

ACKNOWLEDGEMENTS

This guide has been produced by Architects and Building (A&B) Branch of the Department for Education and Employment (DfEE).

The guide takes account of comments made by Zurich Municipal and the Society of Electrical and Mechanical Engineers serving Local Government. The Fire Policy Unit at the Home Office contributed to the section on the law.

DfEE Project Team:	Mukund Patel	Head of A&B Branch
	Chris Bissell	Principal Architect
	Richard Daniels	Senior Engineer
	Bill Beadling	Senior Architect
Consultants:	DSC Associates Ltd	13 Fieldhouse Lane, Durham, DH1 4LT
Illustrations:	Sean Newman	
Cover Drawings:	from a selection by children of Orleans Infant School, Twickenham	

Published with the permission of the Department for Education and Employment on behalf of the Controller of Her Majesty's Stationery Office.

© Crown Copyright 2000.

All rights reserved.

Copyright in the typographical arrangement and design is vested in the Crown. Applications for reproduction should be made in writing to the Copyright Unit, Her Majesty's Stationery Office, St Clements House, 2-16 Colegate, Norwich NR3 1BQ.

First published 2000.

ISBN 0 11 271040 9

Printed in the United Kingdom for The Stationery Office.

TJ1815 C40 8/00

Fire Safety

CONTENTS

INTRODUCTION	3
THE PROBLEM	3
THE LAW	4
Responsibilities	5
Making a risk assessment	5
Fire certificates	6
The general powers and duties of fire authorities	6
New buildings	7
Public entertainment and other licences	7
FIRE SAFETY MANAGEMENT	8
Hazard and risk assessments	9
Close-down procedure checklist	9
Security	10
Emergency plan and fire notices	10
Electrical fire safety	11
Potential high risk areas	12
Displays	13
Furniture and furnishings	14
Gas supplies in laboratories and other serviced spaces	15
Flammable liquids and chemicals	15
Liquefied petroleum gas (LPG) and other gas cylinders	16
Portable heating	16
Waste handling	17
Community use	18
Public performances	18
Smoking	19
Building contractors	19

TRAINING	22
General training	22
Staff training	22
Evacuation procedures	23
BUILDING DESIGN FOR FIRE SAFETY	25
Minimising fire spread	25
Means of escape	25
FIRE FIGHTING EQUIPMENT	28
FIRE DETECTION AND ALARM SYSTEMS	30
Automatic detectors	31
Fire alarm sounders	32
The control panel	33
Signalling system	33
Specification	34
Maintenance and testing	35
SPRINKLER SYSTEMS	36
EMERGENCY LIGHTING	36
PLANNING RECOVERY FROM A MAJOR FIRE	38
MANAGEMENT CHECKLIST	40
SECURITY RISK ASSESSMENT AND FIRE SAFETY	40
Checklist of security issues affecting fire safety	41
FIRE HAZARD AND RISK ASSESSMENT	42
HAZARD AND FIRE PRECAUTION CHECKLISTS	43
Checklist of hazards that can be dealt with by the school	44
Checklist of hazards requiring professional advice	45
FURTHER ADVICE AND HELP	46
REFERENCES	47
BIBLIOGRAPHY	49

Introduction

A large school fire devastates. Its aftermath lingers for years. The long term disruption that follows puts staff and pupils under stress and imposes large financial, educational and administrative costs. It is a price that no school can afford to pay. However, while no school is immune from the risk of fire, schools can certainly reduce the chances of it happening or, if the worst does occur, keep losses to a minimum. This guide shows you how.



The problem

Each year more than 2,000 schools in the UK suffer fires large enough to need action by local fire brigades. The cost of these amounts to over £50 million. The odds on your school experiencing such a fire are about 1 in 15, but that is not the whole picture. Many fires are not reported, at least to fire brigades, particularly if they self-extinguish or are put out by staff. Research by the Arson Prevention Bureau in 1998 found that more than a half of all school fires fall in this category, but that the total cost of unreported fires is unlikely to be very large.

Disruption and losses become significant when a fire spreads beyond the room of origin. Historically, of the 350 or so fires a year in this class, forty or fifty involve insured building losses in excess of £100,000 and more than 20 of these involve losses over £250,000. The average cost of these is about £1 million and some run into several million pounds.

Most school fires are very small and over half do not spread beyond the room where the fire began. This might suggest that the possibility of a costly fire at your school is so remote that it can be considered an acceptable risk and that many fire safety measures are not justified in terms of time and resources. This would be wrong. Fire is indiscriminate. It can occur at a small rural school as readily as at a large, urban comprehensive. Your school is at risk but you can reduce the odds by taking precautions.

Over 70% of school fires are started deliberately. This includes 90% of the larger fires and accounts for 85% of the total cost of school fires. Arson prevention is therefore an important part of a school's security strategy. Any package of measures has to include fire protection, deterring trespass on sites and the prevention of illegal entry into buildings. Security in schools is dealt with at length in *Managing School Facilities Guide 4, Improving security in schools*⁽¹⁾. See also *How to combat arson in schools*⁽²⁾.

The consequential losses, only some of which are covered by insurance can be as serious as the fire damage to the buildings. They include loss of course work which may have been assessed, loss of teachers' aids and records, the long term effect on pupils, particularly small children, and staff stress.

The Law

This section highlights some of the main features of the principal fire and building legislation applicable to schools. It also draws attention to relevant guidance on how to meet the requirements of the legislation. Remember, however, that only the courts can give a binding interpretation on a point of law.

Responsibilities

With schools that are maintained by a local education authority, responsibility for fire safety is usually shared between the authority, the governing body and the headteacher.

Between them, they must ensure that fire precautions in such premises comply with all relevant health and safety legislation cited in this section, including regulation 17 of the Education (School Premises) Regulations 1999⁽³⁾. This requires that every part of a school building, and of the land provided for a school, shall be such that the safe escape of *the occupants* in case of fire is reasonably assured. Particular regard is given to:

- the likely rate at which flames would spread across exposed surfaces;
- resistance to fire of the structures and of the materials of which the structures are made, and their other properties;
- the means of escape in case of fire.

With these schools, the local education authority usually assumes responsibility for the installation and maintenance of the fire alarm systems and the structural fire integrity of the buildings.

In independent schools, responsibility for fire safety generally rests with the proprietor, who is required to register the school under section 465 of the Education Act 1996. Registration will depend, amongst other things, on the provision and maintenance of adequate fire precautions⁽⁴⁾.

Making a risk assessment

Health and safety responsibilities in schools include fire safety⁽⁵⁾. In particular, **the employer** (ie, with maintained schools either the local education authority, or the governing body) is required:

- to make a suitable and sufficient assessment of:
 - a) the risks to the health and safety of *employees* whilst they are at work, in accordance with regulation 3(1) of the Management of Health and Safety at Work Regulations 1999⁽⁶⁾ (which are made under the Health and Safety at Work etc. Act 1974); and
 - b) the risks to the health and safety of other persons (eg, pupils) whilst they are on the premises;

- to record the significant findings of the assessment under regulation 3(6) of those Regulations where five or more people are employed (whether or not they are at work in the same school at any one time or at separate workplaces).

Where the assessment relates to general fire precautions, to be taken or observed by an employer in relation to the risk to the safety of employees in case of fire, it is the fire authorities who have responsibility for enforcement⁽⁷⁾.

In practice, fire brigades will tend to concentrate activities on workplaces with a higher fire risk than schools (but provision of boarding accommodation is likely to influence their inspection programme).

The Home Office has produced guidance to accompany the Regulations, which is useful to read alongside this publication⁽⁸⁾. The guide explains what fire risk assessment is and how to go about it. It also focuses on the provision of fire precautions in the workplace in the light of the findings of fire risk assessment.

Fire certificates

Schools in their use as educational establishments do **not** require a fire certificate. Only those parts of schools, such as large offices, which are put to uses designated by order under the Fire Precautions Act 1971 as requiring a fire certificate, *may* require certification (unless the fire authority has exercised its power to grant an exemption).

The general powers and duties of fire authorities

Schools are not exempt from the general provisions of the Fire Precautions Act. Section 10 enables a fire authority to prohibit or restrict the use of premises which constitute a serious risk to persons in case of fire, and section 19 gives fire officers powers to enter and inspect premises, eg, for the purposes of enforcing the Fire Precautions (Workplace) Regulations.

Some local authorities have local acts which include fire safety matters. The local fire brigade should be aware of these. If asked, they will also give goodwill advice under section 1(1)(f) of the Fire Services Act 1947.

New buildings

For the time being, building work at maintained schools is exempt, under the Building Act 1984, from the building control arrangements that apply to almost all other categories of new construction. Instead it must comply with the DfEE's own constructional standards⁽⁹⁾.

However, the fire safety aspects of the latest version of these standards, which came into effect in November 1997, will generally be satisfied if the building is designed in accordance with the 2000 Edition of Approved Document B (Fire Safety) of the Building Regulations⁽¹⁰⁾. Approved Document B provides guidance on fire safety and includes the location and design of fire escape routes and emergency lighting. It replaces Building Bulletin 7, the previous standard for new buildings and for adaptations of existing buildings⁽¹¹⁾.

Independent schools including any boarding accommodation are subject to the Building Regulations. Boarding accommodation in other schools is not covered by the DfEE Constructional Standards and should also be designed in accordance with the 2000 edition of Approved Document B (Fire Safety).

Public entertainment and other licences

When a school invites members of the public to dancing, music, stage or film shows then a public entertainment, theatre or cinema licence may be required. Shows put on by amateur dramatic societies using the school facilities will almost certainly require a public entertainment licence.

Any function at which alcohol is offered for sale will need a licence, application for which should be made to the Clerk to the local Licensing Justices. Other licences are issued by local authorities under the terms of the Local Government (Miscellaneous Provisions) Act 1982 and will usually impose conditions on, amongst other things:

- the number of people to be present;
- the type of seating;
- the layout of the seating;
- the marking of emergency exits;
- the provision of emergency lighting.

It is probable that a fire officer will inspect the school before the licence is issued and possible that checks will be made when performances are in progress to confirm that the conditions laid down in the licence are being met.

Fire Safety Management

- **To minimise the risk of fire**
- **To protect the means of escape**
- **To limit the spread of fire**

Head teachers and other education managers need to manage fire safety in the same way they manage other health and safety issues, by implementing the policies agreed and monitored by the employer. To do this they will usually consult professionals from their local education authority, their local fire brigade and their insurers.

The main duties regarding fire safety management are to:

- make hazard and risk assessments;
- be responsible for fire safety training;
- produce an emergency plan and put up fire notices;
- conduct fire drills;
- check the adequacy of fire fighting apparatus and its maintenance;
- consult with and implement recommendations of the local fire brigade;
- conduct fire safety inspections, preferably every term;
- make more frequent informal checks to confirm that the fire safety rules are being followed;
- ensure fire escape routes and fire exit doors/passageways are unobstructed and doors operate correctly;
- check that fire detection and protection systems are maintained and tested and records kept;
- ensure close-down procedures are followed;
- include fire safety in the regular health and safety reports to the governing body.

It is useful to keep a fire logbook in which to record essential information such as evacuation procedures, tests on fire fighting equipment, details of training sessions and results of fire drills.

Hazard and Risk Assessments

To comply with health and safety legislation it is the responsibility of the employer to carry out risk assessments for all the hazards faced in schools, including fire. If there are five or more employees a formal record must be made of the significant findings and any measures proposed to deal with them. Checklists are given on pages 40 - 45 to help to do this. The checklists distinguish between the parts of the risk assessment that can be done by school staff and those that require professional input. Professional advice can be obtained from local authority risk managers, fire brigades, police crime prevention officers, insurance companies and fire safety consultants. Some consultants may offer free surveys and advice.

It is inadvisable to rely on risk assessments carried out by commercial manufacturers or installers as they may be biased towards their own products. They will also tend to propose systems to current standards, which may not be necessary as the standards for new school buildings are not intended to be applied retrospectively.

Close-down procedure checklist

The most important steps in fire prevention are good housekeeping and proper close-down procedures.

The following close-down checks are recommended:

- all flammable materials are locked away;
- all valuable equipment is secured;
- no cash is left unsecured overnight;
- all rubbish/waste has been removed from the building and placed in secure storage;
- everyone has vacated the premises and all rooms, especially toilets and showers, have been checked for anyone hiding;
- the external lighting is working correctly;
- all windows are shut and locked;
- all internal doors are closed (to prevent the spread of fire);

- the intruder alarm and fire alarm systems have been correctly set;
- all the external doors have been secured;
- gates in the perimeter fences are shut.

Security

The large number of fires begun deliberately underlines the importance of maintaining general security measures. These may be:

- physical, eg, fences, window grilles and secure doors;
- social, eg, community use and 'Schoolwatch' schemes;
- electronic, eg, intruder alarms, security lighting, closed circuit television (CCTV) for surveillance.

The aim should be to deny the fire-raiser easy access to the school and to sources of fuel, such as waste bins (see page 17).

A checklist of the main security issues affecting overall fire safety is given on page 41.

Emergency Plan and Fire Notices

All workplaces are required by the Fire Precautions (Workplace) Regulations to have an emergency plan. It should include the actions to be taken by staff in the event of a fire, evacuation procedures and arrangements for calling the fire brigade.

In order to familiarise both staff and pupils with the evacuation procedure it is recommended that in every occupied room a fire action notice (see example on the right) should be conspicuously displayed informing the occupants of:

- how to raise the alarm if they discover a fire;
- the action to be taken on hearing the alarm;

FIRE ACTION

If you discover a fire:

1. Raise the alarm. The nearest fire alarm call point is beside the fire door at the end of the corridor.
2. Leave the building immediately.
3. Go to your assembly point in the playground by the most direct route.
4. Do not stop to collect personal belongings.
5. Do not re-enter the building.

Warning of a fire is given by the continuous sounding of an alarm. If you hear the fire alarm you must:

1. Leave the building immediately.
2. Go to your assembly point in the playground by the most direct route.
3. Do not stop to collect personal belongings.
4. Do not re-enter the building.

Only attack the fire with available fire fighting equipment if you feel it is safe to do so.

Fire Action Notice

- the escape routes to their assembly point;
- the location of their assembly point.

For clarity the last two points may need to be shown on a plan of the school. The age and ability of the pupils must be taken into account when preparing the notices. You might consider preparing separate notices for pupils. Evenings and out of hours activities bring strangers into the school who will be unfamiliar with the buildings and their layout. Your fire notices should take this into account. The needs of speakers of other languages must be considered.

In workshops, laboratories, craft areas and kitchens it might be appropriate to display fire prevention notices as a reminder to check that, at the end of lessons, equipment has been switched off, electric plugs removed from their sockets and gas supplies isolated where appropriate.

All fire doors, smoke control doors and designated fire exit routes which need marking as a result of a fire risk assessment are required to be identified by means of signs complying with the Health and Safety (Safety, Signs and Signals) Regulations⁽¹²⁾. One of the requirements is that since January 1999 old 'fire exit' signs should have been changed to include a running-man pictogram (see diagram on page 26). This can be achieved by adding a pictogram sign beside the old lettered one.

Electrical fire safety

Computers and other equipment can impose heavy demands on the school electrical system. Wiring, plugs and sockets that are overloaded or in poor condition are a fire hazard. Overloading of sockets is a particular problem in winter if supplementary electric heaters are in use. Electrical equipment should be switched off when not in use unless it is designed to be permanently connected. Televisions should be unplugged when not in use.

A blown fuse should only be replaced after the cause of its failure has been discovered. It should always be replaced with a fuse of the correct rating and **never** with a fuse of a higher rating or a makeshift fuse from a length of wire.

Procedures should be in place for the regular testing and inspection of electrical circuits and portable equipment⁽¹³⁾.

Flammable material should not be kept in electrical switch rooms and boilerhouses and care should be taken to ensure that any materials stored in switch rooms do not obstruct access to the switchgear. **All combustibles should be kept well clear of electrical equipment and switchgear.**

Potential high risk areas

Teaching and non-teaching accommodation may contain areas of high fire risk.

Teaching areas Many of a school's activities can create a higher than normal fire risk. Particular risk areas are:

- drama;
- design technology;
- laboratories;
- home economics;
- art;
- photographic darkrooms.



Heat bays in design technology are high risk areas

Each such area should be identified and the appropriate fire safety procedures introduced.

Non-teaching areas

These include kitchens, offices, science and technology prep-rooms, boilerhouses, most storage areas and electrical switchrooms. Some of these areas, such as kitchens and boilerhouses, have a higher than normal fire risk and particular attention must be paid to the fire precautions.

All storage areas should be kept clean and tidy. Particular attention should be paid to caretakers' and groundsmen's stores, stage storage areas, PE stores for foam mats, waste storage areas and similar places where flammable material can accumulate.

Sleeping accommodation

Sleeping accommodation in schools is usually a high risk area due to the numbers and ages of the pupils present. A risk assessment is required in accordance with the *Fire Precautions (Workplace Regulations) 1997* and the 1999 Amendment. See *Fire Safety, An Employers Guide*⁽⁸⁾ for further guidance.

Activity Centres outside schools

These pose certain fire and security risks. The centres should be asked to provide headteachers with relevant information on fire and security risks and procedures prior to every school visit. Where residential accommodation is provided this is a high risk. School insurances may not extend to residential accommodation in activity centres, particularly if staff are not present. Insurance cover should therefore also be checked before the visit. See also DfEE publication *Health and Safety of Pupils on Educational Visits*⁽¹⁴⁾.

Displays

No school has enough display space. Corridors often have displays along their entire length. Stairwells and entrance foyers are a popular location for notices and posters. Displays are often suspended from ceilings, light fittings or placed close to heaters. Sometimes the displays are laid out on tables and obstruct escape routes.



Primary schools usually have many displays

The cardboard, paper and plastic that goes into these displays can be a means of rapid fire spread. Having regard to Regulation 17 of the *Education (School Premises) Regulations* (see page 4) it is necessary to reduce the risk of fire spread along display materials. Some general principles which can help reduce the risks are:

- do not put displays down stairways which are part of a designated fire escape route;
- in school corridors, display material should be kept away from curtains, doors and heat sources, so that fire cannot easily spread to the building fabric;
- try to keep down the total area used for displays in any one area. The area may be increased if the displays are treated with one of the proprietary flame retardant sprays or locations are agreed with the Fire Brigade;
- keep displays away from exits;
- keep displays away from ceiling voids which lack fire barriers.

Displays must not obstruct escape routes or obscure fire notices, fire alarm call points, fire fighting equipment, emergency exit signs or lights. Parts of walls (eg, pin-boards) in horizontal circulation areas, which are not protected corridors, may be of a lower class for spread of flame, but limited to lengths of 3m and with gaps of at least 1m. In corridors such materials should not be used immediately opposite each other.

Note that hanging displays can trigger intruder alarms at night, resulting in false alarms and possible withdrawal of police response.

Furniture and furnishings

The selection of upholstered furniture and soft furnishings (including foam filled gymnasium mats) should take into account their fire resistance.

Curtains, including stage drapes, should be labelled during manufacture to indicate that they are either made from inherently fire retardant fabrics or that they have been chemically treated to achieve fire retardance. The manufacturers' or suppliers' instructions should be followed when cleaning. Some treated materials require regular washing to remove dust build-up which can impair their retardant properties, while other treatments must be reapplied after fabrics have been washed.

Existing curtains which cannot be verified as fire retardant may be suitable for treatment. Such treatment is normally professionally applied, but some treatments are available for self application and certain of these may also be applied to stage scenery and decorations.

Upholstered furniture used in schools should comply with the Furniture and Furnishings (Fire Safety) Regulations 1988. These regulations require that the filling and covering materials meet certain criteria in respect of their resistance to ignition.

Upholstered furniture manufactured before the regulations came into force may contain foam fillings which are easily ignited, burn fiercely and generate dense toxic smoke. Existing furniture should therefore be checked to ensure it is labelled as conforming to the regulations. Any furniture not so labelled should be removed from the school site as soon as practicable. Any upholstered furniture offered as a gift should be similarly checked. If in doubt contact the fire service.

Gymnasium mats and crash pads with cellular foam fillings are a particular hazard if they become involved in a fire, as they may burn fiercely and generate dense toxic smoke. This type of PE mat is very popular as they are of high quality. **When not in use they should be kept in a securely locked store which has a minimum fire resistance of one hour.**

The layout of loose furniture, particularly in open plan or semi-open plan teaching areas, should not obstruct escape routes and should take account of the needs of the occupants such as wheelchair users or others who require assistance with mobility.

Gas supplies in laboratories and other serviced spaces

Wherever possible an isolating valve should be fitted in each laboratory to enable gas supplies to gas taps on benches to be shut off at the end of each day's activities. A number of serious fires have occurred when intruders have turned on gas taps maliciously⁽¹⁵⁾.

Flammable liquids and chemicals

The storage of flammable liquids should be strictly monitored, with the amounts of flammable liquids and chemicals stored inside the school kept to the minimum necessary for day to day use. Chemicals must be stored in locked areas.

Highly flammable liquids must be stored in accordance with the Highly Flammable Liquids and Liquefied Petroleum Gas Regulations 1972⁽¹⁶⁾. Highly flammable liquids are defined as liquids with flash points below 32°C. These regulations permit the storage of up to 50 litres of highly flammable liquids in a laboratory, a preparation room or a store used for other chemicals; in a metal cabinet meeting certain criteria, including an appropriate label. Cabinets sold for the purpose by the normal suppliers or by fire equipment specialists will meet these criteria. Alternatively a fire resistant storeroom can be used. The cabinet or storeroom should be dedicated to the storage of flammable liquids and should not contain other chemicals. Large departments may need two such cabinets which should be kept in different rooms some distance apart.

It is also permissible to have out for use in a laboratory or preparation room a few bottles, capacity 500cm³ or less, of highly flammable liquids. To prevent thefts for fire raising or solvent abuse, rooms containing the liquids should be kept locked when not in use.

Staff should know how to deal with spills, and there must be no sources of ignition present where dangerous concentrations of vapour might be expected. There must be no smoking in any place where a highly flammable liquid is present.

If it is necessary for stock levels of highly flammable liquids to exceed fifty litres, an external store, detached from the school buildings, should be provided.

Petroleum spirit is subject to separate legislation which permits the storage of up to 14 litres of gasoline for lawnmowers, etc, in groundsman's stores. These should be located away from places of assembly. They should be half hour fire rated, well ventilated and kept locked. Storage of larger volumes up to 60 gallons is permitted by the legislation, but then a license will be needed from the local authority petroleum officer who will check the suitability of the arrangements for storage and use.

Further guidance is available from the HSE, local petroleum licensing officers and the local fire service.

Liquefied Petroleum Gas (LPG) and other gas cylinders

Storage and marking of LPG and other gas cylinders should comply with the Highly Flammable Liquids and Liquefied Petroleum Gas Regulations 1972⁽¹⁶⁾. Cylinders in use should be kept in a secure area, such as a locked room. Spare cylinders should be stored in a safe position, such as a wire cage protected where necessary against direct sunlight, or in a ventilated fire resistant structure. The structure should be substantially secure against vandals. **Never keep spare cylinders in ordinary store rooms.**

Portable heaters

The use of portable gas or electric heaters needs to be strictly controlled. Staff should follow the manufacturers' instructions in their use and should be fully aware of the hazards these heaters can present. All portable heaters should be guarded and located so that there is no

possibility of their coming into contact with flammable material, including clothing worn by staff, pupils or visitors. They should not be positioned on escape routes.

When a gas heater is not in use its LPG cylinder should be disconnected. Spare cylinders for portable gas heaters must never be stored inside the school building. Even outside they require secure storage as described above.

It is good practice to discourage staff from bringing their own portable heaters and electrical equipment, such as kettles, into school. Where they are allowed, the items should be registered with the school and checked by a competent electrician or gas fitter before use.

Waste handling

Schools can generate a lot of waste. It must not be allowed to accumulate and should never be stored in the school overnight. At the end of each day, more frequently if necessary, it should be gathered up and taken to a secure, external waste storage area.

External waste storage areas are a prime target for the fire raiser.

Rubbish bin fires are very common. If your bin area is near a building then look for ways to make sure that bins cannot be pushed up against the building, particularly close to windows or roof eaves, and set alight. It might be appropriate to build a new, detached bin store. If so, its design should accept the possibility that the bins inside may be set on fire and therefore allow their contents to burn safely.



Above: secure bin store

Left: potentially dangerous unlocked mobile bins

When there is no segregated bin storage, wheeled bins should be chained together and to an immobile object, such as a metal stake, at least 10 metres from any building.

If waste skips or similar receptacles, such as recycling containers, are brought on to the school site, they should either be removed the same day or be lockable so that their contents cannot be used as fuel for a fire. Waste skips should not be placed within 10 metres of a building.

It is advisable to fit 'skirts' around the bases of temporary classrooms to prevent combustible materials being placed under them and ignited. These also stop the accumulation of ordinary rubbish.

Community use

As well as providing extra curricular activities for their pupils, many schools hire out their facilities to local groups for evening and weekend use. These schools often have extended opening hours and actively encourage community use of their premises.

In the evenings and at weekends it is rare for the entire school to be open. In the interests of security and energy conservation it is normal to unlock only those parts of the school which are actually in use. Unless this is done carefully, it is possible that escape routes will remain shut off. Remember people using the school in the evening are likely to be unfamiliar with the layout of the building. Consider their needs generally and the marking of exit routes specifically. One of the users should always be aware of the fire drill and the means of escape from the building.

Community groups sometimes supplement a school's own facilities. Amateur dramatic groups often bring their own lighting and sound equipment. This is fine provided the equipment is checked beforehand to confirm that it:

- complies with the safety requirements for portable equipment;
- will not impose unduly high loads on electrical services;
- will be properly used by competent people;
- is compatible with what the school has.

Public performances

Areas of the school open to the public during public performances, such as school plays, should have emergency lighting on escape routes. Someone needs to be responsible for checking that fire exit doors are

functional and other fire precautions are in place before the public are admitted. Competent attendants are also required to look after the public during the performance. They should:

- be identifiable to the public;
- carry a torch whenever part of the public areas is in darkness;
- ensure there are no areas of overcrowding;
- keep exits and gangways clear;
- be aware of the needs of any people with disabilities.

The number of attendants required will depend on the size of the audience and the type of performance.

The responsible person and the attendants should be familiar with the fire drill, escape routes and the need for any fire doors to be kept shut. Refresher courses on the emergency procedures for the responsible persons should be held at least once a year.

In premises used occasionally for audiences of up to 100, emergency lighting can be by hand-held torches carried by the attendants and available in dressing rooms, etc.

Smoking

Many schools have a no smoking policy or restrict smoking to specially designated areas. However, community use and public performances may create problems in enforcing controls on where smoking may take place. Wherever smoking is allowed, fireproof receptacles should be provided with notices indicating their position and purpose. Never allow waste bins to be used as ashtrays and never empty ashtrays into waste bins. Cleaning staff should empty ash trays into metal containers.

Building contractors

Building contractors working in schools can significantly increase the risk of fire and may cause obstruction to escape routes. They may:

- carry out operations using heat. Plumbing work, paint stripping and repairing flat roofs are possibly the most common examples of high risk work;

- store combustible materials or flammable liquids in, or close to, the school buildings, which could act as a ready made fuel supply for a fire. Examples include petrol, paints, thinners, propane cylinders and waste skips;
- break through fire walls. When a school is rewired, or cables are fitted for telephones or computer networks, the wiring is often carried above a suspended ceiling and taken through fire walls. These breaks in the fire barriers may not always be made good with materials of the same fire resistance;
- interfere with the normal security measures of the school and make it more vulnerable to attack. An example is scaffolding erected against the building which gives an intruder easy access to the upper floors;
- reduce the width or availability of escape routes by their activities, or by the positioning of ladders, trestles, scaffolding, materials or equipment.

These risks can be anticipated by discussing with a contractor how the work is intended to be carried out. Similarly, arrangements for the proper storage of combustible materials, flammable liquids, gases and the siting of skips can be agreed before the contractor comes on site.

Arrangements should be made to monitor escape routes and to prevent obstruction. Where such obstruction is essential to the work activity, satisfactory alternative arrangements should be made for the safe evacuation of all occupants in an emergency.

If the work involves heat processes, such as blow lamps or welding, then a 'hot work permit' system should be used. Your local education authority or insurance company may be able to supply suitable permits. The school should be informed every time that a heat process is used, so that any necessary precautions can be taken. Hot work permits require confirmation that fire precautions have been taken prior to work commencing.

These arrangements are easiest to make on larger, long term projects, where a method statement will be a requirement from the contractor under the Construction (Design and Management) Regulations 1995⁽¹⁷⁾. But do not ignore day to day repair work. Insist that all workmen report to the school office to discuss their work before they start. Construction sites are not subject to the Fire precautions (Workplace) Regulations unless the school is still in use but the Construction (Health, Safety and Welfare) Regulations 1996 apply.

Typical hot work permit checklist of fire precautions

● **Setting up**

- fire fighting equipment and systems are in service;
- fire extinguishers and fire blankets are to hand;
- hot work equipment is in good condition; and
- gas containers/flammable liquid containers to be changed/filled in the open air.

● **Within 15 metres of the work**

- floors swept clean of combustibles and wetted down or covered with non-combustible material where necessary;
- combustible materials, hazardous or flammable liquids have been removed or are protected with non-combustible curtains, sheets or shields;
- all wall and floor openings and gaps through which sparks can fall have been covered with non-combustible curtains or sheets; and
- non-combustible covers suspended beneath work to collect sparks.

● **Work on walls or ceilings**

- any combustible material has been protected against sparks or heat; and
- combustibles moved away from other side of walls and away from metal through which heat can be transferred.

● **Work on enclosed equipment** (Tanks, containers, ducts, dust collectors, etc.)

- equipment cleaned of all combustibles and dust; and
- containers purged of flammable liquids and vapours.

● **Fire watch**

- to be provided during and until 30 minutes after operation;
- supplied with fire extinguishers, fire blankets and/or hose reel; and
- someone is present who has been trained in basic fire fighting and in sounding the alarm.

● **Final Check-Up**

- to be made 60 minutes after completion of any operation; and
- if contractors have had access to the roof space, check the openings in roof voids are properly closed and locked.

Training

- **To make everyone aware of the importance of fire safety**
- **To ensure competence in the school evacuation procedures**
- **To provide staff with a knowledge of basic fire fighting**

General training

Very few people have experienced a fire and the feeling of panic that it can cause. Training can overcome this problem to some extent. It should stress the importance of keeping fire doors shut at all times. Although pupils should be trained in fire awareness it should be stressed that the staff are responsible for fire safety. Every pupil and member of staff should receive training in:

- general fire prevention;
- action to be taken if they discover a fire;
- how to raise the alarm;
- action to be taken on hearing the alarm;
- location of escape routes and assembly points;
- evacuation and roll call procedures.

Staff training

Members of staff should also be given instructions in:

- the operation of the fire alarm control panel(s);
- how to call the fire brigade;
- the location of fire fighting equipment;
- the use of fire fighting equipment (it may be possible to arrange training through the local fire brigade - see below);
- the arrangements for safe evacuation of physically disabled staff and pupils with Special Educational Needs;
- stopping machinery.

In large schools it may not be necessary to train all staff in the use of fire fighting equipment, but a sufficient number who have been trained should always be present when the school is occupied. All staff should

know what hazards the fire extinguishers are provided to cover and the dangers of using the wrong type in areas of special risk, such as on fat fires in kitchens and on electrical or chemical fires.

If members of the public come on to the premises, staff should also be given training in directing, and if necessary, guiding them to a place of safety and checking that they are all out of the building. This process is greatly assisted if there is an access control system which requires members of the public to sign in and out of the premises.

The local fire brigade may provide training in the use of fire fighting apparatus, eg, extinguishers. Some brigades provide half day combined theory and practical courses on fire safety for fire managers and headteachers.

Evacuation procedures

There should be a fire drill at least once a year and preferably once a term. This should be based on the assumption that one or more of the fire escape routes is affected by fire and cannot be used. Members of the school management team or, possibly the health and safety representatives, should act as observers and be told beforehand of the drill. It is also helpful if a member of the local fire brigade attends. At the debriefing they can point out the lessons to be learnt and the areas where improvements can be made.

Details of fire drills which should be entered in the fire logbook include:

- date;
- duration;
- name of instructors/observers;
- type of drill, eg, full evacuation or only of part of the school;
- the results.

Evacuation procedures which are successful under practice conditions may be less so in the event of a fire. Fire drills cannot adequately simulate the confusion and uncertainty which can arise in an emergency.

Evacuation procedures should make allowance for:

- **False alarms.** Irresponsible pupils can regard setting off the fire alarm as a joke. In some schools there are so many false alarms that initiating the evacuation procedures is delayed until the alarm is

investigated and confirmed as genuine. This practice is dangerous. Any delay in evacuating the premises could have very serious consequences. To prevent false alarms it is sometimes necessary to reposition break glass call points and automatic detectors, so that they are more easily supervised by staff. Also anti-tamper devices are available from manufacturers.

- **Full or partial evacuation.** In large schools, particularly those with a number of separate teaching blocks, restricting the evacuation to the block concerned may minimise disruption. However, in some instances, registration classes are not the same as the teaching classes and there are obvious difficulties in establishing that the block has been fully evacuated. It can be difficult to know who is on the school site, particularly during lunchtime when pupils may be allowed off the site. The success of a partial evacuation is also based upon positively identifying the location of the fire and the certain knowledge that it cannot spread to or involve the other blocks. Unless those in charge are absolutely certain on these points then on every occasion a full evacuation should be the rule.
- **Controlling Pupils.** The first priority of staff is the safety of the pupils in their charge. They may choose to lead their class to safety from the front, so that they are best placed to select the safest route. If so, they may have difficulty in making sure that their class stays together. Alternatively they may decide to guide their class from the rear, in which case route finding may have to be left to the children leading the way. There is no correct answer. Each school must devise its own way of handling evacuations based upon layout, and the age and ability of its pupils.
- **Disabled Staff and Pupils.** Arrangements must be made for the safe evacuation of those with disabilities which may include learning, physical and sensory difficulties. This may require special training of staff. It should be remembered that lifts must not be used once the fire alarm has sounded, unless these are specifically designed as evacuation lifts as defined in BS 5588: Part 8⁽¹⁸⁾. See Building Bulletin 91, *Access for Disabled People to School Buildings*⁽¹⁹⁾.
- **Fire fighting.** Members of staff should only consider fighting a fire after they have seen to the evacuation of the pupils in their charge and raised the alarm. They must inform other members of staff of their intention to fight the fire and they must be certain that their actions will not place themselves or others in danger. If they are in the slightest doubt then they must evacuate the building along with their pupils.

Building Design for Fire Safety

- **To minimise the spread of the fire**
- **To provide escape routes enabling the speedy and safe evacuation of the occupants in the event of a fire**
- **To reduce the risk of a fire causing a building collapse**

Minimising fire spread

Most existing school buildings were not constructed to current standards and often have hidden wall, ceiling or roof voids, allowing smoke and fire to spread great distances from the original seat of the fire. This makes fire-fighting very difficult and greatly increases the potential for large losses. Little can be done to change the basic construction, but wall and ceiling surfaces on escape routes can be upgraded to comply with current standards and additional fire barriers and fire doors can be introduced to upgrade the fire rating of escape routes and fire compartmentation. This will limit the spread of fire and significantly reduce the area that could be affected.

Means of escape

A satisfactory means of escape should allow staff and pupils to turn their backs on the fire and move quickly to a place of safety. Escape routes should be short enough to allow all occupants to escape in two or three minutes. In higher risk areas, and those with only one direction of escape, this time may need to be halved. The escape time can be estimated by pacing the route slowly. The time needed will be longer where there is a large number of people unless more escape routes are provided. Remember that people using stairways and those with disabilities move more slowly. To this time a reaction time must be added to allow for the delay before people start to move. This reaction time varies considerably and depends on how well staff and pupils know the fire drill.

It is preferable to provide alternative means of escape from all rooms. However, this is not always possible, particularly in existing buildings, many of which have dead-ends with an escape corridor in only one direction. The escape corridor from a dead-end must be a protected corridor. Existing buildings designed and retained in accordance with

BB 7 will generally be satisfactory, but new schemes should comply with Approved Document B. If in doubt contact the fire service.

Escape from any part of a building will normally be by one of two alternative routes, each leading to a final exit or to a door to a protected stairway. Where only one route is available, any corridor forming part of the route must also be protected.

A serious situation may arise if a fire starts in a corridor, since it may not be detected before smoke cuts off the escape from nearby rooms. For this reason corridors which serve any room with only one exit should have a Class O surface spread of flame to exposed wall and ceiling surfaces, as defined in Approved Document B⁽¹⁰⁾. A protected escape route will in addition have structural fire resistance and fire resistant walls and ceilings. Fire and smoke control doors will be fitted on protected escape routes.

Good design with alternative directions of escape leading to protected stairways. Corridor wall and ceiling lining materials should be class O rated for surface spread of flame.

Protected escape route from dead-end via protected corridor and protected stairway. For existing buildings only. Alternative directions of escape is preferable wherever possible and should be adopted in all new buildings. Protected corridor should contain no pinboard and should have fire resistant enclosing structure.

Fire doors must all have labels.

Label every fire exit.

Fire escape routes

If the integrity of fire resisting construction or doors is compromised, an entire escape route may be threatened. Common problems in schools are:

- missing or damaged ceiling tiles;
- missing or damaged fire barriers in concealed voids;
- broken or missing automatic door closers;
- fire doors which are damaged, ill fitting, or wedged open.



An electromagnetic door retainer

An alternative to wedging doors open is to use electro-magnetic door retainers. These are linked to the fire detection system and normally hold the door open. If there is a fire they automatically release the doors and let them shut.

Escape routes can be compromised by unauthorised or ill thought out displays (see page 13).

Final exit doors on escape routes are frequently fitted with push bars. These are ideal for fire safety, but some types are easily forced open by a moderately competent intruder. In order to prevent this, many schools have developed unauthorised and potentially dangerous methods to make push bars secure. These include hooking chairs over the push bars or chaining the push bars shut. These improvised techniques should be prohibited. Lockable push bars must be unlocked whenever the school is occupied. Generally outward opening doors are required on escape routes for large numbers of people and at the foot of stairways, where people could press up against an inward opening door preventing it from being opened. If in doubt contact the fire service.

Any adaptations or modifications to the premises should always take fire precautions into account. Whilst Approved Document B of the Building Regulations is not retrospective, it should be considered, as the standard to aim for or the local fire officer may be consulted, if the work involves:

- partitioning rooms;
- creating one room from two;
- creating a room within a room;
- exits or escape routes;
- positions of incoming gas or electrical mains;
- ventilation systems;
- refuse incineration.

Special provisions may be necessary to cope with the needs of those with physical difficulties or visual or hearing impairment, eg, visual fire alarm signalling devices may be needed. BS 5588: 1988⁽¹⁸⁾ and



Fire exit push bar, break glass call point, exit sign & water extinguisher.

Building Bulletin 91⁽¹⁹⁾ give detailed advice on, for example, escape refuges for wheel chair users and evacuation lifts.

Where there are large numbers of pupils with special needs, as is increasingly the case with the move towards integration of these pupils into mainstream education, detailed consultations with architects and the local fire brigade may be necessary.

Escape routes should be inspected regularly to check they are not obstructed and that fire exit doors are unlocked. Self closing doors, and those with automatic release, should also be checked to ensure they close fully.

Any defects should be reported and remedied at the earliest opportunity.

Fire Fighting Equipment

Sand Buckets. If provided these should be marked 'Fire' and have lids to prevent contamination. They are useful for containing spillages of flammable or heavy liquids. It is recommended that two buckets of sand are provided in each laboratory for use in conjunction with the appropriate fire extinguisher. Nearly every type of outbreak likely to occur in a laboratory can be dealt with by one or the other.

Fire Extinguishers. Extinguishers are provided to deal with three types of fires that occur in schools.

- Class A fires involve ordinary combustible materials such as wood, paper and textiles. Water extinguishers are suitable for these fires.
- Class B fires involve flammable liquids such as oils, solvents used in chemistry, and cooking fat. Foam, dry powder or carbon dioxide may be used on these fires.
- Electrical equipment fires; dry powder or carbon dioxide can be used on these (dry powder is also recommended for vehicle fires).

Some halon extinguishers (trade names BCE, BFC, BTM or DTE) are also still in existence, although they are being gradually replaced because halons are ozone depleting chemicals. Dry powder can be used as a replacement as, like halon, it can be used on all types of fire.

Each of the four different types of fire extinguisher used to be identified by a distinctive colour: red for water; cream for foam; blue for dry powder; and black for carbon dioxide. Since 1997 all new extinguishers have been coloured red to comply with BS EN3. The same colour scheme is still used on the labels, but these must not exceed 5% of the surface area of the cylinder. Existing extinguishers need not be replaced until the end of their useful life. Extinguishers should be maintained in accordance with BS 5306 *Installation and Maintenance of Portable Fire Extinguishers*. Weekly checks are recommended to include:

- checking the safety clip and indicating devices to determine whether the extinguisher has been operated; and
- checking the extinguisher for any external corrosion, dents or other damage that could impair the safe operation of the extinguisher.

In addition, a basic annual service should be carried out by a competent person, usually the supplier.

Hosereels. These normally consist of a maximum of 30 metres of 19mm internal bore hose connected to the mains water supply. They should comply with BS 5274 *Specification for fire hose reels (water) for fixed installations*. Hoses should be checked annually. These are sometimes used in larger buildings, or where there are special risks, as an alternative to portable extinguishers.

Fire Blankets. These are normally found in kitchens, laboratories and workshops and should meet BS 6575 *Specification for fire blankets*. They can be used to smother small fires involving cooking fat and other flammable liquids. Fire blankets are also invaluable in dealing with people whose clothes are alight. They should be wrapped and rolled in the blanket.

Fire fighting apparatus should be located so that it is:

- conspicuous;
- accessible when needed. If mounted on brackets, its weight should be taken into account in determining the height of the extinguisher above floor level;
- protected from accidental damage.

Recommended type and location of fire fighting apparatus

Type	Location
Water (in general, one 13A ² rated extinguisher per 200 square metres, adjusted up or down depending on the types of risk, with a minimum of one per floor)	Craft rooms Workshops Stages of every assembly hall On escape routes, so that the walking distance to the nearest extinguisher does not exceed 30m.
Foam or dry powder	Laboratories ^{1,2} Home economics rooms ^{2,3} Kitchens
Foam	Boiler rooms where oil fuel is used
Carbon dioxide or dry powder ⁴	Electrical switchrooms and places where live electrical equipment is known or thought to be present, eg, stage lighting control areas and IT classrooms
Dry powder	Vehicle protection
Fire blankets	Adjacent to fire extinguisher in kitchens, laboratories, design technology practical spaces and assembly halls
Sand buckets	Two in each laboratory adjacent to extinguishers

1. In some laboratories where very volatile liquids are used or fragile equipment is installed, dry powder or carbon dioxide may be preferable to foam.
2. In laboratories and home economics rooms, the capacity of extinguishers should be: for water about 9 litres capacity (13A rated), dry powder about 1.5 kg and carbon dioxide not less than 2.5 kg.
3. Where there is no fixed frying equipment, dry powder may be preferable to foam.
4. Dry powder and carbon dioxide do not conduct electricity, unlike water or foam.

In addition to the annual check of fire extinguishers by a competent service engineer, the type and location of each item of fire fighting equipment should be noted on the fire plan.

The local fire brigade are able to advise on the choice of fire fighting equipment and its subsequent maintenance.

Fire Detection and Alarm Systems

- **For the prompt and reliable detection of fire**
- **To alert the occupants so that evacuation can begin**
- **To inform the fire brigade so that they can extinguish the fire**
- **To minimise damage to the buildings and their contents**

In small single storey schools with fewer than 160 pupils hand operated bells or gongs can be used to sound the alarm if there is a fire. These should be sited so that they are audible without exposing the operator to danger from fire. In all other schools some form of electronic fire alarm system is required. An electronic fire alarm system consists of **automatic detectors; break glass call points; the control panel;** and **fire alarm sounders.**

Automatic Detectors

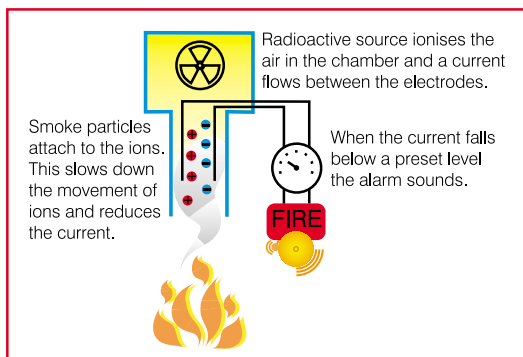
When the school is in session every pupil and member of staff may be regarded as an independent, mobile fire detection system. Most of the premises are in 'wakeful occupancy'. A fire in an area of an occupied building, even one started deliberately, would usually soon be discovered, the alarm raised and the premises evacuated. However, areas that are unoccupied or partly occupied (eg, during evening classes or community use), particularly those in isolated positions, are more at risk.

It follows that automatic fire detection is of greatest value in unoccupied buildings or high risk areas such as boiler rooms and kitchens and that its prime purpose is the protection of property rather than the prevention of loss of life. A fire risk assessment will help identify these high risk areas.

It is important that the detector is matched to the environment that it is to protect. For example, it is better to fit a heat detector in a kitchen rather than a smoke detector which could be triggered by the fumes from cooking. The number and location of detectors will depend upon the size of the buildings, their type of construction and the use to which different areas within the building are put.

Smoke detectors

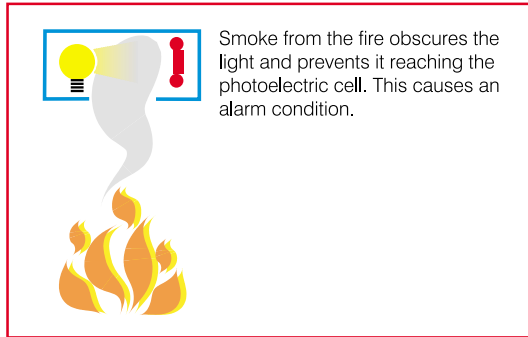
Smoke detectors include ionisation devices which can sense the presence of smoke particles invisible to the naked eye and optical detectors which recognise smoke in the atmosphere.



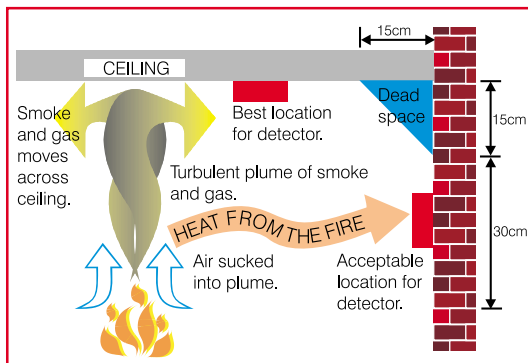
Smoke detector ionisation type

Heat detectors

Heat detectors respond to increases in temperature. Older types rely upon a strip of plastic or metal melting at a relatively low temperature, but these have been mostly superseded by detectors using the expansion of solids, gases and liquids. The temperature chosen for the activation of the detector has to be outside of that normally experienced in the protected area. Some detectors are activated by the rate that temperature rises, as well as by a maximum temperature.



Smoke detector obscuration type



Locating smoke or heat detectors

Fire Alarm Sounders

The alarm should be clearly heard throughout the school and continue to operate until the building is evacuated. It should be instantly recognisable and different from every other audible or visible signal used by the school. If the fire alarm system is also used as a class change system, then its continuous operation should indicate a fire and intermittent operation should indicate class change. This would not be possible if the school operated a phased evacuation system (although this is only really a possibility in an exceptionally large school). Visitors and out of hours users may find the use of an intermittent signal confusing, as in general use this indicates 'stand-by for evacuation'. They will need to be told that an intermittent signal is being used for class change. A fire alarm sounder may also be too loud to be comfortable for class change.

The Control Panel

This monitors the operation of the entire system. Some panels group detectors into zones which are switched on or off from the panel. In this case, a plan of the school showing the zones should be positioned next to the fire alarm panel.

Addressable systems allow each detector to be controlled either individually, or in zones that can be changed as circumstances require. The ideal system would have an addressable control panel large enough to handle the maximum number of zones and detectors that might be needed in the future.

Signalling System

The signalling system can allow the control panel to raise the alarm at the panel, at the school by sounding the alarm or at a central station by an automatic telephone link.

Since the majority of school fires take place when the premises are unoccupied, alerting a central station which provides a rapid response from the fire brigade is most important. The sounding of bells or sirens at an unoccupied school is unlikely to lead to a prompt response. A failure to install remote signalling systems often means that school fires are first reported by a passer-by, by which time the fire is so large that considerable damage is inevitable.

To keep costs down, the telephone link to a central station can be shared with the intruder alarm installation and monitored, so that any tampering with the telephone line will be observed by the central station. Fire alarms will take precedence over intruder alarms.



Fire alarm panel, zone plan, break glass call point and fire bell

The system will run from the mains electrical supply, but if there is a power failure a standby battery provides continuity of power.

Specification

There is no standard system. The design must reflect the individual circumstances of the school and should allow for ease of operation, reliability, and quick and cheap extension or modification.

BS 5839: *Fire detection and alarms systems for buildings*⁽²⁰⁾ describes the various types of fire alarm systems and the levels of protection they provide. The cost of fire detection equipment is such that serious consideration needs to be given to the type of system to be provided. When specifying a system, the maintenance costs as well as the initial capital cost should be considered. Some companies guarantee to provide ongoing maintenance to their systems for a number of years and some offer third party certification to protect the consumer. In the UK the Loss Prevention Certification Board (LPCB) provides such certification and has produced a list of approved fire and safety products and services⁽²¹⁾.

As far as possible, the initial design should take into account the likelihood of the further development of the system. If the specification for the control panel takes future growth into account, it becomes possible to add zones and detectors to the system with minimal delay and least possible cost. In this way the design can take account of the resources that can realistically be made available at any one time.

The positions suggested in BS 5839 for break-glass points, smoke and heat detectors sometimes need to be modified slightly in order to prevent nuisance alarms or damage from misbehaving pupils. However, anti-vandal devices offering protection against nuisance alarms are available from manufacturers. It may be possible to reduce the number of automatic detectors from the numbers recommended in BS5839, without compromising on safety, to provide a more economical degree of protection of the building fabric. For example, the provision of one automatic detector per fire compartment might be considered. In such cases the local police and fire service should be jointly consulted to explore the feasibility of installing an integrated alarm system providing a minimal combination of intruder and fire detection based on an holistic risk assessment.

There is a tendency when specifying fire alarm systems to specify complex state of the art analogue addressable systems together with automatic smoke or heat sensors throughout the buildings. This level of provision is rarely necessary in a school. However, these more sophisticated systems can give an increased level of protection; a reduction in false alarms; easier testing; and the ability to identify where a fire alarm originates.

Professional advice should be sought on the specification of fire alarm systems. This should include the most efficient use of detectors, their location and the minimum amount of automatic detection required. For advice about fire detection and alarm systems and reputable installers contact your insurers, the LPCB, the local education authority risk manager or the local fire service.

Maintenance and Testing

Fire detection systems should be regularly tested by the user and serviced by a trained and qualified engineer in accordance with the requirements of BS 5839. The main requirements are:

- a daily check of the control panel by the user;
- a weekly test by the user:
 - ~ with the electricity mains supply switched off, a manual call point or smoke detector should be operated to test the system. Each week a different call point or detector should be selected;
 - ~ to check that the sounders operate and then reset the system;
 - ~ to complete the fire logbook with details of the date, time and trigger device tested, and enter 'Routine Weekly Test' in the event section. Any defects should be entered in the 'Action Required' and reported to a responsible person;
- quarterly, yearly and 3 yearly maintenance and testing by a qualified engineer. This is required by BS 5839. The approximate cost of an annual maintenance contract to cover regular maintenance and testing for a typical size of primary and secondary school is given in the table below.

	One form entry primary school of gross floor area 1000m ² and 210 pupils (5 - 11 years age range)	Five form entry secondary school of gross floor area 7000m ² and 900 students (11 - 18 years age range)
Annual costs (2000 prices)	£160 - £400 (exc. VAT)	£450 - £1600 (exc. VAT)

The costs for maintenance of analogue addressable systems are typically about 20% more than for conventional systems. However, the initial capital cost of an analogue addressable system is usually less than a conventional system, due to the saving in the amount of wiring needed. Analogue addressable systems require a single cable loop, whereas conventional systems require multiple radial cables.

When any changes or additions are made to the fire alarm systems it is important that the record drawings are updated.

Sprinkler Systems

A sprinkler system is best regarded as a combined detection and extinguishing system. They have a proven track record over many years of successfully controlling fires in commercial buildings. The number and distribution of the sprinkler heads is arranged to cover the area to be protected. With a school, this is usually the entire floor area.

Sprinklers are expensive to install, but are relatively cheap to maintain. By careful design of the system malicious damage can be avoided, for example by using concealed heads. There are additional costs in providing a suitable water supply. With the encouragement of the insurance companies, a number of systems have recently been installed in new school buildings, particularly in areas where there is a high risk of arson. This may result in lower insurance premiums, thereby reducing annual running costs. Installation is more expensive in existing buildings than in new.

Emergency Lighting

The purpose of emergency lighting is to provide sufficient illumination in the event of a failure of the normal electric lighting, so that a building can be evacuated quickly and safely, and to ensure that processes and machinery can be safely closed down.

In schools, emergency lighting is usually provided only in areas not lit by daylight and in those spaces used out of normal hours. These include halls and drama spaces used for performances, rooms used for evening classes and the escape routes from all of these areas to final exits from the building. Emergency lighting is not normally provided on other escape routes, since the children and staff are generally familiar with the buildings and, for most of the year, daylight normally extends to the end of the school day. Examples of places where emergency lighting might be considered are escape corridors, escape stairways and corridors without any windows. It should always be provided in sleeping accommodation. If necessary, check escape routes when it is dark to assess whether emergency lighting is required. In some cases fluorescent marker lines may be effective. This reduces the level of light necessary to see the escape route.

It is recommended that for halls, gymnasias and other areas used by the public after dark, the emergency lighting should be of the maintained type which keeps the emergency lighting on at all material times. On designated escape routes and fire escape stairs the installation can be of the non-maintained type, which will only operate when the normal electric lighting fails and will operate for not less than one hour's duration. The advice of the local fire service should be obtained, particularly if a Public Entertainment or other license is required.

The emergency lighting should sufficiently illuminate the escape routes from the building together with the fire alarm call points, the fire fighting equipment, exit signs and any permanent hazards along the escape routes, such as changes of direction or stairs. Emergency lighting should be maintained by a competent person in accordance with BS 5266 and should be checked at least every month.

Further detailed guidance is given in the CIBSE Technical Memorandum TM12: *Emergency Lighting 1986* and in the British Standard *Code of Practice for Emergency Lighting*, BS 5266: Part 1: 1988, and BS EN 1838: (BS 5266: Part 7: 1999) *Lighting Applications. Emergency Lighting*.

Planning Recovery from a Major Fire

- to minimise the consequences of a fire
- to restore normal operations as soon as possible (disaster recovery)

Fire precautions do not end with the outbreak of a fire. After a major incident, the restoration of lost facilities can take from two to five years. The action taken in the first few hours can save thousands of pounds and speed the recovery process. The time to consider what action to take is before the fire starts and not as the school is burning. Making a contingency plan will allow time for discussion, consultation and the full briefing of all those involved. Even if there has only been an informal discussion between local schools, it is a help if a fire occurs. The following points are worth considering.

Security. A major fire will knock out alarm systems and affect the physical integrity of the buildings. The school site should immediately be made secure. It is surprising how quickly losses from theft after a fire can mount up. Not only portable equipment, but also items such as light fittings, radiators and pipework are at risk.

Salvage. If salvage work is started promptly then much material and equipment can be brought back into full operational order, saving both the cost of replacement and also waiting time. Such material needs to be removed to a safe place where it can be repaired and stored ready for reuse.

Health and Safety. It is possible that a fire might affect parts of the structure containing asbestos, chemicals in laboratories, gas cylinders, and other flammable substances. The location of any of these potential hazards should be noted on the fire plans and these plans should be made available to the emergency services.

Accommodation. If classrooms have to be taken out of use, is there sufficient spare accommodation remaining or will it be necessary to find space in another school or provide temporary accommodation? If arrangements have been made beforehand, other schools may be able to help out with the loan of replacement equipment and materials.

If the school is to be closed immediately after a large fire, how will this information be communicated to pupils and their parents? What arrangements are to be made to look after children whose parents are out at work?

Meals. If the kitchens are taken out of use, what arrangements can be made to provide meals?

Transport. If classrooms in another school are used, it is possible that children will require transport. How quickly can this be set up? Who will pay?

Services. Water and power supplies to the remaining part of the school may be affected. These will need to be checked. Until the telephone lines are restored it might be necessary to consider using mobile phones.

Records. Loss of records can mean severe delays. Many are now held on computer. Are these being backed up at the end of each working day, or at least weekly? Are back-up copies held in a safe location....not the school? This includes a copy of your contingency plan.

Construction Work. If the building, or parts of it, need to be made safe, who will carry out this work? Who will co-ordinate reconstruction work?

Insurance. Who will inform the insurance company? Who will liaise with the loss adjuster and agree the insurance claim?

Contact list. A list of emergency contacts should be made and one copy should be kept by a member of staff off-site.

Proper planning supported by staff training before a major fire can mean that its effects are minimised and the school is brought back to normal as quickly as possible. The costs of disaster planning are low, but the benefits can be incalculable.

Management Checklist

- 1. Fire Safety Policy and Responsibilities.** Consult the Employer's Fire Safety Policy and establish responsibilities of staff for fire safety.
- 2. Fire Hazard and Risk Assessment.** Use the 5 point plan (see page 42 and reference 22) to identify all fire risks and adopt appropriate control measures.
- 3. Provide and Maintain Fire Safety Equipment and Fire Fighting Apparatus**
- 4. Training.** Teaching, non-teaching staff and pupils should all receive training in fire evacuation procedures and fire prevention awareness. Staff should be trained in the use of fire fighting equipment.
- 5. Contingency Plan.** This will cover the actions to be taken to minimise the effects of a fire upon your school.
- 6. Checks and Records.** Establish procedures to carry out regular fire checks and record the results.
- 7. Good Housekeeping.** Day to day measures to minimise the fire risks. These include storage of flammable material, heat processes, temporary heaters, waste disposal, etc.
- 8. General Security.** Well over half of all school fires are started deliberately. Good general security can help to reduce the risk of arson.
- 9. Monitor and Review.** Fire safety is an on-going task. The risks constantly change, therefore the effectiveness of risk control measures must be regularly reviewed.

Security Risk Assessment and Fire Safety

Since arson is the main cause of school fires, there is a considerable overlap between fire prevention and site security. See also *How to combat arson in schools*⁽²⁾ published by the Arson Prevention Bureau. This contains a vulnerability assessment, a checklist for the headteacher and a monthly checklist for the site manager.

The following checklist is based on the risk assessment method for school security given in the booklet, *Improving security in schools*⁽¹⁾.

Checklist of security issues affecting fire safety

Issue	Example of low risk	Example of high risk
Trespass	No cases of trespassers in school grounds	Trespassers commonly present in school grounds
Vandalism	No cases of vandalism reported	Frequent and costly vandalism
Intruders	Good locks on windows and doors. Intruder alarm system linked to a central station	Poor locks and no intruder alarm system
Arson	No previous arson attacks in the school or locality	School itself or schools in locality have suffered from recent break-ins or arson attacks
Site security	Very difficult for intruders to approach school buildings unseen	Easy to reach school buildings, eg, perimeter has weak points or no fencing at all
Out of hours use of school facilities	No reported problems and/or security benefits from out of hours use	Many security problems due to out of hours use, special risks (eg, bars, social clubs)
Community ethos and support for the school	Strong community and parental support benefits security, eg, active Parent-Teacher Associations	Insignificant parent or community involvement or negative attitudes
Condition and appearance of buildings	Buildings well kept and in good repair, with no graffiti. Undersides of temporary buildings closed off	Buildings badly kept and in state of disrepair, with graffiti and vandalism a problem. Undersides of temporary buildings open to rubbish accumulation and arsonists
Recesses and internal courtyards	Not part of the building design, or fenced off	Numerous places for intruders to hide and start fires unobserved
Roof	Roofs cannot be easily climbed onto due to design, application of anti-climb paint or other devices.	Easy access to roofs and upper windows, eg, building features providing natural ladders, low eaves, landscape features
Security lighting	Lighting of all entrances, footpaths and building facades	No lighting, or lighting in the wrong place
Surveillance	Effective surveillance eg, buildings overlooked from busy roads and housing, CCTV covering access, etc.	Remote buildings with no effective surveillance
Fire detection/sprinkler systems	Automatic detection system linked to central station. Sprinkler system installed.	No automatic fire detection or sprinkler system

Fire Hazard and Risk Assessment

- **identify the fire hazards and the staff and pupils affected**
- **assess the risks**
- **take reasonable precautions to minimise the risks**
- **record your conclusions**
- **review the risk assessment regularly**

The specific fire risk assessment required by Health and Safety Legislation, and the Fire Precautions (Workplace) Regulations, is concerned with the safety of the occupants of the building. It can be part of your general review of health and safety risks which you already carry out or, if you wish, as a specific exercise. The process can be broken down into five basic steps⁽²²⁾.

- 1. Identify the fire hazards** and where fires might start.
- 2. Identify the location of people at significant risk in case of fire.**
Decide who, if anyone, might be hurt if there were to be a fire.
- 3. Evaluate the risks.**
Decide if the existing fire safety measures are good enough, or if more needs to be done to make reasonably sure that nobody would get hurt if there was a fire.

Do this by checking:

- controls on ignition sources/ sources of fuel;
- that a fire can be detected in a reasonable time and that people can be warned;
- that people who may be in the building can get out safely;
- provision of fire fighting equipment;
- maintenance and testing of fire precautions;
- that fire safety training is adequate to ensure that those in the building know what to do if there is a fire.

Carry out any improvements needed.

4. Record findings and take action.

In particular you should list the more significant hazards and your most important conclusions, for example:

Rubbish bins kept in secure compound that is locked when not in use and located away from building structure;

Electrical sockets no sockets found overloaded. Portable equipment checked regularly. Electrical installations tested every five years, or more frequently if in poor condition.

- Prepare Emergency Plan
- Inform, instruct and train employees in fire precautions

5. Keep assessment under review. Check that it is up to date and revise it if necessary.

Hazard and Fire Precaution Checklists

The checklists on the next two pages should help with the risk assessment. They identify possible hazards and suggest suitable precautions. The hazards are grouped in two tables. The first group can be dealt with by the school itself, whereas the second requires professional input to the risk assessment. The size and complexity of the buildings and the number of storeys affect the amount of professional input required.

When seeking professional help it is advisable to obtain independent specialist advice rather than to rely solely on manufacturers or suppliers. Their advice may be influenced by commercial interests, resulting in recommendations to upgrade to current standards applicable to new buildings, although the existing equipment may still be acceptable.

Checklist of hazards that can be dealt with by the school

Hazards over which the school has control.	Fire precautions/actions to control risks.
Evacuation in event of fire.	Staff training. Fire practice drills. Suitable fire action notices displayed.
Combustible materials. PE mats of type that burns to form toxic gas. Flammable foam filled furniture.	Identify combustible materials; make sure they are not stored on escape routes or near sources of ignition; reduce fire risk. Store in one hour fire rated store. Replace or locate in area of low fire risk eg, away from escape routes.
Fire exit doors locked, poorly maintained or without Fire Exit signs.	Ensure doors are regularly inspected and maintained, unlocked and available for immediate use at all times when the building is occupied, and they are identified with Fire Exit signs.
Identify possible sources of ignition. Light bulbs and fittings near flammable materials. Overloaded multi-point adapters in electrical sockets. Portable electric or LPG heaters in use. Combustible waste. Unsecured moveable waste and recycling bins and skips left near the school buildings.	Reduce the risk of fire. Replace tungsten filament bulbs by fluorescent fittings in areas where there is a possibility that combustible materials may be ignited. Alternatively, move fittings or combustibles. Only use adapters where it is unavoidable. Do not overload. Provide additional sockets if necessary. Replace naked flame and radiant heaters with fixed convectors or a central heating system. Remove waste frequently. Bins at least 10 metres away from any building, either locked to a metal post or within a secure enclosure.
Flammable wall and ceiling finishes.	Remove or treat flammable wall or ceiling linings.
Display materials.	Location and quantity of display materials on escape routes kept under control. Displays can be sprayed with fire retardant.
Highly flammable materials.	Store highly flammable materials in fire-resisting stores away from sources of ignition.
Hazardous spaces, such as heat bay areas in design technology and chemistry laboratories.	Procedures to reduce risk established and followed; fire resistant materials used where needed and fire fighting apparatus provided.
Ducts, chimneys and flues.	Keep clean and in good repair.
Contractors, eg, using naked flames or heat processes.	Operate a 'Hot work permit' system. Give outside contractors and maintenance staff fire safety information.
Smoking areas, if allowed..	Provide ash trays and fire-proof waste bins for cleaners.
Sub-standard electrical installation posing a fire risk eg, due to insulation breakdown on old wiring.	Keep electrical inspection and testing up to date and carry out repairs.
Dangers from electrical equipment.	Carry out portable appliance tests ⁽¹³⁾ . Only allow a competent nominated person to wire plugs, using the correct sizes of fuse. Keep flexes as short as possible and never use equipment with damaged cables. Take faulty equipment out of use immediately. Make sure that staff know how to isolate the main electrical supply in an emergency.
Fire fighting apparatus.	In correct locations and tested annually.

Checklist of hazards requiring professional advice

Hazards which will require the assistance of a building professional and/or the local fire brigade.	Fire precautions/actions to control the risks.
<p>Escape from fire.</p> <p>Escape routes including corridors and stairs.</p> <p>Hazardous areas eg, kitchen, boiler room, and chemical store.</p> <p>Combustible wall or ceiling linings which could promote rapid spread of flames.</p> <p>Fire doors not fitted with smoke/fire seals, damaged or poorly fitting in door frames.</p>	<p>Adequate fire escape routes</p> <p>Limited travel distances, enclosing construction has adequate fire resistance, fire exits, exit and directional signs and possibly emergency escape lighting.</p> <p>Enclosing construction has adequate fire resistance.</p> <p>Surfaces have adequate resistance to surface spread of flame.</p> <p>Fire doors provided at appropriate positions have correct fire and smoke rating and in good working order.</p>
<p>Reducing the risk of fire.</p> <p>Gas isolation in kitchens, domestic science or science laboratories.</p>	<p>Isolate gas supply preferably with removable key or automatic gas isolation system⁽¹⁵⁾.</p>
<p>Extinguishing the fire.</p>	<p>Adequate means of access and facilities including water supply for fire brigade.</p> <p>Adequate fire fighting apparatus for occupants, eg, hose reels, extinguishers, sand buckets and fire blankets (see pages 28 - 30).</p>
<p>Evacuation of people with physical, behavioural and sensory difficulties.</p>	<p>Design for any special needs, eg, provision of refuges on escape stairs for wheel chairs.</p>
<p>Fire compartmentation.</p> <p>Buildings with overlarge fire compartments.</p> <p>Inadequate fire/smoke barriers between fire compartments.</p> <p>Inadequate fire stopping of services penetrations, eg, ducts, pipework and cableways.</p> <p>Inadequate fire resistance of ducts, flues and chimneys.</p>	<p>Very difficult to correct; some low cost improvement may be possible.</p> <p>Difficult to assess without investigating ceiling voids. Fire plans should show where fire barriers are located.</p> <p>Provide fire stopping.</p> <p>Increase fire resistance.</p>
<p>Fire alarm system.</p> <p>Out of date system, with poor wiring and liable to false alarms.</p> <p>Fire alarm break glass call points inadequate.</p> <p>Locality of high fire risk due to arson.</p> <p>Hazardous areas eg, kitchen, boiler room and chemical store.</p>	<p>Update system, test and maintain to BS 5839.</p> <p>Upgrade number and location.</p> <p>Provision of automatic detectors, sprinkler system or other measures.</p> <p>Provision of automatic heat or smoke detectors.</p>

Further Advice and Help

Local education authority insurance/risk managers and your insurers are able to offer advice on fire safety and insurance matters.

Free advice is available from the local fire brigade who will often be part of the local authority risk management group. Their fire officers conduct inspections of existing buildings and advise on the fire safety of plans for new buildings. The telephone number for non-emergency calls is in the phone book.

There are several national organisations which offer advice:

Department for Education and Employment (DfEE),
Architects and Building Branch,
Caxton House, 6 - 12 Tothill Street, London, SW1H 9NA.
Tel: 020 7273 6237, Fax: 020 7273 6762.
Web: <http://www.dfee.gov.uk/schbldgs>

Fire Protection Association (FPA),
Bastille Court, 2 Paris Garden, London, SE1 8ND.
Tel: 020 7902 5300, Fax: 020 7902 5301.
E-mail: fpa@thefpa.co.uk
Web: <http://www.thefpa.co.uk>

Loss Prevention Certification Board Limited,
Melrose Avenue, Borehamwood, Herts, WD6 2BJ.
Tel: 020 8236 9600, Fax: 020 8236 9601.

The Arson Prevention Bureau, 51 Gresham Street, London, EC2V 7HQ.
Tel: 020 7216 7474, Fax: 020 7696 8996.
Web: <http://www.arsonpreventionbureau.org.uk>

The Fire Policy Unit (FPU) of the Home Office, see FPU page of the Home Office Internet site at <http://www.homeoffice.gov.uk/fepd/fpu.htm>

The LPG Gas Association, Pavilion 16, Headlands Business park,
Salisbury Road, Ringwood, Hampshire, BH24 3PB;
Web: <http://www.lpga.co.uk>

References

1. Managing school facilities, Guide 4, *Improving security in schools*, 1996, ISBN 0 11 270916 8, £6.95, The Stationery Office.
2. *How to combat arson in schools*, Arson Prevention Bureau, 1998.
3. *Education (School Premises) Regulations 1999*, Statutory Instrument 1999 No.2, ISBN 0 11 080331 0, The Stationery Office, £3.
4. A Fire Service Circular on fire precautions in independent schools is likely to be published in July or August 2000. It will replace Fire Service Circular No. 59/1964 and will be available on the Fire Policy Unit (FPU) page at the Home Office site on the Internet at <http://www.homeoffice.gov.uk/fepd/fpu.htm>
5. For detailed advice on health and safety responsibilities in schools refer to guidance by the Education Services Advisory Committee (ESAC) of the Health and Safety Executive (HSE). For example, *Health and Safety Guidance for School Governors and Members of School Boards*, 1998, ISBN 0 7176 0870 0, and *Managing health and safety in schools*, 1995, ISBN 0 7176 0770 4, available from HSE Books, Tel: 01787 881165. <http://www.open.gov.uk/hse/hsehome.htm>.
6. *The Management of Health and Safety at Work Regulations 1999*, Statutory Instrument 1999 No. 3242, ISBN 0 11 085625 2, £3.50 from The Stationery Office.
7. *The Fire Precautions (Workplace) Regulations 1997*, Statutory Instrument 1997 No.1840, ISBN 0 11 064738 6, £3.20 from The Stationery Office, Internet version from <http://194.128.65/si/si1997/97184001.htm> and *The Fire Precautions (Workplace) (Amendment) Regulations 1999*, SI No.1877, ISBN 0 11 082882 8, £2.50 from The Stationery Office. Both publications can be found on the webpage of the Home Office site at <http://www.homeoffice.gov.uk/fepd/fpu.htm>
8. *Fire Safety, An employers guide*, 1999, ISBN 0 11 341229 0, £9.95 from The Stationery Office.
9. DfEE 1997 *Constructional Standards* produced by Architects and Building Branch, address above. Available from DfEE Publications Centre, P.O.Box 5050, Sudbury, Suffolk, CO10 6ZQ, Tel: 0845 6022260 Fax: 0845 6033360.

10. *The Building Regulations, Approved Document to support Part B: Fire Safety*, Department of the Environment, Transport and the Regions, 2000 Edition, DETR, ISBN 1 85112 3512, £9.00. Copies are available from DETR Publication Sales Centre, Unit 21, Goldthorpe Industrial Estate, Rotherham, S63 9BL (Tel: 01709 891318, Fax: 01709 881673); and through booksellers. It will also be available on the DETR Web site at <http://www.construction.detr.gov.uk/br>.
11. *Fire and the Design of Educational Buildings*, DfEE Building Bulletin 7, sixth edition, The Stationery Office, 1988, ISBN 0 11 270585 5, £14.95 (no longer the DfEE reference document on fire safety).
12. *Health & Safety (Safety, Signs and Signals) Regulations 1996, SI 1996 No. 341, HMSO and Guidance on Regulations L64*, HSE Books, 1997, Tel: 01787 881165. <http://www.open.gov.uk/hse/hsehome.htm>
13. *Code of practice for in-service inspection and testing of electrical equipment*, 1994, ISBN 0 85296 844 2, Institution of Electrical Engineers, Tel: 01438 313311.
14. *Health and Safety of Pupils on Educational Visits*, DfEE, 1998, Copies available free from Tel: 0808 100 5060 or from DfEE Publications, P.O.Box 5050, Sudbury, Suffolk, CO10 6ZQ. Please quote reference No. HSPV2.
15. *Guidance Notes on Gas Safety in Educational Establishments, IM/25*, 1989, available from DfEE Architects & Building Branch or the Institute of Gas Engineers, Tel: 020 7636 6603.
16. *The Highly Flammable Liquids and Liquefied Petroleum Regulations 1972 SI 1972 No.917*, The Stationery Office, priced hard copy or free Internet version.
17. *Contractors in schools, Information for Headteachers, school governors and bursars*, IAC(L)98, free booklet, HSE Books 1996
18. BS 5588 part 8: 1988: *Fire precautions in the design and construction of buildings: Code of practice for means of escape for disabled people*.
19. Building Bulletin 91, *Access for Disabled People to School Buildings, Management and Design Guide*, 1999 The Stationery Office, ISBN 0 11 271062 X, £14.95.
20. BS 5389: *Fire detection and alarm systems for buildings Part 1: Code of practice for system design, installation and servicing*.
21. *List of Approved Fire and Safety Products and Services, A specifiers' guide*, Loss Prevention Certification Board, 1996, ISBN 0 902167 42-1.

22. *Five steps to risk assessment, Assess the risks, A step by step guide to a safer and healthier workplace*, Health and Safety Executive, IND(G)163L 5/94 C1500. from HSE Books, Tel: 01787 881165. <http://www.open.gov.uk/hse/hsehome.htm>

Bibliography

BS 476: *Fire tests on building materials and structures*.

HS(G)107 *Maintaining portable and transportable electrical equipment*, 1994, ISBN 0-7176-0715-1, £5.00, from HSE Books, Tel: 01787 881165. <http://www.open.gov.uk/hse/hsehome.htm>

IND(G) 236 *Maintaining portable electrical equipment in offices and other low risk environments*, 1996, ISBN 0-7176-1272-4, free leaflet from HSE Books, Tel: 01787 881165. <http://www.open.gov.uk/hse/hsehome.htm>