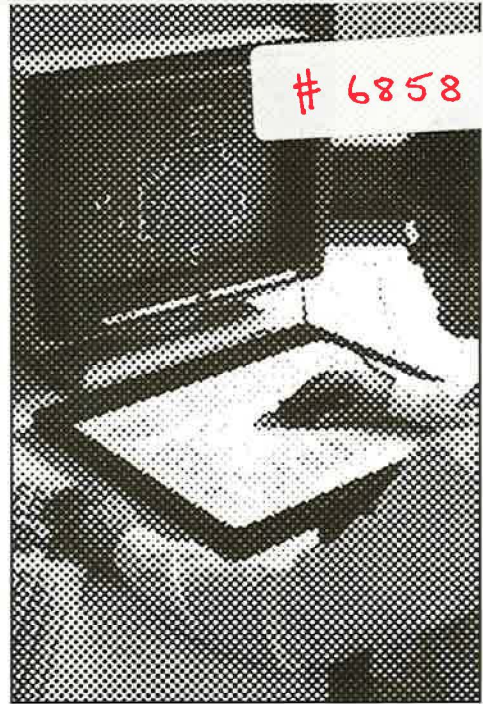


# healthy

*Guidance on  
complying with the  
1992 health and  
safety regulations*



# workplaces

healthy

workplaces

CIBSE Guidance Note

GN2: 1993

Healthy workplaces

Guidance on complying with the  
1992 health and safety regulations



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**The CIBSE gratefully acknowledges the assistance of Paul Ruffles (Lighting Design and Technology Ltd, 31 Bloomfield Avenue, Bath BA2 3AB) in drafting guidance on lighting design for *Healthy Workplaces*.**

# foreword

The new health and safety regulations which became law on 1 January 1993 affect all places of work. As with the *Health and Safety at Work etc. Act 1974* under which they are enacted, these regulations oblige building owners and/or employers to ensure that their premises comply.

Of the new regulations, four have important implications for building services such as heating, ventilation, air conditioning and lighting. Although building design is undertaken by professional architects and engineers, the maintenance and upkeep of a building is controlled by its occupiers who may not be aware of the implications of the new regulations.

This publication seeks to meet the need for a helpful summary of the relevant parts of the legislation and indicates how they apply to the environment of the workplace. It also provides an overview of further available guidance and sources of advice, including professional advisors who will be able to interpret the detail of the regulations relevant to particular needs.

The Institution gratefully acknowledges the help of those who have assisted in the development of this Guidance Note. It is hoped it will play an important role in helping employers and building owners and operators comply with the legislation, and therefore contribute to the provision of healthier workplaces.

Paul Appleby (Building Health Consultants Ltd)

Principal Author

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## 1

New Regulations, based on European Community directives and enacted under the *Health and Safety at Work etc. Act 1974*, came into force on 1 January 1993. This Guidance Note is intended to help employers, building owners and operators, workplace safety representatives and employees by offering advice on how to comply with these Regulations. Of the new Regulations, the following (and their associated Approved Codes of Practice) have an impact on building services, indoor air quality and indoor climate for all types of building in which people work:

- *The Management of Health and Safety at Work Regulations 1992*
- *The Workplace (Health, Safety and Welfare) Regulations 1992*
- *The Health and Safety (Display Screen Equipment) Regulations 1992*
- *The Provision and Use of Work Equipment Regulations 1992*

**Note: this legislation covers more than just building services.**

*The Health and Safety at Work etc. Act 1974* defines general duties for employers, employees, suppliers and others involved in the supply of goods and services through work. In other words the

responsibility is on those who create the risk.

The Act uses the standard of ‘reasonably practicable’ where prevention or control will depend on the extent of risk and sacrifice involved (e.g. cost, effort, inconvenience, disruption), i.e. if the risk is low then less sacrifice has to be made than if the risk is high.

Regulations are the letter of the law, contravention of which can result in prosecution. Approved Codes of Practice define Regulations and can be cited as part of a given case.

The italicised paragraphs at the beginning of each section on specific services are extracts from the relevant Regulations and are reproduced with the kind permission of Her Majesty’s Stationery Office and the Health and Safety Executive.

Relevant CIBSE publications, British Standards and other guidance are referred to throughout this Guidance Note to enable the reader to either obtain more detailed information and guidance or for use in drawing up specifications for specialist consultants. Appendix 1 provides model terms of reference for appointing specialists. Sources of further information, advice and instrument hire are listed in Appendix 2. Checklists are

provided in sections 2 and 3 to assist the reader in complying with good practice as required by the relevant legislation.

Note that compliance with this Guidance Note does not automatically ensure compliance with legal requirements. The reader should also refer to the relevant Regulations and Approved Codes of Practice. Equally, deviation from the guidance contained in this document does not necessarily constitute deviation from good practice.

# summary of relevant legislation

## 2

### Management of Health and Safety at Work Regulations 1992

#### *Who has responsibility?*

Employers, self-employed and employees.

#### *When do they apply?*

1 January 1993.

#### *What do they mean?*

These Regulations are enabled by the *Health and Safety at Work etc. Act 1974* and are part and parcel of that Act. They set out broad general duties which apply to almost all kinds of work, providing detailed requirements for meeting the objectives.

They require the following:

- A suitable and sufficient assessment of risks to the health and safety of employees in the workplace and persons not in their employment who may be affected by their activity. This applies to all possible risk factors and not just those covered by other health and safety legislation. See overleaf and Checklist 1 for brief guidance on carrying out a risk assessment.
- Preventive or protective measures arising from the risk assessment.

- Health surveillance that is appropriate to the risks identified.
- Appointment of persons to assist in devising and applying protective and preventive measures necessary for compliance.
- Emergency procedures.
- Provision of information to employees and others working in the undertaking on the risk assessment, preventive and protective procedures, emergency procedures and the identity of the nominated health and safety personnel.
- Co-operation between employers who share premises.
- Training and capability.
- Every employee shall use machinery, equipment, dangerous substances etc. in accordance with training and instructions given by the employer. Employees shall report danger to the employer or employee responsible for health and safety.
- Temporary workers require comprehensive information on special qualifications or skills required, health surveillance and special features that



**Checklist 1 Checklist for compliance with *Management of Health and Safety at Work Regulations 1992***

The following actions are required by those who are responsible for the health and safety of building occupants:

- Carry out a risk assessment comprising the following tasks:
  - identify all possible hazards and potential effects on health
  - assess the risks from identified hazards
  - assess the effectiveness of existing protective or preventive measures
  - identify people who are particularly at risk
  - record significant findings of assessment.
- Introduce all necessary preventive and protective measures:
  - eliminate hazard if possible
  - introduce control measure at source of risk.
- Introduce a documented health and safety system to ensure the continuing effectiveness of protective or preventive measures:
  - identify priorities and set objectives

— develop and introduce a suitable structure for effective running of a health and safety system

— introduce mechanisms for checking that arrangements have been implemented as planned

— introduce mechanisms for the monitoring and review of the effectiveness of risk control.

- Where there is an identifiable health effect which may be associated with hazards found in the assessment, introduce an appropriate system of health surveillance.
- Emergency procedures should be written down and known and understood by all relevant persons.
- Employees must be informed of the risks identified in the assessment and all necessary preventive and precautionary measures.
- Employees must receive adequate and appropriate health and safety training, repeated or revised as necessary.

are likely to affect health and safety in their particular work situation.

The Regulations require that assessments of risk to health and safety be carried out by an employer, with a review being carried out either when there are good reasons to suspect the validity of the initial assessment or there has been significant change in the matters to which it relates.†

Employers with five or more employees must record the findings of the assessment and identify any group of employees especially at risk.

The Regulations also extend current law requiring employers to consult employees' safety representatives and provide facilities for them.

Checklist 1 lists the actions required by those responsible for the health and safety of building occupants in order to comply with the *Management of Health and Safety at Work Regulations 1992*.

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† At the time of going to press (February 1993) the HVCA was preparing a manual on health and safety risk assessment (see Appendix 2).

## Workplace (Health, Safety and Welfare) Regulations 1992

### *Who has responsibility?*

Employers and any person who has control of a workplace, for example owners and landlords.

### *When do they apply?*

1 January 1993 for workplaces that are new from 31 December 1992; 1 January 1996 for existing workplaces — until then existing requirements apply.

### *What do they mean?*

These Regulations will replace a total of 38 pieces of older law, including parts of the *Factories Act 1961* and the *Offices, Shops and Railway Premises Act 1963*.

The regulations cover all workplaces except means of transport, construction sites, sites where extraction of mineral resources or exploration for them is carried out and fishing boats.

They set general requirements in the areas of the working environment, safety, facilities and housekeeping. Regulations covering the following areas are of particular relevance to the building services manager:

- Maintenance of workplace, and of equipment, devices and systems

- Ventilation
- Temperature in indoor workplaces
- Lighting
- Workstations and seating
- Escalators and moving walkways
- Sanitary conveniences
- Washing facilities.
- Drinking water.

For temporary workplaces the requirements for sanitary conveniences, washing facilities and drinking water apply as far as is reasonably practicable.

For agricultural or forestry undertakings sited away from main buildings the only requirements that apply are those for sanitary conveniences, washing facilities and drinking water.

## Health and Safety (Display Screen Equipment) Regulations 1992

### *Who has responsibility?*

Employers.

### *When do they apply?*

1 January 1993 for all new workstations and/or display screen equipment; if there are extensive changes to an existing

workstation's layout or equipment or if the screen is replaced then that workstation will be treated as a new workstation from the time of the change.

1 January 1997 for workstations and/or display screen equipment installed on or before 31 December 1992.

### *What do they mean?*

These regulations set down minimum health and safety requirements for working with display screen equipment. They apply to all workstations with a display screen, i.e. equipment comprising an alphanumeric or graphic screen regardless of the display process involved. Employers are required to analyse workstations to evaluate safety and health risks and take appropriate measures to eliminate the risks found, and to plan daily work on a display screen so that it is periodically interrupted by breaks or changes in activity.

The main Regulations are:

- Analysis of workstations
- Requirements for workstations
- Daily work routine of users
- Eyes and eyesight
- Provision of training

- Provision of information.

The Schedule to these Regulations provides guidance on minimum requirements for workstations which cover the display screen itself, keyboard, work desk or surface, work chair, environment, task design and software. Another annex discusses possible health risks. Environment-related factors covered are space, lighting, reflections, glare, noise, heat, humidity and radiation.

## **Provision and Use of Work Equipment Regulations 1992**

### *Who has responsibility?*

Employers, self-employed persons and people in control of equipment and premises.

### *When will they apply?*

1 January 1993: the general requirements will apply to all work equipment and the specific requirements will apply to new work equipment provided from that date.

1 January 1997: the specific requirements will apply to all work equipment provided prior to January 1993, until then the existing requirements apply.

### *What do they mean?*

The purpose of these regulations is to combine all the existing laws relating to

equipment used at work, placing general duties on employers and listing minimum requirements. Work equipment covers everything from hand held tools to more complex plants such as oil refineries. 'Use' includes starting, stopping, programming, setting, transporting, repairing, modifying, maintaining, servicing, and cleaning.

The legislation requires employers to:

- consider working conditions and risks in the workplace when selecting equipment
- make sure that equipment used is suitable for its task
- ensure equipment is properly maintained
- provide information, instruction and training on the equipment.

Specific areas of the regulations cover:

- protection from dangerous parts of machinery
- machinery maintenance operations
- danger from specific hazards
- equipment use at very high or low temperatures
- controls and control systems

- isolation of equipment from power sources
- stability of equipment
- lighting and equipment use
- warnings and markings.

# guidance to specific services

## 3

### 3.1 Heating and air conditioning

#### *Health and Safety (Display Screen Equipment) Regulations 1992*

*Heat: ...Equipment belonging to any workstation shall not produce excess heat which could cause discomfort to operators or users.*

*Humidity: ...An adequate level of humidity shall be established and maintained.*

#### *Workplace (Health, Safety and Welfare) Regulations 1992*

*Temperature in indoor workplaces: ...During working hours, the temperature in all workplaces inside buildings shall be reasonable.*

*A method of heating or cooling shall not be used which results in the escape into a workplace of fumes, gas or vapour of such character and to such extent that they are likely to be injurious or offensive to any person.*

*A sufficient number of thermometers shall be provided to enable persons at work to determine the temperature in any workplace inside a building.*

The main point at issue here is what is a 'reasonable' temperature? The Approved Code of Practice to the *Workplace (Health, Safety and Welfare) Regulations 1992* provides guidance on minimum temperatures which is broadly in line with the provisions of the *Offices Shops and Railway Premises Act 1963* which it

supersedes. These temperatures would be considered by most building occupants to be below comfort levels. However the Approved Code of Practice does define a reasonable temperature as one which 'should secure the thermal comfort of people at work', allowing for clothing, activity level, radiant heat, air movement and humidity. For air conditioned buildings in the UK, CIBSE recommends a dry resultant temperature of 19°C to 21°C during winter and 20°C to 22°C in summer for continuous sedentary occupancy.

It is recognised that room temperatures in buildings which have no artificial cooling will exceed the summer values for some of the time, and realistically must be allowed to reach higher levels than this for a proportion of the time. Section A1 (Environmental criteria for design) of the 1986 *CIBSE Guide* provides a graph which shows a band of temperatures plotted against outside temperature, with a maximum of 24 to 28°C at 26°C outside.

The incidence of thermal discomfort can be significantly reduced by the provision of fans or jets to increase air movement over occupants. Ideally, such fans or jets should be controllable by individuals.

At any of the room temperatures given above some people will be dissatisfied with the thermal environment. The Approved Code of Practice stipulates that the dry bulb temperature of workplace air should be reasonable, and requires that thermometers be provided to enable persons at work to monitor dry bulb temperature.

Dry resultant temperature is dependant on thermal radiation and air velocity as well as dry bulb temperature, and is a better indicator of thermal comfort than dry bulb temperature alone. In most spaces which are artificially illuminated dry resultant temperature will be 1 or 2 °C above dry bulb, because of the radiant heating from lights.

The parameters given in the table below all influence what individuals perceive to be a reasonable 'temperature'. The table indicates what factors control these

Parameter	Controlling factors
air dry bulb temperature	room/extract thermostat settings
radiant temperatures	surface temperatures, solar gain, method of heating
air velocity — draught	supply air outlet type, window leakage
temperature gradient from head to feet	method/position of heating and/or air supply
horizontal temperature differences	local heat sources, effectiveness of air supply
floor surface temperatures	floor heat loss, method of heating
clothing	season, gender distribution, nature of work
activity	nature of work

parameters, some or all of which may be under the control or influence of the building operator.

Values are given for a wide range of applications in the *CIBSE Guide*.

Occupants seated near to windows may experience wide variations in thermal radiation. Hence in winter they may experience dry resultant temperatures as much as 5 °C below the dry bulb, together with local cooling of the skin due to radiant heat loss and draught. This effect may be minimal where occupants are seated close to double glazed and sealed windows, but can be a major problem where windows are single glazed and leaky.

On sunny days occupants seated within range may experience direct solar radiation. The Approved Code of Practice states that steps should be taken to

achieve comfortable temperatures by some combination of insulation, cooling, shading windows and isolation from sources of heat. Careful positioning of workstations and provision of solar shading devices are recommended. The *CIBSE Guide* provides a technique by which it is possible to predict the potential discomfort from direct solar radiation. However occupants should be able to choose whether they sit in direct sunlight or not. Direct or diffuse sunlight can also cause major glare problems, particularly with respect to work at display screens (see section 3.3 Lighting); on the other hand it is widely recognised that daylight and views outside from indoors should be available to all building occupants if at all possible.

The Approved Code of Practice to the *Workplace (Health, Safety and Welfare) Regulations 1992* recognises that it will not always be practicable or necessary to provide a comfortable temperature throughout the workroom, and suggests local heating or cooling, or fans and increased ventilation. This allows for the provision of, for example, radiant heating devices, which heat exposed surfaces directly, allowing lower air temperatures, cooling jets or desk or ceiling fans — to create local cooling of the skin, allowing

higher air temperatures to be tolerated. CIBSE gives guidance on the design of radiant heating in *CIBSE Guide* Section B1 Heating and Section A1 Environmental criteria for design.

Most computing equipment gives off heat. It is not usually possible to locate this equipment in a separate room from the occupants, unless a central processor or mainframe computer is used. Printers, however, should ideally be separated since they not only generate heat but also can be very noisy (see section 3.7 Noise).

The main concern is that an unacceptable rise in temperature will result in discomfort. If the building is air conditioned and temperatures drift above comfort limits it may be that the system has insufficient cooling capacity to deal with the peak cooling load. The first stage of any investigation into excessive temperatures will be to examine the sources of heat gain and the economic viability of remedial measures to reduce them compared with modifying the climate systems (air conditioning or ventilation). In the case of older systems this may be because of inadequate allowance for heat gains from office machinery. Alternatively there could be a malfunction of the system. In either case a

survey will need to be commissioned to determine what remedial action is required to improve the thermal climate. If there is no artificial cooling, but a mechanical ventilation system exists a study to examine the feasibility of adding cooling may be required. Similarly if the building is naturally ventilated various strategies for increasing ventilation or adding artificial cooling (air conditioning) may need to be compared.

#### *Measuring temperature*

The location of thermometers needs to be decided with the above considerations in mind. It is important that instruments be positioned to represent the air temperature experienced by the majority of occupants and not be exposed to direct radiant heat or draught. *BS 1041* provides guidance on the selection and use of various types of thermometer. In general accuracy should be better than  $\pm 1^\circ\text{C}$ . Electronic and mechanical instruments will require periodic cleaning and recalibration by the manufacturer.

#### *Measuring humidity*

The Approved Code of Practice to the *Health and Safety (Display Screen Equipment) Regulations 1992* refers to equipment being a source of dry heat and states that 'ventilation and humidity

should be maintained at levels which prevent discomfort and problems of sore eyes'. Ventilation is only relevant to heat and humidity levels when there is no artificial cooling (air conditioning). In which case a large throughput of outdoor air is required to prevent excessive temperature rise. Where the main source of heat gain is computing equipment it is rare for high humidities to be a problem. Low humidity may be a problem in air conditioned or mechanically ventilated buildings during cold spells when there is no humidification (see also section 3.2 Ventilation and air quality).

A combination of low humidity, poor air quality and long exposure to display screens may well cause eye problems. Low humidities may also contribute to static electricity discharges (see *CIBSE Guide* Section A1 Environmental criteria for design and *BS 5958*).

The CIBSE recommends that, for most applications, relative humidity should be between 40% and 70%.

Humidity measurements should be taken in the same positions as air temperatures, ensuring that there are no direct sources of moisture gain and radiant heat. Instruments which are not aspirated, such as the electronic humidity indicators, hair

hygrometers and sling psychrometers, must be in well ventilated locations. Aspirated instruments, such as the whirling sling hygrometer, are ventilated through use. In general accuracy should be better than  $\pm 5\%$  relative humidity. Electronic and mechanical instruments will require periodic cleaning and recalibration by the manufacturer.

### **Fossil-fuel heaters**

The Workplace Regulation dealing with emissions from heating or cooling equipment is essentially a carry over from the *Offices, Shops and Railway Premises Act 1963*. It applies primarily to equipment such as unvented gas-fired and paraffin heaters, which emit potentially harmful substances as part of their normal operation. In Section B1 Heating of the *CIBSE Guide*, it is recommended that the use of flueless devices be discouraged. *BS 5258* Parts 10 and 11 provide guidance on safety of small flueless gas-fired space heaters and *BS 6230* on larger heaters.

Potential harmful effects arising from failure of equipment are covered by the *Provision and Use of Work Equipment Regulations 1992*, which require 'measures to minimise the effects of failure as well as to reduce the likelihood of failure'. Detailed guidance on safety of flued

### **Checklist 2 Air conditioning and heating**

- Check that temperatures do not go outside the ranges recommended by the CIBSE.

If there is cause for concern:

- Check thermostat settings, accuracy and location.
- Check operation and design of thermal systems:
  - if temperatures are adrift in summer, air conditioning or ventilation may be inadequate or at fault, or heat sources may have been added: external consultant may be required.
  - if temperatures are adrift in winter, heating may be inadequate or at fault.
- Check that thermometers are provided in all workplaces.
- Check that all thermometers are accurate to  $\pm 0.5^\circ\text{C}$ .
- A system of registering and recording complaints should be in place — a **questionnaire survey of all staff may be useful**. Check number of complaints relating to the thermal environment and operation of heating or air conditioning.
- Check for sources of radiant gain or loss, such as windows or industrial processes.

If there is cause for concern about high temperatures consider **commissioning a thermal environment survey**.

- Check for sources of draught, such as poorly positioned air terminals, malfunctioning air conditioning or leaky windows and doors.
- Check for signs of low humidity when outdoor temperatures are low, e.g. high incidence of static electricity, complaints of dryness, cracks in wood.

If there is cause for concern consideration might be given to **monitoring winter humidities indoors and comparing with CIBSE guidance, and examining feasibility of adding steam humidification**.

- Check type of humidification, if any:
  - If spray humidifier with pond exists consider replacement with steam humidifier.
  - If obstruction located within 1.5 m downstream of steam humidifier, check for signs of moisture and move humidifier injector or obstruction if necessary.
- Check that gas-fired boilers and room heaters comply with *BS 5258*.\*
- Check that refrigeration system complies with *BS 4434*.\*

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**Investigations of the kind highlighted in bold type should be undertaken by a competent person.**

\* This information should be available from the manufacturer/installer.

gas-fired equipment can be found in BS 5258; Part 1 covers boilers, Part 4 fan heaters, Part 7 covers storage water heaters and Part 13 convection heaters.

### *Air conditioning*

There may also be hazards associated with failure of air conditioning systems, where the room units contain potentially toxic refrigerant. With the increasing popularity of variable refrigerant flowrate air conditioning it is not uncommon to find individual rooms served from a unit containing a coil linked to a condensing unit located outdoors by up to 120 metres of pipework filled with refrigerant. If this refrigerant leaks it must not be able to create an unacceptably high concentration in the workplace. BS 4434 gives safety provisions for personnel in spaces containing refrigeration equipment or pipework.

Humidifiers also present a potential hazard. Spray humidifiers generate a fine aerosol which may be drawn from a sump beneath. If suitable conditions for microbial growth exist in these sumps or on nearby wetted surfaces, a cocktail of micro-organisms could be carried into the humidified space in the water droplets. In severe cases of contamination this has resulted in outbreaks of humidifier fever,

where a high proportion of exposed individuals have developed severe flu-like symptoms. Steam humidifiers are more expensive to run but present fewer hazards, provided they are installed at a distance greater than 1.5 metres upstream from an obstruction in a duct and they are well maintained.

### *What does the building owner/operator have to do?*

Compliance with the above Regulations is required under the *Health and Safety at Work etc. Act 1974*. To comply with the *Management of Health and Safety at Work Regulations 1992* it will be necessary to carry out an assessment to ensure compliance. Checklist 2 provides guidance on this assessment and indicates where manufacturers or installers will need to be contacted for information.

## **3.2 Ventilation and air quality**

### *Workplace (Health, Safety and Welfare) Regulations 1992*

*Effective and suitable provision shall be made to ensure that every enclosed workplace is ventilated by a sufficient quantity of fresh or purified air.*

*Any plant used for the purpose of complying with (the above paragraph) shall include an effective device to give visible or audible warning of any*

*failure of the plant where necessary for reasons of health or safety... (and) shall be maintained (including cleaned as appropriate) in an efficient state, in efficient working order and in good repair.*

*Washing facilities shall not be suitable unless ...the rooms containing them are sufficiently ventilated...*

*Rest rooms and rest areas shall include suitable arrangements to protect non-smokers from discomfort caused by tobacco smoke.*

The Approved Code of Practice to the *Workplace (Health, Safety and Welfare) Regulations 1992* describes the provision of effective and suitable ventilation as that which 'introduces fresh or purified air at a sufficient rate to reduce stale, contaminated, hot or humid air but at a rate that does not cause occupant discomfort from draughts'. Provision of a suitable and effective ventilation system however, not only depends on the system design, including the position of supply and extract terminals which together determine whether the air distributed within the building is effective and draught free, but also on the amount and quality of the air delivered. Guidance on ventilation design is given in BS 5720, BS 5925 and in the *CIBSE Guide* Section B2: Ventilation and air conditioning (requirements). Guidance as to what constitutes a 'sufficient rate' is not given in the Approved Code of Practice,



although reference is made to various guidance notes that aim at compliance with the Regulations.

### **Ventilation Standards**

The Approved Code of Practice to the *Workplace (Health, Safety and Welfare) Regulations 1992* requires that mechanical ventilation systems should never operate at 100% recirculation, which is considered 'unhealthy'. All spaces which rely on mechanical means of ventilation must be supplied outdoor air at a rate sufficient to dilute internally generated pollutants. In the industrial setting, the occupational exposure limits (OELs) published annually by the HSE (*EH40: Environmental hygiene*) are guidelines intended to be used to ensure compliance with the *Health and Safety at Work etc. Act 1974* and the *Control of Substances Hazardous to Health Regulations 1988* (or *COSHH Regulations*), protecting workers from acute or chronic health effects from the substances listed.

Where there are local sources of indoor pollution, such as those frequently associated with industrial processes, local exhaust ventilation will invariably provide the most effective control. Where the only option is general (dilution or displacement) ventilation, air change rates in these spaces must aim to reduce

pollutant concentrations to levels considered to be without risk to health. An assessment of risk and the effectiveness of control is required under the *COSHH Regulations*. In these situations an occupational hygienist and/or ventilation engineer, or other suitably competent person should be consulted. CIBSE provide guidance on the design of industrial ventilation systems in Section B3 (Ventilation and air conditioning (systems, equipment and control)) of the *CIBSE Guide*.

Workers in the non-industrial sector are often exposed to a wide variety and complexity of chemicals and particulates. These can arise from a variety of building materials and furnishings, from work equipment, from environmental tobacco smoke and from the building occupants themselves. Although OELs do still apply, personal exposures to individual

contaminants are rarely above one-thousandth of these levels. Workers in this sector, however, tend to have a greater expectation of their working environment. Guiding authorities have taken these factors into consideration, providing acceptable ventilation rates that are based on odour perception rather than direct health effects.

The *CIBSE Guide* (Section B2) gives recommended outdoor air supply rates per person (see Table below), on a scale which depends on the level of smoking in the space. Being principally based on the dilution of body odour and cigarette smoke, these rates will tend to underestimate outdoor air requirements wherever other odour sources are present. The provision of a clean and hygienic workplace is therefore a necessary requirement if these minimum rates are adopted.

Table B2.2 (*CIBSE Guide*) Recommended outdoor air supply rates for sedentary occupants

Activity	Recommended outdoor air supply rate (litre/s per person)
with no smoking	8
with some smoking	16
with heavy smoking	24
with very heavy smoking	32

It has been estimated that the additional outdoor air required to cater for 'some' smokers (approximately 25% of occupants) will result in a 5% increase in energy costs and add 0.5% to the construction cost of a typical office building. Furthermore it is evident that even outdoor air supply rates in excess of CIBSE recommended levels will not prevent direct exposure to a plume of tobacco smoke. A number of government inquiries have recommended that smoking controls be introduced into workplaces, with the provision of separate smoking rooms, kept under negative pressure by a dedicated exhaust air system which is arranged to discharge air to waste. The Approved Code of Practice to the *Workplace (Health, Safety and Welfare) Regulations 1992* only deals with rest facilities, recommending that either separate rest facilities be provided for smokers and non-smokers or smoking should be prohibited in the facilities.

In addition to the general requirements for ventilating the workplace, the Approved Code of Practice to the *Workplace (Health, Safety and Welfare) Regulations 1992* singles out rooms containing sanitary conveniences, requiring that they should be ventilated so as to prevent lingering, offensive

odours. Guidance for acceptable outdoor air supply rates for this and other building uses are given by *CIBSE Guide* Section B2 Ventilation and air conditioning (requirements).

These rates apply to mechanically ventilated spaces only. Outdoor air supply to naturally ventilated spaces is variable and difficult to predict.

#### **Supply air quality**

In essence, the introduced air should be free from any impurities likely to be offensive or cause ill health. Outdoor air can generally be considered acceptable provided that the air intake is not sited so that excessively contaminated air is drawn into the building, such as might be found near flues or extract outlets, or busy roads.

The level of air pollution in some locations can mean that outdoor air is not suitable to introduce into a building unless it has first undergone adequate particle filtration, and any air that is recirculated should be adequately filtered before being redistributed within the building.

Provision of a visible or audible warning for a ventilation system or device is only required by the *Workplace (Health, Safety and Welfare) Regulations 1992* 'where necessary for reasons of health and safety',

as in industrial local exhaust and dilution ventilation systems specifically designed to provide control of airborne pollutants. This requirement does not apply therefore to general workplace ventilation systems.

#### **Assessment of ventilation systems**

There are a number of possible ways of assessing the effectiveness of a ventilation system in providing sufficient fresh air, ranging from fairly simple to quite intricate. A simple and useful test involves generating 'smoke' from an air current tube to visualise air flow patterns in rooms. This provides a fairly accurate appraisal of the effectiveness of the ventilation system in distributing outdoor air to all parts of the workplace.

An indication of whether there are problems with inadequate outdoor air supply can be obtained by measuring the carbon dioxide concentration when a space is at maximum occupancy. If levels in excess of 1000 ppm are measured this will indicate inadequate ventilation. This is a relatively inexpensive check which can be carried out by a suitably trained person.

Measurement of air velocities in the supply air ductwork enables calculation of the total volume of air being distributed to the space. It cannot, however,

distinguish the proportions of outdoor or recirculated air. Determining air exchange rates in a room or building due to outdoor air alone, requires plotting the concentration decay rate of a tracer gas, such as sulphur hexafluoride. This test is the only method available for determining the air exchange rate of naturally ventilated buildings. Monitoring for tracer gases or measuring air flow rates in ducts are specialised techniques and should only be carried out by a competent person with suitable equipment.

#### *Proper maintenance*

The Approved Code of Practice requires that any device or system used to provide 'fresh' air to a building or space should be maintained in an efficient state so as to ensure that the air produced or delivered is both suitable and sufficient for use within the workplace. The word 'efficient' here relates to good working order and not to productivity or economy. In particular, the plant should be kept clean and free from any substance or organism which may contaminate the air passing through it. Depending on use, compliance with these statements is likely to require a suitable system of maintenance, inspection, adjustment, lubrication and cleaning, as well as the keeping of accurate records. Guidance is given in the CIBSE

#### **Checklist 3 Ventilation**

- Check whether there are regular complaints from occupants indicating air quality problems, concerning odours, eye problems, respiratory problems and headaches, (a questionnaire may be useful in ascertaining incidence of these problems, amongst others).
- Check whether outdoor air control dampers are functioning properly — e.g. are linkages seized up, are motors functioning, have controls been overridden to save energy etc?
- Check that the ventilation system controls do not permit 100% recirculation of air within the building, except when required for pre-occupancy warm-up of the building.
- Check for sources of pollution indoors.

If there is cause for concern about air quality, but uncertainty about sources of odour, dust or other pollutants, consideration should be given to commissioning an **air quality survey — including spot checks of key pollutants.**

- Check that the outdoor air intake is well sited, i.e. away from identifiable pollutant (including odour) sources, and it is clear and unrestricted.
- **If there is cause for concern, check that the ventilation supply rate satisfies CIBSE recommendations. Consideration must be given to the**

**number of people and the level of smoking in the space.**

- **Check that the introduced air is being well distributed throughout the space.**
  - Check that the ventilation system is well maintained in accordance with CIBSE and BSRIA recommendations. This includes regular inspections, cleaning, filter replacement and lubrication as required. Accurate records should be kept of all maintenance work.
- If there is still cause for concern:
- **Check that the ventilation system complies with either BS 5720 or BS 5925, and with CIBSE design guidelines.**

If there remains a problem with passive smoking consideration should be given to introducing smoking controls and allocating separate rest rooms for smokers and non-smokers, complete with a dedicated exhaust air system from the smoking room.

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**Investigations of the kind highlighted in bold type should be undertaken by a competent person.**

document *TM17: Building services maintenance management*. A review of ventilation system hygiene is given in *BSRIA TN 18/92*.

### 3.3 Lighting

#### **Workplace (Health, Safety and Welfare) Regulations 1992**

*Every workplace shall have suitable and sufficient lighting.*

*(Lighting) shall, so far as is reasonably practicable, be by natural light.*

*...suitable and sufficient emergency lighting shall be provided in any room in circumstances in which persons at work are specially exposed to danger in the event of failure of artificial lighting.*

#### **Health and Safety (Display Screen Equipment) Regulations 1992**

*Any room lighting or task lighting provided shall ensure satisfactory lighting conditions and an appropriate contrast between the screen and the background environment, taking into account the type of work and the vision requirements of the operator or user.*

*Possible disturbing glare and reflections on the screen or other equipment shall be prevented by coordinating workplace and workstation layout with the positioning and technical characteristics of the artificial light sources.*

*Workstations shall be so designed that sources of light, such as windows and other openings,*

*transparent or translucent walls, and brightly coloured fixtures or walls cause no direct glare and no distracting reflections on the screen.*

*Windows shall be fitted with a suitable system of adjustable covering to attenuate the daylight that falls on the workstation.*

#### **Provision and Use of Work Equipment Regulations 1992**

*Every employer shall ensure that suitable and sufficient lighting, which takes account of the operations to be carried out, is provided at any place where a person uses work equipment.*

#### **Lighting (illuminance) levels**

The primary requirement for any workplace is that suitable and sufficient lighting be installed. This should be interpreted to mean that for each task performed in the workplace the lighting level, the quality and, for certain tasks, colour rendering of the light is correct for the continuous safe performance of that task.

The absolute minimum lighting level for the safe performance of a task is listed in the HSE's document *HS(G)38 Lighting at work*. These minimum levels do not provide sufficient lighting for the long term optimum performance of that task, neither does the document define the quality necessary to achieve more than a basic lighting scheme. For this, reference

should be made to the *CIBSE Code for Interior Lighting*. In the *Code* the level for each task is given such that the task can be carried out efficiently and without strain on the staff. It includes for corrections where the task is more or less onerous than normal or where the criticality or duration of the task or the age of the operatives is different to normal.

Measurement of lighting levels for work at a desk or other work surface requires an illuminance meter, suitably corrected for the type of lighting installed. Illuminances should be measured in the working plane at every workstation. This may need to be carried out at various times of the day if lighting conditions fluctuate.

The quality of the lighting provided is also defined in the *Code for Interior Lighting*. This has many aspects: glare needs to be limited to ensure that light sources do not dazzle or distract; good modelling needs to be provided by the lighting system in areas where people work; the correct luminance balance between the surfaces in the workplace and between the task and the surfaces needs to be provided to avoid fatigue and to allow fast accurate working. Minimum colour

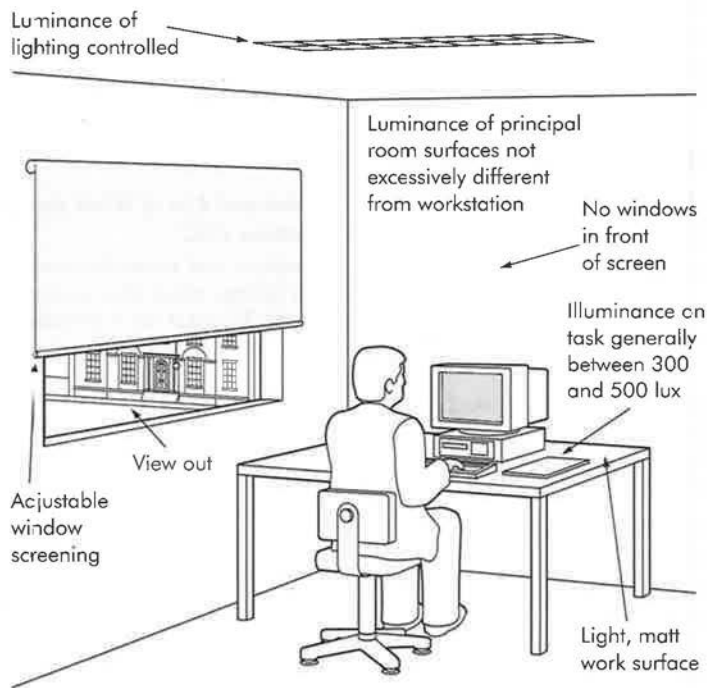
rendering indices are also specified where it is important for the performance of a task. By providing good quality lighting staff satisfaction and productivity are encouraged.

Additional design guidance to the quality of lighting in a number of different types of workplace is given in the series of Lighting Guides produced by the CIBSE. This guidance is very task-specific. For instance the *LGI: Industrial Environment Lighting Guide* individually describes the particular lighting problems associated with such tasks as welding, visual inspection, printing and paint spraying.

### Natural lighting

By requiring the provision of daylight at each workplace so far as is reasonably practicable the *Health and Safety (Display Screen Equipment) Regulations 1992* recognise the preference of users for a link to the outside world. Such a provision is usually of great psychological benefit to the users of a workplace. The provision of daylight normally makes the employees feel less confined and provides the space with a more airy feel. It also allows staff to note changing weather conditions.

It can also have the advantage to the building owner of increasing energy



**Figure 1** Controlling luminance and illuminance in areas with display screen equipment

savings by allowing the daylight to supplement or replace the artificial lighting during part of the day. It should be remembered that the requirements of the *Health and Safety (Display Screen*

*Equipment) Regulations 1992* will mean that ways of controlling the brightness of the windows will be needed. This will normally reduce the level of daylight available for energy saving use.

### Areas with display screen equipment

Special requirements are imposed on the employer using display screen equipment. In such areas the lighting system, the workplace and the equipment in use need to be considered together in order to ensure that no distracting reflections appear on the screen and that the visual environment provides the appropriate contrast between the screen and its background. In addition, windows will need to be provided with adjustable blinds or covering to limit their brightness. (See Figure 1.)

The CIBSE Lighting Guide *LG3: Areas for visual display terminals* sets out design criteria for a suitable visual environment. These criteria provide a useful benchmark with which an existing environment can be compared. Such an environment can be provided by downlighting, by uplighting or by combined up/downlighting. Each method has its advantages and limitations, but all are suitable for display screen equipment if the criteria in the Lighting Guide are followed. *Areas for visual display terminals* also provides guidance to owners of existing installations in checking for problems and in providing solutions to them.

### Checklist 4 Lighting

- Carry out a subjective assessment of glare from the room lights, as experienced by all sedentary occupants. A **questionnaire survey** might be useful in determining the incidence of perceived glare problems.

Glare may be worse in windowed rooms when soft background light from daylighting has reduced, such as on a dull winter's day

- Check that there is no undue glare from windows.
- Check that there is not undue contrast between the windows and adjacent wall surfaces.

If there is a problem with glare or undue contrast from windows then screening in the form of roller blinds or similar may be needed.

- **Measure illuminance levels at the task and compare against recommended design values.**
- Check that the direction of light on the task aids perception and that no disturbing shadows are cast over the task area.
- Check that there is not undue contrast between any display screen and its immediate background.

**If there is then the lighting or room surface reflectances may need to be**

**altered. This may be achieved by the use of screens or decoration.**

- Check that there are no distracting or disturbing reflections on any display screens.

Some reflection is inevitable but it should not be of a level that obscures the image on the screen or is distinct enough to be distracting.

- Check that there are no disturbing reflections from the desk surfaces.

Generally matt surfaces of a light tone are required. Glossy surfaces reflect images of overhead lighting and dark desks cause high contrasts with white documents.

- Check that there are no extremely bright reflections from room surfaces.

These can be distracting and may cause reflection in display screens.

Although most people can identify major problems with seeing conditions, most will not be able to assess the more subtle problems or determine what remedial action is required.

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**Investigations of the kind highlighted in bold type should be undertaken by a competent person.**

*BS 7179* Part 6 also provides guidance on the required lighting levels and visual requirements for work with display screen equipment. *BS 7179* will shortly be superseded by the adoption of part 6 of the International Standard *ISO 9241* by CEN.

### ***Suitable and sufficient emergency lighting***

The minimum levels are set out in *BS 5266*. This generally calls for 0.2 lux along the centre line of defined escape routes, such as corridors, and for 1 lux over areas where there is no defined escape route, such as open plan office areas. Special attention must be given to areas where safety equipment is located such as fire extinguishers, eyebaths and fire alarm call points. Provision of a comprehensive emergency lighting system ensures the safety of occupants and assists in the speedy tackling of emergencies that could otherwise lead to loss of property or production. Further information is provided in the *CIBSE TM12: Emergency lighting*.

### ***Lighting layout and maintenance***

The positioning of lighting equipment can influence the health and safety of the employees in a space. For the benefit of the maintenance staff lighting equipment needs to be positioned in such a way that

safe access for lamp changing and cleaning can be provided. Where lighting is positioned in difficult places, such as over large stairwells, in atria or over process equipment, then winching or access equipment will need to be incorporated in the building's design. Good maintenance ensures long reliable life from the lighting installation and provides optimum lighting conditions for the staff.

Wall-mounted and suspended fittings should be above head height. Desk-mounted lights should be of the low surface temperature type, should be positioned to the side of the user, should be adjustable — but not so much that they can become a glare source to other users of the space — and should have local on/off or dimming control. This provides safe and adaptable lighting which can be tailored by each user to their own needs.

## **3.4 Escalators and moving walkways**

### ***Workplace (Health, Safety and Welfare) Regulations 1992***

*Escalators and moving walkways shall: ...function safely; ...be equipped with any necessary safety devices; ...be fitted with one or more emergency stop controls which are easily identifiable and readily accessible.*

*(Such equipment) shall be maintained (including cleaned as appropriate) in an efficient state, in efficient working order and in good repair...(and) be subject to a suitable system of maintenance.*

The use of escalators and moving walkways is widespread, for example they are found in large shops, shopping centres, banks, hotels, hospitals, airports and railway premises. Some major accidents have been associated with them, in particular involving young children and the elderly.

The diverse environments in which they are used, the varying age and range of people who use them make it difficult to evaluate hazards

The main point of issue is that escalators and moving walkways are designed, constructed, installed, and maintained to function safely.

The Approved Code of Practice to the *Workplace (Health, Safety and Welfare) Regulations 1992* gives escalators and moving walkways as examples of equipment requiring a system of maintenance.

The system should ensure that:

- regular maintenance (including as necessary, inspection, testing,

### Checklist 5 Escalators and moving walkways

- Check that safety rules for construction and installation of escalators and passenger conveyors meet requirements of *BS 5656: 1983*, HSE Guidance Note *PM34 Safety in the use of escalators* and *PM45 Escalators: periodic thorough examination*, CIBSE guidance and manufacturers' guidance.

If the escalator or moving walkway does not meet the standards of *BS 5656*, check whether it can be adapted to meet them.

- Check for falling hazards:
  - is the lighting adequate?
  - is it easy to judge entry and exit points?
  - are entry and exit points obstructed?
  - is there overcrowding or jostling, when it is both running and stationary?
- Check for trapping hazards:
  - adjustment, lubrication and cleaning) is carried out at suitable intervals
- potentially dangerous defects are remedied, and that access to defective equipment is prevented in the meantime

— the gap of the intakes between the sides of escalator steps and skirting, or between the steps themselves as they form or deform,

— the intake between escalator steps and comb plate,

— the entry point of the hand-rail to newel,

— the gap between the balustrade hand-rail and adjacent wall/ceiling or structure at floor intersections,

— badly maintained balustrade hand-rails at the joins and between a slack hand-rail and the balustrade.

- Assess equipment with regard to user safety, e.g. the type and age of escalator or moving walkway, location, environment and type of people using it.

Guidance set out in the HSE Guidance Note *PM34* and *BS 5656: 1983* gives details on standards such as deflector devices, structure, lighting, machinery, handrails, steps and belts, driving mechanism, angle of inclination,

- regular maintenance and remedial work are carried out properly
- a suitable record is kept.

More specific guidance on use and maintenance is given in HSE publications: *PM34 Safety in the use of*

clearances, braking, electrical installation, controls, warning signs and notices, inspections testing and maintenance.

- Carry out daily visual checks on damage to treads and comb plate, skirting, hand-rail speed, emergency stops, lighting, and cleanliness of motor rooms and driving mechanisms.
- Check position and operation of emergency stop devices
- Check that regular maintenance is carried out by a competent person and that thorough examination is carried out at least every six months by a competent person such as an insurer, manufacturer, or suitably contracted engineer. Check that all records are kept and that remedial action is carried out by a competent engineer. The Approved Code of Practice refers to relevant HSE publications and British Standards.

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**Investigations of the kind highlighted in bold type should be undertaken by a competent person.**

*escalators* and *PM45 Escalators: periodic thorough examination* and *BS 5656:1983 Safety rules for the construction and installation of escalators and passenger conveyors*. *BS 2655 Part 5: 1983* provides general requirements for escalators and passenger conveyors.



There is also an interface with other Regulations, for example the *Electricity at Work Regulations 1989* and the *Management of Health and Safety at Work Regulations 1992*.

### **What does the building owner/operator have to do?**

Compliance with regulations relating to safety has been required since 1974 under the *Health and Safety at Work etc. Act*. An assessment of risk is required under the *Management of Health and Safety at Work Regulations 1992*. Checklist 5 provides a guide to this assessment, indicating where external consultants may need to be appointed to carry out specific tasks.

## **3.5 Sanitary conveniences and washing facilities**

### ***The Workplace (Health, Safety and Welfare) Regulations 1992***

*Sanitary conveniences: ...Suitable and sufficient sanitary conveniences shall be provided at readily accessible places.*

*(The sanitary conveniences) shall not be considered suitable unless ...the rooms containing them are adequately ventilated and lit ...they and the rooms containing them are kept in a clean and orderly condition.*

*...separate rooms containing conveniences (shall be) provided for men and women, except where and so*

*far as each convenience is in a separate room the door of which is capable of being secured from inside.*

*Washing facilities: ...Suitable and sufficient washing facilities, including showers if required by the nature of the work or for health reasons, shall be provided at readily accessible places.*

*...washing facilities shall not be suitable unless ...they are provided in the immediate vicinity of every sanitary convenience, ...and in the vicinity of any changing rooms ...whether or not provided elsewhere as well. (The regulations also require) a supply of clean hot and cold, or warm, water*

### **Checklist 6 Sanitary conveniences and washing facilities**

- Check that provision is 'suitable and sufficient', taking into consideration the following factors:
  - type of work: number of people carrying out heavy and/or dirty work.
  - total use, allowing for diversity.
  - timing of breaks: are they staggered?
  - can people use facilities without delay?
  - are there any restrictions to access?
- Check that there is no risk of scalding.
- Check that a satisfactory degree of privacy is available.

*(which shall be running so far as is practicable);...soap or other suitable means of cleaning; ...towels or other suitable means of drying.*

*(Separate facilities for men and women are not required where the facilities) are provided for washing hands, forearms and face only.*

The main point of issue is what is regarded as suitable and sufficient. The facilities should be suitable to enable everyone to use them without undue delay. The Approved Code of Practice to the *Workplace (Health, Safety and Welfare) Regulations 1992* gives minimum numbers

- Is fabric weatherproof, clean, and easy to keep clean?
- Check that ventilation meets minimum requirements (see section 3.2).
- Check that lighting meets minimum requirements (see section 3.3).
- Check that an assessment of the risk of legionellosis has been carried out. Guidance on minimising this risk is given in CIBSE Technical Memoranda: *Minimising the risk of Legionnaires' disease*.

Design guidance is provided in the *CIBSE Guide* Section B4 Water service systems and the current issue of *BS 6465*.

of facilities, but more may be necessary if, for example, breaks are taken at set times, where there is heavy soiling of the body or where members of the public also use the facilities. The Approved Code of Practice also requires special provision to be made for people with any disability to have access to facilities suitable for their use.

These Regulations also cover sanitary accommodation not connected to the workplace, but accessible from it, as well as that which is remote or temporary and where there is no running water or nearby sewer.

The Approved Code of Practice to the Regulations places requirements on the structure, privacy, drainage, ventilation, lighting, and cleanliness of sanitary accommodation, as well as the provision of showers.

Recommended lighting levels for toilets are given in the CIBSE Code for Interior Lighting

Recommended ventilation rates for toilets are given in Section B2 Ventilation and air conditioning (requirements) of the CIBSE Guide.

The Approved Code of Practice stipulates that washing stations must be supplied with either warm water or separate hot

and cold water. If showers have a hot water connection which is capable of supplying water warmer than 50°C they must have a device 'such as' a thermostatic mixing valve to reduce the risk of scalding. Since HSE Guidance Note *HS(G)70: The control of legionellosis including legionnaires' disease* recommends hot water storage at 60°C and a minimum temperature at outlets of 50°C within one minute of running, 'warm' water distribution is not recommended. The risk of scalding at 50°C is minimal for most people. However prolonged contact requires water at around 35 to 40°C. For people who cannot judge temperatures the risk of scalding is greater. For these people the HSE recommend 'fail safe' thermostatic mixing valves on all outlets. These devices automatically close their hot water port if the cold water supply fails.

The Approved Code of Practice provides a useful check for the building operator to ensure that they have sufficient water closets and wash stations for their existing workforce. These are applicable for offices and factories. For other applications reference should be made to the *CIBSE Guide* Section B4 Water service systems.

Other legislation also applies to sanitary accommodation and washing facilities:

- The *Management of Health and Safety Regulations 1992* and the *Control of Substances Hazardous to Health Regulations 1988* require assessments which should identify where additional facilities required for employees who carry out heavy physical and/or dirty work.
- The Approved Code of Practice *Prevention or control of legionellosis (including legionnaires' disease)* requires an assessment of risk of legionellosis and its prevention or control. Guidance on compliance is published by the HSE in the Guidance Note *HS(G)70*. The CIBSE gives detailed technical guidance on minimising the risk of Legionnaires' disease in Technical Memoranda *TM13* (1991). This applies to the possible risk of the growth of the legionella bacterium in pipework, taps, tanks, cisterns and hot water storage cylinders, which, if present can be inhaled by people running taps or taking showers, who as a consequence could catch Legionnaires' disease or related illnesses. Legionnaires' disease is a potentially fatal form of pneumonia.

### 3.6 Drinking water

#### **Workplace (Health, Safety and Welfare) Regulations 1992**

*An adequate supply of wholesome drinking water shall be provided for all persons at work in the workplace.*

*Every supply of drinking water... shall ...be readily accessible at suitable places; and ...be conspicuously marked by an appropriate sign where necessary for reasons of health or safety.*

*...there shall also be provided a sufficient number of suitable cups or other drinking vessels unless the supply of drinking water is in a jet from which persons can drink easily.*

#### **Checklist 7 Drinking water**

- The water supply entering the premises should meet the requirements of the *Water Supply (Water Quality) Regulations 1989*. If there is any concern about mains water quality contact the relevant water undertaker's water quality department.
- **Check that drinking water taps comply with *Water Supply Byelaw 96*.**
- **Check that a cistern associated with drinking water storage complies with *Water Supply Byelaw 30*.**
- **Check the suitability of drinking water services particularly with regard to**

The Approved Code of Practice associated with the *Workplace (Health, Safety and Welfare) Regulations 1992* states that drinking water should normally be provided directly from the mains, but that it may be supplied via a storage cistern provided that cistern complies with the model Water Byelaws, emphasising that it must be well covered, kept clean and tested and disinfected as necessary. Cleaning and disinfection should be carried out in accordance with *BS 6700: 1987: Specification for the design, installation, testing and maintenance of services supplying water for domestic use*

**sanitary appliances with reference to Approved Code of Practice, *BS 6700: 1987, Section 2, sub-clause 5.1.2 and BS 6465: Part 1: 1984*.**

- Check provision of suitable drinking vessels at the source of the drinking water point.
- Check that the drinking water points are clearly and conspicuously marked where necessary.

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**Investigations of the kind highlighted in bold type should be undertaken by a competent person.**

*within buildings and their curtilages*. The Regulations also allow drinking water to be supplied in refillable containers that must be suitably enclosed and refilled at least daily.

Drinking water taps should not be installed in places where contamination is possible, for example in sanitary accommodation, where people could use the tap before washing their hands.

If non-disposable cups are provided then provision for washing them should be provided nearby. The provision of a drinking water fountain and its siting are referred to in *BS 6700: 1987* section 2, sub-clause 5.1.2. Further information on drinking water fountains especially in relation to installation within or near toilet areas is available in *BS 6465: Part 1: 1984*.

Drinking water supplies need only be marked if it is possible for people to drink from supplies not meant for drinking. Marking is not required if the non-drinkable supplies are marked, such as when contaminated water is intended for process use only.

The requirements relating to the supply of drinking water are dealt with in the Water Byelaws and the *Water Supply (Water Quality) Regulations 1989*.

The *Water Supply (Water Quality) Regulations* detail what constitutes wholesomeness, and provide a comprehensive list of biological and non-biological parameters relating to water quality and the limits and values that must be adhered to by the water undertakers.

The model Water Byelaws, amongst many requirements, state that the tap used for drawing off drinking water shall be connected directly to a service pipe linked to the mains supply or where necessary to

a distribution pipe drawing water exclusively from a storage cistern. This storage cistern must be installed in accordance with *Byelaw 30* which deals with cisterns storing water for domestic purposes.

Other requirements relating to the provision of drinking water can be found in the British Standard, *BS 6700: 1987*. Section 2, clause 5: 'Cold water services' specifies requirements regarding siting and installation of drinking water facilities.

Table A1.11 (*CIBSE Guide*) Sound levels for speech intelligibility

Background sound level (dBA)	Background NR	Maximum distance† for intelligibility (m)
48	40	7
53	45	4
58	50	2.2
63	55	1.2
68	60	0.7
73	65	0.4
77	70	0.2
over 70	over 70	Too noisy for speech

† Distances are for normal speech. The distance is increased by raising the voice and is approximately doubled by raising the voice 5 to 6 dB

## 3.7 Noise

### *Health and Safety (Display Screen Equipment) Regulations 1992*

*Noise emitted by equipment belonging to any workstation shall be taken into account when a workstation is being equipped, with a view in particular to ensuring that attention is not distracted and speech is not disturbed.*

These regulations are considering annoyance and stress factors of noisy equipment, rather than actual damage to health or hearing, though long term noise distraction could indirectly affect health and well-being.

The major source of equipment noise at a workstation would normally be the printer. This should be kept to levels which do not impair concentration or prevent normal conversation. Exceptions to this rule include the sound designed to attract the user's attention, for instance to warn of a malfunction.

Noise can be reduced by replacement, sound-proofing or repositioning of the equipment. Thus a printer could be placed on a sound absorbent surface, or sound insulating partitions could be installed between noisy equipment and the rest of the workstation, as long as the location of the equipment is still convenient for all those who need access.

**Checklist 8 Noise**

- Check level of complaints of annoyance and distraction of employees from noisy visual display terminal (VDT) equipment. This could be part of a wider workstation and indoor environment questionnaire survey.
- **Check whether noise levels are within guidelines by measurement techniques using tables to assess noise level for particular application.**

If it is ascertained that there is a problem with noisy VDT equipment:

- Check that equipment is up-to-date and in full working order — if not, overhaul or replacement may be the best means of overcoming the problem.
- To further reduce noise, place equipment on a sound absorbent surface, or surround with sound insulating partitions.
- Check that any equipment which is screened off is still easily accessible to those who use it regularly.
- Check that it is essential for all employees in the vicinity of noisy workstation(s) to be located there.

**The investigation highlighted in bold type should be undertaken by a competent person.**

Background noise levels for annoyance and speech intelligibility in a given environment, can be expressed in dB(A) or as a noise rating (NR) value. The NR value is approximately equivalent to the loudness in dB(A) minus 6.

Background noise from services can be measured when the building is unoccupied and the plant running, provided external noise is not obtrusive, using a sound level meter set to give a readout in dB(A).

*CIBSE Guide* Section A1 Environmental criteria for design gives the recommended noise ratings for various applications (see Table A1.1 from the *CIBSE Guide* on the preceding page). The recommended NR values for most workplaces range between 30 for top management offices and conference rooms, to 45 for computer rooms and canteens. At a distance of 4 metres, speech will be intelligible at or below NR45 so if the above guidelines are followed then normal speech and telephone conversations can take place without undue strain.

Checklist 8 provides a guide to complying with good practice on noise.

**3.8 Miscellaneous equipment*****Provision and Use of Work Equipment Regulations 1992***

*Every employer shall ensure that, where appropriate, work equipment is provided with one or more readily accessible controls, the operation of which will bring the equipment to a safe condition in a safe manner.*

*Every employer shall ensure that, where appropriate, work equipment is provided with one or more readily accessible emergency stop controls, unless it is not necessary by reason of the nature of the hazards and the time taken for the work equipment to come to a complete stop as a result of the action of any control provided by virtue of (the above regulation).*

*Every employer shall ensure that where appropriate work equipment is provided with suitable means to isolate it from all its sources of energy.*

*'Work equipment' means any machinery, appliance, apparatus or tool and any assembly of components which, in order to achieve a common end, are arranged and controlled so that they function as a whole.*

As can be seen by the above definition almost every piece of equipment used at work is covered by this Regulation. It does not just refer to lathes and machine tools in factories but to photocopiers, cash registers and typewriters in shops and offices.

Some of the electrical criteria are of a general nature and merely require the employer to ensure that the equipment purchased is safe in its own right. Each piece of equipment needs to have accessible on/off and operating controls and be so positioned in the workplace that these controls can be easily operated by the user. It should not be possible to accidentally operate the controls that would lead to an increased risk to the user.

The employer must purchase equipment that is safe in its own right and is appropriate to the task and the environment in which it is located. The employer must ensure that this equipment is regularly inspected and tested. This necessitates installing the equipment in such a way that it can be safely maintained.

For those pieces of equipment that present a physical danger to the user, because of exposed moving parts, such as some printers, or because they contain heating elements, such as some catering or process plant, there needs to be easily accessible emergency stop devices provided. If they are not included on the piece of apparatus then they must be provided by the employer. These must be

positioned such that they are not obstructed by the source of danger, i.e. not above a fryer, for example, or behind a print machine. If the activation of an emergency stop device could create a further hazard or if the speed of failure renders the device superfluous then such a device should not be installed.

Each piece of work equipment must have a means of isolation from all sources of energy. For this section this would generally mean isolation from the mains supply but could also be from batteries, a generator or a gas supply. Each isolator must be clearly identified so that the wrong piece of equipment is not disconnected or the operator led to believe that a piece of apparatus is safe when in fact still connected.

Detailed reference to the clauses of the regulations should be made where large scale process or manufacturing equipment is concerned. In general the protection of the users of all work equipment should be paramount when considering the purchase, upgrading or maintenance of any item of work equipment.

Safety of electrical equipment and distribution systems is covered by the *Electricity at Work Regulations 1989* and the 16th edition of the *IEE Regulations for*

*electrical installations*, 1991 (reproduced in *BS 7671: 1992*).

### Checklist 9 Miscellaneous equipment

- Check that all existing items of work equipment have suitable accessible means of control. The controls must not be in a dangerous location.
- Check, where appropriate, that safe means of stopping equipment that present a special risk to the user are provided. Check that these are safely accessible.

If no such control is provided then the employer should seek specialist advice and have such controls provided in a safe and accessible position adjacent to the piece of equipment.

- Check that each piece of equipment can be completely isolated from sources of energy. Where there is more than one source of energy to one piece of equipment then each means of isolation must be labelled to that effect.

## Model terms of reference for consultancy contracts

### 1 Introduction

The surveys which require specialist expertise should be planned in conjunction with the specialists, who will need to be selected well in advance of the audit. The terms of reference should therefore not be too specific, but should enable a judgement to be made on the grounds of quality as well as cost.

### 2 Selection of consultants

The chosen consultant should demonstrate the following characteristics, qualifications and experience:

- Independence: as far as possible consultants should not benefit from their recommendations, particularly where these may restrict the options available. For example a consultant who surveys water systems should not also market water treatment chemicals or supply tank liners.
- Qualifications and experience: check that these are in areas relevant to the proposed surveys, ensure that CVs are

obtained for the personnel who are going to be directly involved with the project.

- Quality assurance: if analytical work is required laboratories should ideally be NAMAS accredited and consultants should be certificated to *BS 5750, Part 1 (1987)* or *ISO 9001: 1987*. If not they should demonstrate that they are making progress towards reaching these goals.

### 3 Model terms of reference

#### 3.1 Preamble

..... (organisation) is carrying out an audit of its computer accommodation and/or a building health check on its offices to ensure that the environment is being maintained within design limits, that all equipment is functioning as intended and that legislative requirements are being met. We therefore require the following survey(s) to be carried out:

Survey 1

Survey 2

etc.

(Give brief outline of the survey(s) required, including the parameters to be

measured, expected accuracy and ranges, and sources for information.)

### 3.2 *Pre-qualification requirements*

- Previous similar experience: give brief case histories of relevant projects.
- Referees: give three previous clients for whom you have carried out similar work, complete with contact names, addresses and telephone numbers.
- CVs of key personnel.
- Approach/method statement: state your approach to this kind of work, detailing any specific area where your company has the advantage over others. Give references and other background material where appropriate.
- Give examples or details of any questionnaires, pro-formas, checklists, or analytical tools used in previous projects by your company.
- Equipment and laboratory facilities: list the main equipment you would use for this project and what arrangements you make for laboratory analysis, where appropriate.
- Quality assurance: provide a review of your current quality management

procedures. Are you currently certified? Give details.

- Professional indemnity: sum insured and policy details.

### 3.3 *Scope*

Following pre-qualification the consultant would be expected to carry out the following as a minimum:

- Site visit: sufficient information would be made available to enable the consultant to establish the full scale and nature of the works, including layout drawings, schematics, specifications, maintenance documentation, previous reports etc., as applicable.
- Develop methodology: the consultant must develop an approach and programme to suit our specific needs and the nature of the project. A detailed method statement is required, justifying the various elements in the quotation.
- Prepare quotation: quotations should be broken down into specific surveys and a time charge rate given for the various categories of staff employed, with an indication of the proportion of overall time allocated to each. The rules for tendering are attached.

- Appointment.
- Carry out survey in liaison with site personnel.
- Report: two copies of a report should be submitted. These should include full details of the methods employed, results, interpretation and analysis, and recommendations for remedial action, including a schedule of works indicating degree of urgency on a five-point scale and budget costings for carrying out the works.



## **Sources of further information and advice**

Association of Consulting Engineers (ACE), Alliance House, 12 Caxton Street  
London SW1H 0QL

Tel: 071-222-6557, Fax: 071-222-0750

The ACE publishes a list of its members and is able to provide information regarding their standing, experience and qualifications. The ACE also offers free advice on the selection of consulting engineers.

British Standards Institution (BSI),  
Linford Wood, Milton Keynes MK14  
6LE

Tel: 0908-220022, Fax: 0908-320856

Telephone 0908-221166 for information regarding British Standards, and 0908-226888 regarding information services.

Building Research Establishment (BRE),  
Bucknalls Lane, Garston, Watford, Herts  
WD2 7JR

Tel: 0923-894040, Fax: 0923-664010

The BRE publishes technical guidance and results of research, and provides an advisory service on technical matters.

Building Services Research and Information Association (BSRIA), Old  
Bracknell Lane West, Bracknell,  
Berkshire RG12 1BR

Tel: 0344-426511, Fax: 0344-487575

BSRIA publishes technical documents and provides a building services library and information service.

Chartered Institution of Building Services Engineers (CIBSE), Delta House, 222  
Balham High Road, London SW12 9BS

Tel: 081-675-5211, Fax: 081-675-5449

The CIBSE publishes various technical publications written by its members offering guidance in building services design. A publications catalogue is available from the above address.

Heating and Ventilating Contractors Association (HVCA), ESCA House, 34  
Palace Court, London W2 4JG

Tel: 071-229-2488, Fax: 071-727-9268

The HVCA represents contractors specialising in the installation, commissioning and maintenance of building services. It publishes guidance on specifying. At the time of going to press (February 1993) a manual on health and safety risk assessment was in preparation.

Health and Safety Executive (HSE), HSE Information Centre, Broad Lane, Sheffield S3 7HQ  
Tel: 0742-892345, Fax: 0742-892333

Information regarding HSE publications (also available from HMSO bookshops) and services is available from the above address or from local area offices.

Her Majesty's Stationery Office (HMSO), PO Box 276, London SW8 5DT  
Tel: 071-873-9090, Fax: 071-873-8200

The HMSO publishes documents produced by government departments, including legislation, available from above address. For general enquiries, telephone 071-873-0011.

### **Instrument hire**

Instruments are available for hire from BSRIA Hire (telephone: 0344-59314), including a help line and on-site installation service.

### **CIBSE consultants**

The following list has been prepared for those who require the services of a professional building services engineer. The consultancies are run by members of the CIBSE. Only practices that have applied for inclusion and have a corporate member as a partner or equivalent appear

in the list. All chartered building services engineers have satisfied the stringent training and academic requirements of the Institution. A more detailed list, outlining fields of expertise and specialisation, is available from the CIBSE.

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84 Lower Barn Road, PURLEY, Surrey, CR8  
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6 John Street, SHOREHAM-BY-SEA, West  
Sussex, BN43 5DN  
Tel: 0273-461337, Fax: 0273-453143

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Craven House, 40 Uxbridge Road, Ealing,  
LONDON, W5 2TZ  
Tel: 081-567-5621, Fax: 081-579-5649

**D W COX ASSOCIATES**

Denton House, Denton Road, WOKINGHAM,  
Berks, RG11 2DX  
Tel: 0734-791878, Fax: 0734-773716

**EDWARD A PEARCE AND PARTNERS**

Old School House, 35 Ewell Road, SURBITON,  
Surrey, KT6 6AF  
Tel: 081-390-6244, Fax: 081-390-1329

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