

Code of practice for fire protection for electronic equipment installations

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Committees responsible for this British Standard

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- British Fire Protection Systems Association
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- BRE/LPC Laboratories
- Home Office
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Foreword

This British Standard has been prepared by Subcommittee FSH/12/4 and supersedes BS 6266:1992 which is withdrawn.

In this revision of this standard, the major changes are:

- a) an expanded section on risk assessment and its application to the design and protection of electronic equipment installations;
- b) widening of the scope to cover all electronic equipment, including PCs within an office environment;
- c) revised advice on the selection of fire protection and detection measures;
- d) additional advice on contingency and recovery planning.

Earlier versions of this standard focused largely on the data processing centre to be found at the heart of a modern industrial or commercial company. At that time, mainframe computers were still the nerve centre of many operations, with high value equipment and potentially significant business interruption implications if the systems were taken out of service for an extended period.

Since then, networked systems have become common, based around industry standard equipment that can be replaced easily in days or hours in some cases. However, centralized computer rooms and communications centres can still be found in many industrial and commercial operations, with similar hazards and risks to those found in their predecessors.

Most electronic equipment has an inherently low fire risk due to the way in which it is designed and operates. It is, however, inherently sensitive to thermal damage (i.e. direct consequences of fire) and non-thermal damage from smoke, corrosive fumes and liquids.

This British Standard is complementary to BS 7974 which gives a structured method for determining the most appropriate fire protection strategy for a building as a whole.

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

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 33 and a back cover.

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Introduction

A fire in an electronic installation can lead to extensive physical damage and serious interruption of operations and services. However, the occurrence of a major fire in an electronic installation is a rare event. This could be because a high degree of security is normally implemented, human activities within central processing equipment rooms are often limited, and smoking is usually prohibited. Also, if a minor fire does occur, the fire load that could contribute to its development is often minimal, linings are usually of low flammability, and very often there will be early detection and extinguishing of the fire, either of which might occur automatically (by fixed systems) or manually (by persons on the premises).

Provided there are persons on the premises, minor incidents that involve electronic equipment can often be dealt with simply by isolating the power to the unit in question. Any residual flaming can then be easily extinguished by use of a suitable portable extinguisher. These incidents can, however, lead to a fire if appropriate action is not taken, perhaps because the premises are unmanned and there is no suitable automatic fire detection system. Even in the absence of flaming combustion, smoke and fumes from overheated components and wiring can lead to damage of sensitive electronic equipment.

Modern electronic equipment constitutes a relatively low fire hazard, although peripheral components can give rise to problems of the type described previously. Accordingly, any fire protection strategy that is directed solely towards fires originating within the actual electronic equipment is deficient. Air-conditioning and power supply equipment, for example, constitute as great a risk as electronic equipment. Many fires affecting electronic equipment originate outside the confines of the electronic installation. In such cases, typical causes of fires include electrical faults, arson and smoking. This reinforces the importance of considering ignition sources other than those associated directly with electronic equipment.

The infrequent occurrence of serious fires in electronic installations does not obviate the need for high standards of fire prevention. The use of fire protection systems, for example sprinkler and fire detection installations, is not, in itself, sufficient to prevent loss from fire. In fact, the prevention of fire is more important since, in many electronic installations, a significant financial loss can result from even a small fire, regardless of whether such a fire is detected or extinguished within a short time of ignition. Accordingly, in this standard advice is given on matters, such as basic housekeeping and avoidance of ignition sources, which can reduce the probability of fire. Advice is also given on contingency planning for recovery after fire and, in particular, protection and duplication of data. It is, however, impossible to eliminate sources of fire entirely, and there is a need to consider the installation of active fire protection equipment. The extensive use of fire protection systems in electronic installations arises not from a high probability of fire, nor from a significant hazard to life, but from the consequences of fire loss.

In practice, a wide variation of dependence on electronic equipment is found. At one extreme, a batch processing operation might be completely duplicated at a second location, so that there is complete redundancy. In this case, a major fire at either location would not cause measurable interruption to the operation. The fire protection strategy for electronic equipment fires could then be related entirely to the physical damage to the equipment and its surroundings and the associated financial cost.

At the other extreme, a “real-time” facility might be absolutely critical to the revenue-earning capacity of an organization, e.g. it might control a major manufacturing process or provide financial dealing information. In such circumstances, even a few minutes downtime can result in significant interruption to users. It might be impractical to restore the service at another location in a short time-scale and so, for these reasons, a sophisticated fire protection system to prevent, detect and suppress fire might be warranted.

It is often necessary to consider the potential for business interruption separately from the potential for material damage. Since the former, in particular, can vary with time because of changes in dependence on electronic equipment or modifications to contingency plans for recovery, it is essential that the standard of protection is reviewed periodically to ensure that it remains appropriate to the exposure to loss.

1 Scope

This British Standard gives recommendations for the protection against fire of electronic equipment, including computers, mission critical servers, internet hosting centres, and systems for communications, design, manufacturing and distribution.

NOTE Guidance on the design of electronic equipment is given in BS EN 60950 and guidance on the design of the physical environment including the air-conditioning and lighting is given in BS 7083.

The standard is applicable to new installations; however the recommendations may be used with an existing installation and when alterations are made to an existing area housing electronic equipment.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

BS 476-4, *Fire tests on building materials and structures — Part 4: Non-combustibility test for materials.*

BS 476-6, *Fire tests on building materials and structures — Part 6: Method of test for fire propagation for products.*

BS 476-7, *Fire tests on building materials and structures — Part 7: Method of test to determine the classification of the surface spread of flame of products.*

BS 476-11, *Fire tests on building materials and structures — Part 11: Method for assessing the heat emission from building materials.*

BS 476-20, *Fire tests on building materials and structures — Part 20: Method for determination of the fire resistance of elements of construction (general principles).*

BS 476-21, *Fire tests on building materials and structures — Part 21: Method for determination of the fire resistance of loadbearing elements of construction.*

BS 476-22, *Fire tests on building materials and structures — Part 22: Method for determination of the fire resistance of non-loadbearing elements of construction.*

BS 5287, *Specification for assessment and labelling of textile floor coverings tested to BS 4790.*

BS 5306-2, *Fire extinguishing installations and equipment on premises — Part 2: Specification for sprinkler systems.*

BS 5306-4, *Fire extinguishing installations and equipment on premises — Part 4: Specification for carbon dioxide systems.*

BS 5306-6.2, *Fire extinguishing installations and equipment on premises — Part 6: Foam systems — Section 6.2: Specification for medium and high expansion foam systems.*

BS 5306-8:2000, *Fire extinguishing installations and equipment on premises — Part 8: Selection and installation of portable fire extinguishers — Code of practice.*

BS 5499-5, *Graphical symbols and signs — Safety signs, including fire safety signs — Part 5: Signs with specific safety meanings.*

BS 5588-9:1999, *Fire precautions in the design, construction and use of buildings — Part 9: Code of practice for ventilation and air conditioning ductwork.*

BS 5839-1:2002, *Fire detection and alarm systems for buildings — Part 1: Code of practice for system design, installation, commissioning and maintenance.*

BS 5852:1990, *Methods of test for assessment of the ignitability of upholstered seating by smouldering and flaming ignition sources.*

BS 5867-2:1980, *Specification for curtains and drapes — Part 2: Flammability requirements.*

BS 6387:1994, *Specification for performance requirements for cables required to maintain circuit integrity under fire conditions.*

BS 6651, *Code of practice for protection of structures against lightning.*

BS 7083, *Guide to the accommodation and operating environment for Information Technology (IT) equipment.*

BS 7176:1995, *Specification for resistance to ignition of upholstered furniture for non-domestic seating by testing composites*.

BS 7273-1, *Code of practice for the operation of fire protection measures — Part 1: Electrical actuation of gaseous total flooding extinguishing systems*.

BS 7671, *Requirements for electrical installations — IEE Wiring Regulations. Sixteenth edition*.

BS EN 3 (all parts), *Portable fire extinguishers*.

BS EN 54-7, *Fire detection and fire alarm systems — Part 7: Smoke detectors — Point detectors using scattered light, transmitted light or ionization*.

BS EN 1047 (all parts), *Secure storage units — Classification and methods of test for resistance to fire*.

BS ISO 14520 (all parts), *Gaseous fire-extinguishing systems — Physical properties and system design*.

EN 54-12, *Fire detection and alarm systems — Part 12: Smoke detectors — Line detectors using an optical light beam*.

Code of Practice for Category 1 Aspirating Detection Systems. Kingston upon Thames: British Fire Protection Systems Association.¹⁾

3 Terms and definitions

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

3.1

aspirating detection system

automatic fire detection system in which a sample of the atmosphere in the protected space is drawn by a fan or pump into a fire detector that can be remote from the protected space

3.2

class 0 material

material that when tested in accordance with BS 476-7 is classified as class 1, and which when tested in accordance with BS 476-6 has a fire propagation index I of not more than 12, and a subindex i_1 of not more than 6

3.3

coincidence connection

facility designed so that an output is obtained only when at least two independent inputs are present at the same time

NOTE For example, an output suitable for triggering a fire suppression system is obtained only after a detector has detected a fire, and at least one other independent detector covering the same protected space has confirmed the existence of the fire.

3.4

electronic equipment area

room, or rooms, which contains the machinery and electronic equipment requiring protection from fire

3.5

equipment protection

provision of a fire detection and/or suppression system to an individual item of electronic equipment

3.6

fire load

quantity of heat that would be released by the complete combustion of all the combustible materials in a volume of a room or area, including the facings of all bounding surfaces

3.7

fire resistance

ability of an item to fulfil for a stated period of time the required stability and/or integrity and/or thermal insulation and/or other expected duty specified in a standard fire resistance test

NOTE BS 476, BS EN 1364, BS EN 1365 and BS EN 1366 give guidance on fire resistance.

¹⁾ Available from BFPSA, Neville House, 55 Eden Street, Kingston upon Thames, Surrey KT1 1BW (Tel: 020 8549 5855, Fax: 020 8547 1564).

3.8

fire risk

product of the following parameters:

- probability of the occurrence of a fire, to be expected in a given technical operation or state; and
- consequence or extent of damage to be expected following the occurrence of the fire

3.9

fire stop

seal provided to close an imperfection of fit between elements and components of construction in a building, or any joint, so as to restrict penetration of smoke and flame through that imperfection or joint

3.10

material of limited combustibility

material which is either:

- a) of a density of at least 300 kg/m^3 which, when tested in accordance with BS 476-11, does not flame, and the rise in temperature on the furnace thermocouple is not more than 20°C ; or
- b) comprised of a non-combustible core of at least 8 mm thick, having combustible facings (on one or both sides) which are not more than 0.5 mm thick

3.11

non-combustible material

material that conforms to BS 476-4, or which, when tested in accordance with BS 476-11, does not flame or cause any rise in temperature on either the centre (specimen) or furnace thermocouples

3.12

pre-alarm warning

early warning of conditions that might (or might not) represent a fire

3.13

protected space

area or volume protected by a fire detection and/or suppression system

3.14

room protection

provision of a fire detection and/or suppression system within a room, floor void or ceiling void

3.15

staged fire alarm system

alarm system in which two or more stages of alarm are given within a specific area

3.16

stakeholders

parties with a direct or indirect interest in the life cycle of an electronic equipment area

NOTE The interest may be:

- financial, e.g. owner or insurance company;
- as a customer (internal or external);
- as an authority having jurisdiction, e.g. building control officer, fire authority;
- in a professional capacity as an adviser to one of the parties, e.g. architect, fire engineer, building service engineer; or
- in a contractual capacity, e.g. a manufacturer, installer or maintainer of equipment.

3.17

total flooding

discharge of an extinguishing agent into an enclosed volume in order to achieve a uniform concentration of the agent within that volume sufficient to extinguish a fire

4 Risk assessment

4.1 General

A risk assessment should be undertaken prior to the specification for the electronic equipment installation, the building and environment in which the equipment will be sited, and the design of fire protection systems. Furthermore, there should be an on-going process of re-assessment as changes and modifications are made to the equipment, its environment, its use and disaster recovery plans.

The risk assessment should be carried out by a competent person or team possessing the following skills:

- a) experience and knowledge of risks associated with the equipment, including both direct and indirect (consequential) costs associated with loss or damage;
- b) an understanding of fire safety engineering principles and techniques, and of how fires can be initiated and spread, and how they can affect electronic equipment, and the effects of those incidents.

Risk is a function of the probability and consequences of a fire.

4.2 Probability of a fire occurring

Fires originating within electronic equipment are rare. The overall probability of fire in an electronic equipment area is more often determined by the presence of other sources of ignition and the availability of combustible materials. Factors to consider are as follows:

- a) supporting electrical equipment and installations, e.g. power supplies, control equipment and switchgear;
- b) air handling equipment;
- c) hot works/maintenance;
- d) deliberate ignition;
- e) smoking;
- f) poor housekeeping;
- g) fire from adjacent areas or premises.

4.3 Consequences of a fire occurring

The consequences of a fire on electronic equipment vary widely. These consequences can include physical injury to personnel, damage to equipment or property, or interruption to operations, resulting in financial loss. When considering fire hazards, the harm to electronic equipment can be summarized as follows.

- a) Damage to materials and/or equipment where the fire originates, for example a component that fails and overheats.
- b) Damage to adjacent materials, components and equipment:
 - thermal, for example direct involvement in fire, and affected by radiant and convective heat;
 - non-thermal, for example damage caused by smoke and products of combustion such as hydrochloric acid vapours from burning PVC.

4.4 Factors affecting risk assessment

When assessing the vulnerability of electronic equipment installations to loss or damage from fire, the following factors should be taken into account:

- tolerance to system downtime;
- equipment redundancy;
- replacement availability;
- specific environmental operational requirements;
- business continuity plans.

4.5 Risk assessment categories

4.5.1 The criticality of most electronic equipment areas can be categorized subjectively, based on factors listed in 4.4. The categories are:

- A — Slight
- B — Low
- C — Moderate
- D — High
- E — Critical

4.5.2 The categories of risk as identified in 4.5.1 should be used to determine the type and level of fire prevention and protection deemed appropriate. Formal and extensive risk assessment methodologies are also available and might be more suitable for Category D and Category E installations. In order to choose a category the criteria given in 4.5.2.1, 4.5.2.2, 4.5.2.3, 4.5.2.4 and 4.5.2.5 should be used.

4.5.2.1 Category A: Slight

Typical features are as follows:

- a) modern small office environment;
- b) personal computers — not networked;
- c) equipment is standard and easily replaceable;
- d) operations can be transferable to another location without great difficulty;
- e) critical files can be backed up periodically, for example on floppy/zip disks or CDR;
- f) potential for business interruption is slight.

Examples of Category A electronic equipment installations are: typical small electronic office; CAD office; small business telephone PABX (Private Automatic Branch Exchange).

4.5.2.2 Category B: Low

Typical features are as follows:

- a) modern commercial/industrial environment;
- b) personal computers — networked;
- c) equipment is standard and easily replaceable;
- d) operations can be transferable to another location with some difficulty;
- e) files can be backed up periodically on central server;
- f) loss can affect a number of PCs or central storage facility;
- g) potential for business interruption is low.

Examples of Category B electronic equipment installations are: typical small/medium business — critical files can be backed up periodically on central server; commercial departments; central CAD/CAM operation; operator area of Call Centre.

4.5.2.3 Category C: Moderate

Typical features are as follows:

- a) dedicated equipment room;
- b) centralized server/computer facility;
- c) equipment is standard but not immediately replaceable;
- d) operations can be transferable to another location with some difficulty;
- e) files can be backed up periodically on central server;
- f) loss affects short-term business operations.

Examples of Category C electronic equipment installations are: dedicated support systems for Category B operation; Call Centre communication facilities, where alternative Call Centre operations exist.

4.5.2.4 *Category D: High*

Typical features are as follows:

- a) dedicated equipment room(s);
- b) centralized server/computer facility;
- c) equipment can be non-standard and not replaceable in the short term;
- d) operations not easily transferable without robust contingency plans;
- e) files can be backed up periodically on central server;
- f) loss affects medium-term business operations.

Examples of Category D electronic equipment installations are: main IT facility; major telecommunication facility; production control computers.

4.5.2.5 *Category E: Critical*

Typical features are as follows:

- a) dedicated premises;
- b) centralized server/computer facilities;
- c) equipment is high value or purpose built and not replaceable;
- d) operations are not easily transferable without extensive and regularly tested contingency plans;
- e) data is backed up on a continual basis on central server(s) and/or remotely;
- f) no or negligible downtime tolerable.

Examples of Category E electronic equipment installations are: financial dealing computer operations; internet hosting centres; air traffic control facilities; nuclear and chemical plant control facilities.

5 Location and construction of dedicated electronic equipment areas

5.1 Sites and buildings

Space separation should be provided between buildings housing electronic equipment and potential fire risks from nearby buildings or outdoor fires in vegetation or storage. Where practicable, vehicles should not be parked in close proximity to the building.

Electronic equipment should not be sited where fire-fighting could be impeded or where there is a risk of flooding from fire-fighting operations.

Consideration should be given to the provision of lightning protection using the risk assessment methodology outlined in BS 6651. Where required, protection from lightning should be provided in accordance with BS 6651.

5.2 Fire separation of electronic equipment areas

5.2.1 Electronic equipment should be separated from other operations, such as offices, storage, or other unrelated processes. This separation should include separation from ancillary accommodation within the area (see **5.6.2**). Separation should be achieved by enclosing the electronic equipment area using fire-resisting construction that has a fire resistance appropriate for the fire load in the adjacent area.

The construction for Category C installations should have a fire resistance of not less than 30 min when tested in accordance with BS 476-20, BS 476-21 and BS 476-22.

When tested in accordance with BS 476-20, BS 476-21 and BS 476-22, the construction for Category D and Category E installations should have a fire resistance of not less than:

- a) 60 min when the remainder of the building has a low fire load, for example offices or factories involved in processes involving wet or non-combustible materials;
- b) 120 min when the remainder of the building has a medium fire load, as found in many factories;
- c) 240 min when the remainder of the building has a high fire load, for example warehouses.

Alternatively, the appropriate fire resistance can be calculated by using fire engineering techniques as described in BS 7974.

5.2.2 Where automatic sprinklers or other automatic fire extinguishing or suppression systems are installed in the adjacent area, the fire resistance of the enclosure may be reduced by 50 %, subject to a minimum of 30 min, i.e. 60 min reduces to 30 min.

5.2.3 Fire-resisting walls and partitions separating the electronic equipment area should be constructed from the structural floor to the soffit of a structural floor or roof above.

NOTE If an area is protected by a gaseous extinguishing system, it is important that walls enclosing the area are constructed from structural floor to ceiling in order to maintain room integrity.

5.2.4 Fire-resisting walls, including any glazing therein, should be fire resistant in terms of both integrity and insulation. Integrity only glazing should be used only when it is clear that radiation through the glazing in the event of an external fire is unlikely to be a hazard, i.e. where there is no electronic equipment or other combustibles in close proximity to the glazing.

NOTE PD 6512-3 gives advice and information on the fire performance of glazed elements in buildings.

5.2.5 Ventilation ductwork or service ducts serving other parts of the building should not pass through an electronic equipment area. If it is not possible to avoid this, the ductwork should be enclosed within a fire-resisting construction in accordance with the methods given in BS 5588-9:1999.

5.2.6 Construction enclosing electronic equipment areas should have the minimum number of openings to other parts of the building, particularly where the construction provides separation from an occupancy of high fire load, for example a storage area. Any openings should be fitted with fire- and smoke-resisting doors, shutters or hatches with the same fire resistance as the structure in which they are fitted.

Where fire-resisting shutters or fire doors are normally controlled by an electromagnetic release mechanism, these should be released on the raising of an alarm within the electronic equipment area and/or an adjacent area. A smoke detector should be sited on the ceiling on each side of the wall opening to trigger the release mechanism.

5.3 Construction materials and linings

Linings to walls, partitions, soffits, ceilings and voids should be made of materials which are of limited combustibility.

5.4 Raised floors within an electronic equipment area

Where raised floors within an electronic equipment area are constructed of combustible materials, the floor should be faced on the underside with non-combustible material.

Where modular raised floors are installed, appropriate lifters should be provided that are easy to locate and readily accessible.

5.5 Suspended ceilings within an electronic equipment area

Suspended ceilings within an electronic equipment area should be made of materials that are of limited combustibility. They should not give rise to the production of decomposition particles, nor of corrosive or toxic fumes, in the event of a fire.

Non-combustible mineral fibre or glass fibre filling inserted above ceiling tiles (e.g. for acoustic or air balancing reasons) should either be sealed in non-combustible bags or chosen with minimum fire propagating properties.

In the exceptional case of a suspended ceiling being classed as the fire-protecting type, i.e. designed to give fire protection to the structure above, the ceiling should be installed in accordance with the manufacturer's instructions; it should not include potential points of weakness, for example recessed plastics light fittings, which were not present in the construction intended by the manufacturer.

5.6 Walls and partitions within an electronic equipment area

5.6.1 Due to the high property value and potential for interruption to operations, additional subdivision of electronic equipment areas can be beneficial. In particular, suitably designed lightweight partitions can limit the spread of smoke during the early stages of a fire, so reducing the extent of damage both in terms of the area affected and the severity of damage to equipment. It is essential that partitions are installed from floor to soffit and all penetrations sealed in order to form effective smoke barriers.

NOTE If an area is protected by a gaseous extinguishing system, it is important that the protected space extends from structural floor to ceiling in order to maintain room integrity.