

Supplement 4

Building security and fire protection

Technical supplement to
WHO Technical Report Series, No. 961, 2011

Annex 9: Model guidance for the storage and transport of time- and temperature-sensitive pharmaceutical products

May 2015

© World Health Organization 2015

WHO Press, World Health Organization, 20 Avenue Appia, 1211 Geneva 27, Switzerland (tel.: +41 22 791 3264; fax: +41 22 791 4857; e-mail: bookorders@who.int). Requests for permission to reproduce or translate WHO publications – whether for sale or for noncommercial distribution – should be addressed to WHO Press, at the above address (fax: +41 22 791 4806; e-mail: permissions@who.int).

The designations employed and the presentation of the material in this publication do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted lines on maps represent approximate border lines for which there may not yet be full agreement.

The mention of specific companies or of certain manufacturers' products does not imply that they are endorsed or recommended by the World Health Organization in preference to others of a similar nature that are not mentioned. Errors and omissions excepted, the names of proprietary products are distinguished by initial capital letters.

All reasonable precautions have been taken by the World Health Organization to verify the information contained in this publication. However, the published material is being distributed without warranty of any kind, either expressed or implied. The responsibility for the interpretation and use of the material lies with the reader. In no event shall the World Health Organization be liable for damages arising from its use. The named authors alone are responsible for the views expressed in this publication.

Contents

Abbreviations	4
Acknowledgements	5
Glossary	6
1. Introduction	8
1.1 Requirements	8
1.2 Objectives	9
1.3 Target audience	9
1.4 Associated materials and equipment	9
2. Guidance	10
2.1 Site security and emergency access	10
2.2 General building security	10
2.3 Controlled and hazardous substances areas	11
2.4 Fire detection systems	11
2.5 Fire suppression equipment	12
2.5.1 Sprinkler systems	12
2.5.2 Smoke ventilation systems	13
2.6 Compartmentation	13
2.7 Fire prevention, training and control procedures	14
2.7.1 Risk assessment	14
2.7.2 Fire prevention	14
2.7.3 Fire safety training	15
2.7.4 Fire control procedures	16
Bibliography	17
Annex 1	
SOP: Fire safety housekeeping	19
A1.1 Policy and objectives	19
A1.1.1 Policy	19
A1.1.2 Objectives	19
A1.2 Responsibility	19
A1.3 Associated materials and equipment	19
A1.4 Procedure	19
A1.4.1 Reducing ignition sources	19
A1.4.2 Reducing fuel load	20
A1.4.3 Maintenance of fire protection measures	20
A1.5 Related documents	21
Annex 2	
SOP: Routine inspection and maintenance	23
A2.1 Policy and objectives	23
A2.1.1 Policy	23
A2.1.2 Objectives	23
A2.2 Responsibility	23
A2.3 Associated materials and equipment	23



A2.4	Procedure	23
A2.4.1	Daily inspections	23
A2.4.2	Weekly inspections	24
A2.4.3	Monthly inspections	25
A2.4.4	Three-monthly inspections	27
A2.4.5	Six-monthly inspections	27
A2.4.6	Yearly inspections	27
A2.5	Related documents	28

Annex 3

SOP: Fire drills		30
A3.1	Policy and objectives	30
A3.1.1	Policy	30
A3.1.2	Objectives	30
A3.2	Responsibility	30
A3.3	Associated materials and equipment	30
A3.4	Procedure	30
A3.4.1	Conducting test evacuations	30
A3.5	Related document	32

Revision history

33



Abbreviations

BS	British Standard
CCTV	closed-circuit television
EHS	environmental, health and safety
NFPA	National Fire Protection Association (United States)
SLA	service level agreement
SOP	standard operating procedure
TTSP	time- and temperature-sensitive pharmaceutical product

Acknowledgements

The author of this document is Dr Clare Barker, Principal Consultant, Fire Engineering Europe, Exova Warringtonfire, England.

Glossary

Controlled or hazardous products: TTSPPs and other products with high illicit value: poisons, narcotics, psychotropic products, inflammable or explosive substances and radioactive materials.

Key fob: A small security device with built-in authentication used to control entry to a building and/or entry through internal doors within a building.

Pharmaceutical product: Any product intended for human use or veterinary product intended for administration to food producing animals, presented in its finished dosage form, that is subject to control by pharmaceutical legislation in either the exporting or the importing state and includes products for which a prescription is required, products which may be sold to patients without a prescription, biologicals and vaccines. Medical devices are not included.¹

Service level agreement (SLA): A service level agreement or contract is a negotiated agreement between the customer and service provider that defines the common understanding about materials or service quality specifications, responsibilities, guarantees and communication mechanisms. It can either be legally binding, or an information agreement. The SLA may also specify the target and minimum-level performance, operation or other service attributes.²

Standard operating procedure (SOP): A set of instructions having the force of a directive, covering those features of operations that lend themselves to a definite or standardized procedure without loss of effectiveness. Standard operating policies and procedures can be effective catalysts to drive performance improvement and improve organizational results.

Third-party accreditation: Accreditation or certification by an organization that issues credentials or certifies third parties against official standards as a means of establishing that a contractor is competent to undertake a specific type of work. Third-party accreditation organizations are themselves formally accredited by accreditation bodies; hence they are sometimes known as *accredited certification bodies*. The accreditation process ensures that their certification practices are acceptable, typically meaning that they are competent to test and certify third parties, behave ethically and employ suitable quality assurance.

¹ Definition from WHO/QAS/08.252 Rev 1 Sept 2009. *Proposal for revision of WHO good distribution practices for pharmaceutical products – Draft for comments.*

² Definition from International Air Transport Association (IATA). *Perishable cargo regulations (ePCR) and Temperature control regulations (eTCR) 2013/2014.*

Time and temperature-sensitive pharmaceutical product (TTSP): Any pharmaceutical good or product which, when not stored or transported within predefined environmental conditions and/or within predefined time limits, is degraded to the extent that it no longer performs as originally intended.

1. Introduction

This technical supplement has been written to amplify the recommendations given in WHO Technical Report Series No. 961, 2011, Annex 9: *Model guidance for the storage and transport of time- and temperature-sensitive pharmaceutical products*.³

1.1 Requirements

Ensure that buildings used to store time- and temperature-sensitive pharmaceutical products (TTSPPs) have sufficient security to prevent unauthorized access and to prevent misappropriation of goods.

Ensure that all areas that are used to store controlled or hazardous TTSPPs are:

- a. dedicated, securely locked facilities that fully comply with all legislative and regulatory requirements applicable in the country where the store is located;
- b. only accessible to authorized staff;
- c. protected by automatic intruder and/or fire and smoke, and/or chemical and/or radiological sensor alarm systems appropriate to the type(s) of product being stored;
- d. designed to be explosion-proof, where explosive TTSPPs are stored; and
- e. continuously monitored by security staff or by a qualified external security company. Continuous monitoring may be on-site or remote.

Provide suitable fire detection and firefighting equipment, including fire hydrants, in all TTSPP storage areas and ensure that:

- a. systems and equipment are appropriate for the class of occupancy and product storage arrangements and are approved by the local fire authority; and
- b. equipment is regularly serviced in accordance with the equipment manufacturers' recommendations and local regulations.

Follow standard operating procedures (SOPs) for fire prevention, detection and control. Train staff and carry out regular fire drills. Prohibit smoking in all areas.

³ <http://apps.who.int/medicinedocs/documents/s18683en/s18683en.pdf>

1.2 **Objectives**

The objectives of this Technical Supplement are to provide guidance on how to meet the above requirements with regard to building security, fire prevention, fire detection and management of the buildings.

1.3 **Target audience**

This document is written for managers of buildings used to store TTSPPs, security personnel and the person designated as the “responsible person” who must carry out a fire risk assessment of the premises.

1.4 **Associated materials and equipment**

None required.

2. Guidance

An effective health service is dependent upon an assured supply of pharmaceutical products many of which have a street value if they are misappropriated. It is essential that compounds in which there are buildings used to store TTSPPs in significant quantities should be adequately protected against fire and theft.

2.1 Site security and emergency access

Compounds containing pharmaceutical stores should be surrounded by perimeter fencing or walls of a suitable height to ensure the security of the grounds and storage buildings against vandalism, theft or arson. If local regulations do not permit perimeter fencing, alternative measures to provide perimeter protection should be taken. There should also be a security gatehouse to monitor vehicles entering and leaving the site. If resources permit, perimeter lighting and monitoring by closed-circuit television (CCTV) should be installed. This is the first level of protection needed to prevent unauthorized access and to prevent theft. Additional levels of security are needed within the individual buildings on the site.

Access roads to all buildings on the site should be provided so that vehicles can deliver goods to the storage facility. Building regulations also require adequate access to a minimum percentage of the building perimeter so that fire and rescue service vehicles can reach the source of a fire; this percentage increases with the aggregate area of the individual building.

2.2 General building security

Windows and doors at ground floor level are most vulnerable and should therefore be fitted with good quality locks. Shutters or fixed security bars are also recommended on windows. Buildings should preferably be protected by an automatic intruder alarm system.

The building should be kept locked and all keys should be kept under close control. Keys should be distributed to nominated keyholders only and regular checks should be made to ensure that they have not been lost. The locks should be of a type whose keys cannot easily be copied, or can only be duplicated with the written authorization of the building manager.

If resources permit, key fob and/or number code entry systems should be used instead of keys. This type of entry system eliminates the need for additional keys to be cut and allows access to be recorded on a computer. This technology also allows lost key fobs to be deleted easily from the system and door codes to be changed regularly.

Where resources permit an audio or video entry system is recommended for additional security.

2.3 Controlled and hazardous substances areas

All areas used to store controlled or hazardous TTSPPs must be securely locked and must fully comply with all legislative and regulatory requirements applicable in the country where the store is located.

These areas should be accessible only to authorized staff and they should be protected by a suitable range of automatic alarm systems appropriate to the types of products being stored and the likely risks. These alarm systems may include intruder detection, fire and smoke detectors, and sensor systems to detect chemical and/or radiological hazards.

Areas used to store potentially explosive substances should be designed to be explosion-proof. All areas should be continuously monitored, as a minimum by security staff by carrying out regular patrols, or by CCTV where resources permit.

2.4 Fire detection systems

Suitable fire protection equipment should be provided in all TTSPP storage areas. It is essential that the following are provided:

- *An automatic fire detection and alarm system:* This should be designed, installed and maintained to the relevant standards.⁴
- *First aid firefighting equipment:* This should include hand-held fire extinguishers selected and maintained to the relevant standards.⁴

To meet the requirements of local building regulations a manual alarm system may be the minimum standard required in warehouses since there is no sleeping risk. However, there are often circumstances in which an automatic fire detection system is needed. For example, this could be needed to compensate for some departure from the guidance in the local building code, or as a component of the operating system for a fire protection system. It may also be needed where a fire could break out in an unoccupied part of the building, which prejudices the means of escape from the occupied parts.

The automatic detection system should be designed, installed and maintained in accordance with the relevant standard.⁵ If maintenance of fire detection and firefighting systems and equipment is contracted out, this should be under the terms of a clearly defined service level agreement (SLA).

⁴ For guidance see the International Fire Code and the national standards cited in the References section. National standards will always have priority; however American, European or British standards have been widely adopted by many countries that do not have their own standards.

⁵ e.g. British Standard (BS) 5839-1 (2013), NFPA 72, or the *International Fire Code*.

2.5 Fire suppression equipment

The following protection systems are desirable where resources allow:

- *An automatic sprinkler system (fire suppression system):* This should be designed, installed and maintained to the relevant standard.
- *A smoke ventilation system:* This may be manually or automatically operated.

2.5.1 Sprinkler systems

An automatic fire suppression system should be provided in accordance with the relevant standards.⁶ It is recommended that the system should be installed and maintained by a contractor with appropriate third-party accreditation.

Firefighting water can be supplied from the following sources:

- *City mains water supply:* The agreement of the water authority is usually required for a city mains connection. Where water quality is poor, strainers must be fitted on all connections to the mains supply.
- *Storage tanks:* This can be a pump suction tank, gravity tank or reservoir.
- *Inexhaustible sources:* This includes lakes or rivers.
- *Pressure tanks.*

The relevant hazard classification of the system for use in high bay pharmaceutical warehouses is typically defined as “ordinary hazard” (OH3 (BS EN 12845) or OH2 (NFPA 13)).

Wet pipe sprinklers should be used in high bay warehouses – this means that the sprinkler network is fully charged with water at all times. The use of the alternative, dry pipe, system could result in an unacceptable time delay between the activation of a bulb and the flow of water through the sprinkler head.

Where the goods are stored in pallet racks, the provision of in-rack sprinklers as well as roof level sprinklers is recommended. The sprinkler bulbs in the in-rack sprinkler heads activate at a much lower temperature than those at roof level; consequently the firefighting water is discharged in a more localized area. This means that the fire can be contained with less water damage than would be expected from the discharge of roof level sprinklers.

In cold climates, the installation may require protection against freezing if the pipework passes through unheated spaces. Freeze-protection can be

⁶ E.g. BS EN 12845, NFPA 13, or the International Fire Code.

achieved using antifreeze liquid or electrical trace heating. Where sprinklers are installed in cold rooms or freezer rooms, dry pendant drops should be used. With this arrangement, sections of dry pipe serve the relevant risk area and the actual flow valves are located outside the cold store. This prevents the water in the system from freezing.

2.5.2 Smoke ventilation systems

Automatic smoke vents are generally provided to assist means of escape from the building. By venting smoke build-up at high level, the occupants can escape from the building underneath the smoke layer in reasonably safe conditions. Additional manually operated smoke vents are generally provided to aid the fire and rescue service with smoke clearance once the fire has been extinguished.

Where both sprinkler systems and smoke vents are provided in a building the interaction between them must be carefully considered. Research by Factory Mutual showed that the provision of automatically operating smoke vents can cause delays in the operation of sprinkler systems. This is because the automatic smoke vents open when triggered by smoke, whereas sprinklers operate when heat is detected. As smoke is generally detected more quickly than heat, Factory Mutual concluded that sprinklers would perform more effectively if there were no vents. Their reasoning was that the building would fill with smoke; this in turn creates low oxygen conditions which limits combustion, allowing the sprinklers to extinguish the fire more effectively.

However, where life safety is the predominant concern and a smoke control solution is used to protect the escape routes within a building, current guidance requires the smoke vents to operate automatically; the vents will therefore activate before the sprinkler system.

Alternatively, if the fire service response time is short, and the sprinkler system is provided with fast response heads, the smoke ventilation system may be activated by the flow switch in the sprinkler supply.

2.6 Compartmentation

Buildings are often divided into compartments enclosed in fire-resisting construction; this approach provides passive fire protection by inhibiting the spread of fire within the building. In order to comply with local building regulations, the size of individual compartments may have to be limited. Compartment size is determined by the overall size of the building, the number of storeys, and whether or not an automatic sprinkler system is provided.

In the United Kingdom, for example, single storey storage buildings which are not provided with sprinklers can have a maximum area of 20 000 m²; where sprinklers are provided the maximum area is unlimited.

2.7 Fire prevention, training and control procedures

Preventing fires from occurring is as important as having properly working fire safety systems to deal with a fire incident. The main objective is to create an operating environment in which fires are prevented from starting in the first place. If a fire does break out, the aim is to prevent it from developing beyond a very minor event.

2.7.1 Risk assessment

The first step in fire prevention is to assess the risks and record them in a risk register.⁷ This requires reviewing and assessing the means by which a fire might start and spread, the potential consequences and the available approaches to mitigate the risk. This includes assessing day-to-day operations, risks associated with periodic building and maintenance work and those arising from installing new equipment, or adopting new or changing technologies.

2.7.2 Fire prevention

Set out below are the principal actions that need to be taken to monitor the behaviour of workers and prevent fires from occurring:

- Smoking is one of the greatest fire risks and it should be prohibited in all buildings and workplaces. Where there is no legal prohibition, smoking should only be allowed in designated smoking areas and fire-safe ashtrays and bins should be provided.
- Enforce good housekeeping practices; this includes implementing routines for the regular removal and disposal of waste.
- Establish and maintain out-of-hours inspection and security procedures, including means of preventing arson.
- Carry out routine checks, inspections, and tests, including monitoring the maintenance of heat generating equipment that could cause fires, chafing of cables, self-heating of cables due to electrical resistance and checks on fuel supplies and storage.
- Issue and control work permits and associated procedures.
- Instruct and supervise contractors and subcontractors carrying out construction and maintenance operations within the building.
- Avoid conditions leading to gas and dust explosion hazards.
- Maintain integration with other systems (e.g. ventilation, communications).

⁷ See for example: Watson N, Serumaga B, McCord J, Inglis A (2013).

2.7.3 Fire safety training

All employees should be given fire safety training by a person who is competent in the subject and who understands effective training methods. If relevant expertise is not available within the organization, an independent expert – for example from the fire service – should be engaged to provide training.

Fire safety training should start with induction training on the first day of appointment of new staff. There should be refresher training at least once a year to ensure that all staff are familiar with the fire precautions for the workplace and are reminded of the actions to take in an emergency. More frequent training should be given where there is a high turnover of staff, or a high risk of fire.

All staff, including part-time staff, security staff, cleaning staff and contractors should be trained and instructed in:

- a. risk awareness;
- b. smoking policy;
- c. basic fire prevention;
- d. good housekeeping;
- e. the fire routine:
 - actions to be taken when a fire is discovered or an alarm is heard;
 - knowledge of the escape routes and exits, especially those not in regular use;
 - raising the alarm and the location of alarm indicator panels;
 - arrangements for calling the fire and rescue service;
 - special provisions for assisting disabled people;
 - location of firefighting equipment;
 - selection and use of firefighting equipment, including hand-held firefighting equipment (on larger premises it may be appropriate to train specific staff instead of all staff);
 - the importance of fire doors and the need to close all doors at the time of a fire and/or on hearing the fire alarm;
 - process shutdown and shutting down of non-essential equipment, stopping machines and processes and isolating power supplies if appropriate;
 - evacuation procedures.
- f. Incident reporting procedures, including for “near miss” events and false alarms. A “no blame” reporting culture should be encouraged.

Supervisory and other staff who have specific responsibility for fire safety should receive detailed instruction in their own duties and appropriate

refresher training at least once, and preferably twice a year. Staff with particular responsibilities are likely to include:

- department heads;
- fire marshals or fire wardens;
- floor supervisors;
- security staff (including night security patrols);
- engineering and maintenance staff;
- receptionists and telephonists.

2.7.4 **Fire control procedures**

Follow the SOP for housekeeping – see **Annex 1**.

Follow the SOP for routine inspection of fire safety installations– see **Annex 2**.

Follow the SOP for fire drills– see **Annex 3**.

Bibliography

- Association of British Insurers. Technical briefing: Fire performance of sandwich panel systems. London: Association of British Insurers; 2003 (<http://www.bre.co.uk/filelibrary/rpts/sandwich/ABIsandwichPanels.pdf>, accessed 15 February 2015).
- British Standards Institution (BSI). BS 5306-1: 2006: Code of practice for fire extinguishing installations and equipment on premises. Hose reels and foam inlets. London: BSI; 2006 (<http://shop.bsigroup.com/ProductDetail/?pid=00000000030140377>, accessed 15 February 2015).
- British Standards Institution (BSI). BS 5306-3:2009. Fire extinguishing installations and equipment on premises. Commissioning and maintenance of portable fire extinguishers. Code of practice. London: BSI; 2009 (<http://shop.bsigroup.com/en/ProductDetail/?pid=00000000030254534>, accessed 15 February 2015).
- British Standards Institution (BSI). BS 5306-8:2012. Fire extinguishing installations and equipment on premises. Selection and positioning of portable fire extinguishers. Code of practice. London: BSI; 2012 (<http://shop.bsigroup.com/en/ProductDetail/?pid=00000000030152566>, accessed 15 February 2015).
- British Standards Institution (BSI). BS 5839-1:2013. Fire detection and fire alarm systems for buildings. Code of practice for design, installation, commissioning and maintenance of systems in non-domestic premises. London: BSI; 2013 (<http://shop.bsigroup.com/ProductDetail/?pid=00000000030260279>, accessed 15 February 2015).
- British Standards Institution (BSI). BS 9999:2008. Code of practice for fire safety in the design, management and use of buildings. London: BSI; 2008 (<http://shop.bsigroup.com/en/ProductDetail/?pid=00000000030158436> accessed 15 February 2015).
- British Standards Institution (BSI). BS EN 12845:2004+A2:2009. Fixed firefighting systems. Automatic sprinkler systems. Design, installation and maintenance. London: BSI; 2009 (<http://shop.bsigroup.com/en/ProductDetail/?pid=00000000030208000> accessed 15 February 2015).
- British Standards Institution (BSI). BS EN 1838:2013. Lighting applications. Emergency lighting. London: BSI; 2013 (<http://shop.bsigroup.com/ProductDetail/?pid=00000000030235104>, accessed 15 February 2015).

- International Association for Cold Storage Construction (IACSC) (European Division). Protocol of designing/constructing new insulated envelope buildings in respect of fire safety considerations. Guidance note no.2. IACSC; 2003
(<http://www.coldstore.biz/DesigningConstructing.pdf>, accessed 15 February 2015).
- International Code Council. 2015 International Building Code and references. Washington (DC): International Code Council, 2015
(<http://shop.iccsafe.org/codes/2015-international-codes-and-references/2015-international-building-code-and-references.html>, accessed 15 February 2015).
- International Code Council. 2015 International Fire Code and references. Washington (DC): International Code Council; 2015
(<http://shop.iccsafe.org/codes/2015-international-codes-and-references/2015-international-fire-code-and-references.html>, accessed 15 February 2015).
- National Fire Protection Association. NFPA 10-2013. Standard for portable fire extinguishers. Quincy (MA): National Fire Protection Association; 2013
(<http://webstore.ansi.org/RecordDetail.aspx?sku=NFPA+10-2013>, accessed 15 February 2015).
- National Fire Protection Association. NFPA 13-2013. Standard for the installation of sprinkler systems. Quincy (MA): National Fire Protection Association; 2013
(<http://webstore.ansi.org/RecordDetail.aspx?sku=NFPA+13-2013>, accessed 15 February 2015).
- National Fire Protection Association. NFPA 72-2013. National fire alarm and signalling code. Quincy (MA): National Fire Protection Association; 2013
(<http://webstore.ansi.org/RecordDetail.aspx?sku=NFPA+72-2013>, accessed 15 February 2015).
- Watson N, Serumaga B, McCord J, Inglis A. Risk management for public sector supply chains: Toolkit for identifying, analyzing and responding to supply chain risk in developing countries. Arlington (VA): USAID | DELIVER PROJECT, Task Order 4; 2013
(http://deliver.jsi.com/dlvr_content/resources/allpubs/guidelines/RiskMgmtPublHealSC.pdf, accessed 15 February 2015).
- World Health Organization. Model guidance for the storage and transport of time- and temperature-sensitive pharmaceutical pharmaceuticals. In: WHO Expert Committee on Specifications for Pharmaceutical Preparations: forty-fifth report. Geneva: World Health Organization; 2011: Annex 9 (WHO Technical Report Series, No. 961; <http://apps.who.int/medicinedocs/documents/s18683en/s18683en.pdf>, accessed 15 February 2015).

Annex 1

SOP: Fire safety housekeeping

A1.1 Policy and objectives

A1.1.1 Policy

In order to protect property and life, SOPs should be followed for fire prevention, detection and control.

A1.1.2 Objectives

This SOP describes the housekeeping routines that should be followed to manage fire safety and to prevent fires from occurring within the building.

A1.2 Responsibility

The Fire Safety Manager or Environmental Health and Safety (EHS) Manager has day-to-day responsibility for the prevention of fires.

Note: It is essential to designate a Fire Safety Manager or EHS Manager to oversee the activities described in this SOP.

A1.3 Associated materials and equipment

None.

A1.4 Procedure

A1.4.1 Reducing ignition sources

Identify and control potential ignition sources.

Responsibility: Fire Safety or EHS Manager

- a. Smoking is not permitted in any areas of the building. Control illicit smoking by appropriate management, or consider providing smoking areas outside the building, provided with fire-safe ashtrays and bins.
- b. Naked flames, e.g. candles, or heaters using naked flames are not permitted.

- c. Hot works⁸ will only be carried out after a permit to work has been issued.
- d. Food and drink preparation and consumption will only be carried out in rest areas designated for this purpose.
- e. Misused or faulty electrical equipment should be reported immediately and replaced or removed.
- f. Overheated or worn cables should be repaired or replaced.
- g. Lighting displays, e.g. halogen lights, should not be placed near flammable material.
- h. In areas where flammable, volatile or explosive materials are stored, ensure that electrical fittings are suitable for the risk classification.
- i. All equipment should be installed, maintained, used and managed in the appropriate manner by competent personnel. This should be supported by staff training.

A1.4.2 Reducing fuel load

The amount of combustible material should be reduced, or stored more safely.

Responsibility: Fire Safety or EHS Manager

- a. Reduce the fire load. For example replace bottled gas heating with electric heating sources, or reduce the amount of bottled gas stored within the building.
- b. Store goods in an appropriate manner, e.g. in dedicated storerooms.
- c. Store and use highly flammable substances safely, and store in appropriate containers.
- d. Control the amount of rubbish and how it is stored. Store rubbish in a safe location away from buildings, preferably in a designated area. Rubbish bins within the building should be emptied every day.
- e. Remove redundant services from voids as these can constitute a significant fire load.

A1.4.3 Maintenance of fire protection measures

Check regularly that fire protection measures are available at all times and will be able to carry out their function in a fire.

⁸ *Hot work* is any process that can be a source of ignition when flammable material is present or can be a fire hazard, regardless of the presence of flammable material in the workplace. Common hot work processes are welding, soldering, cutting and brazing. When flammable materials are present, processes such as grinding and drilling become hot work processes.

Responsibility: Fire Safety or EHS Manager

- a. Keep escape routes clear at all times. Goods and equipment must not be stored on escape routes or allowed to block exits, as this provides an unwanted fire load and a potential ignition source and constitutes a life safety risk.
- b. Maintain door locks, panic bars and automatic door release mechanisms so that they open easily in an emergency.
- c. Do not obstruct fire alarm call points, portable fire extinguishers or fire hydrants with stored goods, machinery or parked vehicles.
- d. Ensure that all fire safety equipment (fire alarms, emergency lighting, and fire extinguishers) are maintained and tested in accordance with the relevant standard by competent personnel – see companion SOP: Routine inspection and maintenance of fire safety installations (Annex 2).
- e. Certain parts of the building may contain flammable elements which can contribute to fire spread, such as insulated core panels surrounding cold rooms and other temperature-controlled areas. Panels should be checked regularly and any damaged panels repaired.
- f. Goods should not be stored close to windows. If the building has a sprinkler system, goods should not be stacked higher than the maximum height recommended in the applicable standard.

A1.5

Related documents

- BS 5306-3: 2009. Fire extinguishing installations and equipment on premises. Commissioning and maintenance of portable fire extinguishers. Code of practice.
- BS 5839-1:2013. Fire detection and fire alarm systems for buildings. Code of practice for design, installation, commissioning and maintenance of systems in non-domestic premises.
- BS EN 12845: 2004 +A2: 2009. Fixed fire-fighting systems. Automatic sprinkler systems. Design, installation and maintenance.
- BS EN 1838:2013. Lighting applications. Emergency lighting.
- International Air Transport Association (IATA). 2013/2014. Perishable cargo regulations (ePCR) & temperature control regulations (eTCR)
<http://www.iata.org/publications/Pages/temperature-control-regulations.aspx>

- National Fire Protection Agency (NFPA) 13-2013: Automatic sprinkler systems. 2013 Edition.
- National Fire Protection Agency (NFPA) NFPA 72-2013: National fire alarm and signalling code. 2013 Edition.

Note: The documents listed above relate to standards and practices in the United Kingdom and the United States. Where other standards apply, adapt the references accordingly.

Annex 2

SOP: Routine inspection and maintenance

A2.1 Policy and objectives

A2.1.1 Policy

To protect property and life, SOPs should be followed for fire prevention, detection and control.

A2.1.2 Objectives

This SOP describes the routine inspections that should be carried out on any fire safety installations provided in the building.

The fire safety equipment within the building, including passive fire protection provisions, should be inspected frequently. Most of the inspection can be undertaken by suitably trained personnel; however if installations such as automatic sprinkler systems and smoke ventilation systems are provided then a formal service level agreement (SLA) should be made with the installer to conduct regular inspection and testing in accordance with the applicable standards.

A2.2 Responsibility

The Fire Safety or Environmental Health and Safety (EHS) Manager has day-to-day responsibility for the prevention of fires.

Note: It is essential to designate a Fire Safety Manager or EHS Manager to oversee the activities described in this SOP.

A2.3 Associated materials and equipment

None.

A2.4 Procedure

A2.4.1 Daily inspections

Responsibility: Fire Safety or EHS Manager

- a. Check automatic fire detection and alarm systems to ensure that:
 - the control panel indicates normal operation;

- if a fault is indicated it should be logged and action taken to rectify it;
- any fault recorded on the previous day has received attention.
- b. Check emergency and escape lighting systems to ensure that:
 - every lamp is lit, if it is a maintained system;
 - the control panel for any central battery system or generator indicates normal operation;
 - any fault found is logged and action taken to rectify it.
- c. Check sprinkler system to ensure that:
 - there is continuity of the connections between the alarm switch and the control unit and between the control unit and the fire and rescue service;
 - the water level and air pressure are correct in any pressure tank that provides a duplicate supply;
 - any necessary corrective actions are taken.
- d. Fire doors that are held open by automatic release mechanisms should be released daily.
- e. Check every point where a portable fire extinguisher or hose reel is usually located. Missing or damaged fire extinguishers or hose reels should be replaced or repaired immediately. Any extinguishers used in a fire, or for training, or which are otherwise discharged, should be recharged immediately.
- f. Document findings and corrective or preventive actions if applicable.

A2.4.2 Weekly inspections

Responsibility: Fire Safety or EHS Manager

- a. Check automatic fire detection and alarm systems to ensure that:
 - The control equipment is able to receive a fire signal and to initiate the evacuation procedure, recording which trigger device has been used.
 - Any standby batteries are in good condition and the fuel, oil and coolant levels of any standby generators are correct and topped up if necessary.
- b. Check the sprinkler system to ensure that:
 - water and air pressure gauge readings on installations, trunk mains and pressure tanks, and water levels, in elevated private reservoirs, rivers, canals, lakes, water storage tanks, etc., meet the design criteria and that all gauge readings and levels are recorded;

- each water motor alarm has been sounded for at least 30 seconds;
 - automatic pumps start when the water pressure is reduced to the specified level;
 - for automated pumps powered by a diesel engine:
 - ▶ the fuel and oil levels of the engine meet the design and/or manufacturer’s specification;
 - ▶ the oil pressure, flow of cooling water through open-circuit cooling systems, or the water level in the primary circuit of closed-circuit cooling systems, all meet the design and/or manufacturer’s specification;
 - ▶ the engine restarts using the manual start test button;
 - the electrolyte level and density of all lead acid cells meet the design and/or manufacturer’s specification. If the density is low the battery charger should be checked for efficient operation and if the charger is working correctly the affected cells should be replaced;
 - the stop valves which control the flow of water to the sprinkler systems from the water supply are in the correct position and any monitoring systems are working correctly;
 - there is continuity of connection between the alarm switch and the control unit and between the control unit and the fire and rescue service for alarm systems which are automatically monitored by the emergency service provider;
 - trace heating systems provided to prevent freezing in the sprinkler systems are functioning correctly.
- c. Check any smoke control systems provided for means of escape by simulating actuation of the system. Ensure that any fans and powered exhaust ventilators operate correctly, smoke dampers close, natural exhaust ventilators open, automatic smoke curtains move into position, etc.
- d. Check fire hydrants once a week to ensure that there are no obstructions that may impede access, that the indicator plates are in position and visible and that the isolating valves are locked open.
- e. Document findings and corrective or preventive actions if applicable.

A2.4.3 Monthly inspections

Responsibility: Fire Safety or EHS Manager

- a. Check the fire detection and alarm system by carrying out the following actions:

- Simulate failure of the normal power supply and start up the standby generator, allow it to energize the system for at least one hour and monitor the system for any malfunctioning caused by use of the generator.
 - Restore the normal power supply and then test the charging arrangements for the generator starting battery. If they are not functioning correctly then appropriate action should be taken.
 - Top up oil and coolant levels and fill the fuel tanks.
- b. Check the emergency lighting system by carrying out the following actions:
- Simulate failure of the supply to the normal lighting and inspect all luminaires and exit signs to ensure they are functioning correctly.
 - If the standby supply is from a generator with back-up batteries, a test should be carried out to determine whether all luminaires and exit signs function correctly, even if the generator is prevented from starting.
 - Repair or replace any luminaires or exit signs that do not function correctly.
 - Restore supply to the normal lighting and ensure that:
 - ▶ indicator lamps or devices to self-contained luminaires or internally illuminated exit signs show that the normal supply has been restored;
 - ▶ indicator lamps or devices to central battery systems show that the normal supply has been restored, and that the charging arrangements are functioning correctly;
 - ▶ the charging arrangements for any battery for starting a generator are functioning correctly;
 - ▶ oil and coolant levels are topped up and fuel tanks filled.
- c. Check hose reels visually once a month to ensure there are no leaks and that drum assemblies are free to rotate on their spindles.
- d. Check the operation of fail-safe mechanisms on automatic opening doors, either by “breaking out” the doorset, i.e. pushing it open manually, or simulating failure of the mains supply. Record the results of the test and repair or replace any faulty doors.
- e. Check doors on hold-open devices by simulating failure of the mains power supply or operation of the fire alarm system. Record the results of the test and repair or replace any faulty hold-open devices.

- f. Check all emergency and panic escape devices on escape doors (especially on external doors not used for other purposes) to ensure ease of operation and opening of the door, this can be affected by weather conditions.
- g. Document findings and corrective or preventive actions if applicable.

A2.4.4 **Three-monthly inspections**

Responsibility: Fire Safety or EHS Manager

- a. Check the smoke control system by simulating actuation, testing each zone separately.
- b. Ensure that all fans and powered exhaust ventilators operate correctly, and that smoke dampers close.
- c. Document findings and corrective or preventive actions if applicable.

A2.4.5 **Six-monthly inspections**

Responsibility: Fire Safety or EHS Manager

- a. Inspections and tests should be carried out by competent personnel on the following:
 - fire detection and alarm system;
 - sprinkler system (if provided);
 - emergency and escape lighting systems.
- b. Log any defects, take any remedial action and obtain test certificates.
- c. Check fire doors to ensure the following:
 - heat-activated seals and smoke seals are undamaged;
 - door leaves are not structurally damaged or excessively bowed or deformed;
 - gaps between the door leaf and frame are not so small as to be likely to bind, or so large as to prevent effective fire and smoke sealing;
 - hanging devices, securing devices, self-closing devices and automatic release mechanisms are operating correctly.
- d. Document findings and corrective or preventive actions if applicable.

A2.4.6 **Yearly inspections**

Responsibility: Fire Safety or EHS Manager

- a. Inspections and tests should be carried out by competent personnel on the following:

- BS 5839-1:2013. Fire detection and fire alarm systems for buildings. Code of practice for design, installation, commissioning and maintenance of systems in non-domestic premises.
- BS 7036 series: 1996: Code of practice for safety at powered doors for pedestrian use.
- BS 7273-4: 2007: Code of practice for the operation of fire protection measures. Actuation of release mechanisms for doors.
- BS 8214: 2008: Code of practice for fire door assemblies.
- BS 9990: 2006: Code of practice for non-automatic fire-fighting systems in buildings.
- BS EN 12101: Smoke and heat control systems.
- BS EN 12845: 2004 +A2: 2009. Fixed firefighting systems. Automatic sprinkler systems. Design, installation and maintenance.
- BS EN 1838:2013 – Lighting applications. Emergency lighting.
- NFPA 13-2013. Automatic sprinkler system. 2013 Edition.
- NFPA 72-2013. National fire alarm and signalling code. 2013 Edition.

Note: The documents listed above relate to standards and practices in the United Kingdom and the United States. Where other standards apply, adapt the references accordingly.

Annex 3

SOP: Fire drills

A3.1 Policy and objectives

A3.1.1 Policy

To protect property and life, SOPs should be followed for fire prevention, detection and control.

A3.1.2 Objectives

This SOP describes the procedure to be followed when conducting fire drills to ensure that the building can be evacuated quickly and safely in the event of a genuine fire.

A3.2 Responsibility

The Fire Safety or Environmental Health and Safety (EHS) Manager has day-to-day responsibility for the prevention of fires and the management procedures related to fire safety.

Note: It is essential to designate a Fire Safety Manager or EHS Manager to oversee the activities described in this SOP.

A3.3 Associated materials and equipment

Stopwatch.

A3.4 Procedure

A3.4.1 Conducting test evacuations

Responsibility: Fire Safety or EHS Manager

- a. Evacuation procedures should be tested at least once, preferably twice, per year.
- b. A full evacuation of the entire building should be carried out at least once a year.
- c. Any deficiencies observed in the fire safety management procedures should be remedied and, if necessary, the written instructions should be amended.

- d. The Fire Safety Manager must identify the purpose of the test evacuation and explain it to the staff so that it can be assessed.
- e. The objectives of a test evacuation are to:
 - test management procedures;
 - provide practical training to staff;
 - establish whether training is satisfactory;
 - identify weaknesses in emergency communications procedures and systems;
 - identify positive and negative reactions of staff with designated responsibilities;
 - assess the reliability of equipment;
 - rehearse joint action with the fire and rescue service.
- f. Test evacuations should not be carried out at regular times; otherwise staff may become prepared for them.
- g. Each test evacuation should presume a different scenario so that different situations can be dealt with.
- h. Prior notice of test evacuations should only be given to those who have designated responsibilities for monitoring the test (e.g. personnel witnessing the exercise and reporting on the positive and negative aspects) so that they are as realistic as possible. People undertaking this monitoring task should not be otherwise involved in the evacuation (e.g. should not be given fire marshal duties).
- i. Continuous monitoring of the evacuation is essential, by video recording if possible, to allow a detailed comparison between planned and actual actions and to assist with training.
- j. Where possible test evacuations should include the procedures for evacuating disabled people.
- k. Fire safety systems should be employed as part of a test evacuation to check whether such systems are creating unforeseen difficulties and whether software-controlled procedures (i.e. those used to switch on fans, open vents, release doors and sound alarms) are operating as intended.
- l. Carry out a full debrief at the end of the exercise so that lessons can be learned and changes made to the evacuation procedures if necessary.
- m. Document findings and corrective/preventive actions if applicable.

A3.5 **Related document**

- BS 9999: 2008. Code of practice for fire safety in the design, management and use of buildings.

Note: The document above relates to standards and practices in the United Kingdom. Where other standards apply, adapt the reference accordingly.

Revision history

Date	Change summary	Reason for change	Approved

