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BSI Standards Publication

Health and safety for design and technology in educational and similar establishments — Code of practice

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Foreword

Publishing information

This British Standard is published by BSI Standards Limited, under licence from The British Standards Institution, and came into effect on 31 October 2021. It was prepared by Technical Committee GME/27, *Safety in school workshops*. A list of organizations represented on this committee can be obtained on request to the committee manager.

Supersession

This British Standard supersedes BS 4163:2021, which is withdrawn.

Information about this document

The Health and Safety at Work etc. Act 1974 [1] places a general duty on employers to ensure, as far as reasonably practicable, the health and safety of employees and other persons affected by their activities.

The Management of Health and Safety at Work Regulations (MSHWR) 1999 [2] require employers to carry out risk assessments for the purpose of identifying what is required to comply with this general duty and any relevant Regulations made under this Act.

Implementation of this British Standard is not a legal requirement but it does provide one means of demonstrating that reasonably practicable steps have been taken to minimize risks from the machinery, equipment, processes and materials used. The recommendations in this British Standard cannot ensure the health and safety of learners and employees without proper training and supervision. Anyone in charge of a teaching space covered by this British Standard is advised to consider the desirability of having recognized accredited training in health and safety.

This British Standard is intended to be a useful guide to those who teach and manage in design and technology areas in educational establishments, and it aims to contribute to the prevention of accidents and dangerous occurrences. Employers and employees can incorporate the recommendations of this British Standard into their working environment.

This British Standard has also been written for persons responsible for providing services, equipment and machinery in educational establishments, and for persons employed to work in these establishments. If similar resources are used in other school departments and colleges of further education, the recommendations of this British Standard can be applied to these departments. They can also be applied where learners are undergoing initial teacher training.

Risk assessment is an important part of health and safety and teachers need to be made aware of the five step approach (information is available via the HSE toolbox¹⁾). In design and technology teaching areas, risk assessments are likely to be applied to the working environment, equipment, processes, techniques and activities.

Practical experience provides opportunities to introduce learners to concepts of risk assessment and safe working methods. With encouragement, learners can develop their understanding of risk assessment processes and, through application of this process, they can be trained to use appropriate control measures to minimize risks to themselves and others. Teachers need to be fully conversant with hazards in the area that they supervise, and that they plan, organize, control and monitor the work so that risks can be controlled.

¹⁾ The HSE toolbox is available at: <https://www.hse.gov.uk/toolbox/>.

Whilst this British Standard is meant to be comprehensive, it does not preclude the development and introduction of new technologies so long as appropriate risk assessments are made and the employer accepts their introduction.

This publication can be withdrawn, revised, partially superseded or superseded. Information regarding the status of this publication can be found in the Standards Catalogue on the BSI website at bsigroup.com/standards, or by contacting the Customer Services team.

Text introduced by or altered by Amendment No. 1 is indicated in the text by tags **A1** **A1**. Minor editorial corrections are not tagged.

Where websites and webpages have been cited, they are provided for ease of reference and are correct at the time of publication. The location of a webpage or website, or its contents, cannot be guaranteed.

Hazard warnings

WARNING. This British Standard calls for the use of substances and/or procedures that can be injurious to health if adequate precautions are not taken. It refers only to technical suitability and does not absolve the user from legal obligations relating to health and safety at any stage.

Use of this document

As a code of practice, this British Standard takes the form of recommendations and guidance. It is not to be quoted as if it were a specification. Users are expected to ensure that claims of compliance are not misleading.

Users may substitute any of the recommendations in this British Standard with practices of equivalent or better outcome. Any user claiming compliance with this British Standard is expected to be able to justify any course of action that deviates from its recommendations.

It has been assumed in the preparation of this British Standard that the execution of its provisions will be entrusted to appropriately qualified and experienced people, for whose use it has been produced.

Presentational conventions

The provisions of this standard are presented in roman (i.e. upright) type. Its recommendations are expressed in sentences in which the principal auxiliary verb is “should”.

Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.

Where words have alternative spellings, the preferred spelling of the Shorter Oxford English Dictionary is used (e.g. “organization” rather than “organisation”).

Contractual and legal considerations

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The recipient is advised to consider seeking professional guidance with respect to its use of this publication.

This publication is not intended to constitute a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

Section 1: General

1 Scope

This British Standard provides recommendations and guidance for persons responsible for the safe use of equipment and machinery in educational and similar establishments and covers:

- a) health and safety management;
- b) planning services; and
- c) teaching areas, equipment, tools and processes.

NOTE Teaching areas includes preparation areas where materials are manipulated and processed, equipment is used and design and/or manufacturing takes place (e.g. food, catering, textiles, graphics, electronics, technology, craft, engineering, manufacturing, woodworking of all types, vocational workshops, motor vehicle workshops and computer areas).

This British Standard also provides recommendations for persons who provide instruction to learners, employees, trainee teachers and adults in the use of equipment and machinery in educational and similar establishments.

The recommendations cover the supply and safe use of equipment, machine tools and materials and chemicals, personal protection and safety management, with particular reference to the hazards involved.

This British Standard applies to schools of all types, including those maintained by local authorities, academies, free schools, independent schools and any type of school for learners with special educational needs. It will also be helpful to further education colleges, universities, teacher training establishments, adult education workshops, and workshops in hospitals and prisons.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes provisions of this document²⁾. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

Standards publications

[BS 546](#), *Two-pole and earthing-pin plugs, socket-outlets and socket-outlet adaptors*

[BS 1363-1](#), *13 A plugs, socket-outlets and adaptors – Part 1: Specification for rewirable and non-rewirable 13 A fused plugs*

[BS 1363-2](#), *13 A plugs, socket-outlets and adaptors – Part 2: Specification for 13 A switched and unswitched socket outlets*

[BS 1363-4](#), *13 A plugs, socket-outlets and adaptors – Part 4: Specification for 13 A fused connector units switched and unswitched*

[BS 1710](#), *Specification for identification of pipelines and services*

[BS 5499-4](#), *Safety signs – Part 4: Code of practice for escape route signing*

[BS 5733](#), *General requirements for electrical accessories – Specification*

²⁾ Documents that are referred to solely in an informative manner are listed in the Bibliography.

[BS 7288](#), *Specification for residual current devices with or without overcurrent protection for socket-outlets for household and similar uses*

[BS 7671](#), *Requirements for Electrical Installations – IET Wiring Regulations*³⁾

BS EN 149:2001+A1, *Respiratory protective devices – Filtering half masks to protect against particles – Requirements, testing, marking*

BS EN 166:2002, *Personal eye protection – Specifications*

BS EN 286-1, *Simple unfired pressure vessels designed to contain air or nitrogen – Part 1: Pressure vessels for general purposes*

BS EN 352-1, *Hearing protectors – General requirements – Part 1: Earmuffs*

BS EN 847-1, *Tools for woodworking – Safety requirements – Part 1: Milling tools, circular saw blades*

BS EN 50144-1, *Safety of hand-held electric motor operated tools – General requirements*

BS EN 60204-1, *Safety of machinery – Electrical equipment of machines – Part 1: General requirements*

BS EN 60309-2, *Plugs, socket-outlets and couplers for industrial purposes – Part 2: Dimensional interchangeability requirements for pin and contact-tube accessories*

BS EN 60335 (all parts), *Specification for safety of household and similar electrical appliances*

BS EN 60529, *Degrees of protection provided by enclosures (IP Code)*⁴⁾

BS EN 60669-2-4, *Switches for household and similar fixed electrical installations – Part 2-4: Particular requirements – Isolating switches*

BS EN 60898-1, *Electrical accessories – Circuit breakers for overcurrent protection for household and similar installations – Part 1: Circuit-breakers for a.c. operation*

BS EN 60947-3, *Low-voltage switchgear and controlgear – Part 3: Switches, disconnectors, switch-disconnectors and fuse-combination units*

BS EN 61008-1, *Residual current operated circuit-breakers without integral overcurrent protection for household and similar uses (RCCBs) – Part 1: General rules*

BS EN 61009-1, *Residual current operated circuit-breakers with integral overcurrent protection for household and similar uses (RCBOs) – Part 1: General rules*

BS EN ISO 7010, *Graphical symbols – Safety colours and safety signs – Registered safety signs*

Other publications

[N1] DESIGN & TECHNOLOGY ASSOCIATION. *Health and Safety Training Standards in Design and Technology*. L74. 2013.

[N2] HEALTH & SAFETY EXECUTIVE. HSG258, *Controlling airborne contaminants at work. A guide to local exhaust ventilation (LEV)* (Third edition). 2017. Available at <https://www.hse.gov.uk/pubns/priced/hsg258.pdf>.

[N3] LIQUID GAS UK (UKLPG). Code of Practice No. 7, *Storage of Full and Empty LPG Cylinders and Cartridges*. 2004.

[N4] CHARTERED INSTITUTION OF BUILDING SERVICES ENGINEERS. *Lighting Guide 05: Lighting for Education* (Society of Light and Lighting SLL LG5). 2011.

[N5] HEALTH & SAFETY EXECUTIVE. WL3, *Welding fume control*. 2021. Available at <https://www.hse.gov.uk/pubns/guidance/wl3.pdf>.

³⁾ This standard also gives an informative reference to BS 7671:2008+A2:2013.

⁴⁾ This standard also gives an informative reference to BS EN 60529:1992+A2:2013.

[N6] INSTITUTION OF ENGINEERING AND TECHNOLOGY. *Guidance Note 3: Inspection & Testing*, 8th Edition.

[N8] INSTITUTION OF ENGINEERING AND TECHNOLOGY. *Code of Practice: In-service Inspection and Testing of electrical equipment*. 5th edition. 2020.

[N7] HEALTH & SAFETY EXECUTIVE. HSG261, *Health and safety in motor vehicle repair and associated industries*. 2009. Available at <https://www.hse.gov.uk/pubns/priced/hsg261.pdf>.

[N9] EDUCATION & SKILLS FUNDING AGENCY. Building Bulletin 101, *Guidelines on ventilation, thermal comfort and indoor air quality in schools*. 2018.

[N10] INSTITUTION OF GAS ENGINEERS & MANAGERS. IGEM/UP/11, *Gas installations for educational establishments*, 3rd Edition.

[N11] HEALTH & SAFETY EXECUTIVE. HSG17, *Safety in the use of abrasive wheels*. Available at <https://www.hse.gov.uk/pubns/priced/hsg17.pdf>

[N12] HEALTH & SAFETY EXECUTIVE. EM9, *Asbestos essentials – Disposal of asbestos waste*. Available at <https://www.hse.gov.uk/pubns/guidance/em9.pdf>

3 Terms and definitions

For the purposes of this British Standard, the following terms and definitions apply.

3.1 competent person

person, suitably trained and qualified by knowledge and practical experience, and provided with the necessary instructions, to enable the required task(s) to be carried out correctly alongside the user of the machinery and/or equipment and giving their full attention to the user

3.2 extra-low voltage

voltage normally not exceeding 50 V a.c. or 120 V ripple free d.c., whether between conductors or to earth

[SOURCE: BS 7671:2008+A2:2013]

3.3 fused isolating switch

isolating switch in which one or more poles have a fuse in series in a composite unit

NOTE Fused switch-disconnectors are also called switched or fused isolators.

3.4 ingress protection (IP) rating

indication of degree of protection against liquids and solids ingress into electrical equipment

NOTE See BS EN 60529:1992+A2, 3.4, definition of “IP code”.

3.5 isolating switch

switch which, in the open position, satisfies the isolating requirements specified for a disconnector

3.6 residual current device

mechanical switching device or association of devices intended to cause the opening of the contacts when the residual current attains a given value under specified conditions

[SOURCE: BS 7671:2008+A2:2013]

3.7 separated extra-low voltage (SELV)

extra-low voltage system which is electrically separated from earth and from other systems in such a way that a single fault cannot give rise to the risk of electric shock

[SOURCE: BS 7671:2008+A2:2013]

Section 2: Health and safety management

4 Health and safety management

4.1 Risk assessment

COMMENTARY ON 4.1

Attention is drawn to the following statutory provisions:

- a) *the general duty of employers, under the Health and Safety at Work etc. Act 1974 [1], to ensure, as far as reasonably practicable, the health, safety and welfare at work of employees and the health and safety of other persons; and*
- b) *the duties imposed by any health and safety regulations relevant to the employer's activities.*

NOTE 1 The Management of Health and Safety at Work Regulations (MHSWR) 1999 [2] require that employers carry out an assessment of the risks to health and safety of employees and other persons.

NOTE 2 The Management of Health and Safety at Work Regulations (MHSWR) 1999 [2] require that young persons (persons under 18 years of age) are not exposed to increased health and safety risks as a consequence of lack of experience, maturity and awareness of risks. Strictly, the Regulations only apply where young persons are employed or are taking part in a work experience scheme, but the principle is the same for learners.

Employers should assess the risks to which young persons are exposed, and implement measures to protect their health and safety, taking account their lack of experience and maturity.

Specific provision should be made for situations where people work alone and/or remotely from assistance. Lone workers should be at no greater risk than other employees and additional risk control measures might be required. Where high-risk activities are to be undertaken, another competent person should be present.

NOTE 3 The appropriate government department for education provides further guidance for local authorities, school leaders, school staff and governing bodies.

4.2 Hazards, risks and risk control measures

4.2.1 Hazards

COMMENTARY ON 4.2.1

Hazards are anything with the potential to cause harm.

Hazards should be identified as the first step in carrying out a risk assessment. When all hazards have been identified, it should be established first whether they can be eliminated. If a hazard can be eliminated it should be eliminated so that there is no risk and the risk assessment process is complete (e.g. use of a battery powered drill eliminates the hazard of mains electricity).

4.2.2 Risk

If a hazard cannot be eliminated, the risk should be assessed.

NOTE The risk is the likelihood of injury or damage occurring and the severity of the consequences. The risk depends on the prevailing circumstances and the risk control measures (see 4.2.3) in place. The risk is affected by the number, experience and level of responsibility of the learners in the teaching environment.

4.2.3 Risk control measures

COMMENTARY ON 4.2.3

Risk control measures can be engineering control measures (e.g. guarding) or procedural measures, such as systems of work in conjunction with instruction and supervision and personal protective equipment (PPE).

Risk control measures should be implemented in the following order.

- a) If possible, eliminate the hazard.
- b) If not possible to eliminate hazard:
 - 1) substitute with a safer alternative;
 - 2) if not possible to eliminate the hazard, reduce risks at source, using engineering controls if practicable;
 - 3) institute procedures and systems of work in conjunction with instruction and supervision; and
 - 4) use PPE (see [4.2.4](#)).

4.2.4 Personal protective equipment

4.2.4.1 General

COMMENTARY ON 4.2.4.1

In many risk assessments, personal protective equipment (PPE) is considered to be the last resort if other control measures do not satisfactorily control the risk from hazards. However, PPE will be referred to on many occasions and specified as part of the control measures for many types of equipment and processes.

An assessment should be undertaken to determine the most appropriate form of PPE to be used, whether singly or combined together, to reduce the risk to the user.

PPE should be entirely personal and articles not provided as class sets unless it can be shown that an appropriate cleaning regime for the articles is in place.

4.2.4.2 Eye protection

COMMENTARY ON 4.2.4.2

Eye protection is covered by a number of European standards, the most common being those produced in accordance with BS EN 166. Eye protection conforming to this BS EN 166 protects the eyes in practical activities from hazards such as chemical or metal splashes, dust particles, materials being projected, gas and vapour, and light radiation.

Eye protection should be provided in many workshop situations where a risk assessment indicates it is necessary with the correct type of lens and frame set out in [Table 1](#).

Table 1 — Eye protection – Frame and lens

Optical quality	Frame	Lens
Class 1: For continuous work	–	1
Class 2: For intermittent work	–	2
Class 3: For occasional work, but must not be worn continuously	–	3
Mechanical properties		
Increased robustness (general purpose)	–	S
High energy impact (190 m/sec)	A	A
Medium energy impact (120 m/sec) Grade 1	B	B
Low energy impact (45 m/sec) Grade 2	F	F
Increased robustness	–	–
General purpose impact – Performance at extremes of temperature	T	T
Areas of use		
Liquids (chemical)	–	3
Large dust particles	–	4
Gas and fine dust particles	–	5
Electric sparking or arc	–	8
Molten metals and hot solids	9	9
Optional properties		
Resistance to mechanical damage (anti-scratch)	–	K
Resistance to misting/fogging	–	N

NOTE BS EN 169 and BS EN 175 cover the appropriate protection for eyes during welding processes.

4.2.4.3 Ear protection

COMMENTARY ON 4.2.4.3

Attention is drawn to the Control of Noise at Work Regulations 2005 [3] with regard to hearing protection, with the various threshold levels covered in [Section 4.9](#), Hazardous Noise.

Ear protection should be provided to reduce the noise levels for the user down to levels that are acceptably safe.

NOTE Ear protection can take the form of ear plugs, ear muffs or semi-inserted caps.

Care should be taken that learners use the most appropriate ear protection for them.

Ear protection should not reduce all noise to the point that instructions from the teacher or communications from other persons cannot be heard.

4.2.4.4 Body protection

COMMENTARY ON 4.2.4.4

Body protection can prevent injury from hazards such as abrasion, temperature extremes, cuts and punctures, impact, chemicals, electric shock, radiation, biological agents, prolonged immersion in water and other wet conditions, electrostatic build-up, slipping, cuts and punctures, falling objects, heavy loads, metal and chemical splashes, and vehicles. Such protection can take the form of gloves or gauntlets, upper arm protection, workshop coats or aprons, leg protection, foot protection, hair bands and head protection.

For general workshop activity, body protection should be provided for such processes as casting, forge work, cooking, working with paint or dyes, working with acids or chemicals, and working with sharp objects, or working in areas where there is the likelihood of heavy objects falling, where it can be shown that there are real hazards against which students and employees need protection.

NOTE In some processes associated with food, the personal protection is intended to protect foodstuffs from being contaminated and not necessarily to protect the person.

A general purpose apron or workshop coat should be provided where necessary to contain loose pieces of clothing, etc., that might otherwise pose a hazard.

Inappropriate footwear should not be permitted in workshops and foodrooms.

4.2.4.5 Lung protection

COMMENTARY ON 4.2.4.5

Respiratory protective equipment (RPE) can protect the lungs of a student or employee from such hazards as dusts, gases and vapours typically found in educational establishments.

The most effective method of protecting students and employees from airborne hazards is by capturing them at source with the use of a local exhaust ventilation (LEV) system or systems, which makes the environment a healthier place in which to work.

A risk assessment to determine whether substances in the air are exceeding the threshold limits is difficult and costly to undertake. Most schools' design and technology departments do not come near to the legal limits that require measures to control the hazard; however, employers generally install LEV systems.

Any LEV systems should be properly designed and installed, and then commissioned and tested regularly.

NOTE Even as a last resort PPE in the form of a mask is not an effective method of reducing airborne hazards. Most masks are not designed for the size of face of a student and so they are not likely to seal properly to the face such that all the inhaled air is filtered. If masks leak in this fashion they are not protecting the user.

Any installed LEV system controlling welding fumes should be tested. Where welding is undertaken, the risk to the operator and those nearby should be assessed and protection from the fumes provided.

4.3 Carrying out a risk assessment

Although it is essential that the risk assessment process is robust, a proportionate approach to safety should be taken and risk management within educational establishments should enable learners to undertake activities safely and not prevent activities from taking place.

NOTE 1 The objective of risk assessment is not to create an environment of absolute safety or zero risk but to take action as appropriate to ensure that significant risks are effectively managed.

Where good practice is not specified or obvious, the likelihood and consequences of the risk should be weighed against both the difficulty and cost, in terms of time and effort, of reducing the risk and the benefits of the activity. In these cases, reasonable risk reducing measures should be pursued up to the point where any further measures would be disproportionate to the benefits expected. If there are five or more employees involved, the significant findings of the assessments should be recorded.

NOTE 2 The Management of Health and Safety at Work Regulations (MSHWR) 1999 [2] specify that risk assessment includes identifying hazards and applying appropriate risk controls; satisfying legal requirements; and structuring risk control decision-making.

In design and technology teaching, risk assessment should be applied to the activities, taking into account the working environment, equipment, processes, techniques and the experience of the users.

Risk assessments should be undertaken for activities that are carried out by teachers and technicians, as well as for those carried out by learners.

Model risk assessments should be adopted and adapted to suit the nature of the activity.

NOTE 3 The HSE toolbox, including the leaflet “Five Steps to Risk Assessment” (INDG 163rev3) [4], provides guidance on carrying out risk assessments.

NOTE 4 The Consortium of Local Education Authorities for the Provision of Science Services (CLEAPSS) has produced “Model Risk Assessments for Design and Technology in Secondary Schools and Colleges” [5]. For Scotland, refer to the equivalent document published by the Scottish Schools Science Equipment Research Centre (SSERC).

NOTE 5 The Design and Technology Association (D&T Association) has produced “Risk Assessment in Secondary School Design and Technology Teaching Environments” [6].

4.4 Health and safety arrangements

COMMENTARY ON 4.4

Employers are legally required to make appropriate arrangements (with regard to the nature of the activities and the size of the undertaking) for effective planning, organization, control, monitoring and review of preventative and protective health and safety measures.

All employees should be informed of their general health and safety responsibilities and any specific tasks delegated to them.

The employer should maintain an up-to-date written statement of health and safety describing the roles and responsibilities of key personnel when there are five or more employees.

NOTE 1 This policy may be further supplemented by local policy statements detailing specific responsibilities and arrangements within design and technology departments.

The employer should have in place proportionate monitoring arrangements to demonstrate the successful implementation of the health and safety policy and the effectiveness of the preventative and protective measures implemented.

NOTE 2 Within design and technology departments, this might be delegated to the head of department/subject lead.

NOTE 3 An annual audit by the head of department/relevant/subject lead can help maintain expected standards. For further information, see the CLEAPSS document G 79 “Auditing health and safety in a secondary school design and technology department” [7] and the D&T Association document “Risk Assessment in Secondary Schools & Colleges Design & Technology Teaching Environments” [6].

If five or more persons are employed, the arrangements should be recorded.

A competent employee should carry out a formal review at least once each school term to verify that the measures remain effective. Any monitoring carried out should be recorded to would demonstrate that monitoring has performed. The frequency of monitoring should be determined by the frequency of use of the equipment being monitored.

NOTE 4 Occasional inspections by specialist health and safety advisers can help maintain standards and keep employees informed of developments in health and safety legislation and good practice.

NOTE 5 See CLEAPSS guide, L 254 “Health and Safety of D&T Workshop Equipment” [8], for further advice on the monitoring of equipment. For Scotland, refer to the equivalent document published by SSERC.

Governors and other responsible bodies have an important monitoring role which should include an annual review of policy, roles and responsibilities and practical arrangements for health and safety in the establishment, including the design and technology department.

4.5 Provision of competent health and safety advice

Employers should appoint one or more competent person(s) to assist with implementing measures to comply with health and safety legislation. If possible, competent persons who provide assistance should be employees.

NOTE 1 An Occupational Safety and Health Consultants Register (OSHCR)⁵⁾ is maintained by the HSE.

NOTE 2 A Directory of Registered Design and Technology Health and Safety Consultants (RDTHSCs) is maintained by the D&T Association⁶⁾.

NOTE 3 For schools who are members of CLEAPSS in England, Wales and Northern Ireland the competent person(s) in terms of Design and Technology, food and art are CLEAPSS. Schools can access current health and safety advice via the CLEAPSS website or use the CLEAPSS helpline. Schools in Scotland can access a similar service via SSERC.

4.6 Health and safety training

COMMENTARY ON 4.6

All employers are required under the Health and Safety at Work etc. Act 1974 [1] to provide, as far as reasonably practicable, all information, instruction, training and supervision necessary to ensure the health and safety at work of their employees.

Employers are required, under the Management of Health and Safety at Work Regulations (MSHWR) 1999 [2], to take into account all employees' capabilities with regard to health and safety.

The Provision and Use of Work Equipment Regulations (PUWER) 1998 (Regulation 9) [9] require that all persons who use work equipment have received adequate training.

Employees should be competent to undertake the tasks expected of them. The competence of relevant employees should be part of the risk assessment process. Proper health and safety training should be provided to employees on induction and when exposed to any new or increased risks.

NOTE 1 The Design and Technology Association (D&T Association) has published training standards which provide a framework that employers can use to cover all elements of health and safety training for D&T. The PUWER regulations [9] require refresher training to be provided when necessary.

A programme of refresher training should be undertaken over a five year period.

NOTE 2 Accreditation provides a record of the training undertaken.

All employees and supporting adults should be trained in safe use of equipment, machinery and processes during initial training, or by in-service training. All those involved in any aspects of food handling should have at least a recognized food safety certificate.

NOTE 3 This is included in the D&T Association publication Health and Safety Training Standards in Design and Technology [N1].

4.7 Reporting accidents and dangerous occurrences

All significant accidents, work related ill health and dangerous occurrences should be reported and recorded either by completion of an employer's report form or by entering details in an accident book. In each case, the circumstances of the accident and the action to be taken to prevent reoccurrence should be recorded.

NOTE The Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR) 2013 [10] require certain types of incidents to be reported to the HSE; see the HSE INDG 453, "A Brief Guide to the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 2013 (RIDDOR)" [11].

4.8 First aid

Sufficient first aid provisions should be made available for employees and learners, including readily available access to a first aid kit.

NOTE 1 The Health and Safety (First Aid) Regulations 1981 [12] require employers to ensure that there is sufficient first aid provision for employees.

⁵⁾ See: <http://www.oshcr.org>.

⁶⁾ See: <http://www.data.org.uk>.

NOTE 2 See HSE publication L74 "The Health and Safety (First-Aid) Regulations 1981. Guidance on Regulation, 2013" [13].

Eye wash facilities should be available, where required (e.g. a suitable mains cold water tap or, where this is not available, proprietary eye wash bottles). First aid materials conforming to *HSE publication L74 [N1]* should be provided. The number of persons competent to provide first aid should be appropriate to the risks. At least one person holding a current first aid certificate or who has been trained in emergency first aid should always be available to attend and to provide first aid when design and technology rooms are in use.

NOTE 3 The appropriate government department for education provides further guidance for local authorities, school leaders, school staff and governing bodies.

4.9 Hazardous noise

COMMENTARY ON 4.9

High levels of noise can cause permanent hearing loss. This can take years to become serious and is irreversible. In general, if persons approximately two metres apart are required to raise their voices to carry out a normal conversation it might be necessary to implement controls under the Control of Noise at Work Regulations 2005 [3], depending on how long they are exposed. The Regulations require the risks from noise to be assessed such that control of those risks can be implemented.

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. gun shots, heavy hammer blows on resonant objects). The Management of Health and Safety at Work Regulations (MHSWR) 1999 [2], Regulation 19 (Protection of young persons), and the Control of Noise at Work Regulations 2005 [3] impose duties on employers and employees if the employees' daily noise exposure reaches specific daily or weekly "action values" and "limit values" as follows:

- a) lower exposure action values:*
 - 1) daily or weekly exposure of 80 dB(A);*
 - 2) peak sound pressure of 135 dB(C);*
- b) upper exposure action values:*
 - 1) daily or weekly exposure of 85 dB(A);*
 - 2) peak sound pressure of 137 dB(C);*
- c) exposure limit values:*
 - 1) daily or weekly exposure of 87 dB(A);*
 - 2) peak sound pressure of 140 dB(C).*

Specific actions are required at each of the action values. The limit value is the level which is not to be exceeded (exposure limit values take account of any reduction in exposure provided by hearing protection).

Weekly personal noise exposure may be used in place of daily personal noise exposure where exposure varies markedly from day to day.

Where LEV is used, the employer should specify systems that have acceptable noise levels in accordance with HSG258 Controlling airborne contaminants at work [N2] and the designer should meet this specification.

Noise generated by LEV can cause problems, especially where ambient noise is low. The noise originates from:

- a) fans – the type of fan, blade design, drive, bearings, mounting, casing, sound;*
- b) insulation and duct connection;*
- c) turbulence in ducts, particularly flexible ducts, bends, changes in cross-section;*
- d) high velocities and large particles;*
- e) small, high-velocity capturing hoods; and*
- f) noise created elsewhere, propagated by hoods.*

Risk from the exposure to noise should be either eliminated at source or, where this is not reasonably practicable, reduced to as low a level as is reasonably practicable.

NOTE 1 Attention is drawn to the Control of Noise at Work Regulations 2005 [3] with regard to an employer's responsibilities.

Where learners are likely to be exposed to noise at or above the upper action value, employers should reduce exposure as far as reasonably practicable using organizational and technical measures other than personal hearing protectors. Where it is not reasonably practicable to reduce the level below the upper action value, personal hearing protectors should be provided and worn, including for persons in the vicinity of noisy operations, including learners.

Suitable health surveillance, including hearing tests, should be provided to employees who are regularly exposed to levels at or above the upper action value or otherwise at risk.

Where the daily noise exposure exceeds the lower exposure action value, employers should make hearing protectors available on request and provide adequate information, instruction and training about risks to hearing, action to minimize noise risk, and how to obtain hearing protectors. At the lower exposure action value, individuals should be encouraged to use personal hearing protectors, without making this mandatory.

Employers should verify that individuals are not exposed to noise above an exposure limit value. If an exposure limit value is exceeded the employers should immediately reduce exposure to noise to below the exposure limit value, establish why it was exceeded, and modify the control measures to prevent it being exceeded again.

In any area where the exposure limit value is likely to be exceeded, employers should mark hearing protection zones with suitable notices and restrict access, where this is practicable and where the risk from exposure justifies it.

NOTE 2 Several pieces of equipment/processes used in design and technology generate noise levels above 85dB(A), e.g. planer/thicknessing machine and portable routers. However, exposure times are likely to be short so action values are normally unlikely to be exceeded.

NOTE 3 Risk control measures could include alternative work methods, equipment selection, workstation design, work schedules and clothing.

Exposure times can be exceeded where a technician uses equipment when preparing work for learners, so this should be controlled by limiting the period of exposure.

The ambient noise levels in the work environment should not adversely affect the ability of the teacher to communicate with the learners.

NOTE 4 The HSE have published noise calculators and ready reckoners which can help calculate daily noise and weekly noise exposures, see <https://www.hse.gov.uk/noise/calculator.htm>.

4.10 Vibration

COMMENTARY ON 4.10

Prolonged and regular exposure to hand/arm vibration (HAV) can affect operators' health. HAV is vibration transmitted from work processes into workers' hands and arms. For example, it can be caused by operating hand held power tools, hand guided equipment or by holding materials being processed, e.g. on pedestal grinding machines. Prolonged and regular exposure can lead to a range of conditions collectively known as hand and arm vibration syndrome (HAVS). This is most likely when contact with a vibrating tool or work process is a regular part of a person's job.

Employers should provide suitable and sufficient information, instruction and training with regard to the risks from vibration, action to reduce the risks, why and how to detect and report signs of injury and entitlement to health surveillance (regular health checks).

NOTE 1 Attention is drawn to the Control of Vibration at Work Regulations 2005 [14] which requires employers to assess the vibration risk to employees.

NOTE 2 The risk of damage from hand/arm vibration depends on the level of vibration and the period of exposure. The Control of Vibration at Work Regulations [14] specify an "action value" and a "limit value" as follows:

- a) daily exposure action value: $2.5 \text{ m/s}^2 \text{ A(8)}$; and*
- b) daily exposure limit value: $5 \text{ m/s}^2 \text{ A(8)}$.*

In the assessment of vibration risk, employees should be assessed to see if their exposure exceeds the daily exposure action value and, if it does, employers should introduce a programme of controls to eliminate risks or reduce exposure to as low a level as is reasonably practicable. Employers should provide health surveillance to employees who continue to be regularly exposed to vibration levels exceeding the action value or otherwise continue to be at risk.

If the assessment shows employees are likely to be exposed to higher than the daily exposure limit value, the employer should take immediate action to reduce exposure below the limit value.

NOTE 3 Risk control measures could include alternative work methods, equipment selection, workstation design, work schedules and clothing.

NOTE 4 Several pieces of equipment/processes used in design and technology can lead to hand/arm vibration, e.g. portable power tools. Rotary action power tools or machines used for more than approximately an hour per day or hammer action tools used for more than about 15 minutes per day, might lead to the action value being exceeded in a much shorter period of time.

Exposure times can be exceeded where a technician uses equipment when preparing work for learners; this should be controlled by limiting the period of exposure.

NOTE 5 The HSE have published a HAV exposure calculator to assist in calculating exposures for hand-arm vibration, see <https://www.hse.gov.uk/vibration/hav/vibrationcalc.htm>.

4.11 Fire hazards

The following fire hazards in design and technology areas should be identified and recorded:

- a) sources of ignition:
 - 1) hot surfaces;
 - 2) cooker hobs;
 - 3) electrically generated sparks;
 - 4) mechanically generated sparks (e.g. from abrasive wheels);
 - 5) naked flames (e.g. in welding); and

- 6) hot materials (e.g. in heat processes);
- b) sources of fuel:
 - 1) flammable liquids (e.g. cooking oils, solvents, petrol);
 - 2) flammable gases (e.g. acetylene, propane); and
 - 3) combustible materials (e.g. wood shavings and dust, plastics dust textiles, soft furnishings, paper and card);
- c) sources of oxygen:
 - 1) natural air flow and forced air flow (e.g. LEV);
 - 2) oxidizing chemicals (e.g. catalysts for glass reinforced plastics work); and
 - 3) oxygen cylinders (e.g. for welding).

4.12 Fire risk control measures

COMMENTARY ON 4.12

Many of the risk control measures recommended in this British Standard for the management of services and specific activities are concerned with controlling the risk of fire.

The following should be assessed in the fire risk assessment:

- a) storage and use of flammable substances;
- b) the management of heat processes; and
- c) the control of dust.

NOTE 1 Fine particles of some dusts are combustible (e.g. wood, plastics and some metals) and can, in the right concentrations, ignite explosively and start a fire.

LEV systems for combustible dusts should be separate, incorporate explosion relief and not be used for processes where sparks are generated.

NOTE 2 See also HSE publication, ATEX 95 [15].

NOTE 3 Sparks from grinding machines, etc., could ignite combustible dust causing an explosion in the ducting or collector.

Dust should not be allowed to accumulate on electrical or other equipment as this can lead to overheating.

NOTE 4 See HSE guidance document HSG103, "Safe handling of combustible dusts: Precautions against explosions" [16] and HSG258, "Controlling airborne contaminants at work" [N2].

Section 3: Planning and services

5 Planning and design

5.1 General

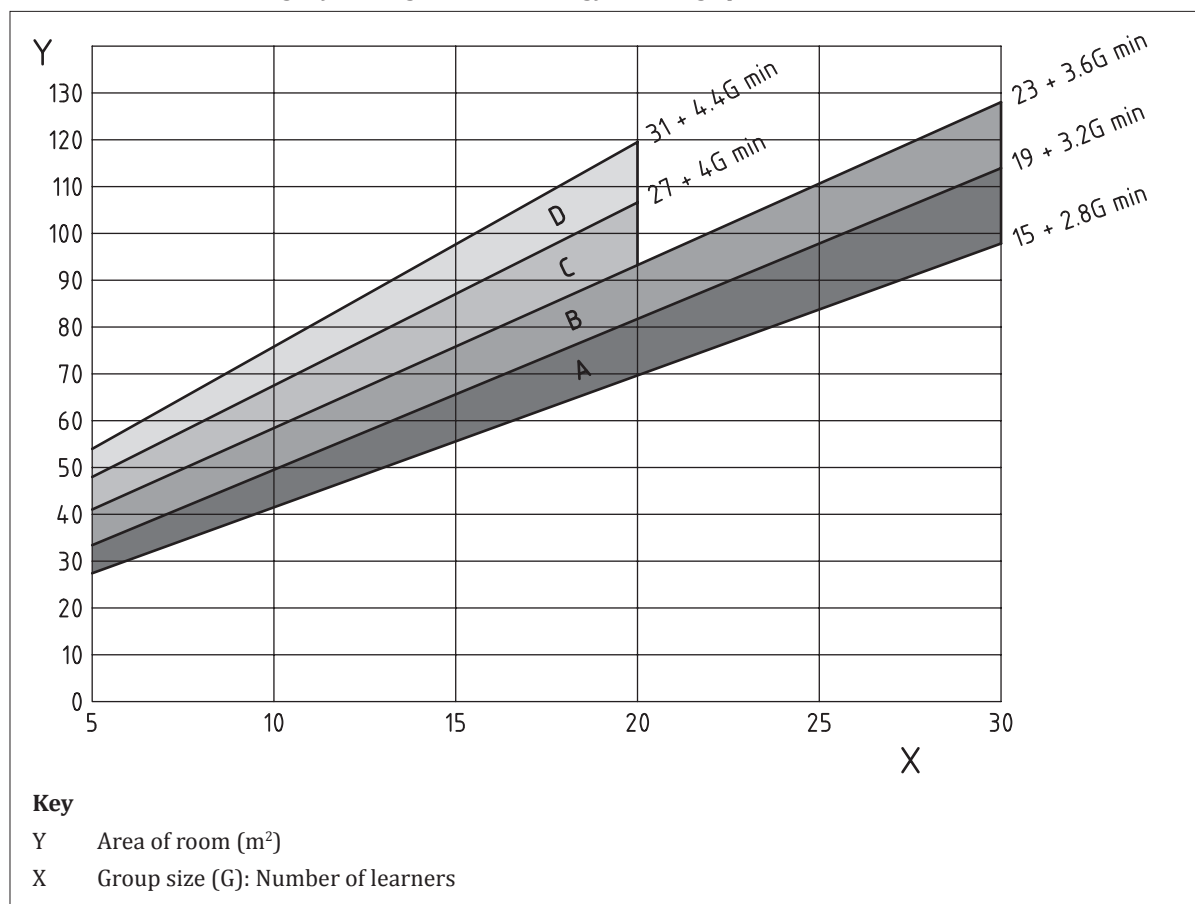
COMMENTARY ON 5.1

The education departments in England, Scotland and Wales provide guidance on the detailed design or work areas, for example DfES Building Bulletins, or the corresponding recommendations for Scotland and Northern Ireland, as applicable.

These include dimensions for safe working areas around individual machines, furniture and equipment for new or refurbished facilities, and floor area ranges for varying group sizes.

The size of rooms required for different design and technology activities related to the size of the group for a single teacher should be in accordance with [Figure 1](#).

Figure 1 — Recommended area ranges for design and technology teaching spaces



Equation (1) should be used to calculate the recommended number of learners in a particular teaching space within each of the area ranges suitable for different design and technology activities as shown in [Figure 1](#).

$$H + (F \times G) = \text{recommended minimum room size}$$

Equation (1)

where:

F is the area per learner (m²)

G is the number of learners

H is the space for fixed equipment (m²)

Example

In Zone D: for 20 learners the area range would be:

Minimum: $27 + (4 \times 20) = 107 \text{ m}^2$

Maximum: $31 + (4.4 \times 20) = 119 \text{ m}^2$

Typical zones for various activities:

General teaching area	Zone A
Electronics and control systems	Zone B
Graphic activities	Zone B
Textiles activities	Zone B
Food activities	Zone C
Resistant material activities	Zone D
Engineering	Zone D

Area ranges for typical group sizes should be in accordance with [Table 2](#).

Table 2 — Area ranges for typical group sizes (in m²)

Zone	Group size				
	18	20	21	25	30
A	65 – 67	71 – 83	74 – 86	85 – 99	99 – 115
B	77 – 88	83 – 91	86 – 95	99 – 106	115 – 131
C	88 – 99	91 – 103	95 – 107	—	—
D	99 – 110	103 – 115	107 – 119	—	—

NOTE 1 If the number of learners in a teaching area exceeds the number for which the room was planned or creates unsafe working conditions the employer might be held liable under the Health and Safety at Work Act 1974 [1] for failing to provide safe working conditions.

NOTE 2 Attention is drawn to the requirements of the Equality Act 2010 [17].

NOTE 3 For more information, refer to, “Food Rooms Design Guide” [18] and “Baseline design for 1,200 place 11 to 16 secondary school finger block with a practical subject” [19].

5.2 Storage

5.2.1 General

Safe storage should be provided for bulk supplies of materials and learners' projects.

Suitable access equipment should be provided for items that are safely stored at high level.

All storage in design and technology areas should conform to the appropriate storage requirements.

5.2.2 Materials

Storage of bulk materials such as textile materials, timber, metal and plastics should be in an area separately designated and supplementary to the teaching area. The storage area should be adjacent to the work area with ready access both to it and to the outside to facilitate deliveries. Adequate racking for the storage of metal rods and tubes, timber, sheet materials and textile materials should be provided. Ends should not protrude from the rack. Retaining bars or chains should be provided if vertical stacking is employed.

To preserve materials in good condition and to facilitate safe handling at all times, timber and plastics should be stored in unheated areas and metals in warm and dry areas. A comfortable working environment should be provided in these areas.

5.2.3 Food

Food components and products should be separated and stored correctly. Provision should be made for storage of four categories of foods: dry and shelf stable foods, fresh fruit and vegetables, frozen foods, and perishable foods. Foodstuffs should be stored separately from food resource materials (e.g. books) and utensils.

Inventories and labelling should be checked regularly at intervals depending on the type of food/products stored.

5.2.4 Hazardous substances

If possible, schools should avoid using hazardous substances. Non-hazardous substances should be chosen in preference to hazardous substances.

Suitable storage areas should be provided for chemicals, flammable liquids, liquefied petroleum gas (LPG), acetylene and oxygen. Hazardous substances should be stored systematically [e.g. highly flammable (liquid or gaseous), toxic, corrosive], be kept apart from substances presenting a different type of hazard, and stored and used in accordance with the manufacturer's instructions.

NOTE 1 Guidance on storage of hazardous substances in technology can be found in the CLEAPSS publication "Model Risk Assessments for Design and Technology in Secondary Schools and Colleges" [5]. For Scotland, refer to the equivalent document published by SSERC.

NOTE 2 If use of a hazardous substance is unavoidable, attention is drawn to the Control of Substances Hazardous to Health (COSHH) Regulations 2002 (as amended) [23] with regard to an assessment of the risks associated with the use and storage of the substance.

The local health and safety adviser or fire prevention officer should be consulted.

NOTE 3 Attention is drawn to the Health and Safety (Safety Signs and Signals) Regulations 1996 [20] regarding the display of safety notices.

NOTE 4 If only very small quantities of some hazardous chemicals are required for occasional use, it might be appropriate to obtain supplies from other stores in the school or similar establishment.

The quantity of any stored substance should be as low as possible in accordance with purchasing and curriculum requirements. Inventories should be reviewed at least once each term and redundant stocks disposed of safely in accordance with the manufacturers' instructions.

NOTE 5 Attention is drawn to the Environmental Protection Act 1990 [21].

NOTE 6 Substances hazardous to health are classified and labelled under the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) Regulation [22].

Risk control measures should be implemented, including the following.

- a) Storage should be secure to prevent unauthorized access.

- b) Adequate local exhaust and general ventilation should be provided and maintained.
- c) Safe systems of work, incorporating instruction, training, PPE and record keeping should be implemented.
- d) Emergency procedures should be provided in case of spillage or accident.
- e) Emergency eye irrigation and body washing facilities should be available.
- f) Pre-prepared spill kits should be used, if possible.

Main stocks of hazardous substances should be kept in a lockable store provided with ventilation at high and low levels on an outside wall. Provision should be made for spill containment within the store. Bottles of hazardous substances of 1 l capacity or greater should be stored at low level, in a position where they cannot be knocked.

Only sufficient supplies of hazardous substances for immediate use should be kept in the work area. Supplies should be stored in strong, locked containers in which any spillage can be retained. Containers should be unbreakable. Glass containers, if used, should be carried in an unbreakable container or plastic bucket. Acids should be stored and used close to a water supply.

NOTE 7 Attention is drawn to the COSHH Regulations 2002 (as amended) [23] with regard to LEV systems being regularly maintained and inspected by a competent person at least every 14 months.

5.2.5 Flammable liquids and highly flammable liquids

COMMENTARY ON 5.2.5

The Dangerous Substances and Explosive Atmospheres Regulations 2002 [24] are concerned with protection against risks from fire, explosion and similar events arising from dangerous substances used, or present, in the workplace. Dangerous substances are substances or preparations which are explosive, oxidizing, extremely flammable, highly flammable or flammable. They include petrol, LPG, solvent-based paints and varnishes, and dusts which when mixed with air could cause an explosive atmosphere.

5.2.5.1 Flammable liquids

COMMENTARY ON 5.2.5.1

Substances described as “flammable” burn but do not give off sufficient vapours at normal room temperatures to form an explosive concentration.

Flammable liquids include paraffin, white spirit, turpentine substitute and oil.

Flammable liquids should be stored in a secure area away from heaters, lights and combustible materials (e.g. paper, cardboard, fabric, wood). Flammable liquids should be kept away from naked lights and smoking should be prohibited in their vicinity.

The risks from spillage should be minimized by using small quantities of flammable liquids and by replacing lids on containers quickly after use. Contact with the skin should be avoided by wearing suitable gloves. Any spillage should be cleared up immediately.

5.2.5.2 Highly flammable liquids

COMMENTARY ON 5.2.5.2

Substances described as “highly flammable” are easily ignited at room temperature and might be explosive. Fire and inhalation hazards are much higher than with flammable liquids. Highly flammable liquids include cellulose paints/thinners, methylated spirits and petroleum-based adhesives.

Vapours from highly flammable liquids are heavier than air and accumulate low down, and can form explosive concentrations.

Highly flammable liquids should be avoided, if possible, however, where they are used, quantities of highly flammable liquids in storage should be kept to a minimum.

Highly flammable liquids should be stored in closed containers in a secure, purpose built highly flammable liquids store, or, if there are no more than 50 l, in a fire resisting, spill resistant cabinet marked with a “highly flammable” warning symbol. All containers should be suitable and properly marked with the “highly flammable” warning symbol. Containers should be returned to the store or storage cabinet immediately after use. Storage cabinets should be kept locked or be in a locked storeroom.

Highly flammable liquids should only be used outdoors, if possible. Petrol tanks should be filled and liquids transferred between containers outdoors, well away from buildings and sources of ignition. Adequate ventilation should be provided by only using highly flammable liquids in open workshops, by opening windows and by operating any extractor fans. Care should be taken to verify that any electrical extractor fans are not a source of ignition.

Highly flammable liquids should not be used in basements, pits or any other areas below ground.

Highly flammable liquids should not be used close to any source of ignition, such as naked lights, welding areas or electrical equipment. Smoking should be prohibited. Combustible materials (e.g. paper, cardboard, fabric, wood) should not be allowed to become soaked with highly flammable liquids.

Risks from spillage should be minimized by using small quantities and by replacing lids on containers. Purpose designed dispensing containers with spring closed caps should be used, if possible. Contact with the skin should be avoided by wearing suitable gloves. Spills should be cleared up immediately and all contaminated rags, paper towels, etc., should be disposed of in an appropriate waste container outside the building.

5.2.6 Liquefied petroleum gas (LPG)

COMMENTARY ON 5.2.6

LPG [propane and butane, and MAPP (methyl-acetylene-propadiene) gas] can be used for heating purposes and as an aerosol propellant. Propane is supplied in red cylinders, and at normal temperatures is stored at approximately 7 bar. Butane is supplied in blue cylinders, and is stored at approximately 2 bar⁷⁾. MAPP gas is supplied in yellow cylinders. The test pressures for propane and MAPP gas are 25 bar and 22 bar respectively.

The following should be taken into account when handling liquefied petroleum gas.

- a) Leaks and/or spills of LPG from cylinders or pipework and fittings could create an explosive mixture in the building.
- b) Cylinders of LPG involved in a fire can explode violently.
- c) Cylinders of LPG are heavy and present moving/handling and toppling hazards.
- d) Escaping vapour from cylinders and aerosols can ignite violently.
- e) Skin and eyes can receive cold burns from rapidly evaporating LPG.
- f) LPG is an asphyxiant.
- g) Burning LPG can produce hazardous fumes.
- h) LPG is heavier than air and sinks to low levels. It can accumulate in cellars, pits, drains or other depressions.

⁷⁾ 1 bar = 105 N/m² = 100 kPa.

Suitable measures should be taken to prevent tampering with and vandalism of LPG cylinders at the design/installation stage. The measures should take into account the general security of the storage area.

A warning sign, “highly flammable LPG”, should be displayed on LPG cylinder storage. LPG cylinders should not be located such that they obstruct any means of escape from buildings or adjoining areas. Portable firefighting equipment should be readily available in the LPG storage area.

NOTE 1 Advice on the provision and use of firefighting equipment can be obtained from the local fire authority.

On fixed LPG installations, housings should be fire resistant, well ventilated and conform to the requirements of the local fire authority.

A schematic drawing of the pipework installation should be provided.

NOTE 2 Attention is drawn to the Pressure Systems and Transportable Gas Containers Regulations 1989 [25].

LPG should be stored and used in a well-ventilated position so that any small leaks can disperse and be diluted to well below the flammable concentration. Signs prohibiting smoking should be displayed in the storage area. LPG should be stored outdoors and away from combustible materials, corrosive materials and oxygen cylinders, and in accordance with *UKLPG Code of Practice No. 7, 2004* [N3]. Other materials (especially combustible materials) should not be stored close to LPG cylinders and should not obstruct or restrict natural ventilation of the storage area.

LPG vapour is denser than air and cylinders should not be stored below ground level or close to drains, cellars or basements.

LPG cylinders should not be subjected to mechanical damage or high temperatures, or dropped. Cylinders should be kept on trolleys and/or secured upright so that they cannot be knocked over. The valves of empty cylinders should be closed to prevent ingress of air, which could form an explosive mixture.

Numbers of stored LPG cylinders should be kept to a minimum. Not more than one spare cylinder should be kept for each application.

NOTE 3 The Dangerous Substances and Explosive Atmospheres Regulations 2002 [24] cover the use and storage of LPG. Although not specifically required by the Regulations, not more than eight disposable cylinders are to be stored together.

NOTE 4 See [BS 5482-1](#) for more information.

5.2.7 Oxygen and acetylene cylinders

The following should be taken into account when handling oxygen and acetylene cylinders.

- a) Compressed oxygen cylinders can explode violently if damaged or if involved in a fire, or could become a missile if the valve is damaged.
- b) Oxygen leakage makes fires burn more quickly and more violently.
- c) Acetylene cylinders can explode violently if involved in a fire.
- d) Acetylene leaks can form an explosive mixture in buildings.
- e) Cylinders are heavy and present moving/handling and toppling hazards.

Numbers of oxygen and acetylene cylinders should be kept to a minimum. Cylinders (even if empty) should be stored in safe, secure, well-ventilated place, preferably outside, and away from combustible materials.

“Compressed gas” and “flammable gas” warning signs should be displayed at cylinder stores.

Cylinders should not be stored below ground level, or next to drains, basements or other low-lying places.

If oxygen and acetylene is supplied through a fixed pipework installation from cylinders outside the building, the cylinders should be in a secure store and a schematic drawing of the pipework installation should be provided.

NOTE 1 Attention is drawn to the Pressure Systems and Transportable Gas Containers Regulations (1989) [25].

Cylinders should not be subjected to mechanical damage or high temperatures, or dropped. Cylinders should be kept in trolleys or secured upright so that they cannot be knocked over.

Acetylene in cylinders is dissolved in a liquid and cylinders should be stored with valves uppermost at all times.

NOTE 2 See 5.2.5.

5.2.8 Glass reinforced plastics materials

The following should be taken into account when handling glass reinforced plastics materials.

- a) Resins and catalysts can be classified as hazardous substances.
- b) Some plastics can give off toxic fumes if overheated or involved in a fire.
- c) Inhalation of fumes and vapours can be hazardous. Individuals can suffer respiratory sensitization and in some cases the effects can be irreversible.
- d) Adhesives containers can split and leak.
- e) Chemicals for glass reinforced plastics work can constitute a fire hazard.
- f) Splinters of material can issue from plastics sheets if they are snapped.

Glass reinforced plastics materials should be stored in cool, dry conditions away from direct heat sources.

Catalysts (organic peroxides) and accelerators (cobalt naphthenate) used for glass reinforced plastics work should be stored in separate (preferably metal) cupboards where any spillage can be retained.

Peroxides should be stored only in vented containers away from any flammable materials and should not be placed in sunlight or near to any source of heat.

Large quantities of catalysts, resins and solvents are a fire hazard and storage of these should be avoided.

5.2.9 Casting and forging materials

A sufficient storage area should be provided for forge fuel and moulding sand. Areas around casting and forging equipment should be kept clear.

5.2.10 Portable equipment

Appropriate storage should be provided for portable equipment (e.g. hand tools, power tools and machine accessories). Specially designed rack systems should be devised to check in and store returned items.

Power hand tools and their cutters should be securely stored to prevent unauthorized use.

5.2.11 Storage of personal clothing and personal protective equipment (PPE)

Suitable and sufficient storage for clothing, school bags and PPE should be available close to the entrance to the teaching space.

5.3 Fire

5.3.1 General

COMMENTARY ON 5.3.1

The management of risks from fire is covered by the following legislation:

- a) *in England and Wales: the Regulatory Reform (Fire Safety) Order 2005 [26];*
- b) *in Scotland: the Fire (Scotland) Act 2005 [27]; and*
- c) *in Northern Ireland: the Fire and Rescue Services (Northern Ireland) Order 2006 [28].*

A fire risk assessment should be undertaken to identify the means of fire prevention and the necessary fire precautions. While a fire risk assessment would typically be undertaken for the whole school, the risk assessment should take account of the specific fire risks in design and technology areas.

NOTE Guidance on carrying out fire risk assessments in educational establishments is available from the appropriate government department.

5.3.2 Fire systems and procedures

The following fire systems and procedures should be present in design and technology areas:

- a) appropriate fire detectors and fire alarms;
 - b) fire escape routes with the correct signs; and
- NOTE* See BS EN ISO 7010 and BS 5499-4 for guidance on escape route signing.
- c) firefighting equipment and suitable arrangements for:
 - 1) preparing, communicating and testing procedures in case of fire; and
 - 2) maintaining and testing fire equipment.

6 Working area environment

6.1 Lighting

6.1.1 General

Sufficient lighting should be provided in work areas. Escape lighting should be provided in high risk areas and in escape routes from high risk areas.

The following levels of lighting should be provided at least in accordance with CIBSE LG5, Table 5.1 and Table 5.3 [N4].

- a) High intensity of natural light (500 lx) should be provided in food preparation areas. Fluorescent lighting or LED lighting with a minimum colour rendering index (Ra) of 80 should be provided to avoid distortion of food colours.
- b) At least 500 lx should be provided for normal bench and machine work (taking into account the stroboscopic effect of fluorescent lighting units).
- c) At least 500 lx should be provided in fabric work areas.
- d) 1 000 lx should be provided for fine bench and machine work. Suitable task lights should be used to provide lighting at 1 000 lx.

Subdued lighting should be provided in forging, brazing and welding areas to enable colour changes in heated metals to be easily observed. These areas should not be located close to windows, especially windows that face south.

Sudden changes in intensity of illumination within work areas or at entrances and exits should be avoided. If possible, natural light should provide the recommended levels of illumination, supplemented by artificial lighting if required. Glare should be avoided.

Lighting units installed in storage areas should be mechanically protected.

Computer visual display units should be positioned away from glare and reflection from lights and windows, and spaced at least 1 m apart. Window blinds should be provided where required. If the computer room is likely to be in prolonged use, anti-glare category 2 light fittings should be installed.

NOTE The Health and Safety (Display Screen Equipment) Regulations 1992 (as amended) [29] provide guidance (see HSE document L26 [30]).

6.1.2 Supplementary lighting

Supplementary lighting should be provided for machine tools and equipment if the main room lighting is not sufficient. Supplementary lighting fitted to a machine and in close proximity to any operation taking place should conform to BS EN 60204-1. Lamps should not operate at more than separated extra-low voltage (SELV), i.e. below 50 V a.c. If the switch for the supplementary light is not easily accessible to the machine tool operator, another switch should be provided adjacent to the light source. Lighting should be provided with a deep shade to prevent glare from polished surfaces.

6.2 Heating and ventilation (including LEV)

Work areas should be maintained at a temperature comfortable to work in when appropriate protective clothing is worn. Heating should be available in rooms used for the preparation of materials, as well as teaching areas.

NOTE 1 Attention is drawn to the Workplace (Health, Safety and Welfare) Regulations 1992 [31], and the HSE Approved Code of Practice and Guidance (L24) [32], and also to the School Premises (England) Regulations 2012 [33]. Equivalent guidance documents are also available in Scotland and Wales.

Food preparation should not be carried out in close proximity to fan-assisted heating units as there is the potential for food contamination from airborne dust.

Fan-assisted heating should be avoided where dust-producing activities are carried out.

Underfloor heating should be avoided in rooms where equipment has to be bolted to the floor.

LEV should be provided if a risk assessment shows that this is required or to ensure the safety and comfort of the operators for the following equipment and processes.

NOTE 2 Attention is drawn to the COSHH Regulations 2002 (as amended) [23].

- a) cooking appliances that give off steam, oil, grease, odour and heat (the ventilation system for food teaching should include a fan of sufficient capacity to ensure the fume load is removed from the equipment);
- b) equipment for heat treatment, including equipment for brazing, forging, welding, cutting, soldering and casting;
- c) woodworking machines, including machines for sawing, sanding, routing, planing and thickening;
- d) chemical processes and procedures, including acid pickling, processes involving plastics, paint spraying, and procedures producing engine exhaust emissions;
- e) metalworking machines (used for grinding and polishing); and
- f) laser and other cutters.

The local exhaust inlet should be sited as close as possible to the source of contaminant. If venting to the outside, care should be taken not to harm persons outside or in another part of the building. Air should be admitted to the room to compensate for air exhausted to the outside.

NOTE 3 For information on airborne contaminants that could present health risks, and on the levels of these permitted in industrial environments, see HSE Guidance Note EH40, "Workplace Exposure Limits" [34].

NOTE 4 For information on LEV see HSE Guidance Book HSG258, "Controlling airborne contaminants at work" [N2].

NOTE 5 For information on LEV see the CLEAPPS document L 225 "Local exhaust ventilation in design and technology" [35].

NOTE 6 Attention is drawn to the COSHH Regulations 2002 (as amended) [23] with regard to thorough examination of ventilation systems at least every 14 months to ensure efficient operation to their original specifications.

The system of examination used should be in accordance with HSG258, *Controlling airborne contaminants at work* [N2]. Records of maintenance should be kept for at least five years and any health surveillance records for individuals for 40 years.

NOTE 7 Additional ventilation or air conditioning might be required where computers are used.

6.3 Surfaces

6.3.1 Floors

Floors in areas where design and technology activities take place should be on one level.

Floors should be provided with a non-slip surface which should be maintained in good condition.

Floors in heat treatment areas should be of fire-resistant material.

Floors in food handling areas should be washable and be washed at the end of every day on which food preparation has taken place.

Due to the risk of injury from needles or pins caught in the pile of a carpet, floors in textile areas should not be carpeted.

NOTE Further information is available on the HSE website.

6.3.2 Ceilings, walls and work surfaces

Work areas ceilings, walls and work surfaces should be smooth, clean and provide a good level of reflected light, except for areas used for heat treatment processes, which should be provided with non-reflective surfaces. Walls adjacent to heat treatment areas should be free of flammable materials. Work surfaces in food handling areas should be smooth and easy to clean. Work surfaces should not be edged with wood or plastics lipping. Ceilings and walls should be suitable for regular cleaning. Separate, clearly coded cutting boards should be provided for working with different foods.

7 Services

7.1 General

Services (electricity, gas, water and compressed air) provided within the work area by pipes and ducts should be colour coded in accordance with BS 1710. Where risks cannot be controlled in other ways (e.g. verbal instructions, suitable guards), safety signs should be provided.

NOTE Attention is drawn to the Health and Safety (Safety Signs and Signals) Regulations 1996 [20].

Fire exit and emergency escape routes, signs should be in accordance with BS 5499-4.

7.2 Electrical installations

7.2.1 General

New fixed installations and alterations should conform to [BS 7671](#).

NOTE 1 Attention is drawn to the Electricity at Work Regulations 1989 [36].

Sufficient socket outlets should be installed.

Drop down ceiling-mounted socket outlets should be used to avoid hazards caused by trailing leads.

Power to socket outlets should be supplied through a non-time delayed residual current device with a rated residual operating current not exceeding 30 mA and an operating time not exceeding 40 ms at a residual current of five times the operating current in accordance with [BS 7288](#), BS EN 61008-1 or BS EN 61009-1.

NOTE 2 Attention is drawn to the Electricity at Work Regulations 1989 [36] with regard to the maintenance of electrical systems and equipment.

Inspections and tests on fixed electrical installations and equipment should be carried out at least once every five years by a competent person in accordance with *Guidance Note 3: Inspection and Testing, 6th Edition* [N6].

Inspections and tests on fixed and portable electrical equipment should be carried out regularly by a competent person in accordance with the *Code of Practice: In-service Inspection and Testing of electrical equipment* [N7]. The frequency of this testing should be based on risk assessment.

NOTE 3 The frequency of inspections and tests of portable equipment depends on the design and use of the equipment (see HSE publication HSG107 [37]).

Electrical equipment should only be used in the intended environment.

Protective conductor current from the power supply circuits of computers should be taken into account when selecting residual current devices, to prevent unwanted tripping to circuits supplying computers. Where necessary, local residual current devices should be provided to reduce the risk of problems associated with information technology equipment in the event of loss of supply.

Special precautions should be taken in areas where equipment with high protective conductor current (e.g. information technology equipment, electronic office equipment, process control equipment) is used.

NOTE 4 For further information, see [BS 7671](#).

If there is a risk of water and/or solids ingress (including use of equipment outdoors), the equipment should have an appropriate ingress protection (IP) rating.

NOTE 5 For details of specifications, and of tests to verify degrees of protection, refer to BS EN 60529.

All portable electrical equipment should be correctly fused.

7.2.2 Food areas

Electrical installations in food areas should conform to [BS 7671](#). Socket outlets should be supplied via a non-time delayed residual current device with a maximum tripping current of 30 mA.

Where a risk assessment indicates the need, an overall main switch for food rooms should be installed. If there is an overall main switch, refrigerators, freezers and appliances with clocks and timers and computers should be supplied by separate circuits which are not under the control of the overall main switch. Electric cookers should have individual circuits at the correct rating to match the appliance. There should be a suitable electrical supply for gas cookers to supply ignition, clocks and timers.

All electrical equipment should be positioned away from sinks. Working areas and electrical sockets should be positioned so that electric cables do not cross cookers or other hot surfaces.

NOTE 1 IET guidance states equipment needs to be suitable for the environment it is installed in and whilst [BS 7671](#) does not give a specific distance the IET Electrician's Guide to the Building Regulations, 5th Edition [[38](#)] recommends a minimum of 300 mm from the edge of the sink unit to the socket outlet.

Warning signs should be displayed adjacent to types of hotplates that show no visible heat source when in operation.

Fixed appliances (e.g. cookers, washing machines and dryers) should be installed by a competent person. To reduce noise levels, washing machines and driers should not be installed in teaching areas. To reduce noise levels, the installation of washing machines and driers in teaching areas should either be avoided or their use limited to time when no formal teaching is taking place.

The flexible cords of portable equipment should be as short as is reasonably practicable and be frequently inspected to ensure they are in good condition. All portable equipment should be unplugged if not in use and before making adjustments or cleaning.

Inspections and tests on fixed and portable electrical equipment should be carried out regularly by a competent person in accordance with the *Code of Practice: In-service Inspection and Testing of electrical equipment* [N8]. The frequency of testing should be based on risk assessment.

Portable electrical equipment should be inspected regularly and tested periodically.

NOTE 2 See HSE Guidance Book HSG107 [[37](#)].

Electrical equipment should not be used with damp or wet hands.

Food teaching equipment, including cookers, washing machines and dishwashers, that have been installed via a permanent cable, should be fitted with an isolating switch that is clearly labelled and visible to identify the appliance supplied, so that the appliance can be isolated.

Appliances supplied via a plug and socket should have the plug clearly labelled to identify the appliance supplied, so that the appliance can be isolated.

7.2.3 Computer areas

The electrical supply to computer rooms should conform to [BS 7671](#). Any servers should be supplied through an individual dedicated supply that cannot be switched off unintentionally. Sufficient socket outlets should be provided in the room to avoid use of adaptors or extension leads to computers and peripheral equipment (e.g. printers, scanners, control boxes, monitors).

7.2.4 Main work area switchgear

The electrical supply to work areas should conform to [BS 7671](#). In each workshop area it should be possible to disconnect and isolate all electrical circuits that supply fixed equipment and socket-outlets by a single switch conforming to BS EN 60669-2-4 or BS EN 60947-3. Switchgear should be clearly labelled to show the circuit or function controlled. The isolating switch should be readily accessible, clearly labelled "main switch", and lockable in the "off" position. The switching device should not control lighting or space heating equipment provided for health and safety, such as extraction fans and specific socket outlet circuits for computers, refrigerators and freezers and cleaning purposes. Workshop areas without electrically operated fixed equipment and only a 230 V a.c. supply should be fitted with an isolating switch and an emergency switching system (see [7.2.5](#)) if there is rotating or other machinery (but not portable machinery) present.

7.2.5 Work area emergency switching systems

COMMENTARY ON 7.2.5

Attention is drawn to the Provision and Use of Work Equipment Regulations (PUWER) 1998 [9].

Emergency switching systems should be provided in each separate student work area which controls only that work area. Preparation areas for employee use only need not have any emergency switching system and should not be affected by the emergency system of any other area. The systems should switch off all circuits supplied via the isolating switch in an emergency. Critical circuits specifically installed to remove hazards (e.g. fume extractor fans, lighting, alarm circuits) should not be controlled by the emergency system.

The emergency switching device should be a remotely operated contactor or circuit breaker that opens when the coil is de-energized. The switching device should be controlled by a series of readily accessible non-latching push buttons evenly distributed around the work area, at an approximate height of 1.5 m and clear of benches and machines. It should only be possible to reset the remotely operated contactor or circuit breaker by a single key-operated spring return switch sited within view of the work area it controls. A responsible person should retain the key.

NOTE See also BS EN 60204-1, [BS 7671](#) and BS EN ISO 13850.

Push buttons should be conspicuous and coloured red on a yellow mounting surface (see BS EN ISO 13850) and a safe condition sign conforming to BS EN ISO 7010 should be located adjacent to each switch.

The emergency stop system installed in a workshop should not negate any other safety systems fitted to machines, e.g. braking systems on hand fed wood cutting machines.

The electrical supply should be turned off at the end of the working day.

7.2.6 Electrical equipment for fixed machine tools

COMMENTARY ON 7.2.6

The Provision and Use of Work Equipment Regulations 1998 (PUWER) [9] require that, where appropriate, stop, emergency stop and emergency isolation systems are to be installed for each item of work equipment.

Electrical equipment for fixed machine tools should conform to BS EN 60204-1.

Motor starters, switches and controls for fixed machine tools should conform to and be fitted in accordance with BS EN 60204-1 and [BS 7671](#). They should be readily accessible to the operator from the normal operating position and not require the operator to reach over any moving parts of the machine. Emergency stop switches (which could be the normal “off” switch) should be provided at all fixed machines, where a risk assessment shows that it is required and easily actuated by the user. An emergency stop switch should only control the power to the machine to which it is fixed and not other machines in the work area.

Foot operated pedal switches should not be used to turn on a machine.

Any fixed machine or item of electrical equipment should be supplied via:

- a) a fused isolating switch conforming to BS EN 60947-3, or
- b) a connection unit conforming to [BS 1363-4](#), or
- c) a circuit breaker conforming to BS EN 60898-1, or
- d) a residual current operated circuit-breaker (RCBO) conforming to BS EN 61009-1.

The supply cables should be enclosed within suitable robust conduit or trunking or armoured cable.

Any controls or means of isolation not incorporated in the equipment should be located not more than 2 m away from the equipment and positioned so that they can be operated safely while the equipment is in use. Each switching device should be clearly marked with its function and its associated machine/equipment.

Where a machine mounted on a fixed bench and/or is intended to be secured to the bench is fitted with a 13A plug top, i.e. scroll saws, bench drills, disc sanders and other similar small machines, it is not advised to supply these from a 13A socket outlet, instead the machine should be wired directly from a fused connection unit conforming to [BS 1363-4](#).

The fused connection unit should be able to be locked off and isolated with an isolating switch conforming to BS [EN 60947-3](#) and fitted with an appropriately rated fuse.

The final supply cord from the machine should be further protected with conduit, flexible conduit or trunking.

Electric motors with a rating exceeding 0.37 kW should be provided with control equipment incorporating a means of protection against overcurrent in the motor, with the exception of motors incorporated in current-using equipment conforming to a British Standard.

Means to prevent automatic restarting of an electric motor after certain types of stoppage (e.g. no-volt release starter) should be provided, with the exception of automatic control devices that are set to start motors at some interval and where other safety precautions are taken against unexpected restarting.

NOTE The use of plastic conduit or trunking in workshop areas should not be used since it can be easily damaged.

7.2.7 Electrical supplies for motor vehicle workshops

Electrical installations within motor vehicle workshops should be installed and maintained by competent persons and should conform to [BS 7671](#).

NOTE 1 Attention is drawn to the requirements of the Dangerous Substances and Explosive Atmospheres Regulations 2002 [24] concerning installations within potentially explosive atmospheres, and HSG261, "Health and safety in motor vehicle repair and associated industries" [N8].

Socket outlets should be supplied via non-time delayed RCD with a residual current not exceeding 30 mA.

Where supplies are provided for portable power tools and equipment, they should be supplied via industrial type sockets conforming to BS EN 60309-2 at the appropriate voltage.

Extension leads should not be used.

Socket outlets should not be sited below 1 000 mm from floor level to reduce the risk of igniting spilt petrol or flammable liquids.

Where possible, hand lamps should be battery-operated, and the batteries rechargeable. Alternatively, these should be supplied at reduced voltage such as 110 V centre tapped to earth or a separated extra low voltage (SELV) supply not exceeding 50 V a.c.

NOTE 2 See HSE publication PM38 [39] for guidance on the selection and use of handlamps.

Fixed items of electrical equipment should be supplied via a fused electrical isolator.

Electrical installations within motor vehicle workshops should be tested and inspected at three year intervals in accordance with HSG261, *Health and safety in motor vehicle repair and associated industries* [N8], to ensure safety and a written record is kept of the inspection, reports and any repairs completed.

7.2.8 Electrical supplies for portable equipment

Cordless, battery-operated portable tools should be used wherever possible.

Mains-powered portable equipment (indoors or outdoors) should be supplied via a socket-outlet protected by a residual current device (see 7.2.1). The effectiveness of these devices should be verified frequently, using the test button, in accordance with the manufacturer's instructions.

For construction related vocational courses, SELV supplies incorporating a 110 V centre tapped transformer should be used to minimize the risk of serious electric shock. Socket-outlets should conform to BS EN 60309-2 and should be colour-coded yellow.

Socket-outlets of supplies with different voltages should not be compatible with outlets of other voltage systems.

For a standard nominal 230 V a.c. supply with neutral at, or approximately at, earth potential, the socket-outlets should conform to BS 1363-2. Equipment that requires installation in a particular location or that requires an industrial type plug, should be supplied by socket-outlets conforming to BS EN 60309-2, colour-coded blue.

Sufficient socket-outlets should be provided to avoid use of adapters or extension leads.

Equipment that requires an electrical supply greater than 16 A and/or 250 V should be directly connected to fixed wiring.

Socket-outlets for use by cleaning employees only should conform to BS 1363-2. These socket-outlets should be protected by a residual current device and should be sited adjacent to an entrance door if possible. If it is essential to locate socket-outlets for caretaking employees in work areas, these should be supplied from an independent circuit (also protected by a residual current device) labelled "Cleaning use only".

In new installations, surface-mounted boxes for electrical accessories should not have multiple conduit knockouts. For socket-outlets or plugs, security screws that require a special tool for insertion and removal should be used.

Socket-outlets with neon indicators should only be used to supply equipment for which an indication of an "on" condition is required (e.g. a refrigerator). Neon indicators should not be used to indicate that a socket-outlet is "off".

Socket-outlets that supply voltages greater than extra-low voltage and up to 250 V (a.c. or d.c.) and that do not conform to BS 1363-2, BS 7288, BS EN 60309-2 or BS 546 (shuttered) should conform to BS 5733.

Socket-outlets that are intended to, or are likely to, supply power for outdoor use should be supplied via a residual current device not exceeding 30 mA.

7.3 Mains gas installations

7.3.1 General

All work on gas fittings should be carried out by someone who is qualified to work on the specific type of gas appliance.

NOTE 1 See the Gas Safe Register at <https://www.gassaferegister.co.uk/>.

NOTE 2 IGEN/UP/11 [N10] covers gas installations for educational establishments. Gas Safety (Installation and Use) Regulations 1998 (as amended) [40] apply to gas installations.

7.3.2 Main isolator

Emergency control valves should be situated:

- a) as near as practicable to the point where the gas supply enters the building, either internally or externally;
- b) in a readily accessible position;
- c) so that the key or lever (handle) is parallel to the pipe when the valve is open and pulled down to close; and
- d) with a test point fitted downstream of each valve.

The emergency control valve key or lever should be securely attached to the valve and should be clearly labelled.

7.3.3 Room isolation

Design and technology work areas with gas equipment should have a means of isolating the gas supply to the room. The means of isolation should be in a readily accessible position and be clearly marked, but should not be readily accessible to learners. The means of isolation should be either a manual valve or a fail-safe electrically-operated solenoid valve that might form part of an emergency stop system within the room.

The gas supply should be turned off at the end of the working day.

7.3.4 Ventilation systems

COMMENTARY ON 7.3.4

Guidance on ventilation systems and on the use of gas installations in educational establishments can be found in IGEM/UP/11[N10].

Purpose provided permanent ventilation should be fitted to provide sufficient fresh air for the purposes of combustion and climate control for all gas appliances used in educational establishments. There should be sufficient ventilation to prevent a build-up of carbon dioxide and carbon monoxide.

NOTE 1 For information on ventilation in conjunction with gas appliances that could present health risks and on the levels permitted in workplace environments, see HSE Guidance Note EH40, "Workplace Exposure Limits" [34].

For all new installations and existing installations that are being refurbished or systems where any new gas-fired appliances are installed, a means of monitoring the correct provision of air supplies should be provided if a mechanical system is used to provide air for combustion or to extract the products of combustion. Such systems should be interlocked to the gas supply to ensure that the gas-fired appliance is unable to be operated without the fans being operational.

For existing installations where such safety interlocks are not installed, a written robust safe system of work should be produced, which can include the use of suitable signage, to ensure that the gas-fired appliance is not used until the supply air (where required) and extraction fans are operational.

NOTE 2 The air supply needed can be supplied by opening a window or door.

Gas safety interlocks should be provided to all existing installations. Gas-fired appliances should not be operated without adequate supply air and extraction systems.

NOTE 3 Attention is drawn to the Gas Safety (Installation and use) Regulations 1998 (as amended) [40] regarding interlocked ventilation systems.

NOTE 4 An existing system which is installed without the benefit of a gas safety interlock would only be classified as "Not to current standards" by someone on the Gas Safe Register if it can be shown that measures have been taken to prevent the use of the gas-fired equipment without the extraction operational. Such measure include the provision of suitable notices indicating that extraction systems are to be used. However, if evidence was found that the gas-fired

equipment was being used without the supply air or extraction systems operational, the engineer would classify the installation as “immediately dangerous” and would request permission to disconnect and make safe the installation.

7.4 Fixed installations using liquefied petroleum gas

All work on fixed installations using liquefied petroleum gas (LPG) should be carried out a competent person.

NOTE See the Gas Safe Register at <https://www.gassaferegister.co.uk/>.

LPG should be supplied by hard pipe from cylinders located outside the building in the open air. Cylinders should be securely fixed in an upright position with the valve uppermost. Manifold systems should incorporate a main shut-off valve and a regulator downstream (appropriately set), and a non-return valve downstream of these.

LPG-fired appliances should be fitted with appropriate safeguards (e.g. flame failure devices, shut-off valves, pilot burners).

7.5 Water installations

Hot and cold water should be provided in each work area and sinks should be fitted with bottle traps. Soap and hand drying facilities should be provided in each work area.

Waste pipes should be able to resist corrosion from weak acid solutions.

In food teaching areas, sinks should be provided with hot and cold water and the cold water should be of drinking water quality. A safe drinking water sign conforming to BS EN ISO 7010 should be placed adjacent to the relevant tap. Hot water should be at a temperature of between 46 °C and 48 °C to allow thorough removal of grease without the risk of scalding.

Water systems should be tested at regular intervals to satisfy *Legionella* environmental health requirements.

7.6 Compressed air systems

COMMENTARY ON 7.6

The Pressure Systems Safety Regulations 2000 [41] apply to mobile and fixed compressed air systems.

Compressed air systems where the maximum operating pressure (in bars) multiplied by the internal volume of the pressure vessel (in litres) exceeds 250 l should have a “written scheme of examination” drawn up by a competent person and should be thoroughly examined by in accordance with the scheme.

NOTE Preparation of a written scheme of examination and performance of the examinations are normally contracted to insurance companies with specialist engineers.

Air receivers should conform to BS EN 286-1. They should be tested hydraulically and a certificate obtained from the manufacturer or a competent authority (e.g. an insurance company) stating the safe working pressure (SWP) of the receivers and details of the hydraulic tests. The SWP should be clearly marked on the receiver. Air receivers should be fitted with a suitable pressure gauge and safety valve and an appliance for draining any condensate from the receivers. Air receivers should have an opening sufficiently sized to allow cleaning and thorough examination. If the receiver is designed so that the internal surface cannot be thoroughly examined, a suitable hydraulic test should be carried out instead.

Water in the receiver should be drained at least once per week. Air receivers should be installed outside the work area if possible. If installed inside the work area, the level of noise produced should be taken into account and action taken, as appropriate.

7.7 Machine installations

COMMENTARY ON 7.7

The Provision and Use of Work Equipment Regulations (PUWER) 1998, Regulation 5 [9], require that work equipment is suitable for the intended purpose and that it is located where risks to health and safety are minimized.

The location of work equipment should be chosen taking account of the location of other equipment, the purpose of the equipment and the operating position.

NOTE 1 See also DfES Building Bulletin 81 (archived publication) [42].

Machinery should be secured so that it cannot creep or be toppled. Floors should be level to prevent distortion of machines and should be checked for hidden services prior to drilling for fixings. Fixings for floors with surface finishes (wood block, tiles, vinyl sheeting, asphalt) should be long enough to penetrate the building structure or, where this is not possible, fixings appropriate to the particular surface finish should be used. Spring washers (or preferably lock nuts) should be used if a machine is liable to vibrate. Machines with a high centre of gravity should not be mounted on flexible mounts or glued felts. Glued felts and rubber composition pads should not be glued to a surface that is glued to the floor.

Benches that support machinery should be level, secure, sufficiently strong and at an appropriate height for safe operation of the equipment. Machines should be fixed securely to the bench if required. Equipment that does not require fixing (e.g. food processors, sewing machines) should be fitted with rubber feet to prevent slipping on the work surface.

If provision is to be made for machines to be moveable to suit curriculum demands, they should be stable in use and correctly connected to the electrical supply. A risk assessment should be carried out before machines are moved and this should include manual handling hazards.

NOTE 2 Until January 2023 a CE mark is required for new machinery, however after this date the marking required depends on the time at which the machinery was placed on the UK market and whether it is a qualifying Northern Ireland good. Depending on the circumstances, the marking required will be either UKCA, CE, or CE +UKNI, indicating that the machine has been designed and built in accordance with the essential safety requirements of the Supply of Machinery (Safety) Regulations 2008 (as amended) [43] and the Supply of Machinery (Safety) (Amendment) Regulations 2011 [44].

These regulations are designed to provide a consistent and appropriate level of safety on new machinery. The regulations apply to the manufacturer of the equipment or their authorized representatives and are in addition to the duties of care that PUWER [9] and MHSWR [2] impose on users of equipment. Compliance marking does not, in general apply to used machines, although PUWER [9] does. However, purchasers need to be aware that such marks do not necessarily indicate that the equipment is suitable for the robust use typical of educational environments and it is advised that a risk assessment is carried out of proposed systems of work and hazards arising from the machine in the teaching environment.

7.8 Lifting equipment

COMMENTARY ON 7.8

The Lifting Operations and Lifting Equipment Regulations (LOLER) 1998 [45] apply to equipment and accessories used for lifting and lowering loads (e.g. vehicle hoists, lifting beams, pulley blocks, engine cranes, jacks, chains, slings, eyebolts).

LOLER 1998 [45] require that:

- a) all lifting operations are planned, supervised and carried out safely by competent persons;*
- b) lifting equipment is sufficiently strong, stable and suitable for purpose, and positioned or installed correctly to prevent risk of injury;*
- c) the safe working load and other appropriate information to be taken into account for its safe use are visibly marked on the equipment and accessories;*
- d) a test certificate is provided by the equipment supplier; and*
- e) thorough examinations are carried out by a competent person at appropriate intervals (these are normally every 12 months for lifting machines such as hoists or cranes, and every six months for loose lifting equipment such as chains, slings, eyebolts. Examinations are normally contracted to insurance companies with specialist engineers.)*

In addition to thorough examinations, lifting equipment may be inspected at suitable intervals between thorough examinations.

Manufacturers of lifting equipment typically provide a guide on the frequency of inspections.

Inspections should be regular (weekly, monthly or quarterly). Inspections, where required, should include visual and functional checks.

NOTE 1 Inspections are typically carried out on machinery (e.g. hoists).

NOTE 2 Lifting accessories such as chains or slings do not normally require an inspection as long as they receive a thorough examination at the appropriate interval and a proper preuse check.

Reports of examinations should be kept so that appropriate action can be taken, as required.

Section 4: Teaching areas, equipment, tools and processes

8 General health and safety

Areas where tools and equipment are used have varying degrees of risk for all users and where design and technology activities are carried out, there should be clear health and safety guidance for using all teaching resources and for all environments.

NOTE In addition to the examples given in this British Standard, model risk assessments and an example model safety policy are available from CLEAPSS, available at www.cleapss.org.uk/. For Scotland, refer to the equivalent document published by SSERC, available at www.sserc.org.uk/.

The guidance should include advice to teachers, technicians and learners on safe use of specific equipment and safe organization of the teaching environment.

Employees should have at least a good understanding of equipment and processes, they should be confident in their use and be fully aware of the risks involved and safety measures required to ensure safe working.

Employees should be trained to the standards specified in the *Health and Safety Training Standards in Design and Technology* [N1], which recommends that refresher accreditation/training be undertaken at least every five years. All health and safety training should be recorded and updated as part of professional good practice.

Learners should be fully instructed in the use of equipment and processes before commencing the activity. Learners should be fully instructed in hazards associated with equipment and the precautions provided to counter these. The teaching environment should be appropriate for the task, it should be well maintained and the level of supervision appropriate for the level of risk. Close supervision should be provided with high-risk operations. The use of hand-held power tools should be closely monitored, especially if powered by mains electricity. Tools and equipment should be well maintained, including regular sharpening of tools, as appropriate.

A record of learners' competencies should be kept.

9 Management of the teaching environment

9.1 General

The maximum number of learners in any one work area should be determined to ensure safe working and effective supervision.

In England and Wales, there should be a maximum of 20 learners with one competent, qualified teacher in any one practical work area.

In new buildings that have been designed in accordance with *Building Bulletin 103* [46], any increase in this number of 20 learners should be substantiated by a written risk assessment.

NOTE 1 See DATA publication *Risk Assessment in Secondary School and Colleges in Design and Technology Teaching Environments* [6].

This assessment should be signed to show the agreement of the teacher involved and the employer who will be taking responsibility for this departure from the recommended group size.

In Scotland and Northern Ireland, there should be a maximum of 20 pupils for all classes in practical subjects.

NOTE 2 In Scotland, The Schedule of Salaries and Conditions of Service for Teachers in School Education requires that classes in practical subjects have no more than 20 pupils. This is based on the Schools (Scotland) Code 1956 Regulation 15 (2) [47].

NOTE 3 In Northern Ireland, the Department of Education – provides guidance on class sizes in practical subjects for post-primary schools in Circular 2004/05 “Class sizes in practical subjects in post-primary schools” [48], which can be summarized as follows.

Under Regulation 15 of the Secondary School (Grant Conditions) Regulations (Northern Ireland) 1973 [49]:

- a) a practical subject includes science, technology and design, home economics, art and design, physical education and music;*
- b) the maximum number of pupils under instruction by one teacher for a class in a practical subject is 20, except where approved by the Department.*

The Department is prepared to approve class sizes in excess of 20 where:

- 1) a class of pupils is under instruction in a practical subject and are not involved in practical activities;*
- 2) the activities are unlikely to present a risk to the health and safety of the pupils in the class; and*
- 3) classrooms meet the required standards as set out in paragraph 6 of Circular 2004/05 [48].*

Risk assessments should be carried out to determine the appropriate number of learners in the work area. Any adaptations required should be clearly documented.

NOTE 4 Attention is drawn to the D&T Association publication “Risk Assessment in Secondary School Design and Technology Teaching Environments” [6].

The risk assessment should take the following factors into account:

- a) the size and layout of the work area;
- b) the size and number of items of furniture and equipment in the work area;
- c) the type of activities carried out in the work area;
- d) the age and ability of the learners;
- e) the competence and experience of the teacher;
- f) the extent of technician or other appropriate support;
- g) whether learners with special needs are present;
- h) whether there are learners whose first language is not English; and
- i) the behaviour of the learners.

NOTE 5 If the number of learners in a teaching area exceeds the number for which the room was planned, or creates unsafe working conditions, the employer can be held liable under the Health and Safety at Work etc. Act 1974 [1] for failing to provide safe working conditions.

Teachers should verify that, following a thorough risk assessment:

- 1) the teaching environment is suitable for the class size;
- 2) the class is orderly and properly managed;
- 3) basic rules of care and maintenance are followed; and
- 4) safety checks and control measures are taught conscientiously and that learners benefit from a good example.

Learners should only work in a high-risk area when it is fully under the control of a person competent to work in the area (i.e. a person with demonstrated competency through an authorised training scheme) and, where appropriate, risk assessments have been carried out taking into account the learners' capabilities. For specific higher risk activities, training and assessment of individual learners should be carried out and training records kept.

NOTE 6 The risk assessment might indicate that closer supervision, use of physical aids, provision of instructions in a second language, modified group sizes and/or special teaching programmes are needed.

NOTE 7 See 4.3 for details on how to carry out a risk assessment.

Where a risk assessment indicates the need for PPE, signs shall be provided in the area clearly advising the use of PPE.

NOTE 8 Attention is drawn to the Personal Protective Equipment at Work Regulations 1992 [50].

NOTE 9 Attention is drawn to the Health and Safety (Safety Signs and Signals) Regulations 1996 [20].

Spilt oil, water, food debris and chemicals should be cleaned away immediately. Accumulations of waste materials should be removed from floors each day.

Floors should be kept free of obstacles and tripping hazards.

Duckboards should not be used.

9.2 Health and safety monitoring

Health and safety monitoring should be carried out regularly to ensure that:

- a) emergency stop systems operate effectively;
 - b) room isolating gas taps or controls are clearly marked, accessible, and in working order;
 - c) only authorized competent persons use specialized equipment;
 - d) the power isolator is locked in the "off" position when the room is unsupervised;
 - e) equipment guards and protective interlocks are in place and properly adjusted;
 - f) health and safety notices are clearly displayed in accordance with BS EN ISO 7010;
 - g) learners receive appropriate health and safety instruction (and a record of their training is kept) before equipment is operated or before heavy items are lifted or handled;
 - h) suitable protective clothing is worn and PPE provided, where risk of injury cannot be controlled by other means;
 - i) first aid kits are provided in accordance with the establishment's health and safety policy;
 - j) first aid kits are provided;
- NOTE 1 Attention is drawn to the Health and Safety (First Aid) Regulations 1981 [12] (see HSE Approved Code of Practice and Guidance L74 [13]).*
- k) floors, doors and gangways are kept clear and free from obstructions;
 - l) floor surfaces are not slippery;
 - m) fire doors are operational and clearly marked, can be easily opened, and are free from obstructions;
 - n) fire-fighting equipment is readily available;
 - o) materials, tools and ancillary equipment are stored safely;
 - p) flammable materials are stored safely in a suitable lockable cupboard;
 - q) food products are stored at the correct temperature;

- r) socket outlets, plugs and flexible cords are maintained in a safe condition and are safely anchored by the cord grip;
 - s) fume and dust extraction systems are maintained in good working order;
- NOTE 2 Attention is drawn to the COSHH Regulations 2002 (as amended) [23] with regard to thorough examination of systems by a competent person at least once every 14 months and that records of test results are kept.*
- t) gas hoses are maintained in a safe condition;
 - u) residual current devices are checked using the test button in accordance with the manufacturer's recommendations; and
 - v) maintenance is carried out regularly and written records kept.

NOTE 3 The CLEAPSS document G 79 "Auditing health and safety in a secondary school design and technology department" [7] and the D&T "Association document Risk Assessment in Secondary Schools & Colleges Design & Technology Teaching Environments" [6] can be used as guides. For Scotland, refer to the equivalent document published by SSERC.

9.3 Electrical equipment

Inspections and tests on fixed electrical installations and equipment should be carried out at least once every five years by a competent person in accordance with *Guidance Note 3: Inspection and Testing, 8th Edition* [N6].

NOTE The frequency of inspections and tests of portable equipment depends on the design and use of the equipment (see HSE Guidance Book HSG107 [37]).

Electrical equipment should only be used in the intended environment.

Electrical equipment should not be used with damp or wet hands.

Only persons with sufficient technical knowledge and practical skills should fit plugs to the equipment.

Power operated equipment and tools should be isolated from the power source and locked in the "off" position in the following situations:

- a) when left unattended for any period of time or at the end of the working day;
- b) when the competent qualified person is not in the work area;
- c) before clearing out any blockage; and
- d) before cleaning is carried out.

A responsible person should retain the key.

Power-operated equipment and tools should be switched off in the following situations:

- 1) before guards are adjusted or re-adjusted;
- 2) before measuring or gauging is carried out;
- 3) before tools are adjusted or changed;
- 4) before coolant pipes are adjusted or re-adjusted; and
- 5) before removing chips or swarf.

Multi-purpose machines should only be used if they are in accordance with the recommendations for the individual machines that they replace. Powered equipment and tools should only be used within the design working capacity and with accessories of the recommended range of sizes.

9.4 Plugs for portable equipment

Plugs for portable equipment should either conform to [BS 1363-1](#) (i.e. should have sleeved pins) and should be fused either in accordance with the equipment manufacturer's instructions or in accordance with BS EN 60309-2, [BS 546](#) (fused) or [BS 5733](#).

Plugs and sockets used outdoors should be supplied via a residual current device in accordance with BS EN 60529 or BS EN 60309-2.

NOTE In hose/wash-down areas, a higher degree of protection might be required and the manufacturer's advice might be necessary.

Only persons with sufficient technical knowledge and practical skills should fit plugs and carry out portable appliance testing (PAT).

9.5 ICT/Computer workstations

Workstations should be capable of being adjusted to accommodate learners of various sizes.

NOTE Information technology suites used by learners are not covered by the Health and Safety (Display Screen Equipment) Regulations 1992 [29]. However, general duties under the Health and Safety at Work etc. Act 1974 [1] in relation to persons who are not employed do apply. Any workstation used by an employee is required to meet the "minimum requirements" of the Health and Safety (Display Screen Equipment) Regulations 1992 [29]. These are laid down in a schedule to the regulations. Where an employee is a "user", a full risk assessment is required.

9.6 Maintenance

COMMENTARY ON 9.6

The Health and Safety at Work etc. Act 1974, Section 2 [1], requires that employers ensure equipment is safe and that risks to health and safety are minimized. The Provision and Use of Work Equipment Regulations (PUWER) 1998 (Regulation 9) [9] require that work equipment is maintained in efficient working order.

A competent person should carry out regular formal inspections and tests (if appropriate) to identify any faults that require repairs. All portable electrical equipment should be visually examined before use to verify that cables are not damaged or plugs loose and wires are not exposed.

A competent person should carry out repairs and maintenance of machines.

NOTE 1 See the Gas Safe Register at <https://www.gassaferegister.co.uk/>.

A regular maintenance programme should be put into operation and a maintenance log kept.

The frequency of formal inspections and tests should be chosen depending on the design, use and location of the equipment.

NOTE 2 A formal annual inspection by a suitably competent or qualified person, who may be an outside contractor, is advisable but more frequent in-house monitoring of the safety of machines and equipment is required. The frequency of such in-house checking depends on the frequency of use of the machines and equipment.

Hand tools should be visually inspected at regular intervals to check the condition and, if appropriate, the sharpness.

10 Food

10.1 General

Floors and all surfaces in food handling areas should be washable. Surfaces should be washed before and after food preparation is undertaken.

Separate, clearly coded cutting boards should be provided for working with different foods.

10.2 Hazards

Employees and learners should be made aware of the following hazards:

- a) electrical appliances and equipment, which can present a hazard of electric shock;
- b) hot surfaces and liquids, which can cause burns and scalds;
- c) dust and grease accumulating on surfaces;
- d) trailing cables and obstructions, which can present a tripping hazard;
- e) spillage, which can cause slips and falls;
- f) gas, which can cause an explosion;
- g) insufficient ventilation;
- h) contact with cutters or blades, which can cause cuts;
- i) broken cutters and blades from cutting operations, which can be violently ejected if incorrectly fitted;
- j) inadvertent operation of appliances and equipment;
- k) appliances and equipment, which can present a noise hazard (see 4.9); and
- l) batteries.

10.3 Risk control measures

Appliances and equipment should be robust and single-purpose and only be used for the design purpose in accordance with the manufacturer's recommendations.

Learners should be made aware of hazards associated with appliances and equipment and precautions that should be taken during use. Learners should be assessed as competent before using the equipment, a record of their training should be kept and they should be supervised at all times by a trained, competent person. PPE should be provided, where appropriate.

Learners should be instructed that long hair and loose clothing are to be secured and that jewellery is to be removed.

Ear and/or eye protection should be provided if required by the risk assessment.

Portable appliances and equipment should be kept in suitably locked storage when not in use.

Detachable tools and cutters should be removed and stored separately.

The storage and security of knives should be based on local risk assessment.

NOTE The frequency of inspections and tests of portable equipment depends on the design and use of the equipment (see HSE publication HSG107 [37]).

Gas appliances should be turned off after use. The main gas valve covering the room should be turned off at the end of the working day.

Warning signs should be displayed adjacent to types of hotplates that show no visible heat source when in operation.

The length of flexible cords of portable equipment should be as short as is reasonably practicable and they should be frequently inspected to verify that they are in good condition. All portable equipment should be unplugged if not in use and before making adjustments or cleaning. Portable electrical equipment should be inspected and tested in accordance with the risk assessment.

Electrical equipment should not be used with damp or wet hands.

Portable appliances, equipment and supply leads should be visually examined before use.

A competent person should carry out inspections and tests (as appropriate), with records kept. PPE should be provided, where appropriate.

10.4 Portable electrical appliances and equipment

Battery-powered portable electrical appliances should be used, if possible. Batteries should be charged, fitted and disposed of in accordance with the manufacturer's instructions.

Portable electrical appliances should be single-purpose and robust. Portable electrical appliances should conform to the relevant part of [BS EN 60335](#). Mains sockets should be protected by a residual current device (see [7.2.1](#)).

Portable electrical appliances and equipment should be fitted with the correct plug to match the socket outlet and be correctly fused. Adapters should not be used. The length of supply leads should be kept to a minimum to avoid tripping or accidental disconnection.

Portable electrical appliances should be included in a maintenance programme in accordance with the manufacturer's recommendations.

NOTE The frequency of inspections and tests of portable equipment depends on the design and use of the equipment (see HSE publication HSG107 [37]).

10.5 Fixed electrical appliances

Refrigerators, freezers, washing machines, tumble dryers and dishwashing machines should be installed by a competent person. Plugs and leads should be regularly inspected.

Socket outlets supplying appliances located under a work surface (e.g. dishwashers, tumble dryers and fridges) should be accessible when the appliance is pulled out and preferably be controlled by an accessible switch.

Appliances built into furniture (integrated appliances) should be connected to a socket outlet or fused connection unit that is readily accessible when the appliance is in place and in normal use, or supplied from a socket outlet or other connecting device controlled by a readily accessible double-pole switch or switched-fused connection unit.

Fixed electrical appliances should be included in a maintenance programme in accordance with the manufacturer's recommendations and subject to portable appliance testing.

NOTE The frequency of inspections and tests of portable equipment depends on the design and use of the equipment (see HSE publication HSG107 [37]).

Fixed electrical appliances, such as cookers, should be used in accordance with the manufacturer's instructions. A risk assessment should be carried out taking into account the users of the equipment. All fixed electrical appliances should be permanently wired into the electrical installation of the room by a competent person.

10.6 Food – appliances and equipment

10.6.1 Domestic oven and hob: gas, electric, dual fuel

10.6.1.1 Hazards

Employees and learners should be made aware of the following hazards:

- a) electric shock;
- b) hot surfaces, which can cause burns;
- c) steam from food being cooked, which can cause scalding; and
- d) gas leaks.