6

The design, installation, commissioning, operation and maintenance of services must comply with statutory requirements. Note should be taken of the relevant documents listed in this section and the References. The Appendix gives further detail of some of the regulations mentioned in this section.

It is advisable to produce elevations detailing the services provision on walls at an early stage in the planning of a design and technology space. In this way the positions of pipework, drainage, electrical trunking and heat-emitters can be coordinated with the heights and locations of window sills, furniture, fittings and equipment (see 'Perimeter benching' in Section 4). The effect that future adaptations may have on the service installation should be borne in mind at the design stage.

# Services and environmental design

# Services

## Electricity

### General

New fixed installations and alterations should conform to the Electricity at Work Regulations 1989 and to BS 7671 (see References). BS 4163 provides comprehensive guidance on the design and maintenance of electrical systems in design and technology areas, including references to relevant regulations and guidance. This section provides a brief overview.

All electrical equipment should be of an appropriate Index of Protection (IP) rating. For example, if there is a risk of water and/or solids ingress, the equipment should have a rating of at least IP 44. For details of specifications, and of tests to verify degrees of protection, reference should be made to BS EN 60529.

### Whole-room controls

Each work area containing fixed electrical equipment (e.g. a resistant-materials room or a preparation area) should have a lockable single-switch disconnector, ideally near the main entrance to the space, or adjacent to the teaching focus or whiteboard, and easily accessible to the teacher. This should control all the electrical-power circuits but not lighting or circuits serving ICT equipment or equipment which is designed to remove a hazard (such as a fume-extraction system). There are no recommendations to have an overall main switch for food-technology rooms.

Each work area containing fixed electrical equipment should also have an emergency-stop system which switches off all circuits supplied via the switch-disconnector in an emergency. The emergency-stop buttons must be readily accessible to the teacher and positioned at a height of 1.5m to ensure clearance of machines and benching; there may be several emergency-stop buttons located at intervals around the room. In view of the increasing use of portable CAM machines, hand power tools and other portable equipment, it is recommended that the emergency-stop system control all socket outlets too, except those serving ICT equipment.

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The reset switch should be key-operated to ensure that only authorised persons can reset the power. The contactor in the stop circuit should also provide under-volt release.

Critical circuits specifically installed to remove hazards (e.g. fume extractor) and fan, lighting and alarm circuits should not be controlled by the emergency system.

## Controls for fixed equipment

All fixed equipment should be controlled by an isolating switch located either on the equipment or within two metres of the normal operating position, and accessible to the operator. For certain machines, e.g. circular saws or bandsaws, the switch should be lockable. All machines and equipment should have mechanically protected cabling (i.e. armour-flex cable).

Most machines also require individual emergency-stop buttons, controllable via knee or foot (see Section 5). Further details can be found in BS 4163.

## Electrical supplies for food-technology equipment

Cookers in food rooms should be wired from local isolators. There should be a 13-amp supply for gas cookers to supply clocks and timers. Microwave and combination ovens can be connected via a 13-amp plug. All electrical equipment should be of an appropriate IP rating.

Supplies to commercial-sized fridges and freezers should be on dedicated circuits.

## Electrical supplies for ICT equipment

Where required, local computer network servers should be supplied through an individual dedicated supply that cannot be switched off unintentionally. Sufficient socket outlets should be provided to minimise the use of adapters or extension leads to computers and peripheral equipment.

Consider high-integrity earthing for circuits serving IT equipment, as required by BS 7671, for new work.

## Residual-current devices (RCDs)

The need for protection, additional to the overload protection provided to comply with BS 7671, should always be considered. For example, residual-current devices (RCDs) cut off the power supply to the room in the case of a fault in the circuit. Any equipment designed to remove a hazard should not

be included on an RCD-protected circuit. Where electrical experiments are being carried out, a higher standard of protection can be achieved by the additional use of 1:1 isolating transformers.

In all areas of high risk from electrical hazards, the use of RCDs rated at 10mA (milliamps) should be considered.

Because there is unavoidable earth leakage current from the power supply circuits of computers, they may cause nuisance tripping of residual current devices.

## Low-voltage supplies

Extra-low voltage for practical work can be provided either by portable transformers providing a range of voltages or by bench-mounted trunking systems (see 'Perimeter benching' in Section 4). 230-volt AC electrical systems in furniture have particular requirements regarding the number of socket outlets, connected loads, fuse protection, shock protection, earthing, etc.

## Structured data cabling (network cabling)

Structured data cabling is a fundamental part of the services installation of a modern design and technology facility. The type of cabling (e.g. category 5e or category 6) should be carefully chosen, and installed and commissioned in accordance with industry standards. A Patch panel should be provided for a local server with connections for wireless network hubs and final data points.

## Electric arc welding

Electric arc welding equipment must have a properly earthed transformer. A separate earth lead from the workpiece to the mains earth should be fitted.

## Portable equipment

If mains-powered portable equipment is to be used at loose tables in the centre of the space, it should be serviced from overhead via hanging sockets in order to minimize the use of extension leads and the possibility of tripping. Floor sockets may be considered but they can present significant hazards: paper clips, liquid and dust can enter them, leads can constitute tripping hazards or become trapped. It is also not possible to fit a transformer plug into a floor box.

Where portable equipment is provided, details of potential benching layouts together with the electrical loading of each supply point must be assessed

during the early stages of the development to ensure the potential loading of circuits is fully considered. Only portable equipment rated at less than 13 amps should be fitted with a normal BS 1363 plug top.

Socket outlets that will be used for mains-powered portable equipment (indoors or outdoors) should be protected by an RCD with a trip rating of 30 mA or less, conforming to BS EN 61008-1, BS EN 61009-1 or BS 7288.

All socket outlets should be positioned away from sinks to reduce the risk that electrically powered equipment is placed in water. In food-technology rooms, socket outlets should be positioned to ensure that an electrical cable attached to a piece of equipment doesn't have to cross a hot cooking surface.

Electrical supplies and SVGA cabling will be required for interactive whiteboards and ceiling-mounted projectors

## Gas and air supplies

### Mains gas

Mains gas is used to service cookers in food spaces and for heat treatment (for example a chip forge) in resistant-materials areas. Wherever mains gas is supplied, there must be some way of readily isolating and restoring the gas supply to each room. The principal isolating gas tap should be easily accessible, but not readily accessible to pupils. To prove that all downstream isolation valves are in a closed position prior to the restoration of gas supplies after a shut-down, a weep by pass pressure-proving system can be employed in large installations.

The automatic weep by pass pressure-proving system will facilitate safe daily isolation and restoration of the gas service and also automatic interlocking to ventilation systems and fire alarms where they are required. However, consideration will need to be given where the fire-alarm bells are used for other purposes such as for class-change.

Specialist advice should be taken before fitting leak-sensing controls, emergency shut-off valves, or ventilation-control or fire-alarm interlocks to gas supplies as they should not be fitted to some equipment.

Advice on gas installations is given in the publications IGE/UP/11[16] and BS 4163 (see References).

Note

16. *Gas Installations for Educational Establishments,* UP11, Institution of Gas Engineers and managers, 2004.

## Bottled gas

Cylinders of oxygen and acetylene gas must be stored and handled with care. When not in use they must be stored in an area agreed with the fire officer. If the gases are piped to the bench from an external store, this must be of fire-resistant construction with access from the outside only. Gas bottles, whether in use or not, must always be housed in a well ventilated area, that must not be below ground level.

Liquefied petroleum gas (LPG) is sometimes used for brazing and should be supplied by hard pipe from cylinders located outside the building in the open air. These must be separate from oxygen cylinders and any combustible materials. It is essential to follow all safety precautions when using bottled gases and the fire-prevention officer must be consulted at an early stage. Refer to BS 4163 for more detailed guidance.

## Compressed-air supplies

Compressed air (used in pneumatic work) can be supplied locally by a portable unit with flexible pipework or it can be piped from a fixed remote unit. The main dangers from using compressed air are:

- An airline being directed at a part of the body
- Excessive working pressures
- Air receivers installed in cramped, inaccessible and poorly ventilated areas
- Home-made air (or steam) receivers or those which have not had regular inspections; these can explode at high pressure

All compressors should be kept out of the reach of pupils and regular maintenance and testing by a competent engineer are essential. The Pressure Systems Safety Regulations 2000 apply to mobile and fixed compressed-air systems. BS 4163 (see Appendix) provides guidance. Noise from compressors needs to be considered.

# Water

Pupils need ready access to hot and cold water from all design and technology spaces and ideally within the space itself. In food rooms there must be hot, cold and drinking water. Sinks should be fitted with bottle traps, and wherever weak solutions of acid are used, wastepipes should be able to withstand the corrosive effect. Food-technology rooms should be fitted with at least one dedicated basin for hand washing.

In food rooms, it is good practice to provide all taps for washing-up with water at a supply temperature of 60°C – this higher temperature than is suitable for normal hand-washing is needed to remove grease and helps to kill bacteria. However, at wash-hand basins, blended supplies should be provided.

The Water Supply (Water Fittings) Regulations 1999 (see *Water Regulations Guide* at www.wras.co.uk) require backflow prevention to be fitted to water supplies to equipment such as domestic clothes- and dish-washing machines which will contain a category 3 fluid (one which can cause contamination of the water supplies in cases of back syphonage). Workshop areas may house equipment which contains fluid categories 4 or 5, for which more stringent backflow prevention is required. These requirements are retrospectively enforceable under the Water Industry Act, 1999.

# Environmental design

Environmental standards including heating, ventilation, lighting and acoustics are covered in the publications listed in the References. The following summarises the main requirements.

## Ventilation

The ventilation of all design and technology spaces must be designed to provide adequate ventilation for the occupants. It should also dilute fumes (e.g. from paint spraying) and water vapour and vapourised fats generated by cooking in food rooms. Dust extraction will be required from woodworking machines.

Where flueless gas appliances such as cookers are installed, adequate ventilation is required to safeguard against the possibility of incomplete combustion producing carbon monoxide.

The provision of oxygen detectors or carbon-monoxide detectors should be considered, to warn occupants of dangerous incomplete combustion which can occur if the ventilation is insufficient for combustion or if the cookers are badly maintained. Because of the high ventilation rates required in such spaces, pre-heating of the ventilation air should be considered. Guidance is available in BS 6173 on air supplies required to support combustion where cookers are installed.

The Education (School Premises) Regulations 1999 give ventilation rates which allow for occupancy of teaching spaces. These require that 'controllable ventilation should be provided at a minimum rate of three litres of fresh air per person per second for each of the maximum number of persons the area will accommodate', and that 'the spaces should be capable of being ventilated at a minimum rate of eight litres of fresh air per second for each of the usual number of people in the space'.

The Workplace (Health, Safety and Welfare Regulations) 1992: Approved Code of Practice and Guidance' , L24, 1996 also applies during occupation.

The guidance states that the fresh air supply rate should not normally fall below five to eight litres per second per occupant (regulation 6, page 9). Factors to be considered include the floor area per person, the processes and equipment involved, and whether the work is strenuous.

The risk assessments produced by CLEAPSS (the Consortium of Local Education Authorities for the Provision of Science Services) for pollutants assume at least three air changes per hour in spaces of average size. If in design and technology workshops the ceiling height is low a higher ventilation rate will be required to achieve the same air-change rate.

Ventilation should be achieved by natural means wherever possible. However, some form of LEV is likely to be needed in certain situations (see below).

Some form of mechanical ventilation will be required in most food areas at least some of the time, to deal with the heat-gain and water vapour produced by cooking and other equipment, as well as solar gains (see Local exhaust ventilation below). Mixed-mode mechanical/natural ventilation systems rather than full mechanical ventilation systems will probably be the most economic solution. Heat recovery on local extract fans and on supply and extract systems may be helpful in winter to minimise ventilation heat losses. However, there will need to be bypass or separate arrangements for summer ventilation. Cleaning of grease from any heat-recovery systems must be considered during design. Food rooms should ideally be enclosed in order to prevent dust from contaminating food, particularly where resistant-materials spaces are nearby. Opening windows may need to have fly guards to prevent insect contamination.

Food stores, refrigerators and freezers must be maintained at the correct temperature. If refrigerators or freezers are kept in storerooms there must be sufficient ventilation so that the general conditions remain cool. Any ventilation and extraction systems should be designed by specialists to create appropriate conditions for comfort and health.

## Local exhaust ventilation

Local exhaust ventilation (LEV) is needed to extract dust or fumes that pose a risk to the health and safety of users or affect their comfort. LEV may be necessary following a risk assessment carried out under COSHH (see Appendix). Typical situations where LEV may be needed (taken from BS 4163, see Appendix), are:

- Cooking appliances that give off steam, oil, grease, odour, heat and products of combustion

- Equipment for heat treatment, including for brazing, forging, welding, and soldering
- Woodworking machines, including for sawing, sanding, planing, and thicknessing
- Chemical processes, including acid pickling, plastics work, paint spraying, and engine exhaust emissions
- Working with adhesives
- Metalworking machines (grinding and polishing)
- Working with plastics and glass-reinforced plastics (GRP)

BS 4163 and HSG37 provide useful guidance on LEV and refer to further documents. Some key points include:

- Combustible dusts (e.g. fine particles of wood, plastics and some metal dusts) should be collected separately from those produced by processes where sparks are generated
- The local exhaust inlet should be sited as close as possible to the source of contaminant, and extraction should be to a place which will not cause harm.
- It is essential that air is brought into the space to compensate for air exhausted to the outside (note that make-up air may need to be heated in order to maintain adequate internal conditions).

CAD/CAM machines require their own extraction systems which can be very noisy, and since they are often left running during other class activities this can cause disturbance. Cookers in food rooms will need adequate extraction. This may be in the form of individual extraction hoods although these too can be noisy.

Where gas cooking appliances are used, the ventilation may be regarded as a 'power-operated flue' as described in the Gas Safety Regulations, and may need to be interlocked with the gas supply. BS 6173 provides further guidance. This type of ventilation may need to be provided at source in the way of LEV in accordance with COSHH requirements. The HSE guidance note on ventilation of kitchens in catering establishments gives good advice, some of which is applicable to food-technology rooms as well as school kitchens.[17]

Note

17. *Ventilation of Kitchens in Catering Establishments,* HSE Books, 2000.

Adequate combustion air as required by BS 6173 means that ventilation controls may need to be interlocked with gas supplies, e.g. on kitchen extract systems, unless an alternative means of reducing risk to a practicable level can be demonstrated by other suitable methods of working. Also, in some situations fire-alarm systems must be linked to extract fans, so that they are shut down in the event of a fire. Specialist advice on these matters will be required from a suitably qualified engineer.

## Heating

An appropriate temperature must be maintained at all times, particularly in workshops and preparation areas because low temperatures and draughts can make it more difficult to handle materials or operate machinery, while high temperatures and inadequate ventilation may lead to fatigue. Temperature and humidity levels must also be appropriate to the materials stored in storerooms; for example, overheating or poor ventilation can damage timber stocks. Convector heaters should be avoided in dusty areas such as resistant-materials spaces as they blow out recirculated dust. Radiators can be a suitable solution.

## Lighting

The quality of light is very important both for safety reasons and to contribute to the general atmosphere of a teaching space. Much can be achieved through the design of the building form, selection of luminaires (i.e. light fittings) and use of colour. Ideally, all teaching spaces should be lit by natural light, supplemented in deep rooms by electric light. It should be possible to control groups of luminaires separately, particularly those over the projection screen or whiteboard. Some form of daylight and sunlight control (such as blinds) will be needed in most spaces to ensure good visibility of the electronic whiteboard and any computer screens in the area.

Building Bulletin 87, *Guidelines for Environmental Design in Schools*,[18] recommends a level of 300 lux for general lighting in most teaching areas and 500 lux wherever visually demanding tasks, such as fine work with fabrics, are done. Good rendering of colours is important and lamps of CIE colour-rendering group 1B should be provided. Additional task lighting needs to be considered for machines in the resistant-material space and possibly for other activities such as circuit-board work. Directional lighting is recommended in display areas. If a lit display unit is enclosed, it will need to

Note

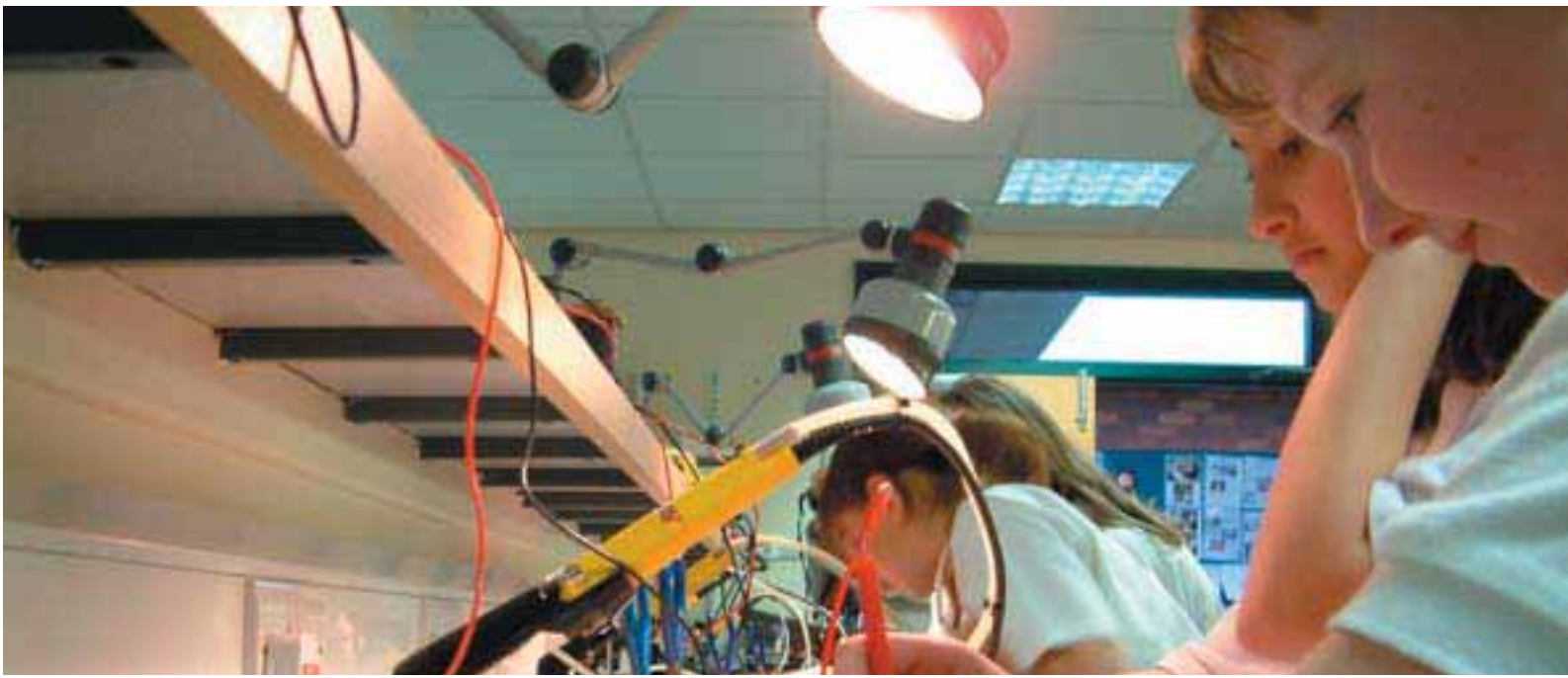
18. The revised version can be found at *www.teachernet.gov.uk/energy*

be designed to avoid the build-up of heat as this can be a fire hazard. Luminaires that are designed to minimise glare and reflection on the vertical plane should be used in areas where a number of computers are used (such as shared resource areas or graphics rooms). However, glare and reflection on the horizontal plane are usually equally important and the type of luminaire chosen should also minimise this type of glare. It is an advantage to be able to vary the lighting environment by providing, for example, separate controls to different parts of a space or dimming switches. Lighting controls such as daylight sensors can reduce running costs and are particularly suitable for storerooms.

Movement-sensing controls are best avoided in design and technology areas as it can be dangerous for the lights to switch off unexpectedly when people remain still.

The choice of luminaires is particularly important in workshop and preparation areas. Integral machine lighting should be fitted with deep reflectors to avoid glare from shiny surfaces. In certain circumstances some electric lamps, particularly mains-frequency fluorescent lights, can create a stroboscopic effect, making moving parts of machinery appear static. This can be overcome in various ways including using high-frequency control gear (see BS 4163). For this reason, and because of its better energy efficiency, high-frequency control gear should generally be specified as standard in design and technology spaces.

Emergency lighting is required for machine areas in order to provide illumination where machine parts may continue to move after the electricity supply has failed. Where it is required, emergency lighting should comply with BS 5266.



Subdued lighting should be provided for brazing and forging work areas as direct light might prevent a lit torch being seen. The walls in heat-treatment areas should be matt to avoid glare from reflections.

Sealed lighting units should be provided in dusty areas such as resistant-materials spaces to avoid dust build-up and to reduce maintenance costs.

In storage and preparation areas, lighting levels should be adequate for staff to see loads clearly and assess their weight before handling. Electric lighting should provide an even spread of light without deep shadows in order to minimise tripping hazards.

Building Regulations Approved Document L require lighting controls to be fitted in some instances although some lights should always remain uncontrolled.

## Acoustics

Design and technology spaces should be designed to have a suitable acoustic environment for the health and safety of the occupants and for teaching. Consideration must be given to the noise level created by machinery (e.g. planers, compressors and dust-extraction units), and its effect on hearing, speech intelligibility and the audibility of warning sounds for safety purposes.

The noise produced by CAD/CAM machines should be taken into account when designing a space. A specially designed enclosure may be needed to prevent noise from CAD/CAM machines from disturbing other class activities. Where possible, steps should be taken to reduce noise generation at source.

Building Bulletin 93, *Acoustic Design of Schools*, contains performance standards for acoustics (indoor ambient-noise levels, sound insulation, reverberation, etc.) and guidance on how to achieve these standards.

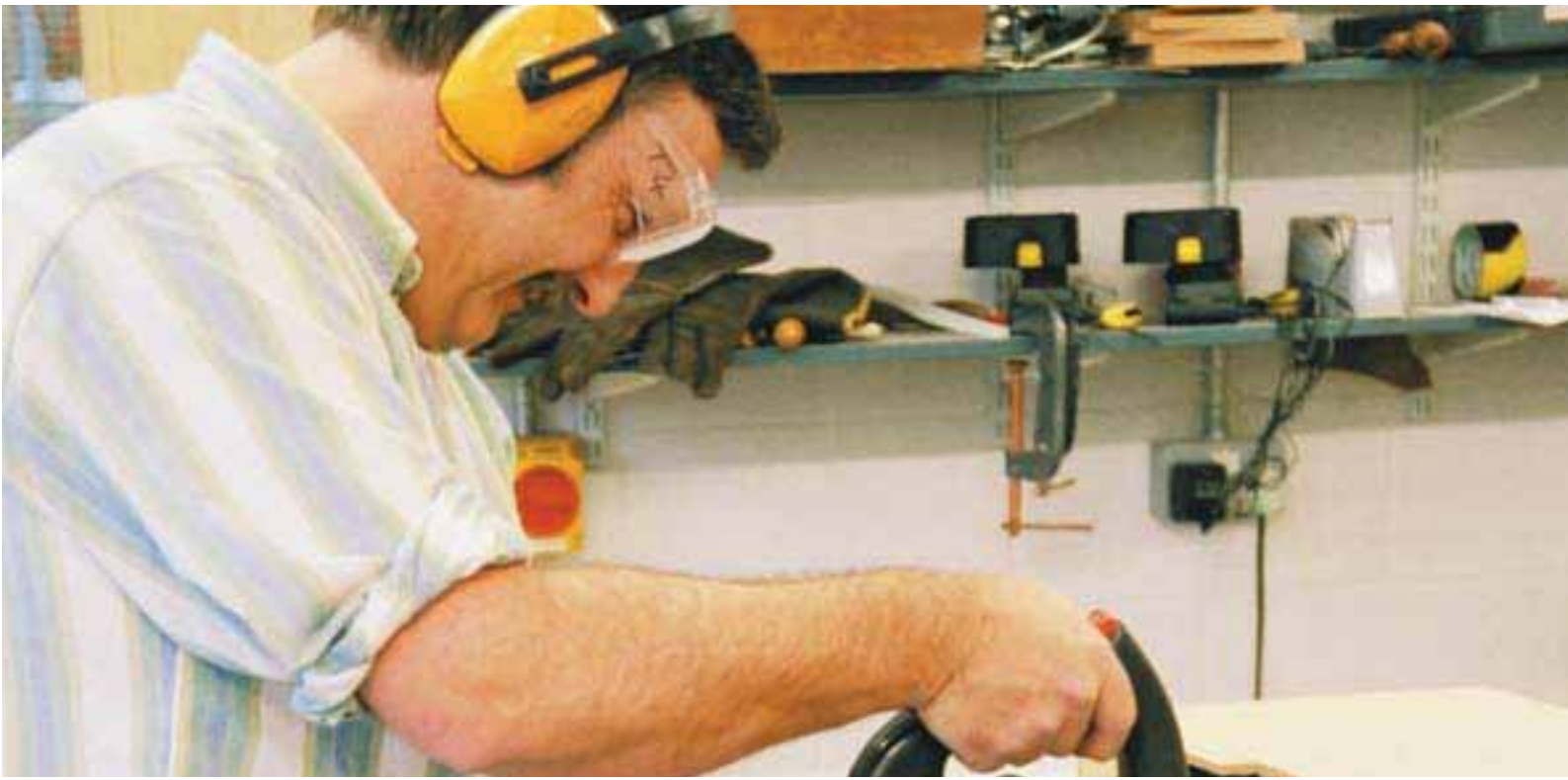
Fire-alarm sounders and flashing beacons may be required in areas with high activity-noise levels and where students have impaired hearing.

## Hazardous noise

High levels of noise can cause permanent hearing loss. The risk of hearing damage depends on the sound level and the length of exposure. Some impact-type sounds can cause hearing damage instantaneously (e.g. gunshots or heavy hammer blows on resonant objects).

The Noise at Work Regulations 1989 require an assessment of noise exposure to be carried out by a competent person. The regulations specify duties of employer and employee if the employee' s daily noise exposure reaches specific 'action levels'. Action levels describe a person's daily personal noise exposure, taking account of both noise level and exposure time. The first action level is 85 A-weighted decibels (dB(A)), the second is 90 dB(A), and the third peak action level is 140 dB(A). In school, only the teacher or technician is likely to have long enough exposure time to reach the first action level and even that may not be reached. Nevertheless, employers have a general duty under the regulations to reduce the risk of hearing damage to the lowest level reasonably practicable.

In 2006, the UK legislation will be changed as a result of a new European directive relating to noise at work, the Physical Agents (Noise) Directive, published in February 2003. The main changes to the legislation are a lowering of the action levels (e.g. the first action level will fall from 85 dB(A) to 80 dB(A)). An overview of the Noise at Work Regulations is included in Appendix 9 of Building Bulletin 93.



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This section is divided into three parts. The first gives general guidance on the capital cost of providing design and technology accommodation in secondary schools, the second part looks at the cost and procurement of furniture and equipment and the third analyses a case-study example.

# Cost guidance

# General cost issues

## New building versus adaptation or refurbishment

Constructing and fitting out a completely new design and technology facility in an existing school can cost between £1,500 and £1,700 per $m^2$ of gross floor area provided. These costs include building work, fixed and loose furniture and equipment, associated site works and professional fees, but exclude land-purchase costs and VAT. Factors influencing the cost include briefing requirements, standard of specification, site conditions, ease of access, the size of the project, and whether the building is single or multi-storey. Design and technology accommodation that is part of a whole new school may cost up to 5% less than this due to the economies of scale that can be achieved.

The costs of adapting and refurbishing existing buildings tend to be more variable. In the case of refurbishment requiring, for instance, only redecoration and a few extra service outlets, and where there is substantial reuse of existing furniture and equipment, the costs could be as little as 10% of the equivalent cost of new accommodation. In more complex projects, the costs can approach those of a new building.

Where, in an existing school, there is a choice between building a new facility and adapting or refurbishing existing accommodation, the latter will usually provide a more economic solution. As the overall gross floor area does not increase, the recurrent costs associated with new accommodation, e.g. heating, lighting, cleaning, maintenance, rates, etc., will be avoided (these could cost up to £50 per $m^2$ of gross floor area annually). In addition, the adaptation or refurbishment of an existing building may make it easier to create or maintain appropriate links between existing curriculum areas.

All projects, whether for new building, adaptation or refurbishment, should be considered in the context of a school's overall long-term building-development plan.

## Temporary accommodation

Permanent construction is preferable to temporary accommodation for design and technology accommodation, for a number of reasons. It is often difficult to manage environmental-temperature control in temporary buildings. They need frequent maintenance, which increases running costs, and will have a shorter design-life. Security is an important issue with potentially very expensive equipment being accommodated. Temporary buildings may be less convenient if they are isolated from the rest of the design and technology department, making the sharing of resources and equipment more difficult.

Temporary buildings can, however, provide a cost-effective solution to a short-term accommodation need, e.g. during building work, or to accommodate a short-term peak in a school's roll. A typical six-month hire charge for a 100m$^2$ temporary building fully fitted and serviced for design and technology, inclusive of delivery, installation and removal, is £15,000–£20,000 (excluding VAT). If temporary accommodation is needed for more than around two years, outright purchase and installation is more economical, costing between £700 and £900 per m$^2$ (excluding VAT) for a building fully fitted with design and technology furniture and equipment. This is about 50% of the cost of equivalent new permanent accommodation.

## Building consultants' fees

New building work, including extensions and substantial adaptations to existing accommodation, will normally be managed and supervised by professional building consultants, usually architects. Depending on the nature and scale of the work, there may also be other consultants, including building surveyors, quantity surveyors, structural engineers and mechanical and electrical engineers. The overall fee for these services will generally amount to between 10 and 15% of the value of the building contract, although higher fees may be payable in exceptional circumstances. The respective professional institutions will supply details of the services that can be provided as well as information on fees.

The value of the building contract on which a fee is assessed will usually include fixed furniture and fittings, e.g. shelving, benching and cupboards. Care should be taken to ensure that fees are not paid on the value of items which, whilst forming part of the main building contract, have been independently designed, procured and fixed by a specialist contractor. There may, however, be fees payable for any necessary coordination and liaison work between the project team and specialist contractors.

There will also be fees payable in respect of a planning supervisor, building regulations approval and planning permission. Site investigation work will also normally be required if building new accommodation.

## Value Added Tax

Under current regulations most school building work will attract VAT at the standard rate. The exceptions are freestanding buildings and some types of extension project at schools which have charitable status, i.e. most voluntary-aided and foundation schools. In these cases the work can be zero-rated. Furniture, equipment and professional fees are standard-rated whatever the type of project. DfES grant aid will cover the additional burden of VAT where payable. In LEA school-building projects any VAT payable is recoverable by the local authority.

As VAT can have a considerable impact on the cost of a project, advice on its application should be sought from the local HM Customs and Excise Office at an early stage in the planning and design process.

# Furniture and equipment

Furniture and equipment (F&E) for design and technology often forms a large percentage of the building costs due to the specialist nature of much of the equipment. ICT plays a large part in the cost, partly as machines are increasingly operated by computers and also because powerful computers with good resolution and large memories are required to run sophisticated software. Furniture is often more expensive as it has to be particularly robust and multi-functional to withstand the number of activities carried out in design and technology. Costs are usually expected to fall within £400–450 per $m^2$, including small equipment and consumables.

In some local education authorities, the procurement of furniture and equipment, fixed and/or loose, is managed by the authority's supplies organisation. Where this service is not provided, it may be necessary to employ the project architect or another agency to provide the procurement

service. This can cost up to 6% of the value of the furniture and equipment supplied. In small projects this work is sometimes undertaken by the school itself.

Some F&E suppliers provide a 'turn-key' service for school building projects, i.e. they supply and fit all the furniture and equipment, and decorate the space. However this is less likely in a design and technology project owing to the wide range of F&E required for design and technology compared with, say, science. Those suppliers that do provide the service often buy in many of the items from other suppliers, resulting in schools paying more than they would by buying themselves. Another risk with the turn-key approach in a design and technology project is that a company's standard stock items are provided which may not always be appropriate to the particular needs of the department.

With some items of equipment, e.g. lathes, schools sometimes deal directly with the manufacturer. Some machinery can be purchased second-hand at specialist dealers and at auctions, although allowance will need to be made for the cost of any overhauling and safety checks. The health and safety implications of reuse will need to be considered as older furniture and equipment may no longer meet with current standards (see Appendix).

# Cost analysis Case Study 1

## Background

The case study is a new design and technology block for an 11–16 secondary school which has 750 pupils on roll. Group sizes are around 21 at KS 3 and 16–18 at KS 4. The school's particular strength is in electronics and control systems. Two of the spaces are described in Section 2.

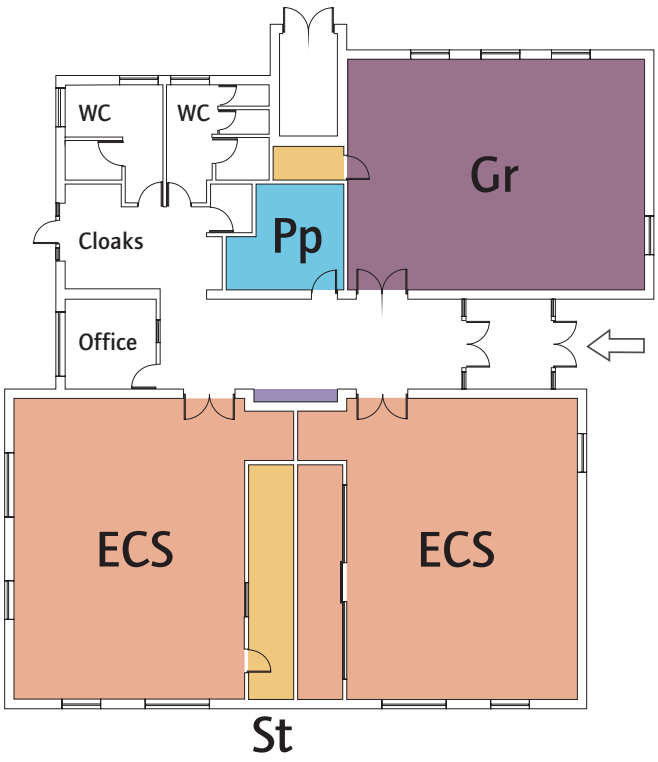
## The project

The new block is part of a major county-wide design and technology redevelopment programme. In this school, existing 1960s buildings that contain high-alumina cement are gradually being replaced. This new stand-alone block houses three design and technology spaces (graphics, control technology and electronics). The remaining design and technology spaces are in the existing buildings (resistant materials, food and textiles (shared

with art)). Being self-contained allows the block to be let out to the community after hours (particularly the IT facilities).

Staff worked closely with the local-authority architect on the design of the new block. Although the overall size of the building was given, the teachers were involved in deciding positions of partitions and the individual room layouts. Each space has therefore been designed to suit the school's particular ways of working. The corridor is wider than average to allow for display and the floor is used to test robots and other control projects.

The building, which has a floor area of 414m$^2$, is a simple form using traditional materials. In addition to the three teaching spaces, there are supporting spaces for staff and storage, as well as toilets and a cloakroom because it is a stand-alone block. The main structure consists of concrete strip foundations, cavity walls in blockwork and facing bricks, timber-trussed rafters, concrete roof tiles, double-glazed timber windows and doors, and veneered internal doors. Finishes include painted plaster walls and isolated tiled splashbacks, carpet or vinyl flooring, and suspended ceiling throughout. Heating is via a gas-fired boiler and fan-convector radiators, and mechanical ventilation is provided throughout. Fire and security alarm systems are provided as extensions to the existing installation. The contract was procured through a two-stage selected-tender process, and the contract period was 22 weeks.



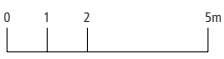




**FIGURE 7.1**
Building unit plan

# 7 Cost guidance

## Furniture and equipment

All furniture items were procured via a local-authority supplies company of which the school's own authority is a key member. All furniture procured from the supplies company is pre-tendered on behalf of its members. The company's in-house design team (which also designed much of the furniture procured) advised on layout and provision of furniture and drew up detailed cost schedules.

Orders were then placed either by the general contractor for fixed furniture, or by the school's local-authority property-services division for loose.

Each of the three teaching areas had fixed benching and shelving as well as a provision of loose furniture. Although the computer tables were essentially free-standing, the school opted to have them floor-fixed; this meant that as they were then classed as fixed furniture they were ordered via the general contractor. Specialist equipment was ordered and specified by the school itself.

Furniture provided included beech-faced chipboard side benching; computer chairs; adjustable shelving; composite material pin-up boards; under-bench cupboard units; heavy-duty serviced tables; bag-storage units; filing cabinets; and general tables. Interactive whiteboards are provided in all three technology spaces.

## The cost

The tender sum was £428,425 in December 2000. The location factor for this region at that time was 0.92 (national average is 1.00). The table below gives the costs at price levels for the fourth quarter of 2003 with a standardised location factor. Costs increased by more than 21% between 2000 and 2003.

**FIGURE 7.2**
Cost data table

| | £ | cost/m$^2$ |
|---|---|---|
| Substructure | 43,387 | 105 |
| Superstructure | 201,096 | 486 |
| Mechanical and electrical (M & E) services | 178,290 | 431 |
| Furniture | 31,109 | 75 |
| Equipment | 28,394 | 69 |
| External works | 84,802 | 205 |
| Total | 567,078 | 1,371 |

The pie chart shows the percentage distribution of costs.

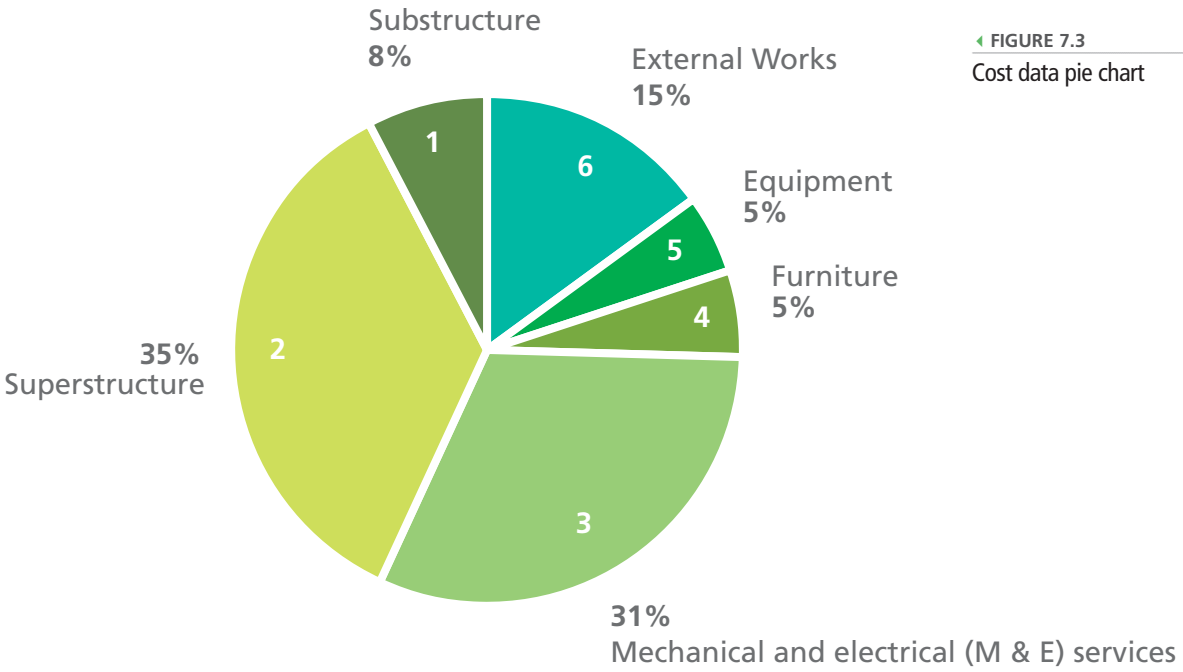



FIGURE 7.3
Cost data pie chart

## Cost comment

The basic building cost at current prices (4Q 2003) is £1,022/$m^2$ after adjusting for location factor. This is slightly below the DfES's current guide cost for secondary schools and in part reflects the relatively simple design of the scheme.

The mechanical and electrical (M&E) installation is slightly more expensive than it would have been had the project involved general teaching accommodation because of the heavily serviced nature of the facility. The level of professional fees at 14% was typical for a project of this type; one would expect the fee percentage to reduce for larger schemes.

A total of £59,503 was spent on furniture and equipment, broken down as 37% on fixed furniture, 17% on loose furniture and 46% on equipment. These costs are, if anything, lower than might be expected. This may be because some specialist equipment (including ICT), was bought from a separate budget and therefore not included in these costings.

# Appendix

This section summarises the major health and safety regulations and advisory codes of practice which have direct relevance to school design and technology accommodation. Advice on health and safety matters is also given earlier in the publication, and is cross-referenced here in brackets. For matters of detail it is advisable to refer to the source reference document.

# Health and safety in design and technology

# The health and safety system

If The Health and Safety Executive (HSE) consider it necessary to supplement existing health and safety arrangements they have three options for action:

- Regulations
- Approved codes of practice (ACoP)
- Guidance

Regulations are made, in most cases, under the Health and Safety at Work Etc. Act 1974 (HSWA) and deal with the workplace. These regulations (which include EU legislation) refer to 'employers' and 'employees'. In the case of schools, employers will be assumed to be the local education authority, school governing body or proprietor, and the employees, the teachers and support staff. Pupils are classed as a third party and may not be covered by the regulations, but are covered under the general requirements of the HSWA.

Approved codes of practice offer practical examples of good practice. They give advice on how to comply with the law. They have a 'special legal status' which means that if someone is prosecuted for a breach of health and safety law, and it is proved that they have not followed the relevant provisions of the approved code of practice, a court can find them at fault. However, compliance with the law can be shown in some other way other than through the approved code of practice.

The main purposes of guidance are to interpret the law, to help people comply with the law and to give technical advice. Guidance is not compulsory, but a person following the guidance will normally be doing enough to comply with the law.

# BS 4163, Health and Safety for Design and Technology in Schools and Similar Establishments, Code of Practice, HSE, 2000

BS 4163 is the main approved code of practice covering design and technology in schools and colleges. It sets out clearly what a safe design and technology environment should be, and includes guidance on managing health and safety. The pertinent points from the other documents referred to in this appendix have been incorporated into this code of practice. Information that is particularly relevant to accommodation includes (relevant sections in this document are given in brackets):

## General brief

Includes information on briefing by teachers to architects, and general planning, building and furniture considerations (see Sections 2, 4 and 5)

## Storage

Makes reference to the storage requirements of hazardous materials, bulk materials and specific types of materials, e.g. plastics (see Sections 3 and 4)

## The working environment

Covers such aspects as lighting, heating, ventilation, flooring and wall surfaces (see Section 6)

## Services

Detailed information about main workshop switchgear, including electrical circuits, socket outlets and emergency switching devices (see Sections 5 and 6)

## Machinery

Detailed recommendations on individual machines likely to be placed in a school workshop, highlighting requirements for ventilation, siting, controls, guarding and personal safety (see Sections 2, 5 and 6)

BS 4163 provides a comprehensive list of references to other useful publications including those from the Design and Technology Association (DATA) and the Consortium of Local Education Authorities for the Provision of Science Services (CLEAPSS).

The British Standard states that 'risk assessment is an important part of health and safety and all teachers should be aware of the Health and Safety Executive booklet " INDG 163: Five Steps to Risk Assessment" '.

## Control of Substances Hazardous to Health Regulations 2002 (COSHH)

The COSHH regulations are one of the most important items of recent legislation affecting work premises in both the public and private sector, including schools. Employers are responsible for assessing the use of hazardous substances to ensure this is controlled without risk to health. Employees also have a responsibility to report potential problems and may be delegated the task of assessing potential risks in their particular specialist area. Areas of concern in art, design and technology are:

- Workshops
- Art and textiles rooms
- Food rooms

COSHH requirements fall into four categories:

- Assessment
- Prevention
- Control
- Management

Risk assessment is the crucial first step; schools must assess the risks associated with the storage and use of hazardous substances. This is covered in BS 4163 (see above), and CLEAPSS publishes *Model Risk Assessments for Design and Technology in Secondary Schools*, which covers all material areas, identifying hazards and their control. Forms of control include personal protective equipment (PPE) and local (extract) exhaust ventilation (LEV) installations (see Section 6), but where possible prevention is preferable to control.

# The Food Safety Act 1990

This act contains specific requirements for food which is sold or supplied. The school kitchen is covered by the act but not necessarily the food teaching room. The act has implications for work in mini-enterprise projects and where activities are intended to mimic commercial catering. Some of the main points are listed here, but schools should check the legal position regarding food safety with their local Environmental Health Officer.

- The law will apply in a school food room if food is either sold or supplied to any person who is not the maker of the food product.

- If a school sells or supplies food it must register as a food business with its local authority and be liable to visits by an environmental health officer.

- For a school to be a registered food business it must sell or supply food items for a total of five or more days in any consecutive five-week period. This is a requirement of the Food Premises (Registration) Regulations 1991 (as amended).

- The main concerns of the Food Safety Act are the provision of safe food in a clean environment. Specific requirements, such as hand-wash basin provision, equipment requirements, including adequate refrigeration, suitable wash-down surfaces, both horizontal and vertical, the obligations on management and requirements for food handlers are laid down in regulations made under the act, viz. the Food Safety (General Food Hygiene) Regulations 1995 (as amended) and the Food Safety (Temperature Control) Regulations 1995 (as amended).

- When pupils make food for their own consumption in lessons this is considered to mirror domestic kitchen activity. These are therefore not subject to the requirements of the act. However if, for example, there is an outbreak of food poisoning in a food technology room, it is against the requieremens of food law that the school is likely to be judged. It is good practice to instil in pupils an understanding of personal hygiene and safe food-handling techniques.

## The Electricity at Work Regulations 1989

These regulations place a duty on employers to ensure that as far as possible all electrical equipment and installations are constructed and maintained so as to prevent danger.

For fixed installations BS 7671, *Requirements for Electrical Installations*, is the standard usually followed in this country for the design and construction of electrical installations. Its associated Guidance Note 3 on inspection and testing gives guidance on the maintenance of fixed installations. These publications are available from the Institution of Electrical Engineers (IEE).

Guidance on maintenance of appliances is available in HSE publication HSG107, *Maintaining Portable and Transportable Electrical Equipment*. Guidance is also available in IEE publication *Code of Practice for In-Service Inspection and Testing of Electrical Equipment*.

## The Supply of Machinery (Safety) Regulations 1992

Since 1 January 1995, most machinery supplied in the UK has had to meet the health and safety requirements outlined in these regulations, which are aimed at the manufacturers of machinery. The regulations set out clear design criteria for compliance including:

- Lighting (see Section 6)
- Fire risks (see Section 6)
- Control devices (see Section 6)
- Noise emission (see Section 6)
- Guarding

Meeting the requirements of these regulations will ensure compliance with Section 6 of the HSWA which deals with the general safety of machinery in the workplace.

A CE marking on a machine indicates that the manufacturer has complied with relevant supply law and with all relevant essential health and safety requirements in the Supply of Machinery (Safety) Regulations. False certification by a manufacturer is a criminal offence. Schools should ensure that any machine they purchase has a CE mark. However, a CE mark is not a

guarantee of safety, and end users should still make sure (as far as they can) that the machinery is safe and suitable for its intended task.

The Supply of Machinery (Safety) Regulations do not apply in general to second-hand or donated machinery. However, if the second-hand machine in question is substantially refurbished (i.e. the majority of components have been replaced), or its use is substantially different from that for which it was originally intended, it will be treated as a new machine for the purposes of the law, and will have to go through the CE-marking process.

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

These regulations apply to all workplaces including schools. The regulations cover aspects of health and safety in the workplace (replacing a number of old regulations), and set out the responsibilities of both employer and employee. Issues of direct relevance to design and technology include:

- Maintenance
- Environmental issues (see Section 6)
- Room dimensions (the 11m$^3$ per employee recommended in the Approved Code of Practice does not apply to teaching areas)
- Workstation layout and furniture (see Sections 2 and 4)
- Free floor space and circulation routes (see Sections 2 and 5)

## The Manual Handling Operations Regulations 1992 (as amended)[19]

These regulations seek to prevent injury to any part of the body during the process of manual handling at work. They stress employers' responsibility to ensure employees' health and safety through the avoidance of any manual-handling operation involving risk of injury. In the case of schools this would apply to all staff working in preparation areas, for example emptying dust containers (see Section 3).

The regulations give design guidance aimed at reducing the risk of injury during manual-handling operations. The considerations outlined are:

Note

19. The Guidance that goes with the manual handling regulations is currently being updated, mainly to take account of recent research findings. The revised guidance is due to be launched in 2004.

- Space allocation (see Sections 2 and 5)
- Flooring (see Section 4)
- Temperature (see Section 6)
- Ventilation (see Section 6)
- Lighting (see Section 6)
- Storage details (see Section 3)

An ergonomic approach to lifting and the use of mechanical or automated aids, e.g. wheeled trolleys, are both encouraged.

It is important that schools carry out risk assessments of manual handling taking place in design and technology areas. Refer to HSE leaflets[20] INDG 143, 'Getting to Grips with Manual Handling', which highlights the importance of risk assessment, and INDG 163, 'Five steps to Risk Assessment', which may prove useful when considering possible dangers in the classroom.

## The Management of Health and Safety at Work Regulations 1999

These regulations set out general duties for employers concerning the management of health and safety for their employees. They cover four basic aspects of health and safety:

- Planning
- Organisation
- Control monitoring
- Review

The regulations have little direct relevance to the design of school buildings. However, certain management procedures may result in specific requirements for the design and layout of design and technology areas.

Note

20. Available on the HSE website.

## The Personal Protective Equipment (PPE) at Work Regulations 1992 (as amended)

The regulations aim to ensure that employers provide adequate PPE for their employees. PPE is defined as any item which protects a person against any health and safety risk. It does not, however, cover any equipment which may be required as a direct result of COSHH regulations. Like COSHH, the PPE regulations regard prevention as an initial action. For example, suitable guarding to a machine is preferable to the operator wearing goggles when using the unguarded machine. PPE should always be regarded as the last resort to protect against risks to health and safety; safe systems of work should always be considered first.

Direct reference is made in the regulations to the accommodation of PPE, e.g. coat pegs for protective clothing (see Section 2).

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

These regulations set out the health and safety management duties of employers to employees who habitually work with display-screen equipment. The regulations require employers to:

- Identify what constitutes display-screen equipment
- Identify who is a user
- Assess workstations and reduce risks
- Ensure all workstations meet minimum requirements
- Plan for breaks and changes of activity
- Provide eye and eyesight tests
- Provide training and information

Other areas include the working environment and software.

Teachers would not normally be considered habitual users of IT, and the DSE directives do not directly relate to pupils as they would not be classed as habitual users of workstation equipment. However, it is vital that staff and

pupils' health and safety[21] are looked after by the school and this document is a valuable source of reference when designing an environment (including workstations) where display-screen equipment is used. Issues covered include:

- Furniture (see Section 4)
- Lighting (see Section 6)
- Space
- Noise
- Heat and humidity (see Section 6)

An ergonomic approach is recommended, adjusting workstations to meet the workers' needs.

These regulations have been amended through the Health and Safety (Miscellaneous Amendments) Regulations 2002 to:

- Take account of a European court case which decided that the specified minimum requirements applied to all workstations (not just to those used by 'workers' as defined in the DSE Directive)
- Developments in technology since 1992, including laptops and non-keyboard input devices, e.g. the mouse
- Clarify the requirements for eye tests and training of new users

Two HSE documents provide guidance on this area:

- *Working with Display Screen Equipment: Guidance on Regulations* covers the legal and technical details of the regulations.
- *The Law on VDUs: An Easy Guide* offers step-by-step practical help in what to look for, how to manage risks and what actions to take if problems arise.

Both guides include a workstation checklist that can be used to carry out risk assessments.

## The Provision and Use of Work Equipment Regulations 1998

The regulations' prime objective is to ensure that all work equipment provided for use at work meets various health and safety standards. 'Equipment' may include component parts of an item of machinery (see Supply of Machinery (Safety) Regulations 1992).

Note

21. These duties are highlighted in Section 3 of the Health and Safety at Work Act 1974.

The regulations set out a number of requirements that both equipment manufacturers and employers must meet. Issues covered include:

- Safe construction and design of equipment, its component parts and additional safety features (see Section 5)
- Suitability for purpose
- Conditions in which equipment is used, which will include suitable space allocation for that equipment (see Section 5)
- Inspection
- Training
- Dangerous parts of machinery (including guarding)
- Stop controls

The approved code of practice L114, Safe Use of Woodworking Machinery, is based on the Provision and Use of Work Equipment Regulations 1998.

# References

## General School Design

DfES Building Bulletin 98, *Briefing Framework for Secondary School Projects*, the Stationery Office, 2004.

*The Education (School Premises) Regulations*, The Stationery Office, 1999.

## Storage

DfEE Building Bulletin 89, *Art Accommodation in Secondary Schools*, The Stationery Office, 1998 (see sections 2 and 3).

*Getting to Grips with Manual Handling*, INDG 143 Rev 1, HSE Books, 2000.

*Manual Handling Operations Regulations 1992: Guidance on Regulations*, L23, HSE Books, 1998.

## Furniture

BS 5873, *Educational Furniture*, British Standards Institution, 1980_1998 (see Parts1_5).

DfEE, *Furniture and Equipment in Schools: A Purchasing Guide*, The Stationery Office, 2000.

## Equipment

*Health and Safety (Display Screen Equipment) Regulations 1992* SI1992/2792, The Stationery Office, 1992.

*PUWER 1998 Provision and Use of Work Equipment Regulations 1998, Open Learning Guidance*, The Stationery Office, 1999.

*Safe Use of Machinery*, PD5304, British Standards Institution, 2000.

*Safe Use of Woodworking Machinery: Provision and Use of Work Equipment Regulations 1998 as Applied to Woodworking Machinery*, L114, HSE Books, 1998.

*Supply of Machinery (Safety) Regulations 1992*, SI1992/3073, The Stationery Office, 1992.

*Supply of Machinery (Safety) (Amendment) Regulations 1994*, SI1994/2063, The Stationery Office, 1994.

*The Law on VDUs: An Easy Guide*, HSG90, HSE, 2003.

## Services and environmental design

*An Introduction to Local Exhaust Ventilation*, HSG37, HSE , 1993.

*Approved Document L2 – Conservation of Fuel and Power in Buildings Other Than Dwellings: 2002 Edition*, The Stationery Office, 2001.

BS 5266, Part 1 *Emergency Lighting. Code of Practice for the Emergency Lighting of Premises Other Than Cinemas and Certain Other Specified Premises Used for Entertainment,* British Standards Institution, 1999.

BS 5925, *Code of Practice for Ventilation Principles and Designing for Natural Ventilation*, British Standards Institution, 1991.

BS 6173, *Specification for Installation of Gas-fired Catering Appliances for Use in All Types of Catering Establishments (2nd and 3rd Family Gases)*, British Standards Institution, 2001.

# References


BS 7288, *Specification for Socket Outlets Incorporating Residual Current Devices (SRCDs)*, British Standards Institution, 1990.

BS 7671, *Requirements for Electrical Installations. IEE Wiring Regulations*. 6th edition, British Standards Institution, 2001.

BS 8313, *Code of Practice for Accommodation of Building Services in Ducts*, British Standards Institution, 1997.

BS EN 60529, *Specification for Degrees of Protection Provided by Enclosures*, British Standards Institution, 1992.

BS EN 61008 part 1, *Specification for Residual Current Operated Circuit-breakers Without Integral Overcurrent Protection for Household and Similar Uses (RCCBs). General Rules*, British Standards Institution, 1995.

BS EN 61009 part 1, *Specification for Residual Current Operated Circuit-breakers With Integral Overcurrent Protection for Household and Similar Uses (RCCBs). General rules*, British Standards Institution, 1995

DfEE Building Bulletin 87, *Guidelines for Environmental Design in Schools*, see the latest version on www.teachernet.gov.uk/schoolbuildings.

DfEE Building Bulletin 90, *Lighting Design for Schools*, The Stationery Office, 1999.

DfES Building Bulletin 93, *Acoustic Design of Schools*, The Stationery Office, 2004.

*Electricity at Work Regulations 1989*, The Stationery Office, 1989.

*Gas Installations for Educational Establishments*, UP11, Institute of Gas Engineers & Managers, 2004.

*IEE Code of Practice for In-service Inspection and Testing of Electrical Equipment*, 2nd edition, Institute of Electrical Engineers, 2001.

*Maintaining Portable and Transportable Electrical Equipment*, HSG107, HSE , 1994.

*Ventilation of Kitchens in Catering Establishments*, HSE Books, 2000.

*Water Industry Act*, The Stationery Office, 1999.

*Water Supply (Water Fittings) Regulations*, The Stationery Office, 1999.

# General health and safety

*A Step by Step Guide to COSHH Assessments (Revised Edition)*, HSG 97, HSE Books, 2004.

BS 4163, *Health and Safety for Design and Technology in Schools and Similar Establishments*: Code of Practice, British Standards Institution, 2000.

*Code of Practice 7 – Storage of Full and Empty LPG Cylinders and Cartridges*, LP Gas Association, 2004.

*Control of Substances Hazardous to Health*, L5, HSE Books, 2002.
Note: Read in conjunction with 'A Step by Step Guide to COSHH Assessments listed above.

*Dangerous Substances and Explosive Atmospheres Regulations 2002*, The Stationery Office, 2002.

*Five Steps to Risk Assessment*, INDG 163 REV1, HSE Books, 1998.

*Health and Safety at Work Act 1974*, The Stationery Office, 1974.

*Health and Safety Training Standards in Design and Technology*, The Design and Technology Association, 2003.

*Management of Health and Safety at Work Regulations 1999*, SI1999/3242, The Stationery Office, 2000.

*Model Risk Assessments for Design and Technology in Secondary Schools and Colleges (Revised)*, Consortium of Local Education Authorities for the Provision of Science Services (CLEAPSS), 2000.
Note: Available to members and associates only, contact CLEAPSS on 01895 251 496. A CD ROM with this publication and additional leaflets and information has also been published.

*Personal Protective Equipment at Work: Guidance on Regulations Personal Protective Equipment at Work Regulations 1992*, L25, HSE Books, 1992.

*Risk Assessment in Secondary Schools and Colleges Design and Technology Teaching Environments: Health and Safety Guidance (Fully Revised Edition)*, The Design and Technology Association, 2003.

*Work with Display Screen Equipment: Health and Safety (Display Screen Equipment) Regulations 1992 as Amended by the Health and Safety (Miscellaneous Amendments) Regulations 2002* – Guidance on Regulations, L26, HSE Books, 2003.

*Workplace Health, Safety and Welfare Regulations 1992: Approved Code of Practice and Guidance*, L24, HSE Books, 1996.

## Food safety

*Food Safety (Temperature Control) Regulations 1995 (as amended)*, SI 1995/2200, The Stationery Office, 1995.

*Food Safety Act 1990*, The Stationery Office, 1993.

*Food Safety (General Food Hygiene) Regulations 1995 (as amended)*, SI 1995/1763, The Stationery Office, 1995.

*Food Premises (Registration) Regulations 1991 (as amended)*, SI 1991/2825, The Stationery Office, 1991.

## Websites

CLEAPSS (The Consortium of Local Education Authorities for the Provision of Science Services)

http://www.cleapss.org.uk

A nationwide subscription advisory service supporting science and technology teaching in schools. Provides practical advice on matters such as health and safety. At the time of writing all LEAs in England, Wales and Northern Ireland are members and hence all their officers and schools have free access to the services as do the vast majority of independent schools and colleges which are associate members.

## The British Standards Institution

http://www.bsi-global.com

For access to British Standards publications including BS 4163, Health and Safety for Design and Technology in Schools and Similar.

## The Design and Technology Association

http://www.data.org.uk

DATA provides a guidance service to staff on health and safety and risk assessments.

## The Health and Safety Executive

http://www.hse.gov.uk

The HSE website has useful health and safety information and publications on topics including wood dust and Control of Substances Hazardous to Health (COSHH) procedures.

## The National Association of Advisers and Inspectors in Design and Technology

http://www.naaidt.org.uk

The site provides a discussion forum for design and technology teachers and advisers. The NAAIDT also produces publications and organises training on health and safety matters.

## TeacherNet

http://www.teachernet.gov.uk/schoolbuildings

For DfES design guidance including Building Bulletin 98, Briefing Framework for Secondary School Projects and Furniture and Equipment in Schools Projects.

# Index

# Index

## Furniture


adjustable computer chair

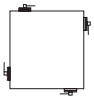

polypropylene chair

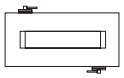

stool

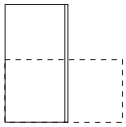

upholstered chair


adjustable drawing table


apron hooks


4-person multi-bench


2-person multi-bench


relocatable serviced table (with alternative position)


mobile whiteboard


mobile flipchart


display point


display shelf


display cabinet/ storage


whiteboard

electronic whiteboard


magazine rack

teacher's table

## Storage units


filing cabinet


filing cabinet below surface


storage cupboard


tall storage cupboard


storage cupboard below surface


tray storage


tray storage below surface

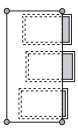

mobile tool storage


drawing chest


components bins


general-purpose trolley


coats and bags storage


mobile tray unit


tray trolley

## CAD/CAM equipment


CAD/CAM plotter


CAD/CAM plotter & cutter


CAD/CAM milling machine


CAD/CAM lathe


CAD/CAM engraving machine (small)


CAD/CAM engraving machine (large)


CAD/CAM laser cutting machine

## Textiles equipment


ironing board


sewing machine


screen-printing table


pegs for fabric


screen-printing sink


abrasion tester and electric ring


textiles display carousel unit

## ICT equipment


computer workstation

CPU


laptop


desktop printer

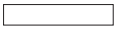

scanner

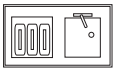

photocopier

## Electronics equipment


soldering point


etching tanks


serviced trunking


PCB unit


eye-wash sink

## AV equipment


T.V.


Wall-mounted TV/video player


TV/video trolley


Video/data projector (portable/table-mounted)


Video/data projector (ceiling-mounted)

## Glossary of Acronyms

CAD/CAM – computer aided design/ computer aided manufacture
LEV – local exhaust ventilation
PPE – personal protective equipment
CNC – computer numerically controlled
PCB – printed circuit board
4Q – fourth quarter (in a year)

# Colours

## Colours for generic layouts

- Loose unserviced
- Fixed serviced
- Re-locatable serviced
- Resources
- Coats and bags
- Fridges
- Presentation

## Colours for case study plans

- ECS Electronics and control systems
- St Store
- Fd Food technology
- Off Staff base
- RM Resistant materials
- Pp Preparation (RM, Fd, ECS)
- Tx Textiles
- DR Resources
- Gr Graphic products



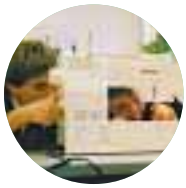














This bulletin provides guidance to anyone involved with the briefing and design process for design and technology accommodation. It supersedes the original Building Bulletin 81 (1996) having been updated to reflect current thinking on secondary school design and education. The guide includes information on: the link between activities and facilities, planning individual spaces, furniture and equipment, services and environmental design and cost.

Case study examples from real schools are used throughout the document reflecting the variety of ways in which design and technology activities can be accommodated.

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ISBN 0-11-271170-7

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