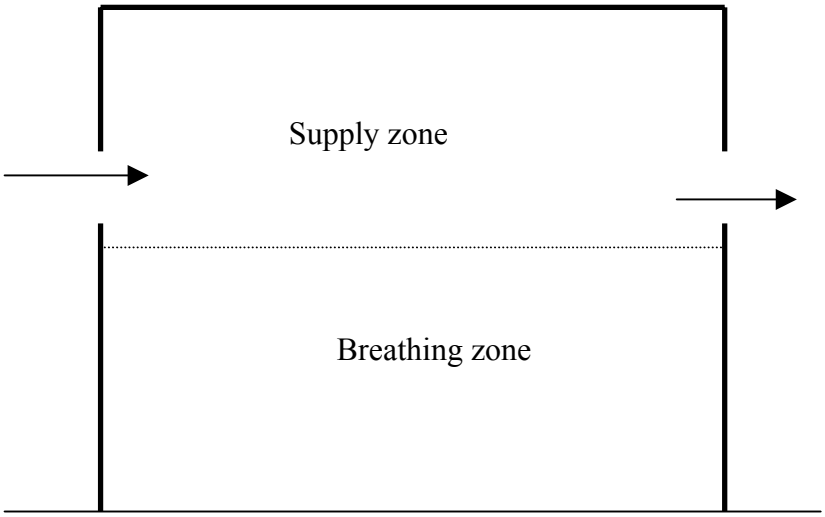
How to ventilate

Air can be introduced by natural or mechanically assisted means. Natural ventilation relies on sufficient air routes to be available through windows, doors and the building fabric to allow air to naturally infiltrate into the building. Mechanical ventilation means the provision of fans and possibly ductwork to propel air into or out of the building. Reliance on infiltration as the sole means of ventilation to meet occupancy needs is becoming less acceptable and current Building Regulations place emphasis on the deliberate provision of ventilation.
For new buildings the designer should minimise infiltration by making the structure as airtight as possible except for intended ventilation openings. Appropriate ventilation must then be provided to ensure the necessary air changes are achieved to maintain a comfortable environment.

The effectiveness of ventilation can be related to the locations of the air inlets and outlets. Examples of options are:

a) mixing supply and exhaust air at high level



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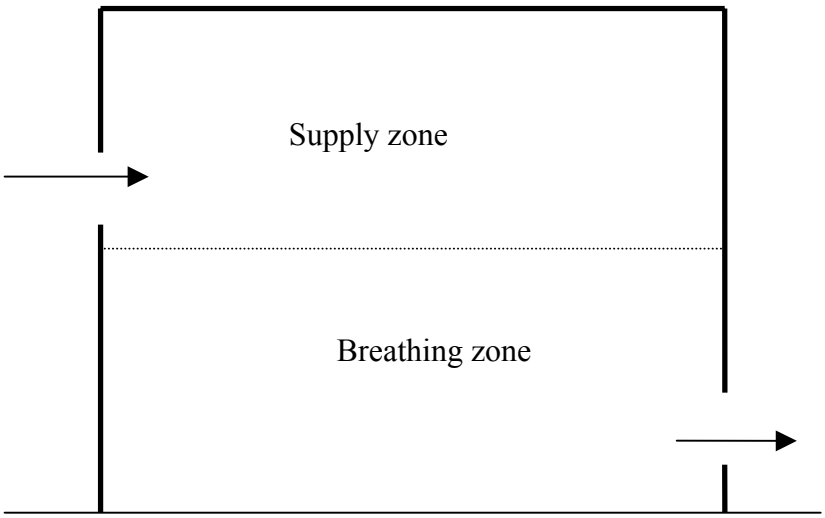
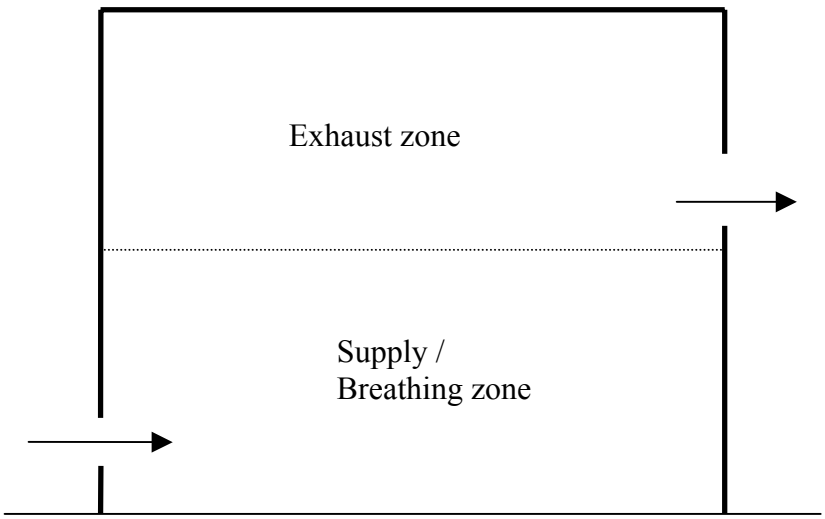
b) supply at high level, exhaust at low level



c) supply at low level, extract at high level



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In cases a) and b) mechanical ventilation can be considered. Better effectiveness is obtained where there is little temperature difference between the incoming air and room air. Case c) applies to natural ventilation.

Where the fresh air source is serving both smoking and non-smoking areas, the extract should be through the smoking area so that fresh air is drawn first through the non-smoking area. Similarly, air extracted from a catering area must be directed straight to outside otherwise the fumes and smells of food production can cause problems and complaints from customers.

What is comfort?

People are assumed to be thermally comfortable when they are satisfied with their thermal environment. This requires that they should feel neither too hot nor too cold and there is no local discomfort causing them to be too hot or too cold (e.g. draughts, open fires causing local warm spots). Because people are thermally dissimilar, it is very difficult to achieve a satisfactory environment for all occupants. The aim of the designer is to achieve an optimum thermal comfort when most of the occupants are satisfied.

The amount of clothing worn will influence the temperature at which occupants are comfortable. In Table 1, it is assumed that lighter clothing is being worn in summer compared with winter, and that in winter people will be wearing slightly warmer clothes in a pub than they would in a restaurant.

The summer comfort temperatures given in Table 1 apply to air-conditioned buildings. Higher temperatures may be acceptable if air conditioning is not present.

Draughts
The cooling effect of air movement is well known. If excessive, this can give rise to complaints of draughts. The temperature of the moving air is not necessarily that of the room air nor that of the incoming ventilation air but will generally be between these values. The back of the neck is particularly sensitive to air movement and if the air stream is directed onto this part of the body, the maximum allowable air speed is reduced. Research has found that people are more tolerant to air movement if the direction of the air movement varies. Dissatisfaction due to draughts is not only a function of mean air speed and local air temperature, but also fluctuations of air speed.

Airborne contaminants
Building occupants may be exposed to a mixture of many airborne contaminants. The air may contain chemicals and micro-organisms which have originated from several sources both within and outside the building. One source of contaminants in mechanically ventilated buildings is poorly maintained ventilation systems which can release pollutants from dirt or mould accumulated in filters and other internal surfaces. Regular cleaning and maintenance are therefore very important factors in reducing non-human odours. Concentrations of individual contaminants can be in the order of one thousandth that of published exposure limits but may still be above odour detection thresholds. Substantial improvements in indoor air quality can result if smoking is eliminated.

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How contaminants affect people
A substance that enters the nasal cavity may be sensed by two largely separate detection systems:

- The olfactory sense, responsible for odour detection
- The general chemical sense, sensitive to irritants

Humans adapt to odours with time, whereas irritation may increase with time.

Irritation due to exposure to environmental tobacco smoke increases by a factor of two during the first hour of exposure, after which a steady state occurs. The perceived odour intensity declines by a factor of 50% and levels out after only a few minutes.

Air Cleaning

In addition to using fresh air from outside, another option to help achieve a satisfactory internal environment, and overcome the problem of tobacco smoke, is to use an air cleaner. These work by providing a high level of filtration of the air and removing contaminants such as tobacco smoke. They treat the internal air, but do not provide a source of fresh air. The location of such a unit is important to achieve optimum performance and should ideally be determined by a specialist who can assess the options available at the particular location. Maintenance of such equipment is essential since they work by removing particulates from the air. Maintenance typically consists of replacing the filtration medium and will need to be carried out on a three month to six-month basis dependant on the level of pollutants needing to be removed and type of equipment installed. It can often be carried out by the building occupant.

The type of equipment used should be approved by the Air Cleaner Manufacturers Association (ACMA) who have a certification programme for suitable equipment.

Air cleaning equipment can also improve the internal environment when the fresh air supply is from a potentially dirty/polluted source such as a city centre where there is likely to be traffic and other sources of pollution being brought into the occupied space.

Passive smoking

When smokers and non-smokers share the same room, non-smokers cannot avoid inhaling some of the tobacco smoke. This is passive smoking.

Under the Health and Safety at Work Act 1974, employers have to ensure, as far as reasonably practicable, the health, safety and welfare of employees. If an employee has a respiratory condition, and is required to work in a smoky atmosphere which could make the condition worse, the employer must take action to deal with the risk.

Employers have a common law responsibility to provide a safe place of work. Under the Workplace (Health, Safety and Welfare) Regulations, 1992, employers need to ensure there are arrangements to protect non-smokers from discomfort due to tobacco smoke in rest areas.

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In 2002, the Health and Safety Commission issued a draft Approved Code of Practice (ACOP) on passive smoking in the workplace. Following consultation, they concluded that the ACOP should be introduced. To date this has not happened. However, other countries (Ireland, Australia, Canada, Hong Kong and USA) have announced bans on smoking at work.

A recent investigation / study in 10 pubs in Staffordshire found that having non-smoking areas appeared to generate a 7% increase in takings, indicating that customers appreciate a cleaner atmosphere and getting rid of tobacco smoke can help improve business.

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