



OHS Information Sheet No. 5

The Working Environment: Part 1 – Thermal Comfort (Revised)

This information sheet is part of a series which provide practical advice on a range of workplace hazards that should be controlled in order to prevent accidents and work-related illness. Thermal comfort raises issues for the indoor and outdoor working environment, although the guidance contained in this information sheet relates mostly to the indoor office-type situation. Three important factors determine the thermal comfort of the working environment. These are:

- temperature
- air humidity
- rate of air movement (ventilation).

The guidance contained in this revised version updates and supersedes the previously issued information sheet. Particular attention is drawn to the role of Departmental Energy Managers in the area of thermal comfort.

Temperature

There is a legal minimum temperature requirement of 16^o Celsius unless much of the work involves severe physical effort, in which case the temperature should be at least 13^oC. These temperatures refer to readings taken using an ordinary easily read dry bulb thermometer, the availability of which is required under the Workplace (Health, Safety and Welfare) Regulations (NI) 1993.

The readings are normally taken close to workstations, at working height and away from windows. However, it is appreciated that a temperature of 16^oC may not ensure reasonable comfort for staff who spend most of the day at a desk. Accordingly, premises managers may find it useful to establish temperature guidance based on the principle that at least 80 per cent of the persons who occupy the particular environment will find it acceptable or “comfortable”. Staff will usually regard their thermal environment as being either comfortable, too hot or too cold. Indeed 'comfort' in psychological rating scales has been described as 70% or more subjects agreeing.

While the first initial check on the standard may be made by using an ordinary dry bulb thermometer it may be necessary for a building services engineer and/or a hygiene and safety adviser to carry out further readings using a sling psychrometer (whirling hygrometer); and if there are particular problems associated with radiant heat, by the use of a globe thermometer.

Recent guidance issued by the Health and Safety Executive suggests that it is reasonable to maintain a temperature around 19^oC; other guidance for sedentary occupations suggests between 19^o and 21^oC during winter and 20^o to 22^oC in summer as the comfort zone. It is accepted that heat from solar gain or emitted by office machinery or normal human activity will contribute to these levels.

For this reason, the Fuel and Electricity (Heating) (Control) (NI) Order 1975, as amended, prohibits the use of fuel or electricity to raise the temperature of a building above 19^oC, which, taking account of the above incidental heat gains, will generally provide a comfortable working environment.

Buildings which have no artificial cooling will exceed the summer values for some of the time, but the incidence of thermal discomfort in these circumstances can be reduced by opening windows and, in extreme cases, the use of fans to increase air movement. Guidance should be obtained from the building services engineer, premises officer or Departmental Energy Manager.

If the temperatures are outside this range, especially above 26^oC, it is likely that some people will start to experience some degree of discomfort, the common symptoms being complaints of tiredness, lack of concentration and headaches.

The symptoms associated with poor indoor air quality are often described as being multi-factorial, thus when considering temperature we should also consider humidity and ventilation. It is also important to recognise that suitable clothing should be worn and that heating systems should not emit offensive or injurious fumes. Heat stroke, heat syncope and dehydration are examples of

conditions at the extreme end of the scale ie very hot temperatures, very humid conditions, heavy manual work or a combination of all three. They are not associated with routine sedentary office work.

Humidity

Humidity is the concentration of water vapour in the air and is usually expressed as relative humidity, measured as a percentage of the moisture that would completely saturate air at the existing temperature. It has little effect on thermal comfort at ordinary room temperatures, but extremes are to be avoided. While no specific standards are prescribed by law, the ideal relative humidity (RH) of air for comfort is in the range 55 - 65 per cent, though the range of 40 - 70 per cent is usually considered acceptable. Above and below these limits there appears to be an increased tendency to ill-effects. The symptoms of low RH, ie a dry atmosphere, are mostly due to the effects on the mucous membranes of the nose, eyes and throat. Exceptionally high RH, ie very moist (above 70 per cent), causes discomfort as heat controlled by sweating is impaired. Such humid conditions can lead to excessive mould growth on walls, stored goods and documents and once the mould has grown, there is a potential for mould spores which can in some cases cause problems.

In buildings with mechanical ventilation systems (air conditioning) artificial humidity is often provided by water spray or (preferably) by steam humidifiers. While increased humidification, especially during the use of artificial heating systems, will reduce the number of complaints associated with dry air and, in some instances complaints associated with exposure to static electricity, its installation, use and subsequent maintenance has to be carefully monitored by a competent person to ensure the avoidance of contamination by micro-organisms which may result in outbreaks of humidifier fever.

Ventilation

The final factor to be considered in regard to thermal comfort is adequate ventilation and the rate of air movement, the legal requirements for which are also considered in the Workplace (Health, Safety and Welfare) Regulations (NI) 1993 and the associated Approved Code of Practice. The general principle is that "effective and suitable provision shall be made to ensure that every enclosed workplace is ventilated by a sufficient quantity of fresh or purified air".

The air which is introduced should, so far as is reasonably practical, be free of any impurity which is likely to cause ill-health or be offensive. Air taken from the outside may generally be considered fresh but air inlets for ventilation systems should not be sited where they may draw in contaminated air, for instance, close to a flue, an exhaust ventilation system outlet or an area where vehicles manoeuvre.

It may be necessary to filter inlet air to remove particulate contaminants. For mechanical ventilation systems which re-circulate air, designs should be such that re-circulated air can be adequately filtered to remove any impurities. Purified air should also have some fresh air added to it prior to re-circulation, so the system design should ensure fresh air inlets are kept open.

Detailed guidance on ventilation design is provided in BS5720, BS5925 and in the information available from the Chartered Institution of Building Services Engineers (CIBSE). However, it should be borne in mind that a comfortable level of ventilation is a very subjective assessment in that some people prefer to work near an open window while others consider any perceptible air movement to be a draught.

Air flow below about 0.2 metres per second is imperceptible and an air flow in excess of 0.4 metres per second will be considered a draught by a lightly-clothed sedentary worker. At this level the air flow is quite noticeable although it may not be enough to disturb the papers on a desk. The sensation of being in a stream of strong blowing air will mean that the air flow rate is more than one metre per second.

The minimum amount of fresh air to keep the atmosphere comfortable depends on the level of occupancy in the building and the production of heat or fumes from any processes carried on. In offices where natural ventilation is not an option, a mechanical ventilation system will normally be adequate if it conforms with the following standards:

- ▶ there should be a minimum fresh air flow of eight litres per second per person in no smoking areas;

- ▶ an area with an air flow velocity in excess of 0.25 to 0.35 metres per second would be considered as draughty, and of less than 0.1 metres per second as stagnant. Unless temperatures are extreme, air velocities should normally be in the region of 0.1 to 0.15 metres per second, and up to 0.25 metres per second during the summer;
- ▶ rooms housing machinery such as photocopiers, and rest rooms where smoking is allowed should be examined in regard to the need for separate extract ventilation systems;
- ▶ air inlets for the ventilation systems should be sited to avoid introducing pollution from outside the building.

In circumstances where there have been a number of complaints of discomfort, a simple assessment of the ventilation system can be carried out by measuring the carbon dioxide concentrations when a space is at maximum occupancy. For example, if levels in excess of 1,000 ppm are measured this may indicate unsatisfactory ventilation, thus prompting the need for a more detailed investigation by a competent person.

All air conditioning systems should be installed, commissioned and subsequently inspected and maintained in accordance with the manufacturer's instructions. Any faults should be reported immediately to the premises manager who, if there is cause for concern about air quality, or uncertainty about sources of odour, dust or other pollutants, can consider the value of an air quality survey including spot checks of key pollutants.

The value of proprietary ionisers and air purification devices is often raised. Ionisers are portable devices which emit a stream of negative ions, and the manufacturers often claim all sorts of health benefits. Current research has not substantiated any of these claims. It is accepted that ions, both positive and negative, may exert some influence on comfort and well-being, but several studies have shown that ion generating machines have no major effect on the working environment and the people in it; air movement generated by a simple fan may be equally effective and less costly.

The use of proprietary portable air cooling or humidification equipment developed for computer rooms and other special environments also requires specific assessment, especially if there is a risk from water systems giving rise to the release of micro-organisms capable of causing ill-effects such as humidifier fever.

References

- Workplace Health, Safety and Welfare (Workplace) Regulations (NI) 1993.
- Workplace Health, Safety and Welfare - Approved Code of Practice 1993.
- Briefing Note No I Standards for a Healthy Indoor Environment. 4th Edition. OHSa. 1995.
- Guidelines on the Health and Safety of Office Workers. HSA. 1995.
- Fuel and Electricity (Heating) (Control) (NI) Order 1975.
- Fuel and Electricity (Heating) (Control) (NI) (Variation) Order 1980.

Sources of advice

- Line Manager.
- Personnel Branches.
- Departmental/Agency Safety Adviser.
- Departmental Energy Manager.

The NICS Occupational Health Service is available to offer professional advice if there are any doubts or concerns regarding the health issues raised in this information sheet or to answer queries on specific cases.

Contact: Centre for Workplace Health Improvement
Occupational Health Service
Lincoln Building
27 - 45 Great Victoria Street
BELFAST BT2 7AD
Tel: (028) 9025 1888
Fax: (028) 9025 1539
E-mail: ohs@dhsspsni.gov.uk

OHS
is committed
to promoting
Health
in the workplace

Centre for Workplace Health Improvement
Occupational Health Service
Lincoln Building
27 - 45 Great Victoria Street
BELFAST BT2 7AD

Tel: (028) 9025 1888
Fax: (028) 9025 1539
E-mail: ohs@dhsspsni.gov.uk