NSAI Standards

Irish Standard
I.S. 3218:2013+A1:2019

Fire detection and alarm systems for buildings - System design, installation, commissioning, servicing and maintenance & Amendment 1:2019

I.S. 3218:2013+A1:2019

Relationship with other documents and/or
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I.S. xxx: Irish Standard – national specification based on the consensus of an expert panel and subject to public consultation.

S.R. xxx: Standard Recommendation - recommendation based on the consensus of an expert panel and subject to public consultation.

SWiFT xxx: A rapidly developed recommendatory document based on the consensus of the participants of an NSAI workshop.

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Údarás um Chaighdeáin Náisiúnta na hÉireann

DECLARATION

OF

SPECIFICATION

ENTITLED

FIRE DETECTION AND ALARM SYSTEMS FOR BUILDINGS –

SYSTEM DESIGN, INSTALLATION, COMMISSIONING, SERVICING

AND MAINTENANCE

AS

THE IRISH STANDARD SPECIFICATION FOR

FIRE DETECTION AND ALARM SYSTEMS FOR BUILDINGS –

SYSTEM DESIGN, INSTALLATION, COMMISSIONING, SERVICING

AND MAINTENANCE

_____

NSAI in exercise of the power conferred by section 16 (3) of the National Standards Authority of Ireland Act, 1996 (No. 28 of 1996) and with the consent of the Minister for Business, Enterprise and Innovation, hereby declare as follows:

1. This instrument may be cited as the Standard Specification (Fire detection and alarm systems for buildings – System design, installation, commissioning, servicing and maintenance and Amendment 1:2019) Declaration, 2019.

2. (1) The Specification set forth in the Schedule to this declaration is hereby declared to be the standard specification for Fire detection and alarm systems for buildings – System design, installation, commissioning, servicing and maintenance and Amendment 1:2019.

(2) The said Standard Specification may be cited as Irish Standard 3218:2013+A1:2019 or as I.S. 3218:2013+A1:2019.

3. (1) The Standard Specification (Fire detection and alarm systems for buildings – System design, installation, servicing and maintenance) Declaration 2013 is hereby revoked.

(2) Reference in any other standard specification to the Instrument hereby revoked and to Irish Standard 3218:2013 thereby prescribed, shall be construed, respectively, as references to this Instrument and to Irish Standard 3218:2013+A1:2019.

Foreword

The aim of this Standard is to promote wider understanding of the different types of fire detection and alarm systems and modes of operation which may be employed. It also aims to encourage uniformity of application, based on providing enhanced safety to persons in the event of an outbreak of fire and having due regard to the hazard level and degree of familiarity and alertness of occupants within particular buildings.

Fire detection and alarm systems are an integral part of the overall protection of the building. The contents of this Standard should therefore be considered by all disciplines involved in the design process.

[A1] Amendments are indicated by the TAG [A1] [A1] [A1]

[A1] This Standard is an amendment to I.S. 3218:2013. It [A1] has been prepared with the assistance of the National Standards Authority of Ireland Fire Safety Standards Committee (FSSC), representation on which includes the Chief Fire Officers Association (CFOA), Engineers Ireland (EI), the Irish Insurance Federation (IIF), major users represented by the Office of Public Works (OPW), the Health Services Executive (HSE), the Institution of Fire Engineers (IFE), the Irish fire industry represented by the Fire Engineering Systems Association (FESA) and the Fire Industry Association of Ireland (FIAI) and Fire Alarm Manufacturers.

[A1] A number of revisions have been made with the main changes in Clause 9. This Standard includes a number of minor editorial corrections which are not detailed in this document. [A1]

Compliance with an Irish Standard does not of itself confer immunity from legal obligations. Special risks or hazards should be identified in the initial risk assessment and any specific standards applying to these should be agreed amongst the parties.

When it has been determined that a fire detection and alarm system is required, then in the absence of any other regulatory requirement, this standard is suitable.

It is expected that users of this Standard are competent, and should have sufficient training, experience and knowledge appropriate to the nature of the work to be undertaken (see definition, **competent person**).

Such persons should be able to demonstrate their competence to the satisfaction of the Client/User, and are advised to consider third party Certification, which may be coupled with assessment of a quality system such as one in accordance with I.S. EN ISO 9001.

There are a number of Annexes to this Standard. These Annexes are referred to as either Normative or Informative Annexes. Normative Annexes are mandatory for compliance with this Standard whereas Informative Annexes are for information only.

IMPORTANT — For transition arrangements from I.S. 3218:1989 & I.S. 3218:2009 to I.S. 3218:2013[A1] +A1:2019 [A1], see Clause 4.

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Fire Detection and Alarm Systems for Buildings - System Design, Installation, Commissioning, Servicing and Maintenance

1 Scope

This Standard provides requirements and recommendations for the planning, design, installation, commissioning, servicing and maintenance of fire detection and alarm systems in premises including those used for residential/domestic purposes. The Standard does not recommend whether or not a fire alarm system should be installed in any given building (see Building Regulations, Technical Guidance Document B). When it has been determined that a Fire Detection and Alarm System (FDAS) is required, this standard is suitable.

The systems covered in this Standard are referred to as Fire Detection and Alarm Systems (FDAS). The Standard covers systems ranging from simple installations with one or two manual call points, up to complex installations with automatic detectors, manual call points, control and indicating equipment, and communication with the public fire service, etc. It also covers the provision of signals to initiate, in the event of a fire, the operation of ancillary services (see 6.16) and other precautions and actions.

The required service, maintenance and repair of ancillary services are not covered in this Standard.

Consultation with the appropriate Fire Authority is advised before undertaking the design or installation.

This Standard does not cover systems combining fire alarm functions with other non-fire related functions, although some guidance on such integrated systems is given in Annex G.

This Standard does not cover systems whose primary function is to extinguish or control the fire, such as sprinkler or automatic extinguishing systems, even though they might have a secondary alarm function. It does, however, cover the use of a signal from an automatic extinguishing system as one initiating element of a fire alarm system.

Recommendations for fire protection for electronic equipment installations are given in BS 6266.

2 Normative references

This Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references subsequent amendments to or revisions of any of these publications apply to this Irish Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

I.S. 3217 [A1] ⟨A1⟩, Emergency Lighting

I.S. EN 54-2:1999/A1:2006, Fire detection and Fire Alarm Systems – Part 2: Control and Indicating Equipment

I.S. EN 54-4, Fire Detection and Fire Alarm Systems – Part 4: Power Supply Equipment

I.S. EN 54-5 [A1] ⟨A1⟩, Fire detection and Fire Alarm Systems – Part 5: Heat Detectors – Point Detectors

I.S. EN 54-7 [A1] ⟨A1⟩, Fire detection and Fire Alarm Systems – Part 7: Smoke Detectors – Point Detectors using scattered light, transmitted light or ionization

I.S. EN 54-10, Fire Detection and Fire Alarm Systems – Part 10: Flame Detectors – Point Detectors

I.S. EN 54-11:2001/A1:2006, Fire detection and Fire Alarm Systems – Part 11: Manual Call Points

I.S. EN 54-12 [A1] [A1], Fire detection and Fire Alarm Systems – Part 12: Smoke Detectors – Line Detectors using an Optical Light Beam

I.S. EN 54-13 [A1] [A1], Fire detection and Fire Alarm Systems – Part 13: Compatibility Assessment of System Components

I.S. EN 54-20:2006, Fire detection and Fire Alarm Systems – Part 20: Aspirating Smoke Detectors

I.S. EN 54-23, Fire detection and Fire Alarm Systems - Part 23: Fire alarm devices - Visual alarm devices

I.S. EN 54-25:2008, Fire detection and Fire Alarm Systems - Part 25: Components using Radio Links

I.S. EN 50200 [A1] [A1],, Method of test for resistance to fire of unprotected small cables for use in Emergency Circuits

I.S. EN 50272-1, Safety requirements for secondary batteries and battery installations - Part 1: General safety information

I.S. EN 60849:1999, Sound Systems for Emergency Systems

I.S. EN 61672 [A1] [A1], Electroacoustics – Sound Lever Meters – Part 1: Specifications

BS 5839-6:2004Fire Detection and Fire Alarm Systems for buildings - Part 6: Code of Practice for the Design, Installation and Maintenance of Fire Detection and Fire Alarm Systems in [A1] domestic premises [A1]

[A1] [A1]

CISPR 14-1, Electromagnetic Compatibility-Requirements for Household Appliance, Electric Tools, and Similar Apparatus - Part 1: Emissions

CISPR 14-2, Electromagnetic Compatibility-Requirements for Household Appliances, Electric Tools, and Similar Apparatus - Part 2: Immunity - Product Family Standard

ET 101, National Rules for Electrical Installations

[A1] NOTE This Standard is currently being developed under NSAI as I.S. 10101. [A1]

[A1] I.S. EN IEC 60079-0, Explosive atmospheres - Part 0: Equipment - General requirements [A1]

3 Terms and definitions

For the purposes of this Standard the following definitions apply:

acceptance
decision that the installed system meets the requirements of a previously agreed specification

addressable system
system in which signals from detectors, manual call points, or any other devices are individually identified at the control and indicating equipment [A1⟩ by providing an English text description of the location of origin ⟨A1]

alarm device
electrical, electronic, mechanical or tactile apparatus connected to a fire detection and alarm system that will generate a signal to alert occupants of a system event by means of production of sound, production of visual indication, tactile vibration or any combination of the above

alarm load
maximum power (normally electrical) that might be required under the fire condition

Alarm Receiving Centre (ARC)
continuously manned premises, remote from those in which the fire alarm system is fitted, where the information concerning the state of the fire alarm system is displayed and/or recorded, so that the fire service and other planned response can be summoned

Note 1 to entry: In the previous edition of this Standard, alarm receiving centres were called remote manned centres. The term "central station" is sometimes used as a synonym for alarm receiving centre. The term "alarm receiving centre" is often replaced by the acronym ARC.

alarm zone
structural sub-division of the protected premises, in which the fire alarm warning can be given separately, and independently, of a fire alarm warning in any other alarm zone (may be different to **detection zone**)

ancillary equipment
equipment which can initiate or be initiated by the fire detection and alarm system

apartment
see **flat**

approval
confirmation by a competent person or body of the appropriateness of the applied solution

approval body
body accepted by an authority having jurisdiction or other competent organisation as having the expertise necessary to assess the compliance of the installed system with this Standard

area
any room, corridor, space, duct or void within a building

aspirating smoke detector (ASD)
smoke detector consisting of one or more smoke sensing elements, an aspirator, one or more flow sensors and necessary controls/electronics, typically housed in a single enclosure, forming the main part of an ASD system but excluding the sampling device

a) ASD system:

smoke detection system, in which air and aerosols are drawn through a sampling device and carried to one or more smoke sensing elements by an integral aspirator (e.g. fan or pump)

b) sampling device:

component or series of components or dedicated device (e.g. a single sampling pipe, network of sampling pipes, dedicated duct probe or hood) which transfers samples of air to the ASD

audibility
property of a sound which allows it to be heard among other sounds

Note 1 to entry: Audibility depends upon the relative loudness and frequency content of the sound in comparison with other sound which are present at the same time.

authorised person
person who is competent, for the particular purpose of this Standard, in relation to which the expression is used and who is also either the occupier, or a contractor who is for the time being under contract with the occupier, or a person employed, appointed or selected by the occupier or such contractor, to carry out work or duties in relation to the FDAS

authority having jurisdiction
body having powers provided under local, regional, national or European legislation

automatic fire detection and fire alarm systems
system (other than a single self contained smoke or fire alarm) in which an alarm of fire can be initiated automatically

Note 1 to entry: Automatic fire detection and fire alarm systems may be classified as follows:

a) **two-state fire detection systems:** fire detection and alarm systems that are capable of indicating only two output states, namely the "normal" or "fire" conditions.

b) **intelligent/analogue fire detection systems**: automatic fire detection and alarm systems in which a signal representing the value of the sensed phenomenon is processed (whether within the detector or at the control and indicating equipment) with a view to enabling more than two output states to be given, representing normal, fire and at least one other abnormal condition. The processing may take the form of application of fixed thresholds to the value of the sensed phenomenon, or more complex analysis of the various parameters of the signal, such as measurement of rate of rise, shape of curve, or area under the curve. The purpose of the analysis is normally identification (but not necessarily display to the user) of conditions that are not representative of fire, but that can result in a false alarm from a two-state fire detection system. In most intelligent/analogue fire detection systems, the value of the sensed phenomenon may also be made available to an authorized person, such as a service technician.

Note 2 to entry: There are systems with more than two-states and these are referred to as multi-state systems.

battery
source of standby power from a collection of cells

beam detector
more commonly used term for a 'line smoke detector using an optical beam'

car-park
buildings or parts of buildings used as parking for cars and vehicles and including car/vehicle-parking areas, circulation areas, corridors, stairs and ancillary areas

car-parking area
designated open plan floor area on which vehicles are parked including driveways and open walkways

building
any class or classes of structure or erection (whether temporary or permanent) or part of such structure or erection of any kind of material (see also **premises**)

CIE
see **control and indicating equipment (CIE)**

circuit
assembly of fire alarm components supplied from the same control equipment and protected against overcurrent by the same protective device(s) or current limitation arrangements

circulation area
area (including a stairway) used mainly as a means of access between a room and an exit from the building or compartment

combustion gas detector
automatic fire detector sensitive to gaseous products of combustion and/or thermal decomposition

commissioning
process by which it is verified that the installed system meets the defined requirements

commissioning engineer
person who carries out the process of commissioning

commissioning provider
organisation or person responsible for the process of commissioning

competent person
person having regard to the task he or she is required to perform and taking account of the size or hazards (or both of them) of the undertaking or establishment in which he or she undertakes work, possessing sufficient training, experience and knowledge appropriate to the nature of the work to be undertaken

Note 1 to entry: For the purposes of the above account should be taken, as appropriate, of the framework of qualifications referred to in the Qualifications (Education and Training) Act 1999.

component
device performing a function for the protection of life and/or property that is required by European or national guidelines or regulations

control and indicating equipment (CIE)
component or components of a fire detection and alarm system through which other components may be supplied with power and which:

a) are used to:

1) receive signals from the connected detectors, manual call points, or any other devices (e.g. input/output units),

2) determine whether these signals correspond to a fire alarm condition,

3) indicate any such fire alarm condition audibly and visually,

4) indicate the location of the danger,

5) interface with other ancillary devices or services,

6) possibly record any of this information.

b) are used to monitor the correct functioning of the system and give audible and visual warning of any faults (e.g. short circuit, open circuit or fault in the power supply),

c) if required, are able to pass on the fire alarm signal:

1) to audible and/or visual fire alarm devices,

2) through suitable transmission equipment to an alarm receiving centre,

3) through further control equipment to an automatic fire extinguishing system

critical signal path
all components and interconnections between every fire alarm initiation point (manual call point, automatic fire detector or input devices) and the input terminals on, or within, each fire alarm device and/or ancillary interface

designer
person or organisation taking responsibility for the work outlined in Clause 6

detection zone
subdivision of the protected premises such that the occurrence or a fire within it will be indicated by a fire alarm system separately from an indication of fire in any other subdivision (may be different to **alarm zone**)

Note 1 to entry: A detection zone will usually consist of an area protected by several manual call points and/or detectors and is separately indicated to assist in location of the fire, evacuation of the building and fire-fighting.

detector
part of an automatic fire detection system that contains at least one sensor which constantly or at frequent intervals monitors at least one suitable physical and/or chemical phenomenon associated with fire, and that provides at least one corresponding signal to the control and indicating equipment.

Note 1 to entry: Detectors may be classified by the form of their output:

— Intelligent/Analogue detector: A detector which gives an output signal representing the value of the sensed phenomenon. This may be a truly analogue signal or a digitally coded equivalent of the sensed value. This detector does not itself make a decision of fire,

— Multi-state detector: A detector which gives one of a limited number (greater than two) of output states relating to 'normal' or 'fire alarm' and other abnormal conditions,

— Two-state detector: A detector which gives one of two output states relating to either 'normal' or 'fire alarm' conditions.

display
visual indication of a condition or status

duct
tube or conduit, passage way or continuous space in a building or machine for air, cables or other services

dwelling
single family dwelling house, self-contained flat or maisonette

escape route
route by which a person may reach a place of safety, and in relation to any point in a building a route from that point to a place of safety

exit
way out which is intended to be used at any time to ensure the safe dispersal of persons from the building

emergency supply
electricity supply which is intended to be available in the event of a failure of the normal supply. This supply is primarily intended to ensure the safety of persons, within and around the premises

false alarm
fire signal resulting from a cause(s) other than fire

fault
failure within the system in such a way as to jeopardise the correct functioning of the system

fault signal
signal intended to indicate the occurrence of a fault

fault warning
fault signal perceptible to a person

final voltage of a battery
voltage at which the cell manufacturer considers the cells to be fully discharged at the specified discharge current

final exit
termination of an escape route from a building giving direct access to a street passageway, walkway or open space, and sited to ensure rapid safe dispersal of persons from the vicinity of a building so that they are no longer in danger from fire or smoke

fire
pyrolysis or combustion needing investigation and/or corrective action in order to prevent danger to life or property

fire alarm signal
visual, audible or tactile indication of fire

fire alarm device
component of a fire alarm system, not incorporated in the control and indicating equipment, which is used to give a warning of fire e.g. sounder or visual indicator

fire alarm response strategy
pre-planned procedures which are expected to be followed when a fire alarm occurs

fire alarm sounder
sound generating device intended to signal an audible warning of fire between a fire detection and fire alarm system and the occupants of the building, without the use of a voice signal

fire compartment
building or part of a building, comprising one or more rooms, spaces or storeys, constructed to prevent the spread of fire to or from another part of the same building or adjoining building: a roof space above the top storey of a compartment is included in that compartment

fire hazard level
likelihood of fire occurring

fire resisting construction
construction that is able to satisfy for a stated period of time the appropriate criteria given in building codes (see Technical Guidance Document B) and relevant standards

fire risk
combination of the probability of fire occurring and the magnitude of the consequences of fire

fire safety strategy
coherent and purposeful arrangement of fire protection and fire prevention measures which is developed in order to attain specified fire safety objectives

fire signal
signal intended to indicate the occurrence of a fire

fixed temperature heat detector
automatic fire detector which activates at a pre-set temperature.

Note 1 to entry: Now referred to in I.S. EN 54 as a 'static heat detector'

flame detector
automatic fire detector which responds to the radiation emitted by the flames from a fire

flat
separate and self-contained premises constructed or adapted for residential use and forming part of a building from some other part of which it is divided horizontally or vertically

heat detector
automatic fire detector which responds to an increase in temperature

hierarchical system
networked system in which one control and indicating equipment is designed as the main control and indicating equipment, and in which the main control and indicating equipment is able to:

a) receive signals from and/or transmit signals to subsidiary control and indicating equipment,

b) indicate the status on the subsidiary control and indicating equipment

inspection
routine processes by which the system, its functioning and its indications are manually checked at pre-determined intervals

installation
work of fixing and interconnecting the components and elements of a system

installed system
system after installation and commissioning has been completed

installer
person or organisation having responsibility for all or part of the process of installation

integrated system
system in which the fire detection and alarm functions are integrated with other non-fire functions

intelligent system
software or firmware-controlled fire detection and alarm system in which decision algorithms have been installed to allow appropriate selection of responses to various defined inputs

lantern-light
construction standing above the surface of a roof and intended to admit light to the space below

line detector
fire detector in the form of a continuous detection medium (e.g. cable or fibre optic) which is capable of sensing fire anywhere along its length, and which indicates an overheat or alarm condition

logbook
part of the building fire safety documentation where all events relating to the fire alarm system are recorded

low fire risk area or room
area or room containing little or no combustible material and no ignition sources, in which any foreseeable fire is unlikely to spread such as to present any significant threat to escape by occupants or damage to property

maintenance
work on and repairs necessary in order to maintain the efficient operation of the installed system

maisonette
dwelling, forming part of a larger building which includes rooms at 2 or more levels that are more than half a storey height apart

manual call point
component of a fire detection and alarm system which is used for the manual initiation of an alarm

manual system
system containing no automatic detectors and in which an alarm of fire may only be initiated manually

maximum alarm load
maximum load imposed on a fire alarm system power supply under fire conditions, comprising the power required for simultaneous operation of all fire alarm devices, fire signals from all automatic fire detectors and manual call points in the building, any power drawn by other systems and equipment in the alarm condition and any power required for transmission of fire signals to an alarm receiving centre (if a facility for this is provided)

mimic diagram
diagrammatic representation of the protected building(s), carrying active indications which are directly related to the protected building(s) layout

minimum static response temperature
minimum temperature at which a heat detector would produce a fire alarm signal if subjected to a very small rate of rise of temperature

mixed user building
premises in multiple occupancy in which two or more classes of occupancy (purpose groups) exist

Note 1 to entry: Classes of occupancy are taken from TGD B "classification of buildings by purpose group".

monitored wiring
wiring in which a failure, whether to open circuit or to short circuit, will result in a fault warning and not an alarm of fire

multiple occupancy
building in which two or more classes of occupancy (purpose group) exist, i.e. a premises in which control of various parts of the premises lies with several different occupants and/or external parties

multi-sensor fire detector
fire detector that monitors more than one physical and/or chemical phenomenon associated with fire

networked system
fire detection and fire alarm system in which more than one CIE are interconnected and able to exchange information

normal supply
supply from which the fire alarm system is expected to obtain its power under normal conditions

phased evacuation
system of evacuation in which different parts of the premises are evacuated in a controlled sequence of phases, those parts of the premises expected to be at greatest risk being evacuated first

Note 1 to entry: A phased evacuation will normally require at least a two-stage alarm system.

place of safety
place, normally in the open air at ground level, in which persons are in no danger from fire

point detector
detector which responds to a phenomenon sensed in the vicinity of a fixed point

pre-alarm warning
early warning of conditions which might (or might not) represent a fire

premises
any place, such as a building and the immediate lands bounded by any enclosure of it, any tent, moveable or temporary structure or any installation or workplace (see also **building**)

primary cells
cells that are not rechargeable

professional engineer
competent person who is a member of a Professional Body or Organisation which promotes and monitors skills-development in the design of FDAS systems, through certified training and Continuous Professional Development (CPD) programmes

protection
in the context of this Standard, protection can have several meanings, including the:

— presence of one or more detector(s) able to initiate actions needed for the safety of life or property in the event of a fire,

— provision of mechanical protection to prevent damage to system components from impact, abrasion, rodent attack, etc.,

— provision of fire resistance to prevent damage to system components from fire in their vicinity,

— provision of electrical protection to prevent temporary or permanent disruption to the system due to over voltage, excessive current, high transient or radio-frequency interference, etc.

protocol
software code or language which the loop field devices and CIE employ to communicate with each other

purchaser
person or organization taking primary responsibility for acceptance of and payment for the installed system

Note 1 to entry: Purchaser may delegate responsibility to a nominated third party.

quiescent condition
condition of the installed system when it is supplied by power from its normal supply, and has no indicated fire alarms, fault warnings or disablements

radio-linked system
fire alarm system in which some or all of the interconnections between components are made by radio-links

rate of rise detector
automatic fire detector which initiates an alarm when the rate of change of the measured phenomenon with time exceeds a certain value, for a sufficient time

Note 1 to entry: For each class in I.S. EN 54-5, there are two subclasses: R and S. So-called rate of rise detectors may be taken to correspond to R, and fixed temperature detectors to S.

repair
non-routine work necessary to restore the efficient operation of the installed system

repeat indicating panel (repeater panel)
panel which replicates all or some of the indications and/or controls of the control and indicating equipment

responsible person
person having control of the building and/or premises, whether as occupier or otherwise, or any person delegated by the person having control of the premises to be responsible for the fire alarm system and the fire procedures

refuge area
area that is enclosed with fire-resisting construction (other than any part that is an external wall of a building) and served directly by a safe route to a storey exit, evacuation lift or final exit, thus constituting a temporarily safe space for persons with disabilities to await assistance for their evacuation

Note 1 to entry: Refuges are relatively safe waiting areas for short periods. They are not areas where persons with disabilities should be left alone indefinitely until rescued by the fire brigade, or until the fire is extinguished. (This should not be confused with the use of refuges in progressive horizontal evacuation, e.g. in hospitals from which people may not need to escape but from where there is the potential for further escape should that become necessary).

search distance
distance which has to be travelled by a searcher from the point of entry to a Detection Zone in order to determine visually the position of a fire

secondary cells
cells which are electrically rechargeable

sector
subdivision of the protected premises normally containing several Detection Zones.

Note 1 to entry: A sector may cover more than one building

servicing
routine testing and reporting on the operation and performance of the components of the system and inspection of the protected area

short circuit isolators
device, which may be connected into a transmission path of a fire detection and fire alarm system, to limit the consequences of low parallel resistance faults between the lines of this transmission path

Note 1 to entry: A short circuit isolating device may be a physically separate device or it may be incorporated into another device (e.g. integrated into a smoke detector or detector base).

smoke
particulate and aerosol products of combustion generated by a fire, whether this be of the smouldering or open flame type

Note 1 to entry: In general, the particle diameters range from 1 nm (invisible smoke) to 10 μm (visible smoke).

smoke detector
automatic fire detector sensitive to particulate products of combustion and/or pyrolysis suspended in the atmosphere (aerosols)

soak period
period after a fire alarm system has been commissioned, but prior to handover, during which the system's performance in relation to false alarms and faults is monitored

sounder
any electrical, electronic or mechanical device which generates an audible output

staff alarm
restricted alarm, following the operation of a manual call point or automatic fire detector, given to certain staff in the premises to permit investigation prior to evacuation

staged fire alarm system
fire alarm system in which two or more stages of alarm can be given within a given area

Note 1 to entry: Examples of staged alarm systems are a two-stage system capable of giving "alert" or "evacuate" signals, or a three-stage alarm system capable of giving "staff alarm", "alert" or "evacuate" signals.

Note 2 to entry: The normal condition, under which no alarm is given, is not counted as a stage of alarm.

standby load
power taken by the system under failure of the normal supply but otherwise quiescent condition

standby supply
electricity supply, commonly from a rechargeable battery, which is automatically connected to the fire alarm system when normal supply fails

static element (heat detector)
see **fixed temperature heat detector**

storey exit
final exit, or a doorway opening into a protected stairway, firefighting lobby or external escape route, or a doorway in a compartment wall that is common to two or more buildings (a separating wall)

supplier/system supplier
organisation from which all or part of the hardware and/or software for the installed system is purchased

Note 1 to entry: If all the hardware and/or software for an installed system is purchased from a single organisation, then that organisation is called the system supplier.

tactile alarm device
electrical or mechanical devices that make use of touch to communicate fire related information to individuals who have certain disabilities e.g. vibrating pads for persons with impaired hearing or sight etc.

third party
body or organisation other than the Designer, Installer, Supplier, Commissioning Provider or Customer

time-related system
system in which the response or sensitivity of automatic fire detectors is changed with the time of day

travel distance
distance which a person must travel in order to be able to effect operation of a manual call point

user
person or organisation having control of the building (or part of the building) in which the fire detection and alarm system is installed

verification
process by which the installer or other contractor satisfies the customer that the installed system meets the defined requirements

voice alarm system
sound distribution system that provides means for automatically broadcasting speech messages and warning signals

Note 1 to entry: Voice alarm systems normally include a facility for transmission of live voice messages as well as automatically generated messages.

voice sounder
fire alarm sounder that contains the components necessary to generate and broadcast digitally recorded speech messages

void (concealed space or cavity)
space enclosed by elements of a building (including a suspended ceiling) or confined within an element, but not a room, cupboard, circulation space, protected shaft or space within a flue, chute, duct, pipe or conduit

Note 1 to entry: commonly used term for spaces or plenums above a false ceiling or below a raised accessed floor. Also includes roof spaces and cavities and spaces behind partition walls. Often used for routing of building (mechanical, electrical, etc.) services

zone
structural sub-division of the protected premises in which a function may be carried out separately from any other sub-division

Note 1 to entry: The function may, for instance, be:

a) the indication of the occurrence of a fire (detection zone),

b) the giving of a fire alarm (alarm zone).

Note 2 to entry: Zoning for different functions need not be identical.

zone chart
zone map
diagrammatic representation of the building, showing at least the building [A1] exits and 〈A1] entrances, [A1〉 〈A1] and the division into detection zones showing boundaries and access routes to zones

4 Transition arrangements from I.S. 3218:1989, I.S. 3218:2009 [A1] & I.S. 3218:2013 to I.S. 3218:2013 +A1:2019 [A1]

Because of the duration of building projects any Fire Detection and Alarm Systems (FDAS) designed in accordance with I.S. 3218:1989, I.S. 3218:2009 or I.S. 3218:2013 for which a Fire Safety Certificate under the Building Control Regulations has been granted, may proceed to completion but all reasonably practicable steps should be taken to bring such systems into conformity with I.S. 3218:2013 [A1] +A1:2019 [A1].

A note on all System Certification documents stating that the design and installation is in accordance with I.S. 3218:1989, I.S. 3218:2009 or I.S. 3218:2013 shall be included.

All variations from the standard for which a Fire Safety Certificate under the Building Control Regulations has been granted shall be recorded on the System Certification documents.

Fire Detection and Alarm Systems (whether new installations, extension/alterations or modifications to existing installations) shall be commissioned to I.S. 3218:2013 [A1] +A1:2019 [A1]. In addition, the areas covered in any new installation or any system extension/alteration or modification shall be designed and installed to I.S. 3218:2013 [A1] +A1:2019 [A1].

User responsibilities for all Fire Detection and Alarm Systems shall be in accordance with I.S. 3218:2013 [A1] +A1:2019 [A1].

Servicing and maintenance for all FDAS shall be in accordance with I.S. 3218:2013 [A1] +A1:2019 [A1].

There is no requirement for a Fire Detection and Alarm System designed, installed and commissioned to a previous version of I.S. 3218 to be upgraded in whole or in part to the latest version of the standard unless:

a) the owner [A1] decides to upgrade the system to I.S. 3218:2013+A1:2019 [A1], or

b) the existing installation cannot be incorporated in a new system and would detrimentally affect either its operation or the effective operation of the new upgrade, or

c) an upgrade is required by a Fire Safety Certificate under the Building Control Regulations for material alterations, extensions or change of use of the premises.

5 System design: Overview

5.1 General

The primary function of a fire alarm system is to give an early alarm of fire in a building in order to enhance the safety of the occupants by increasing their chance of escape to safety and by initiation of other emergency actions.

A secondary function is to reduce the loss of, or damage to, property by increasing the probability of early detection and extinction of fire.

Any persons using this Standard shall be a **competent person** (see definition) and shall be able to demonstrate their competence to the satisfaction of the client/user (see Foreword).

For specific risks, additional standards or guidance documents may apply. Designers should acquaint themselves with Irish, European and International best practice as part of the Risk Assessment Analysis, and any other relevant documents should be nominated in the specification.

Because of the great variety of systems covered by this Standard, the systems have been divided into a number of different categories, each identified by an alphanumeric designation.

Category M: manual alarm systems that comprise manual call points and alarm devices throughout all areas of the premises and have no further sub-division. Premises protected by automatic detection systems shall also be provided with manual call points.

Category L: systems having automatic detection intended for the protection of life and property. Such systems shall always contain a category M system. Category L systems are sub-divided into:

- **Category L1:** systems having detection, manual call points and alarm devices installed throughout the protected premises,
- **Category L2:** a category L3 or L4 system in the entire premises augmented by additional protection in specified areas. Such a system shall be designated as a category L2/L3 or L2/L4,
- **Category L3:** systems installed for the protection of escape routes and adjoining areas,
- **Category L4:** systems installed for the protection of escape routes only where structurally protected alternative escape routes are available and where occupants are wakeful and trained.

5.2 Premises in multiple occupancy

In some premises, control of various parts of the premises may lie with several different occupants and/or external parties.

Systems installed in premises in multiple/mixed occupancy are given the suffix letter X in their category. Premises in multiple/mixed occupancy may consist of one fire alarm system with multiple occupants or two or more fire alarm systems that are interconnected.

The purpose of having a suffix "X" in a system category is to clarify to the relevant authorities and responsible persons that:

a) a number of parties may share responsibility for response to fire, and/or,

b) there may be a number of fire alarm systems which may have different categories of protection and may require different fire response strategies.

5.3 Confirmation of system category

Because of the wide range of systems covered by the requirements and recommendations of this Standard, it should be appreciated that the specification of requirements for a system simply by reference to the number or title of this Standard without further definition will have little meaning. The category of system to be installed shall always be included in the specification and the Certificates of Design and Commissioning (e.g. L1, L2/L3, M, L4/X etc.), and the specification for the category of system shall always include details of the areas of the premises which are to be protected. Where different categories of protection are being specified for different parts of a premises, the category of protection in each part of the premises shall be clearly noted in the design specification and the system certification.

NOTE 1 For guidance on suitable category levels for specific types of premises see Annex I.

NOTE 2 For FDAS in residential buildings, see Clause 10.

5.4 Fire detection and alarm system design development and implementation process

5.4.1 General

The introduction of an automatic fire detection and alarm system into a building can be a complex series of activities involving several parties and multiple activities.

In all cases, the process shall commence at the initial design development phase of the project and shall not be an “add-on” element when the project is at an advanced stage of design and/or construction.

The FDAS development and implementation process essentially comprises 4 phases:

— Fire Safety Strategy development,

— Design Process,

— Installation, Commissioning and Handover,

— User activities (Operation, Service and Maintenance).

More comprehensive details are included in Clause 6.

5.4.2 Fire Safety Strategy development

The designer shall review the proposed project with respect to all issues that relate to life safety and that could or will influence the Fire Alarm System design and/or implementation, and develop a fire safety strategy which could include:

— Fire Risk Assessment [A1⟩ ⟨A1],

— emergency vehicle access,

— premises access/egress,

— designated escape routes,

— fire compartmentation,

— evacuation procedures,

— fire refuge,

— places of safety,

— construction,

— premises usage – initial and future,

— occupancy proposals (immediate/future fit-out/partial occupancy),

— staff ratio,

— [A1] ancillary services

— FDAS cause and effect strategy.

NOTE This list is non-exhaustive. [A1]

Many of the above items will be addressed as part of the normal design process for simple, standard premises types. In other more complex, large or unusual cases, specialist Fire Engineering expertise will be required to evaluate the needs of the premises, for example:

a) review the project in respect of the requirements and recommendations of this Standard taking account of the Building Regulations, relevant Codes, Standards, Planning Conditions, Fire Safety Certificate, etc and all other factors pertinent to the premises. Depending on the size and/or complexity of the project, this may involve several parties,

b) where the project involves an existing premises, carry out a survey of the current fire alarm systems where relevant. Determine the extent to which any existing fire alarm system should interface with the new system,

c) develop and document a Fire Safety Strategy for the project that will lay down a brief that can be used by all relevant parties involved in the design and installation of Life Safety services for the project.

5.4.3 Design process

The party nominated to design the system shall design and specify the new fire alarm system, taking account of relevant conditions of the Fire Strategy and any requirement for phased occupancy or other non-standard aspects of the project. The Designer shall issue the Certificate of Design in compliance with Annex C 1.

Certificates of Installation and Commissioning should not be issued until after issue of the Certificate of Design. Where it cannot be adequately determined who shall sign the Certificate of Design, then it shall be the responsibility of the party who has determined the category of the system to sign the Certificate of Design.

The design process shall consider the particular needs of all building occupants/users.

A single party should retain overall control of the fire alarm system design development and implementation process.

Following the appointment of fire alarm contractor(s)/supplier(s), the party nominated above shall review the design/installation/commissioning proposals and obtain agreement and sign-off by all parties. As this Standard imposes significant duties on all parties involved in the fire alarm system design development implementation process, this review is considered essential and critical to the success of the project.

NOTE The issuing of false or misleading information in this Certificate is an offence under the Fire Services Acts 1981 and 2003. [A1] [A1]

5.4.4 Installation and commissioning

a) [A1] Obtain Certificate of Design, building (premises) fire detection and alarm zone layouts and required FDAS cause and effect strategy from designer, [A1]

b) Install the system [A1] [A1] ,

c) Commission the system (see 6.2.9 (g)),

d) Handover and instruct user in the system operation,

e) Provide safety file information.

5.4.5 User actions

a) User shall arrange for system servicing and maintenance (see 9.1 and 9.2),

b) User shall carry out periodic system audits and implement necessary changes (see [A1] 9.2.2 [A1]).

5.5 Certification

The Fire Safety Strategy may dictate variations from this Standard. The recording of these agreed variations is acceptable and an essential part of the certification process. All such variations shall be recorded on the Certificate of Design.

6 Design considerations

6.1 Purposes of fire alarm systems

The primary function of a fire detection and alarm system is to give an early warning of fire in a premises in order to enhance the safety of the occupants by increasing time available to escape to safety or by initiation of other emergency actions. A secondary function is to reduce the loss or damage to property by increasing the probability of early detection and extinction of fire.

6.2 Design process

6.2.1 General

The design process is a critical element of the fire alarm system development and installation process. It includes the integration of the proposed design with a Fire Safety Strategy for the premises.

It shall be carried out by an experienced and competent designer who has appropriate qualifications and fire detection and alarm design experience, such as a chartered or professional engineer or other competent person.

It is the responsibility of the designer to demonstrate that they are competent to carry out the design of a fire detection and alarm system.

It is recommended that a single organisation assumes and retains responsibility for the fire alarm system design development and implementation process where this is practicable. This party will normally be the Designer who, having designed and specified the system will proceed to choose system suppliers, installers and commissioning providers and subsequently would ensure that the purchaser (or end-user) receives the System Documentation and instructions from the relevant party or parties.

Where it is not possible for a single organisation to assume this role for the full fire alarm project, each party that controls a phase of the project shall ensure that full and detailed documentation is passed on from their phase of involvement to the next party so that the purchaser (or end user) receives completed System Documentation and instructions. This process shall be coordinated and supervised by the System Designer or the final party responsible for the fire alarm system design process.

6.2.2 Fire safety strategy

The Fire Safety Strategy (see also 5.4.2) will have provided the following information which is critical to the Design Process:

- the Fire Risk Assessment
- the required system category or categories. This information will be confirmed by the Fire Safety Certificate when one is granted but will normally be required by the Designer in advance of the receipt of the fire certificates,
- the evacuation strategy. This may also include direction on alarm sequencing or operation,
- escape routes and escape doors/exits,
- structural detail that would influence the fire alarm system design,
- phased or partial occupancy requirements,
- Fire Service access points,
- premises occupation details. This shall include details of any operational aspects such as day and night entry/exit locations and multiple occupancy,
- floor plans and fire compartmentation detail. These shall be agreed before a design can be finalised,
- details of monitoring facilities to which the premises system is to be connected particularly in the case of a campus style premises.

6.2.3 Early discussion

To a large extent the design and specification of the fire alarm system will depend on the response and actions required after the alarm has been given. It is thus essential that these actions are pre-planned and the subject of early discussion (see 6.2.8.4).

If the premises contain alarm systems associated with hazards other than fire, then the various hazard alarms shall be properly co-ordinated and be distinct from each other. In these premises the relative priorities shall be carefully assessed, and the system arranged so that a higher priority alarm cannot be prevented or obscured by one of a lower priority. Although in general fire will have the highest priority, there are premises in which other hazards may have higher priorities than fire.

6.2.4 Controlled software

It should be noted that extension, correction or modification of software-controlled systems may involve modification of the control software. Consideration shall be given at the contract stage to provide for continued support of such changes throughout the expected lifetime of the system (see 6.2.10 and 6.3.8).

6.2.5 Multiple occupancy buildings (X)

If the premises is under the control of more than one occupant, a fire in a part of the premises under the control of one occupant may spread to or otherwise affect a part or parts under the control of others, and it is important that all those who might be affected by the fire be properly informed. Appropriate consultations shall take place early in the planning of the new system, since the interactions with other occupancies may significantly affect the design of the system.

A fire condition in any one occupancy may be indicated in all other occupancies which could be affected, and each system configuration/fire strategy shall be implemented to suit the appropriate response.

Where multiple occupancy buildings include residential accommodation refer to Clause 10.

6.2.6 Actuation of ancillary services

The fire alarm system may be designed to close or open circuits to ancillary services by means of relays or similar devices. The requirements and recommendations of this Standard may not fully satisfy these special requirements for ancillary services, and reference to specifying authorities or other codes of practice may be necessary. [A1] 〈A1〉

[A1] Where ancillary services are connected to the FDAS, the required operation of these ancillary services shall be detailed on the system designer's FDAS cause and effect strategy.

NOTE Functional testing under the FDAS cause and effect strategy is not covered under this Standard.

Further information is given in 6.16. 〈A1〉

6.2.7 Installation in potentially explosive or flammable atmospheres

If it is necessary to install fire alarm equipment or wiring in areas where there may be a potentially explosive or flammable atmosphere, then the system shall comply with the requirements of [A1] I.S. EN IEC 60079-0 〈A1〉.

6.2.8 Initial phase of the design process

6.2.8.1 The initial phase of the design process includes a review of the project taking account of:

- the Building Regulations,
- relevant Codes,
- standards (I.S. 3218 and other relevant standards for specific premises types),
- planning conditions,
- Fire Safety Certificate,
- appropriate Health and Safety Requirements,
- other factors pertinent to the building.

6.2.8.2 Much of the above will be taken from the Fire Safety Strategy outcome where this is carried out by an organisation other than the system designer. This will culminate with decisions regarding the choice, category and purpose of system, taking account also of possible future needs for extension or alteration or planned change of use.

6.2.8.3 An examination of the proposed development plans shall include a survey of any related existing premises coupled with an assessment of the usage of the building including any periods of non-occupancy, partial/phased occupancy or foreseeable change of use.

6.2.8.4 The system designer shall consult the following interested parties where appropriate:

a) consultants (including architects),

b) purchaser and/or end-user. In a multi-occupancy building, consultation with other occupants,

c) the local fire authority,

d) the installer of the system,

e) the fire insurer,

f) the fire alarm system supplier,

g) the supplier of any communication link,

h) the alarm receiving centre (ARC), if one is used,

i) any ancillary service connected to the FDAS system.

Any deviations from the requirements and recommendations of this Standard shall be agreed by the interested parties and specified in the design documentation/Certificate of Design.

6.2.8.5 If the work is an extension of an existing installation, the existing equipment shall be thoroughly investigated to ensure that it will function satisfactorily in conjunction with the new equipment and that the power supplies have adequate capacity to supply the additional load.

Prior to undertaking changes or extensions, consideration shall be given to their effect on the performance of the existing system and agreement shall be obtained from interested parties. Following completion of the alterations, inspection, testing, commissioning and certification shall be carried out in compliance with the requirements and recommendations in Clause 8.

Changes to the system that might affect its response to fire or fault conditions shall only be undertaken by competent personnel. However, it is acceptable for local information such as identification of zone or sensor locations to be altered by personnel authorised by the responsible person.

Where the operation of the system depends on a stored program, provision for changing this program shall be carefully controlled. In general, program changes should only be made following discussions between the relevant parties listed in 6.2.8.4. Also, the requirements in 6.2.10 shall be implemented.

6.2.9 Detailed design process

Ideally, a single party should maintain overall responsibility for the system design, development and implementation process.

Where a single party does not maintain overall responsibility, the verification process set out in 8.5.11.2 should be considered for inclusion in the specification.

In either case, the following shall be implemented:

a) design of the installation taking account of this Standard and the requirements of the Fire Safety Strategy,

b) the inclusion of any special accommodation required for the equipment,

c) taking account of any special structural provisions required for the equipment or its wiring, such as chases, ducts or conduits,

d) the design phase shall take into consideration the action to be taken in the event of fire,

e) system specification, including requirements regarding future service and maintenance requirements (see 6.2.10 and 8.5.8),

f) the fire alarm system design documentation shall include the completed Certificate of Design for the proposed system. This confirms the Designer's requirements for all future parties in the process,

g) pre-qualification of potential supply/installation/commissioning providers to ensure that such parties have the competence to deliver the project being designed. Commissioning providers shall be able to formally demonstrate competence in commissioning procedures (see Foreword),

h) tender/quotation stage,

i) consideration of proposals, prices and delivery times,

j) issue of Certificate of Design and confirmation of the detailed system design with the selected system provider. Before commencement of the project, it is essential that the proposed installation is fully discussed and agreed with the party or parties that are to be contracted to supply, install and commission the fire alarm system,

k) these discussions/agreements shall include the requirements of 8.5.1, 8.5.2, 8.5.8 and 8.5.9 and allocate and agree responsibilities as per Annex H (pre-project meeting),

l) agreement on any variation to the design specification, including any application of fire codes or other standards. See also 6.6.10,

NOTE Where specific elements of other fire codes or standards are utilised as part of the design process causing variations to this standard then the extent of application shall be noted on the Certificate of Design (Annex C 1).

m) agreement on delivery, installation schedule and commissioning commencement and completion timescales,

n) consideration of the impact of any partial or phased occupancy requirements of the project and how this can safely be accommodated without exposing any parties to a greater hazard from the effects of fire than would apply if the entire installation was fully installed and commissioned,

o) specification for purchaser/user instruction and the documentation required to be produced for the Safety File,

p) where practicable, the purchaser/user shall be provided with a contract for servicing in compliance with I.S. 3218 for the first 12 months following commissioning, as part of the system handover. This will ensure that the fire alarm system is properly serviced from the date on which it is commissioned, and this is seen as being essential in ensuring that the fire alarm system will operate as designed if it is activated.

Where this is not practicable, a proposal for Servicing and Maintenance shall be included with the Safety File along with a clear warning that the system may not operate as designed/commissioned if a service agreement is not entered into immediately and that a re-commissioning of part or all of the system may become necessary if there is a delay in implementing such Servicing and Maintenance procedures.

Product or system warranties shall not be deemed as a substitute for the annual service/ maintenance contract.

6.2.10 Additional Considerations

6.2.10.1 General

A critical element of the design of the fire detection system will be its life expectancy and satisfactory performance for that period.

6.2.10.2 Provision of adequate maintenance services

Care should be taken at design stage to ensure that adequate maintenance services, including availability of spare parts and competent personnel, are available in the local market to support the system for the duration of its operational life and facilitate any modifications or alterations which might be required (see also Clause 9 User responsibilities).

In addition, special consideration shall be given to the support required for modern software – based FDAS systems which use operating procedures/codes to communicate between devices and CIE.

These operating codes are commonly referred to as **protocols** (see definition).

Within the fire industry, multiple CIE manufacturers share protocol information with multiple device manufacturers on a global basis and resultant systems are widely available and used. Such systems are commonly referred to as “open protocol” systems.

Where such a system is proposed, based on the co-operation of two or more manufacturers, then documentary evidence should be provided by the joint manufacturers and the local supplier of such systems to confirm the compatibility requirements as set out in Annex A.

Where the CIE and the devices and the protocol all come from the same manufacturer, then documentary evidence should be provided by the manufacturer and the local supplier of such systems to confirm the compatibility requirements as set out in Annex A are met. Such systems are commonly referred to as "closed protocol" systems.

Both types of system are widely available, and this standard does not specify which type should be used, but in either case, the specifier/designer shall ensure (e.g. by inclusion in scope of supply at appointment/award stage or by obtaining warranties) that continuity of support services will be available and that no undue restrictions will inhibit open market access by end user/system owner to servicing, maintenance, spare parts or modifications to the system.

6.2.10.3 Anticipated life expectancy of equipment employed

This should include assessment of the age of the technology employed in the system components and the anticipated obsolescence of such equipment due to new/emerging technologies. Suppliers/manufacturers ongoing "backwards compatibility" of components should also be assessed.

6.2.10.4 System configuration

The complexity of modern fire detection and alarm systems and the facilities available means that most systems "cause and affect" is programmed through a system configuration software package.

The system designer shall ensure that the software necessary for the configuration of the system throughout its anticipated life is available to the end user either by inclusion in the scope of supply at tender stage or by obtaining warranties ensuring the availability of suitable software and competent personnel to the end user.

Where software and/or system configuration is protected by access codes or firmware or other means, then the support structures for maintenance shall be detailed and formally documented at the design/award stage and included in the handover documentation.

6.3 Circuit design

6.3.1 General

Care shall be taken to ensure compatibility of all components which form part of the fire alarm system or which are connected with it in any way (see 6.3.6).

When considering the compatibility of components with respect to operating or signal voltages (including tolerances), due allowance should be made for voltage transients. If surge protection or suppression is not provided as an integral part of the equipment, then surge suppression components should be provided on the connections to any vulnerable equipment.

The design of a fire alarm system shall provide reliable facilities for transmission to the control and indicating equipment of signals from manual call points or detectors, and for the transmission of any resultant fire signal to sounders and indicating equipment and to any ancillary equipment which is to be operated by the fire alarm system (see 6.2.6, 6.12 and 6.16).

Except in radio-linked systems, detection circuits shall be so arranged that an indication is given at the control and indicating equipment within 100 s of the occurrence of any disconnection, open or short

circuit in a cable which would disable one or more detectors and/or call points, or of a failure of any other interconnection, and this shall be done without giving a false alarm.

Although the wiring of a system is monitored, the regularity of routine testing is important and shall be considered at the design stage. It may be considered desirable to include a method of manually testing circuits and such a method shall always be provided where wiring or other interconnections are unmonitored. A manual call point may be used to provide a method of manual testing for detector and/or call point circuits, but the call point used should be one remote from the control equipment so that all the wiring of the circuit is tested (see 9.2).

6.3.2 Circuits containing fire detectors

The wiring arrangement of the system shall be such that a fault, or faults, in one Detection Zone cannot prevent the operation of the system in other Detection Zones of the building.

A single fault shall not remove protection from an area greater than that allowed under 6.4.2 a) to d) for a single Detection Zone.

Two concurrent faults shall not remove protection from an area greater than 4 000 m^2.

Removal of a detector or call point from a circuit shall cause a fault signal to be generated at the control and indicating equipment within 100 s.

Removal of a detector from circuit shall not affect the operation of any manual call point on that circuit.

The operation instructions (see 8.5.9.2.3) should draw the users' attention to any significant adverse effects on the remainder of the system due to the removal of one or more detectors and/or call points, e.g. potential impact on cause and effect operations.

If malicious removal is considered likely, detectors of a type that can be removed only by the use of a special tool shall be used.

The system shall be so designed as to minimise any disruption during testing and, as far as possible, retain the ability to initiate the general alarm devices. Any provision for the isolation of detectors or call points for testing shall be such as to allow the operation of alarm devices in response to the operation of detectors or call points that have not been isolated (see 9.2.4.11).

6.3.3 Circuits containing alarm devices

6.3.3.1 General

If alarm devices use the same wiring as detectors, then no alarm device shall be affected by the removal of any detector other than in the case of fire alarm devices and detectors that are combined at a single fixing position, and where only the removed device is affected.

Any alarm device that is necessary in order to reach the audibility levels recommended in 6.6 or the design visual indications or warn persons of the need to evacuate the premises shall be removable only by the use of a special tool. If removal has any impact on the remaining devices on the circuit then a fault warning shall be generated at the CIE.

6.3.3.2 Sounder circuits

The wiring of sounder circuits shall be so arranged that, in the event of a short circuit developing in any part of the wiring of sounder circuits during a fire, a minimum of one alarm sounder will continue to

sound within the building. This minimum provision shall ensure that a general alarm can be given at the start of a fire and for a significant period thereafter, and that in the event of the fire burning through a sounder cable, the alarm will be maintained at a minimum of one point in the premises, usually near the control equipment.

The minimum sounder circuit provision does not ensure that the reduced alarm is audible throughout the building. In some installations the minimum provision against loss of signal may not be sufficient.

6.3.4 Loop Circuits

If devices such as detectors, call points or sounders are connected to control equipment by a loop circuit, then, provided that the devices can receive or send signals in either direction, they will continue to operate even with a single open circuit or high series resistance in the ring. Such faults shall be indicated at the control and indicating equipment.

6.3.5 Circuits protected against cable faults

In loop circuits, short circuit isolating devices can be provided, such that a short circuit will affect only the section between the isolators. The isolators may be independent devices or may be contained within other devices on the circuit. In such a system a single fault, whether to open or short circuit conditions, can affect at most the section of the loop between the nearest isolators. Where the effect of the fault is to reduce to one the number of signal paths to any detector or call point, the CIE shall indicate the fault and should preferably indicate the position of the fault.

Cable faults which disable one or more detectors and/or call points shall be indicated, without giving a false alarm, within 100 s of their occurrence (see 6.3.1).

In the event of two faults, any devices between the two faults will usually be isolated and no longer function. If both sides of a loop feeding one fire compartment pass through a second compartment, a fire in this second compartment could damage both cables and thus isolate the devices in the first compartment (see 6.3.2).

The design and installation of the wiring shall comply with the requirements of 6.4 and 6.14.

IMPORTANT —

a) **Ring circuits forming loops of detectors or sounders shall employ a separate and distinct route for the feed and return paths, i.e. four-core or multi-core cable shall not be employed to carry both the feed and return cable cores.**

b) **Loop cables shall be dedicated to the purpose of providing interconnection of the loop devices and additional cores shall not be included for any other purpose.**

6.3.6 Compatibility

All the components of a fire alarm system shall be mutually compatible and should comply with the requirements of I.S. EN 54-13.

Compliance of an individual component with this or associated standards does not mean that it will work satisfactorily with another component complying with the same standards.

The party responsible for ensuring compatibility shall be identified at an early stage.

Where the components of a particular installation are supplied by different system suppliers, it is essential that compatibility between components is assured by the Designer of the installation. In such circumstances the Designer shall consider the data provided with each item against the requirements for compatibility set out in Annex A.

6.3.7 Compliance with standards

All components used in the system shall comply with relevant parts of I.S. EN 54 and shall have undergone type testing to those standards.

6.3.8 Program controlled systems

Fire detection systems are available in which the primary function is carried out by microprocessors or similar devices, in which the particular characteristics of a system are dependent on a stored program. In addition to the requirements and recommendations of the remainder of this part of this Standard, such systems shall comply with the following:

a) Facilities provided for the alteration of the stored program shall be protected against unauthorised interference (see 6.2.8.5 and 8.5.2),

b) Those functions of the system which are recommended in this Standard shall not depend on programs stored on rotating disks, other storage media using moving parts, or any other form of easily corruptible memory,

NOTE 1 Memories that are designed to be written to as part of their normal operations, such as RAM, are considered to be easily corruptible.

c) The decision algorithm used within the control system shall be such that the sensitivity of the system cannot fall outside that specified in the relevant parts of I.S. EN 54, except in time related systems (see definitions). Where manual changes to the algorithm or its parameters are possible the ability to carry out the alterations shall be restricted to competent persons authorised by the system supplier or maintenance provider (see (a), 6.2.8.5 and 8.5.2),

d) The operation of processors shall be continuously monitored. In the event of failure, a fault warning shall be given which should be automatically reset after the system has been restarted. The fault shall be automatically recorded,

e) To improve reliability, a methodical and formal approach to software design shall be followed,

f) Following re-initialisation, repair of any fault, or restoration of any power supply failure, the system shall be capable within 30 s of sounding a general alarm, and within a further period of 10 min normal detection and alarm capability shall be attained without further manual intervention (other than the silencing of any fault warning).

NOTE 2 It is acceptable for the restoration of functions additional to the requirements and recommendations of this Standard (e.g. giving additional information about evacuation routes) to require manual intervention and/or to take longer than 10 min.

6.3.9 Early warning (pre-alarm)

In some types of system an early warning (pre-alarm) can be given of conditions which might (or might not) represent a fire. Such warnings should not initiate a full fire alarm, but may be used to alert personnel to the need for an inspection, thus reducing the number of false alarms and possibly giving earlier response (see 9.2.3.5).

6.3.10 Time related systems

Where human or industrial activity during working or wakeful hours could result in false alarms, particularly where the presence and behaviour patterns of people make it unlikely that a fire would go undetected by human agency, it may be useful to consider a time related, dual sensitivity system. Various options are available, and each should be considered in the light of the fire risk and type of occupancy. No such options, for either new or existing systems, shall be implemented until agreement has been reached under the procedures outlined in 6.2.8.4.

NOTE Where such systems are employed, their category classification (see Clause 5) may change with the time of day (see also 6.8.6.3).

6.4 Zones

6.4.1 General considerations

In the preplanning of emergency procedures for a building it is essential to divide it into easily identifiable detection zones (see definition "**zone**" and 6.4.2) in order that an alarm of fire may be co-ordinated at one central or convenient location. Refer to 6.12.8.2 for details of information required for detection zone charts.

In general, alarm signals used in different detection zones in the same premises should be the same unless the background noise in one or more zones is such as to require different sounders (see 6.6.4.5).

Each detection zone should be readily accessible from the point(s) where the indication of the location of fire is provided. In general, access to any detection zone should be by normal circulation routes. However where small areas of the building are defined as detection zones for specific purposes (such as the existence of a special risk) it may be permissible for access in the immediate vicinity of that detection zone to be by another route, for example through another room.

NOTE 1 In systems other than addressable systems, signals coming from individual detectors or groups of detectors cannot be separately identified. In these systems, therefore, to allow detection zone identification it is usual for each detection zone to be fed by a separate circuit. It has thus become common for the concepts of 'detection zones' and 'circuits' to be used interchangeably. In addressable systems, however, several detection zones (defined as subdivisions of the premises, see definition "**zone**") can be fed from a single circuit whilst retaining detection zone identification. It is thus important that in such systems the concepts of 'zones' and 'circuits' be treated separately. In an addressable system the detection zone is programmed on the control panel and does not affect or determine wiring of the circuits.

The need for subdivisions of a building into discrete alarm zones may arise for a number of reasons, including:

— the use of phased evacuations (see definition "**phased evacuation**"),

— any other circumstances in which a two stage alarm arrangement applies.

Since it will be the case that, when occupants of one alarm zone are required to evacuate, occupants of one or more alarm zones above, below or adjacent to that zone will be expected to remain in the building, every alarm zone needs to be separated from all other alarm zones by fire resisting construction. For example, in some complex public buildings, such as shopping centres, alarm zones are designed to coincide with smoke control zones, which are separated from each other by smoke curtains, rather than fire resisting construction. However, in this case, the audible signal is normally given by a voice message, rather than audible fire alarm devices.

As the subdivision of a building into alarm zones implies that, in the early stages of a fire, occupants in certain areas will not be expected to evacuate, the configuration of alarm zones might require approval by the authority responsible for the enforcement of fire safety legislation in the building.

Where fire codes or other standards are utilised as part of the design process causing variations to this standard then the extent of application shall be noted on the Certificate of Design – Annex C1.

The following requirements and recommendations are applicable:

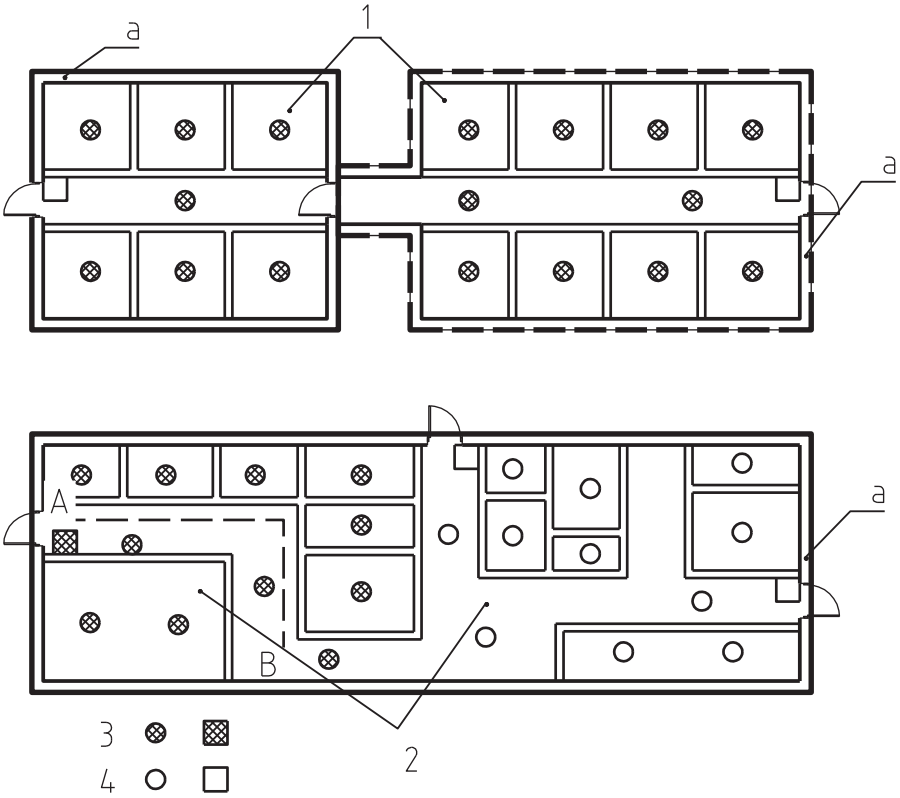
a) the boundaries of every alarm zone (other than external walls) shall comprise fire- resisting construction,

b) the extent of any overlap of alarm signals between alarm zones shall not be sufficient so as to result in confusion of occupants in any area of the building,

c) a common signal shall be used throughout all alarm zones to convey the need for evacuation, and a (different) common signal shall be used throughout all alarm zones for any alert signal that can be given by the system (this could be a continuous signal for evacuation and a pulsed signal for alert (see 6.6.9),

d) while an alarm zone may incorporate more than one detection zone, the boundaries of alarm zones should coincide with the boundaries of the relevant detection zones (see Figure 1),

e) the user or purchaser should ensure that, where appropriate, the configuration of alarm zones is approved by the relevant enforcing authority or authorities.



Key

a	Fire compartment boundary
1	2 Fire compartments in 1 Detection Zone
2	2 Detection Zones in 1 Fire compartment
3	Detection Zone 1 devices
4	Detection Zone 2 devices
A to B	Search distance 30m maximum

Figure 1 — Detection Zones

6.4.2 Requirements for the size and number of detection zones

The size and number of Detection Zones into which the premises are divided shall comply with the following:

a) the floor area of a single Detection Zone shall not exceed 2 000 m^2,

b) the search distance, i.e. the distance that has to be travelled by a searcher inside the Detection Zone in order to determine visually the position of the fire, shall not exceed 30 m. Remote indicator lamps outside doors, etc. may be helpful, especially if doors are likely to be locked. By making an area easier to search, the use of remote indicator lamps may reduce the need for a large number of small Detection Zones,

c) if the total floor area of a building is 300 m^2 or less, then it may be considered as a single Detection Zone even though there may be more than one storey,

d) if the total floor area of a building is greater than 300 m^2, then all Detection Zones shall be restricted to a single storey, except that:

— if the total floor area of a fire compartment is 300 m^2 or less, and any communication with other fire compartments is only at the lowest level of the building, then that fire compartment may be considered as a single Detection Zone even though there may be more than one storey within it,

— if detectors or call points are fitted in stairwells, lift wells and other flue-like structures extending beyond the one floor but within one fire compartment, then the volume of the well or shaft shall be considered as one or more separate Detection Zones,

— where a Detection Zone extends beyond a single compartment, the Detection Zone boundaries shall be the boundaries of fire compartments. Thus, it is permissible to have two or more complete fire compartments in one Detection Zone, or two or more complete Detection Zones in one fire compartment. It is not permissible to have a Detection Zone which extends into parts of two compartments, or a compartment which extends into parts of two Detection Zones,

e) in systems containing only manual call points (Type M systems) [A1] the [A1] location of a fire will usually be known to the person operating the call point. If satisfactory provision is made for this information to be passed to the person in charge of the building, limitations on the size of the Detection Zone may be relaxed. It should however be borne in mind that if the area covered by a Detection Zone is excessive it may be difficult to locate a call point from which an alarm originated,

f) for the systems in buildings in multiple occupation (see 6.2.5) the zoning arrangement shall take account of the fact that premises may not all be occupied at the same time and no Detection Zone shall include areas in more than one purpose group,

g) in very large systems such as those covering more than one building it may be necessary to create sectors (see definition "**sector**") in order to restrict the number of Detection Zones from which alarms may originate simultaneously or in succession. Such restrictions shall be applied only after consultation among the interested parties listed in 6.2.8.4,

h) where a special fire risk is present within a larger protected area, and it is considered important to obtain rapid identification of a fire in that risk, the risk shall be considered as a separate Detection Zone,

i) in premises providing sleeping accommodation the factors mentioned in (a) to (h) shall be considered in relation to the Fire Safety Strategy adopted for the premises. In any Detection Zone in which automatic detectors are provided for the purposes of life safety, it is of paramount importance that the precise location of the origin of an alarm of fire can be quickly determined.

- [A1] As an alternative to 6.4.2 i), and where accurate information about the location of the fire is critical to the evacuation process and the safety of life (e.g. in health care premises, residential care homes, hospitals) then an addressable system shall be employed. [A1]

- If the arrangement of an area is complex and time is likely to be wasted in a search for the fire, then notwithstanding any limits shown above, the area should be further subdivided into Detection Zones that are easier to search.

NOTE In some clauses of this Standard an area constraint is given based on the area allowed under 6.4.2 for a single Detection Zone. The area allowed should be considered as subject to all the constraints to 6.4.2 and not simply the 2 000 m^2 allowed by 6.4.2 (a).

6.4.3 Zoning of manual call points

Manual call points included within a Detection Zone may be wired to the detector circuit for that fire Detection Zone provided the requirements and recommendations given in 6.3 are followed. It should be remembered, however, that people escaping from a fire will not necessarily operate the manual call point nearest to the fire. To prevent misleading indication of the position of the fire, it may be preferable for manual call points to be indicated separately from detectors. If manual call points have been sited, for example, on the staircase landings, so that in a multi-Detection Zone building their indication of the position of the fire may be misleading, then it is preferable for them either to be arranged as a separate Detection Zone, or to be incorporated in the Detection Zone described in 6.4.2 d).

6.5 Communications for emergency response via off-site organisations

6.5.1 General

a) For a fire detection system to give maximum benefit, its alarm should be passed on to the fire service with the minimum delay. The user shall be responsible for ensuring that adequate arrangements are in place for summoning the fire service. It may be permissible for the alarm to be passed on by telephone, if there are adequately trained persons on the premises at all times, but frequently the only reliable method will be over an automatic link to an alarm receiving centre (ARC).

b) Where manual means are employed to communicate with the fire service the user shall ensure that there is no risk to the person(s) involved.

c) The requirement for any automatic means of transmission of the alarm shall be determined following the completion of the risk assessment process at the design stage. (See also 8.5.10.2 (b)).

For details of requirements for connecting to alarm receiving centres (ARC) see Annex B.

6.5.2 Automatic transmission of the alarm

Some of the available methods of automatic connection to the fire service are described in Annex B.

Within the building, the communications wiring shall be considered as part of the fire alarm installation and they should be:

— routed to avoid areas where fire is likely to start or to spread rapidly,

— routed through those areas protected by automatic fire detection or fire suppression systems (where these exist),

— installed in accordance with 6.14.

Where the control and indicating equipment and the alarm transmission equipment are in separate enclosures the interconnecting cables shall comply with 6.14.2.1 and be monitored for open or short circuit faults.

In the event of a failure of lines or equipment, a fault warning should be given at a continuously manned point, usually at the alarm receiving centre (ARC), and the occupier of the premises should be informed so that arrangements can be made for the continued protection of the premises.

If the alarm is transmitted to the fire service via an ARC, the users shall satisfy themselves as to the reliability of the method of communication used between the ARC and the appropriate fire service.

Transmission of the alarm shall not be prevented by the act of silencing alarm sounders, nor shall it depend on the state of any silencing switch.

6.5.3 Non-automatic transmission of the alarm

If communication with the fire service is by means of telephones, care should be taken that the operation of fire alarm and fault warning sounders does not interfere with telephone speech/audibility or intelligibility.

6.6 Audible and visual alarms

6.6.1 General

Advice on the connection of audible/visual alarm circuits is given in 6.3.3. Wiring used for alarm devices shall comply with 6.14, and should be considered as circuits required to function for an appreciable period during a fire.

A fire alarm system shall have an audible and visual alarm device mounted externally to the building in order to guide firefighting assistance to the correct entrance point to the building, i.e. where the fire alarm indicator panel is situated. The position of this sounder should be agreed with the fire authority, it shall be adequately protected from the weather, and its case shall be clearly marked 'FIRE ALARM', (see 6.2.8.4).

In buildings which are not permanently manned, the external sounder shall automatically silence after a period of 15 min, but any visual indicator associated with the entrance or acting as guidance to the location of the control panel (see 6.12.3.2) shall continue to operate.

Due account of this additional alarm load shall be taken in the calculation of the standby battery capacity.

In buildings of multiple occupancy it may be necessary for an alarm of fire to be given in premises other than those in which the alarm has been initiated (see 6.2.5, 10.2.3 and 10.2.4).

A clearly labelled facility shall be available for starting or restarting the fire alarm devices. Operation of this facility shall not be dependent on the state of any silencing device (see 6.12.3.2 and 6.12.3.8).

6.6.2 Sounders adjacent to CIE

A sounder shall be provided adjacent to the control and indicating equipment to draw attention to the indications of fire. The sound level of this sounder shall be suitable for its application, e.g. the sound level required in a fully manned security room may be low, while that required where the control equipment is unwatched in a noisy environment would be high (see also 6.12.5).

6.6.3 Fire alarm sounders

The number of fire alarm sounders used shall be sufficient to produce the sound level requirements given in 6.6.4.1 in all accessible parts of the premises.

Each system shall comprise a minimum of two sounder circuits within the building (excluding the panel internal sounder).

It is essential that an audible fire alarm can still be given in the event of failure of one sounder circuit, and hence any system shall have a minimum of two sounder circuits even if the recommended sound level is achieved with a single sounder.

At least one sounder shall be provided in each fire compartment.

Sounders shall be suitably distributed throughout the building having regard to the attenuation of sound caused by walls, floors, ceilings and partitions. Particular attention shall be paid to attenuation where sounders in one area are expected to serve surrounding areas. It is unlikely that sound levels in a room will be satisfactory if it is separated from the nearest sounder by more than one door.

The recommended mounting heights for audible alarm devices is at least 1 800 mm above finished floor level with no maximum mounting height provided all required sound pressure levels can be achieved. Care should be taken when determining the minimum mounting heights of audible alarms to ensure that no excessive sound level greater than 118 dB(A) are exceeded at any accessible levels.

6.6.4 Audibility of alarms

6.6.4.1 Level of sound

A minimum sound level, when measured within 1 metre of any wall or partition, of either 65 dB(A), or 5 dB(A) above any other noise likely to persist for a period longer than 30 s, whichever is the greater, shall be produced by the sounders in all accessible parts of the building except as set out in 6.6.4.1.1 or as may be recommended in 6.5.3. If the fire routine for the premises requires the audible alarm to arouse sleeping persons then the minimum sound level shall be 75 dB(A) at each bed head with all doors shut. This may require sounders in every room. This will not guarantee that every person will be awakened but can reasonably be expected to wake a sleeping person in most circumstances (see 6.6.3).

Generally, a large number of quieter sounders are preferable to a few very loud sounders, as excessive noise levels disorientate and make communication difficult. The maximum sound level from a single sounder shall not be greater than 118 dB(A) at any normally accessible area so that it is unlikely to cause any damage to hearing.

In premises used for public entertainment, retail and similar premises, in which the pressure level of music or sound is likely to be greater than 80 dB(A), the music or sound shall be muted automatically when a fire alarm signal is given.

The sound pressure levels shall be checked using an instrument complying with I.S. EN 61672-1, class 2 (or better) with slow response and "A" weighting. The instrument shall have a valid calibration certificate or shall be calibrated in-house annually (or more frequently if usage requires) using a calibration instrument which itself has a valid calibration certificate issued by a recognised third party.

The in-house calibration shall be performed to a documented method by competent staff using appropriate reference standards and equipment.

In general (excluding at bed heads) the minimum sound levels recorded shall be taken at the height and location where people are likely to be located (i.e. 1,2 m to 2 m above each floor level).

Where fire codes or other standards are utilised as part of the design process, the extent of application shall be noted on the Certificate of Design.

6.6.4.1.1 Marginal allowable variations to audibility requirements.

The minimum sound level to be achieved in the following non-residential areas shall be no less than 60 dB(A) provided no ambient noise greater than 55 dB(A) persists for periods longer than 30 seconds:

— Stairwells,

— Corridors ≤ 3 m wide,

— Enclosures ≤ 25 m^2.

The minimum sound level to be achieved in non-residential area enclosures between 25 m^2 to 60 m^2 shall be in accordance with Figure 2 provided no ambient noise greater than 55 dB(A) persists for periods longer than 30 seconds.

〈A1〉

6.6.4.1.2 Emergency voice communication systems

As far as reasonably practicable, emergency voice communication systems in buildings should be located where the background noise levels are normally low. Background sound levels should not exceed 40 dB (A). During the design of both the FDAS and the emergency voice communication system only visual and/or tactile alarm devices shall be located in the vicinity of any communication points. No fire alarm audible device should be located in this vicinity.

Any design variation shall be recorded on the Certificate of Design. 〈A1〉

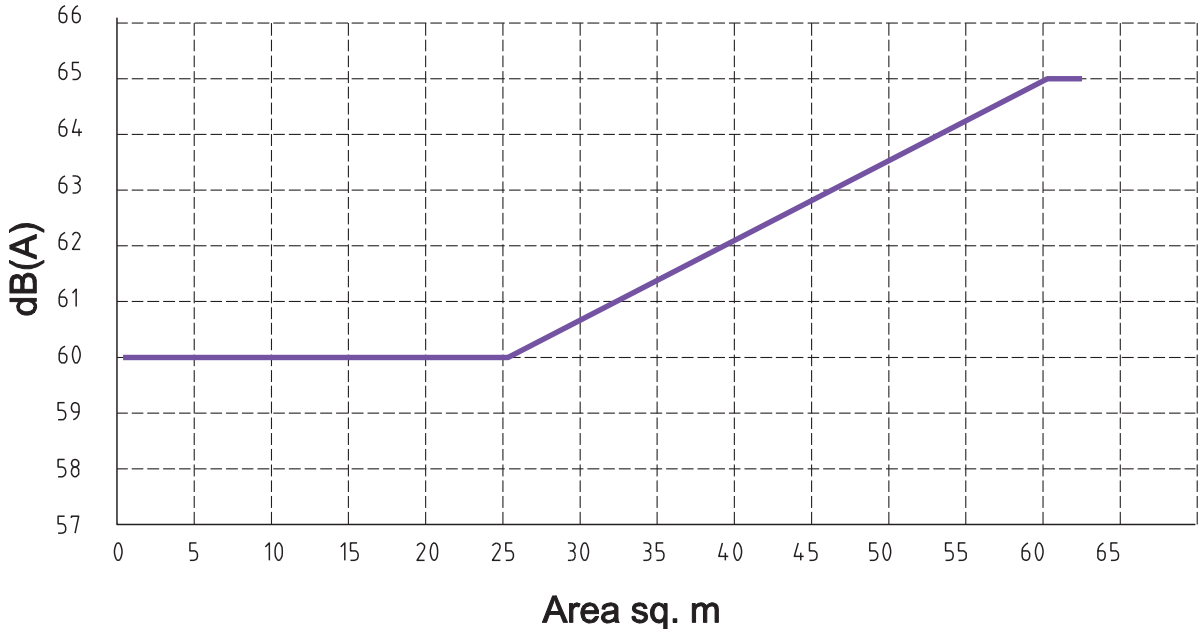


Figure 2 — Marginal sound levels

6.6.4.2 Discrimination

The type, number and location of fire alarm sounders shall be such that the alarm sound is distinct from the background noise. The tone of the fire alarm sounders shall be distinct from any other sounders likely to be heard, and in particular shall be distinct from the audible fault warning signal given by the CIE. All fire alarm sounders within a system shall have similar sound characteristics, unless particular conditions such as an area of high background noise makes this impracticable. In this case other types of fire alarm may also be provided (see also 6.6.4.5 and 6.6.7).

Where a common system or multiple systems are installed on a campus style facility then all fire alarm sounders shall have similar sound characteristics.

6.6.4.3 Frequency

Fire alarm sounder frequencies should ideally lie in the range 500 Hz to 1 000 Hz. If a two-tone alarm is used, at least one of the major frequencies shall lie within this range. Where the frequency range of background noise is such as to mask the 500 Hz to 1 000 Hz range, then the use of sounder frequencies marginally outside this range will be acceptable.

6.6.4.4 Sound continuity

The sound of the fire alarm should be continuous in the area of the origin of fire, although the frequency and amplitude may vary, provided that the distinction from the alert signal described in 6.6.9 is clear.

6.6.4.5 Audible alarms in noisy areas

In parts of buildings where there are noisy machines, the power requirements of the high power sounders needed to comply with the requirements of 6.6.4.1 may place excessively high demands on the capacities of standby supplies. In such cases, the sounders of the fire alarm system (the primary sounders) may be reinforced by secondary sounders operated directly from the mains supply and without standby supplies, provided that all of the following apply:

a) when the machine noise ceases and the secondary sounders are out of service, the primary sounders meet the sound levels recommended in 6.6.4.1,

b) the primary sounders in all other parts of the premises are distinctly audible at all times when operated,

c) failure of the supply to the secondary sounders will result in the silencing of the noisy machines.

6.6.5 Grouping of fire alarm sounders

In a small building the sounding of alarms can be so arranged that any alarm operates the sounders throughout the building.

In larger building complexes it is essential that the grouping of fire alarm sounders is based on consideration of the fire routine of the building or individual premises and on the action, which would be required of people in those areas if fire should occur. The grouping should be so designed that, wherever the origin of the fire, any person needing immediate warning, whether for evacuation or any other action, will receive that warning automatically and without any manual intervention. The grouping should be reflected in the fire instructions issued for the use of the occupants (see also 6.6.9, 6.6.10 and 10.2.3).

6.6.6 Audible warning of operation of CIE

For guidance see 6.12.5.

6.6.7 Visual, tactile and other alarm signals

6.6.7.1 General

The building occupants of any building may include people with visual and/or hearing impairment. Visual and/or tactile alarms shall be considered in addition to sounders. In areas where a normal alarm sound level may be ineffective, e.g. where the background noise is excessive, where hearing protection is likely to be worn, or where the occupants are hearing impaired or may be sleeping, visual alarms and/or tactile alarm devices shall be used.

In general, visual alarm signals and tactile alarm devices shall only be used to supplement audible alarms. They shall not be used on their own. The operation of a sounder shall not be prevented by a defect in a visual signal tactile alarm or vice versa.

Wiring to visual alarm signal and portable tactile alarm devices shall comply with requirements for wiring to alarm sounders, (i.e. shall be in accordance with 6.14.2). A common fault signal from the radio transmission device emitter for use with tactile alarm devices shall be connected to the main fire alarm and control indicating equipment.

A failure of the interconnection between the transmission equipment and the portable alarm device shall be identified at the portable alarm device by a visual and tactile signal within 5 min of the failure.

6.6.7.2 Visual alarm devices

Any visual signal forming part of the fire alarm system shall be clearly distinguishable from any other visual signal used in the premises. Where flashing lights such as xenon flash tubes, rotating beacons or high intensity LED's are used, it is important that there is no possibility of confusion with two-stage alarms (see 6.6.9). The flashing rate shall be in the range 30 cycles to 120 cycles per minute (0,5 Hz to 2 Hz) and shall be synchronised if used in open plan areas.

The intensity of the light shall be sufficient to draw the attention of people in the vicinity, but not so high as to cause difficulty in vision due to glare.

The recommended mounting height for visual alarm devices is 2 100 mm above finished floor level and no closer than 150 mm to the ceiling.

Where it has been determined (on the basis of consideration of hearing impairment) that a visual alarm device (VAD) is to be employed then the VAD equipment shall comply with the requirements of I.S. EN 54-23.

6.6.7.3 Tactile alarm devices

Tactile alarm devices may be fixed, moveable or portable and should be regarded as fire alarm devices for the purpose of this Standard. The intensity output of a tactile alarm shall be sufficient to attract the attention of the persons requiring notification of a fire alarm signal and in some cases may need to wake a person from a state of sleep.

The fire alarm signal shall be given at the tactile device within five seconds of the generation of the alarm signal at the fire detection and alarm control indicating equipment.

In a fire condition the tactile transmission equipment shall continue to transmit fire alarm signals until such time as the fire alarm control indicating equipment cancels the alarm signal.

Systems using radio signals shall be able to generate 100 % coverage in and around the building they cover.

All radio signalling equipment used for tactile alarms devices shall comply with all relevant parts of the I.S. EN 54 series of standards.

A portable alarm device may be powered from a single power source e.g. a battery. A low power condition shall be identified by the portable tactile device to indicate that the unit needs a new battery or battery recharge. The remaining battery power in the portable unit shall be sufficient to operate the tactile device for an alarm condition for a further 24 h so as to allow enough time for the user to replace or recharge the portable tactile device battery.

6.6.8 Coded fire alarm signalling

Coded fire alarm signalling on alarm sounders (e.g. one ring meaning 'first floor' and two rings meaning 'second floor', etc.) shall not be used. Such coded signals on alarm sounders are liable to misinterpretation however well drilled fire-fighting staff or occupants may be.

6.6.9 Two-stage fire alarms

In certain large or complex buildings, it may be considered desirable to utilise a two-stage alarm system, stage one serving as an "alert" signal, stage two as "evacuate", or as a combination of the two, in such manner as to produce an immediate "evacuate" signal in the area of origin of the alarm, and an "alert" signal in other predetermined areas. In any such system provision should be made to change manually and automatically the "alert" signal to the "evacuate" signal, within a specific time e.g. 2 min.

Two-stage alarms shall be considered only after close consultation with the interested parties as defined in 6.2.8.4, and particularly with the local fire authority.

Many combinations of two-stage alarm systems are possible and it is important, therefore, that the one selected shall be decided as a result of due consideration of 6.2.2 and 6.2.3. See also Annex M.

6.6.10 Staff alarms

In some premises an initial general alarm may be undesirable. In some premises e.g. residential (institutional), healthcare premises, residential care homes and hospitals, distress or disturbance due to alarms may create additional problems for staff. In such premises it may be desirable, subject to statutory or other requirements, to restrict the local alarm in the first instance to the staff. A restricted alarm system shall only be used subject to agreement with the relevant fire authorities and where staff, including night staff, are sufficient in number and fully trained in the action that they are to take in the event of a fire.

Where specific elements of other fire codes or standards are utilised as part of the design process causing variations to this standard then the extent of application shall be noted on the Certificate of Design (Annex C 1).

The restricted alarm may be given by means of sounders or other types of communication (including personal paging systems) not noticeable to public, residents or patients. The technical requirements as set out in 6.6.7.3 shall also apply to personal paging systems.

Sounders may be supplemented by an adequate number of visual signals throughout the premises for staff recognition only. A restricted alarm system should incorporate means of summoning fire-fighting staff and the fire brigade to the outbreak when the alarm is given.

Premises having a restricted alarm system shall also have provision for sounding a general alarm, which should be sounded either if a responsible person considers it desirable to do so, and automatically after a predetermined period. The responsibility and criteria for sounding the general alarm shall be decided as part of the action to be taken in the event of fire and shall be clearly specified and understood. Restriction of the alarm in this way shall not prevent immediate transmission of the alarm to an alarm receiving centre (ARC). The authorities concerned shall be consulted very early in the design stage as to the specification of an appropriate system.

6.6.11 Silencing devices

It should be a principle of design and operation of a fire alarm system that once an alarm state has been initiated it should continue until normal conditions have been restored. However, a silencing device shall be provided which can silence general alarms or alert signals.

The responsibility and criteria for operating any silencing device shall be decided as part of the action to be taken in the event of fire and shall be clearly specified and understood. Silencing procedures for Alarm or Alert signals shall be decided following consultation (see 6.2.8.4). However remote "offsite" silencing or reset shall be prohibited unless the system is a remote, totally unmanned facility.

The operation of a silencing device shall:

a) require a manual operation,

b) cause the indicating device described in 6.12.5 to turn on,

c) not cancel any visual signal of the alarm at the control equipment,

d) not prevent the proper receipt of alarms from any Detection Zone(s) not already providing an alarm,

e) not prevent the correct operation of any control for starting or restarting the fire alarm sounders,

f) not prevent the transmission of an alarm to an ARC.

In addition to the silencing switch at the control and indicating equipment, provision may be made for silencing switches in individual Detection Zones remote from the control and indicating equipment. Operation of a remote silencing switch should:

1) require a manual operation,

2) result in a visual and/or audible signal at the remote switch and at the main control panel which shall continue while the alarm sounders remain silenced,

3) be automatically reset on operation of the main silencing or reset switch.

IMPORTANT — the reset switch should not be used as a method of silencing the alarm sounders, since this may destroy the indication of the location of a fire.

NOTE The reset switch should be capable of being operated only by a suitably authorised person, so that a record may be made of any fault or alarm indications before they are cleared from the indicating panel (see 9.1.2.2.). A key operated reset switch may be suitable for this purpose.

6.6.12 Audible alarms by intercommunication or public address equipment (voice alarms)

Where intercommunication or public address equipment is used in lieu of conventional sounders, the following shall be ensured that:

a) the alarm of fire is automatically and simultaneously transmitted to all areas in which the alarm is required, taking priority and overriding every other facility and circuit condition of the equipment,

b) other signals, e.g. meal-break, start and stop work, cannot be confused with the fire alarm signals and cannot be broadcast at the same time as fire alarm signals,

c) the power supply equipment complies with the requirements of 6.13. If the intercommunication or public address equipment shares the power supply of the fire alarm system, then the total standby and alarm loads of both systems shall be considered when calculating the battery capacity,

d) in the event of mains failure, the duration of the standby supply cannot be made to fall below that recommended in 6.13 by the use of the system for purposes other than giving the fire alarm,

e) the cable and wiring of the system comply with 6.14,

f) the system complies with I.S. EN 54, and I.S. EN 60849,

g) the CIE shall have control sounders as detailed in 6.12.5.

Where the transmitted alarm is a voice message, the following shall be ensured:

1) that a suitable alarm (either pre-recorded or synthesised) is immediately and automatically transmitted on the receipt of a fire signal; this transmission shall not depend on the presence of an operator,

2) that the time interval between successive messages does not exceed 30 s, and that 'fill-in' signals similar to those of conventional sounders are used wherever periods of silence might otherwise exceed 10 s,

3) that during fire alarm conditions all microphones are automatically disconnected, except one, designated the 'fire microphone' and retained in circuit so that it can be used for announcements and instructions relating to the fire,

4) that all voice messages are clear, short, unambiguous and, as far as practicable, pre-planned,

5) that the level of sound in the building complies with the requirements of 6.6.4.1.

Where the transmitted alarm is not a voice message, its audibility shall comply with the requirements of 6.6.4.1.

6.6.13 Limitation of alarm information

In some systems much information about both the state of the system and any fire condition is available. It is important that, in order to avoid confusion, the amount of information given is limited to that which is both necessary and sufficient.

6.6.14 Use of the fire alarm sound for other purposes

In general, fire alarm sounds shall not be used for purposes requiring responses differing from those which would be required in a fire. They may be used to initiate an emergency evacuation of a building due to other emergency circumstances (e.g. bomb alert, etc).

6.7 Manual call points

6.7.1 General

Manual call points shall comply with I.S. EN 54-11 and shall be incorporated into all categories of automatic fire detection systems. Manual call points shall be clearly identifiable and have a simple method of operation. The method of operation of all manual call points in an installation should be identical unless there is a special reason for differentiation.

A person operating a manual call point should not be left in doubt as to the success of the operation. In general, the delay between operation of a call point and the giving of an audible or visual confirmation shall not exceed 3 s. The operation of the integral LED indication on addressable manual call points within the specified time shall be deemed to satisfy this requirement provided the indication is activated by a confirmation signal from the control and indicating equipment. Configuration of manual call points for coincidence (double knock) operation ⟦A1⟩ with an automatic detector or another manual call point shall not be used ⟨A1⟧.

The design of the system shall be such that an alarm initiated at a call point cannot be cancelled at the call point.

Requirements additional to those of I.S. EN 54-11 may be necessary where call points are to be used in flammable or explosive atmospheres (see 6.2.7), or where frangible element fragments are objectionable, such as in food preparation areas.

NOTE I.S. EN 54-2 permits a delay of up to 10 s in the response of control equipment. Accordingly, a delay of 10 s may be acceptable, subject to the agreement of the relevant enforcing authority and the recording of the delay as a variation on the Certificates of Design and Commissioning.

6.7.2 Siting

Manual call points shall be located at all exits (except as permitted in 6.7.3), on defined escape routes (to comply with travel distances), at all final exits, storey exits, accommodation stairways and within refuge areas.

Manual call points shall also be located in the stairwell enclosure unless:

— a manual call point is located inside each storey exit, and

— additional call points are located on selected stairwell landings as per Table 1.

They shall be so located that, to give the alarm, no person in the premises need travel more than 30 m. It may be necessary to have travel distances to a call point much less than 30 m where the expected occupants of the building are likely to be slow in movement, or where potentially hazardous conditions exist, e.g. in close proximity to cellulose spray booths. The action to be taken in the event of fire may make the provision of additional manual call points necessary.

In general, call points shall be fixed at a height of 0,9 m to 1,2 m above the floor, at easily accessible, well-illuminated and conspicuous positions free from obstruction. Manual call points shall be sited against a contrasting background to assist in easy recognition. They may be flush mounted in locations where they will be seen readily. Where they are to be viewed from the side (e.g. corridors or narrow spaces) they shall be surface mounted or semi recessed in order to present a side profile area of not less than 750 mm^2 which will be visible from a reasonable distance. They shall not be obstructed by mounting beside door frames or behind pillars, structural members or decorative objects. Where such objects obstruct the visibility of the call point, additional call points that are readily visible shall be installed.

In areas where manual call points are likely to be subject to casual/malicious operation, it may be acceptable, subject to the agreement of the relevant enforcing authority, for a transparent, hinged cover to be fitted to the manual call points. Operation of this two-action manual call point then involves lifting the cover and operating the manual call point in the normal manner.

Opening the hinged cover may be further restricted by a locking “Tab and Tie” arrangement providing the restraining tab will release with minimum force.

Where manual call points with covers are used in a system then this shall be noted as a variation on the Certificate of Commissioning. If the covers are retrospectively fitted, then a Certificate of Commissioning as per Annex C 4 shall be issued.

Table 1 — Manual call point siting in staircases

Floor																						Zone
40	**Floors 30 to 40 - Repeat as for floors 10 to 19**																					**D**
30	**Floors 20 to 30 - Repeat as for floors 10 to 19**																					**C**
20																		X	X	X		**B**
19																	X					**B**
18																X						**B**
17															X							**B**
16														X				X	X	X		**B**
15													X				X					**B**
14												X				X						**B**
13											X				X							**B**
12								Example B →			X			X	X			X	X	X		**B**
11										X			X				X					**B**
10									X			X				X						**B**
9					Example A →			X			X				X							**A**
8							X			X			X	X	X			X	X	X		**A**
7						X			X			X					X					**A**
6					X			X			X					X	X					**A**
5						X			X			X			X	X						**A**
4				X						X			X	X				X	X	X		**A**
3			X			X	X	X	X			X					X	X	X				**A**
2		X			X						X				X	X						**A**
1	X																					**A**
Ground	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	**A**
Basement 1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	**A**
Basement 2	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	**A**
Basement 'n'	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	**A**

Notes:

1 The maximum travel distance to inspect a zone is 30 metres. High rise stairwells should therefore be broken into separate zones so that the travel distance is not exceeded. Suggested that a maximum of 10 floors per zone be used.

2. Example A: Call points are located on Ground floor, 3rd floor, 6th floor + 9th floor.

3. Example B: Call points are located on Ground floor, 〈A1〉 3rd floor, 6th floor, 9th floor + 12th floor. 〈A1〉

6.7.3 Multiple exits to open air

It is recognised that certain buildings present difficulty where multiple exits to open air exist particularly at ground level and compliance with this Standard would necessitate the installation of excess numbers of manual call points. Examples could be office blocks or hospital wards with exit doors from each room or large function rooms in the entertainment/leisure industry. Spacing may be amended as set out in Figures 3 and 4 provided the following apply:

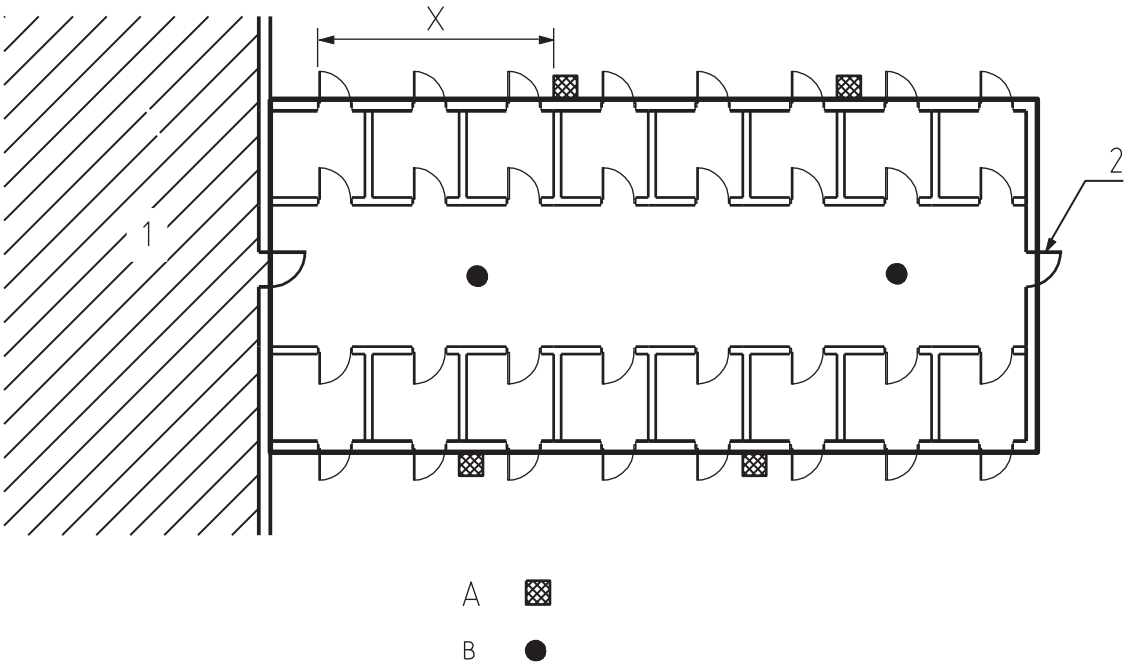
— the protected space is less than 500 m^2, and

— the protected space has automatic fire detection devices installed to a minimum of category L4, and

— the fire strategy risk assessment has determined the number and location of manual call points required in the space, provided that:

— for multiple rooms with multiple exits (Figure 3) the maximum travel distance to encounter a call point on exiting the area is 15 m, or

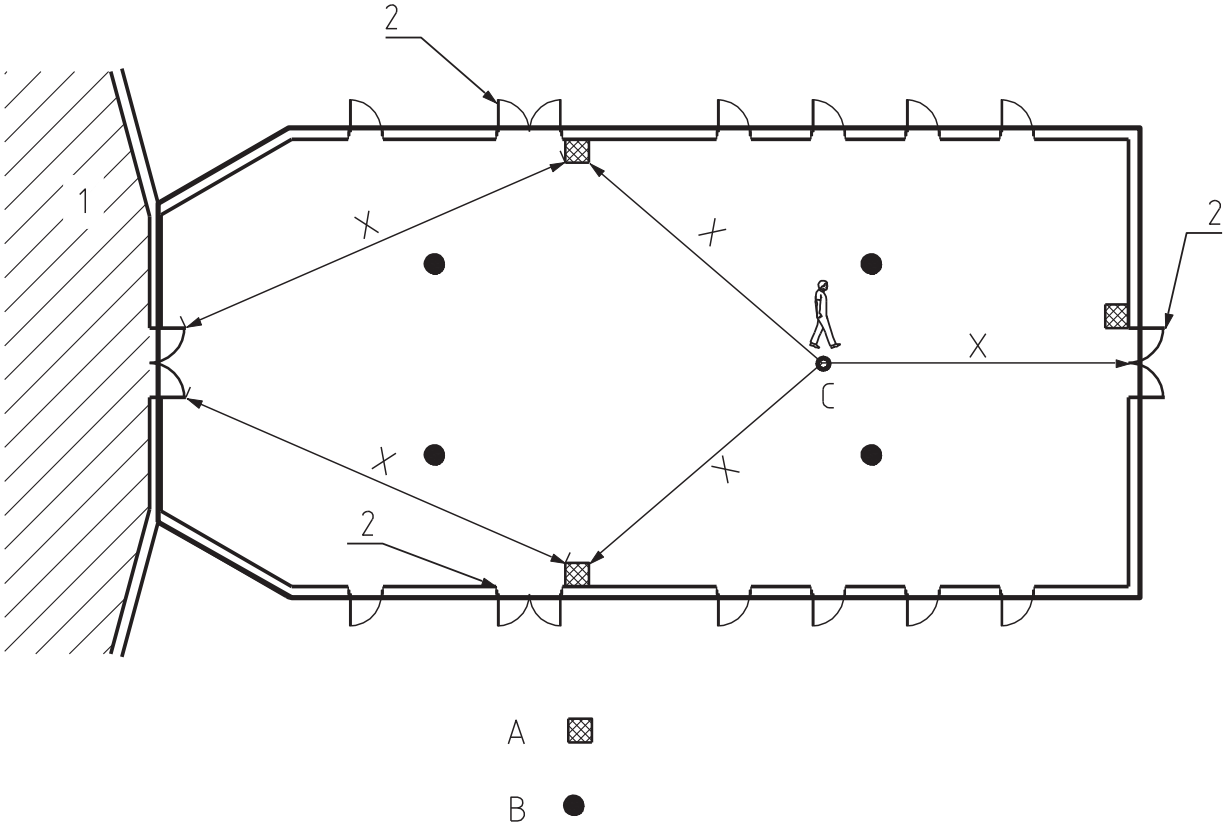
— for single rooms with multiple exits (Figure 4) the maximum travel distance within the space to meet a call point is 15 m.



Key

1	Main building
2	Designated exit to open air as determined by fire strategy
A	Manual call point
B	Detector
X	15 m maximum

Figure 3 — Multiple room and multiple exits (e.g. typical office/hospital ward)



Key

1	Main building
2	Designated exit to open air as determined by fire strategy
A	Manual call point
B	Detector
X	15 m maximum

Figure 4 — Single room and multiple exits (e.g. typical function room)

6.8 Types of fire detectors

6.8.1 General

Fire detectors are designed to detect one or more of the four characteristics of a fire: smoke, heat, combustion gas and radiation (flame). No one type of detector is the most suitable for all applications and the final choice will depend on individual circumstances. It will often be useful to employ a mixture of different types of detector.

All fire detectors will respond to some extent to phenomena other than fire. Reducing the incidence of such false alarms is covered in Clause 7, and categories of false alarms are given in 7.1.

6.8.2 Heat-sensitive detectors

There are two main types of heat-sensitive detector. One is the 'point' type of detector responding to the temperature of the fire gases in the immediate vicinity of a single point. The other is the 'line' type of detector which is made of continuous cable constructed of materials with heat sensing properties and

which responds to the temperature of the fire/fire gases in the vicinity of a section of the line (not necessarily straight).

In both types (point and line) there are two main subdivisions:

a) Static (fixed temperature) elements. These are designed to operate when they reach a pre-selected threshold temperature,

b) Rate-of-rise of temperature elements. These are designed to operate when the sensed temperature rises abnormally quickly.

Point heat detectors shall comply with I.S. EN 54-5.

Heat detectors complying with I.S. EN 54-5 will always have fixed temperature elements and may additionally contain rate-of-rise elements. Heat detectors not containing fixed temperature elements are unlikely to respond to very slow-growing fires and shall therefore not be used.

NOTE Reference in this clause to static and rate-or-rise elements should not be taken as requiring physically separate elements, but as requiring a detector response equivalent to that of a detector containing the separate elements. Particularly in intelligent/analogue output detectors, the response of a single temperature sensor can be electrically modified to produce the desired detector response.

6.8.3 Smoke detectors

6.8.3.1 General

Smoke detectors fall into the general categories of Point type, Optical Beam, Aspirating and Video.

6.8.3.2 Point Type

6.8.3.2.1 General

There are two commonly used classes of point type detectors, 'Ionisation chamber smoke detectors' and 'Optical chamber smoke detectors'.

Point smoke detectors shall comply with I.S. EN 54-7.

6.8.3.2.2 Ionisation chamber smoke detectors

These are based on the principle that the electric current flowing between electrodes in an ionisation chamber is reduced when smoke particles enter the chamber.

6.8.3.2.3 Optical chamber smoke detectors

These operate by detecting the scattering or absorption of light by smoke particles in the detector chamber.

6.8.3.3 Optical beam smoke detectors

Optical Beam Smoke detectors are effectively line detectors since they can detect the presence of smoke in only a small part of the beam. They comprise a transmitter and receiver or transmitter/receiver combination with a reflector to return the light beam. The light source is normally of the infra red type and detection is based on the reduction of the light signal returned to the receiver by obscuration due to the smoke.

Some optical beam smoke detectors can also sense thermal turbulence from a fire by detecting the refraction of the beam at turbulent interfaces between hot and cold air.

Optical beam smoke detectors shall comply with I.S. EN 54-12.

NOTE Some optical beam smoke detectors have features that make them less prone to false alarms caused by misalignment of the beam (e.g. as a result of building movement) or by a solid object (such as a banner in the beam path or an insect crawling across the lens) causing partial obscuration of the beam.

6.8.3.4 Aspirating smoke detectors (ASD)

Aspirating smoke detectors shall comply with I.S. EN 54-20.

The sampling device used on an aspirating smoke detection system typically consists of one or more sampling pipes each with one or more sampling holes. There are three classes of ASD systems defined in I.S. EN 54-20:

— Class C, normal sensitivity systems, each individual sampling point is required to be capable of detecting the standard test fires used to test point type detectors,

— Class B, enhanced sensitivity systems, are used where increased sensitivity is needed to overcome some dilution effects such as high ceilings or moving air flows,

— Class A, high sensitivity systems are used for areas with high smoke dilution or where the earliest warning is required for the protection of business-critical or high value processes or objects.

The intended Class of any ASD system should be clearly understood and the particular design of the sampling device (i.e. the pipe network and sampling holes) should be in accordance with the manufacturers' instructions to achieve the intended Class sensitivity at each sampling point.

With all ASD Classes, each sampling point may be considered as "equivalent to" (Class C) or "more sensitive than" (Classes A & B) a point type smoke detector and consequently, the spacing of the sampling points are based on the spacing requirements of point type detectors (see 6.10.4). However, due to the "cumulative effect" whereby low density smoke entering several ASD sampling points can trigger an alarm, the ceiling height limits for ASD systems installed in open spaces do not follow those for point type detectors (see 6.10.4.6 and Table 3).

The amount of air entering each hole is usually small, and does not significantly modify air or smoke flows within the protected space beyond the immediate vicinity of the sampling hole, but provided it is in accordance with the manufacturers' recommendations, the sampling hole location may be less than the minimum 25 mm below the ceiling as set out in 6.10.4.3. The system should be such that separate fire signals are obtained from each Detection Zone (2 000 m^2).

6.8.3.5 Video Fire detection

The characteristics of smoke, heat and flame can be analysed by monitoring video images captured by camera. They can be used to monitor very large areas, both indoor and outdoor, and require line of sight to the protected space.

6.8.4 Flame detectors

Flame detectors detect ultraviolet and/or infra-red radiation. Both types use radiation-sensitive cells that ‘see’ the fire either directly or through built-in lenses or reflectors.

Infra-red flame detectors are intended to respond to the flickering radiation emitted by the diffusion type of flame normally found in fires. Due to the presence of other infra-red sources, such as the sun, infra-red flame detectors will usually have some methods of discriminating between fire and non-fire radiation. Flicker sensing or the use of one or more specific infra-red emission bands are common techniques.

Ultraviolet flame detectors detect the ultraviolet radiation emitted from flames, and normally operate in the range of wavelengths from 200 nm to 270 nm. Solar radiation in this range is absorbed by the high altitude ozone layer, and hence ultraviolet detectors do not normally respond to sunlight.

Flame detectors shall comply with I.S. EN 54-10.

6.8.5 Carbon monoxide fire detectors

Carbon monoxide fire detectors are combustion gas detectors. Carbon monoxide is generated where the fire is smouldering and/or slow burning and particularly where the supply of oxygen (air) to the fire is limited. These conditions are generally to be found in enclosed or poorly ventilated spaces.

In the development of a fire, smoke and carbon monoxide are spread by convection. However, carbon monoxide spreads further by diffusion (like an odour).

Carbon monoxide fire detectors are susceptible to false alarms where the environment may be subject to sources of carbon monoxide not related to a fire condition (e.g. exhaust fumes) and their application shall be carefully considered. They are immune to many other forms of environment contamination such as steam and dust.

Carbon monoxide fire detectors use an electrochemical cell as the sensing element. These cells have a finite life which is affected by environmental conditions including temperature and humidity. In addition, they are susceptible to contamination by chemicals such as alcohol, hydrogen and ammonia.

[A1] Carbon monoxide fire detectors shall not be used for the purpose of detecting carbon monoxide as a toxic gas (e.g. incomplete combustion in boilers). [A1]

6.8.6 Multi-sensors

6.8.6.1 Multi-sensors are point type detectors incorporating two or more sensing elements each of which responds to a different physical or chemical characteristic of fire. [A1] The sensed phenomena (products of combustion, heat, gases, etc.) may be integrated to produce one combined output to enhance the performance of the system in detection of fire and/or to increase its resistance to at least certain categories of false alarms. [A1]

6.8.6.2 The method (if any) of combining the signals from each sensor varies between different proprietary multi-sensor fire detection systems. In some systems, there is significant potential for reduction of many types of false alarm.

6.8.6.3 With some multi-sensor fire detectors it is possible to disable an individual detection sensor. This might be used in a time related system to reduce false alarms. For example, with a heat and optical multi-sensor detector the optical sensor might be disabled during the day. If this is the case, it is vital that the detectors are spaced for the least sensitive sensor, in this case, heat (see also 6.3.10 and 6.10.4).

6.8.6.4 The service life of a multi-sensor will be dictated by the shortest service life of any one detection element and this should be highlighted in the handover documentation for the benefit of the end user.

6.9 Choice of fire detectors

6.9.1 General

The system chosen should have detectors that are suited to the conditions and that provide the earliest reliable warning.

A combination of various types of detector may be necessary.

In general, heat detectors give appreciably slower response than other automatic detectors but may be less liable to give false alarms (see Clause 7).

Heat and smoke detectors are suitable for use in most buildings but are generally unsuitable for open-air applications where linear heat, flame or video detectors are more appropriate.

Before final selection of detector type, an assessment should be made of the potential impact of a fire before operation of a detector. The choice of detector may also be affected by the environmental conditions.

Consideration shall also be given to the maintenance requirements for each type of detector employed. Particular emphasis should be given to access and in situ testing in accordance with the manufacturers' instructions.

6.9.2 Heat detectors

Unless otherwise set out in this Standard, heat detectors may be used in all areas where they satisfy the purpose without giving rise to false alarms and can be applied within the limitations of their spacing as set out in Table 2 and Table 3. Combination rate of rise/static temperature heat detectors should take precedence over static only elements unless conditions dictate that their use would give rise to unacceptable false alarms.

6.9.3 Smoke detectors

6.9.3.1 Smoke detectors shall be used in all escape routes or areas where the production of smoke could present a threat to occupants. Optical chamber smoke detectors (or multi-sensors which incorporate an optical chamber smoke sensor) are recommended for corridors and stairways. Consideration should be given to both stratification and air flow in protected spaces which might delay or prevent smoke reaching a point type detector. In addition, optically dense smoke generated by very slow burning fires will be relatively cold and will not necessarily rise to the detection point by natural convection until considerable volumes/heat are present. Where such conditions are anticipated then consideration should be given to using more point detectors strategically placed in locations where smoke is likely to travel to, or alternative methods of detection such as optical beams (6.9.3.5), ASD (6.9.3.4) multi-sensor technology or the addition of combustion gas sensors (e.g. 6.9.5).

6.9.3.2 Point Type Optical chamber smoke detectors are sensitive to the larger, optically active, particles found in optically dense smoke, but are less sensitive to the small particles found in clean-burning fires.

Where there are production areas or processes that produce smoke, fumes, dust, etc. which might activate smoke detectors, an alternative type of detector(s) should be used, i.e. heat, flame, etc.

6.9.3.3 Point Type Ionisation chamber smoke detectors are particularly sensitive to smoke containing small particles such as are produced in rapidly burning flaming fires but may be less sensitive to the larger particles found in optically dense smoke which may be produced by smouldering materials.

They are affected by high velocity air movement (generally greater than 10 m/s) thus the positioning relative to air handling equipment or natural ventilation should be considered at design stage.

Certain flammable liquids and gases will burn rapidly with little or no smoke unless the flame impinges on other materials. In these cases, supplemental or alternative detection should be considered (flame, heat multi-sensor etc.)

NOTE Both Ionisation and Optical chamber smoke detectors have a sufficiently wide range of response to be of general use. In some premises however, there may be specific risks for which one type is particularly suitable (or particularly unsuitable); this should be determined at the Design stage.

6.9.3.4 Aspirating smoke detectors are commonly used for three principle reasons:

— **Very Early Warning –** e.g. in a critical environment with high airflows which dilute smoke before traditional detection techniques can operate.

— **Enhanced smoke sensitivity -** e.g. to combat smoke dilution where the ceiling is higher than normal or where an earlier than normal warning is required.

— **An alternative to point or beam type smoke detectors** - e.g. where service/maintenance access is difficult, concealed detection is required, building deflection is expected, smoke dilution is likely, aesthetic detection is desired, or where harsh conditions (such as dust, dirt or steam) are present.

These principle reasons are reflected in the I.S. EN 54-20 sensitivity classes (A, B & C) and the appropriate Class should be clearly specified.

NOTE The I.S. EN 54-20 Class of an ASD system describes the sensitivity at each sampling point – not the sensitivity of the central detector so the number of holes and distances (e.g. maximum distance or transport time to the detector) supported by any particular model/configuration should be checked.

For all applications of aspirating smoke detectors, the manufacturers' instructions shall be followed.

6.9.3.5 Optical beam smoke detectors are suited for the protection of large open spaces with medium to high ceiling levels and particularly where access to point type detectors would be hazardous, difficult or interfere unnecessarily with normal operations.

Optical beam smoke detectors are not recommended in spaces where engine powered vehicular transport operates in the protected area (diesel forklifts, etc. producing exhaust fumes/gases).

6.9.4 Flame detectors

6.9.4.1 Flame detectors detect either ultraviolet (UV) or infra-red (IR) radiation and may be constructed to detect combinations of both forms of radiation or similar radiation at differing bands on the light spectrum. Both types use radiation sensitive cells that ‘see’ the fire either directly or through built-in lenses or reflectors.

6.9.4.2 Flame detectors depend on “line of sight” and their location is dependent on the anticipated source of the flame. Where obstructions are anticipated multiple detectors may be required to see flames behind or under the obstruction(s).

For all applications of flame detectors, manufacturers' recommendations shall be followed.

6.9.5 Carbon monoxide fire detectors

Carbon monoxide fire detectors are particularly suitable for supplementing smoke detectors where there is a risk of a smouldering deep-seated fire, fire in an enclosed space or a risk of stratification taking place. They may be considered as primary detectors where the main risk has been identified as a smouldering fire and heat/smoke detectors have been deemed unsuitable.

Carbon monoxide fire detectors shall not be used as the sole means of detection on escape routes or where the requirement is to detect electrical fires, fast burning fires, fires involving flammable liquids or in areas subject to sources of carbon monoxide, alcohol vapour, hydrogen or ammonia.

Carbon monoxide fire detectors shall not be used as the primary detector for the purpose of detecting carbon monoxide as a toxic gas where generated by defective heating or other appliances (boilers etc). For further information see 6.8.5.

6.9.6 Video detection systems

The application of video detection systems is a specialist field and the manufacturers should be consulted and their recommendations followed.

Examples of applications could be:

— large storage yards,

— turbine and machinery halls.

Where video fire detection systems are employed the designer shall ensure that adequate emergency/standby power is provided.

6.10 Systems installed for life safety

6.10.1 General

All premises including residential and domestic dwellings shall be provided with some means of giving the occupants warning in case of fire. This will require the installation of a fire alarm system capable of being heard throughout the premises.

A fire alarm installation is intended to enable a fire to be detected at a sufficiently early stage for the safe and timely evacuation of occupants and to prevent extensive property damage. In general people are very sensitive fire detectors, but they are not always present or alert. There may be parts of the premises that are not normally attended during working hours, and outside working hours there may be no one on the premises. The use of detectors can then significantly reduce the effect of a fire, provided that suitable provision has been made for the necessary subsequent action.

Every portion of the premises should be suitably protected, and each effectively enclosed space should be considered separately for this purpose.

Because of the wide range of systems covered by the requirements and recommendations of this Standard, it should be appreciated that the specification of requirements for a system simply by reference to the number or title of this Standard without further definition will have little meaning. The category of system to be installed shall always be included in the specification and Certificates of Design and Commissioning (e.g. L1, L2/L3, M, L4/X etc.), and the specification for the category of system shall always include details of the areas of the premises which are to be protected.

Where different categories of protection are being specified for different parts of a premises, the category of protection in each part of the premises shall be clearly noted in the design specification and Certificates of Design and Commissioning.

6.10.2 Manual systems (Category M)

Category M systems provide only for manual initiation of the alarm and comprise of manual call points generally as in 6.7 with alarm devices throughout the premises. In some small buildings this may be all that is required, but it should be remembered that the efficiency of a Category M system depends on the presence of people to detect the fire, and on the training, they are given in the procedures to be followed if a fire occurs.

A Category M system should be considered the minimum requirement only in the following circumstances:

a) the Fire Safety Strategy risk assessment allows this option, and

b) if there will be alert (and suitably trained) people near the origin of the fire, and

c) if the normal occupants of the premises will be able to escape in a rational manner and at a reasonable rate without assistance, and

d) if the premises is provided with an adequate number of protected escape routes, and

e) suitable procedures are in place for the safe evacuation of all visitors.

6.10.3 Automatic detection systems (Category L)

6.10.3.1 General

6.10.3.1.1 Early warning

Where early warning of fire is necessary for the safety of life, automatic fire detectors shall be installed. They shall never be considered as sufficient on their own but shall be used to complement a manually operated (Category M) fire alarm system. The extent of protection required in any premises shall be decided in conjunction with the consultation parties described in 6.2.8.4. The extent of protection may be considered under four categories,

- protection of escape routes only (Category L4 system),
- protection of escape routes and adjoining rooms (Category L3 system),
- protection of vulnerable areas with significantly high life hazard (Category L2/L3 or L2/L4 system),
- and total coverage (Category L1 system).

6.10.3.1.2 Escape routes

6.10.3.1.2.1 General

In general, the escape routes should be the normal corridor and circulation areas within the building, i.e. the normal routes by which people move round the building. In some cases, a circulation area may be the only escape route available, for example, corridors outside bedrooms (defined escape routes). Some parts

of escape routes may fall outside the normal circulation areas (undefined escape routes), such as where an escape route leads through a room. All such routes shall be treated as escape routes.

6.10.3.1.2.2 Protection of escape routes

It is accepted that many people are unwilling to walk through smoke when visibility is less than about 10 m. This visibility has been adopted as representing the point in the progressive smoke logging of an escape route at which its use is no longer possible, and an alarm of fire should therefore be given while sufficient time remains for the occupants to use the escape routes before the visibility falls to this level. The choice, siting and spacing of smoke detectors as recommended for the various system categories should achieve this.

IMPORTANT — Heat detectors are unsuitable for use in escape routes.

6.10.3.1.2.3 Escape route voids

Voids above or below, or spaces accessible from designated corridor escape routes or lobbies except as permitted in 6.10.5.11, shall be treated as part of the escape routes and shall have independent protection unless:

— the voids or spaces are less than 800 mm high/deep, and

— there is no significant fire loading within these spaces, or the fire rating between the escape routes and the voids/spaces is the same fire rating as the escape route structure.

For further details on horizontal voids, see 6.10.5.9.

6.10.3.2 Category L4 systems

6.10.3.2.1 Category L4 systems are for the protection of escape routes only. The lowest level of automatic fire protection throughout a premises is a Category L4 system. This should give warning to the occupants in time for those not already directly affected by the fire to use the escape routes.

6.10.3.2.2 A Category L4 system is intended for use where a level of protection greater than that afforded by a Category M system is desirable, but circumstances do not call for a higher category of protection. A Category L4 system places a significant degree of reliance on the presence of people to detect the fire and on the training, they are given in the procedures to be followed if a fire occurs.

6.10.3.2.3 Where a Category M system is not considered adequate or appropriate, a Category L4 system confined to corridors, circulation areas and escape routes may be all that is required in the following circumstances:

a) the Fire Safety Strategy risk assessment allows this option, and

b) where all the normal occupants are wakeful and trained and

c) if the escape routes are adequately protected by structural means in accordance with Technical Guidance Document B (TGD B) from the spread of fire or its products, and adequate alternative escape routes are always available, and

d) suitable procedures are in place for the safe evacuation of all visitors.

In a Category L4 system the increased detector spacing distances allowed in 6.10.5.2 will not be allowed.

It should be noted that protection of escape routes in a Category L4 system may also involve the installation of detectors in adjoining rooms of special risk category (e.g. transformers, switch gear, gas meter rooms, flammable liquid stores, kitchens, cleaners' cupboards, etc.). This could lead to a Category L2/L4 system classification where significant additions of high risk areas have been added to the basic L4 system.

NOTE An L2/L4 system will not provide a level of protection equivalent to a category L3 system.

A1 A1

6.10.3.3 Category L3 systems

6.10.3.3.1 Category L3 systems are used for the protection of escape routes and adjoining areas. This system will require the installation of automatic fire detectors on the escape routes and in adjoining rooms or spaces that open onto the escape routes and shall give warning to the occupants of the building in time for those not already affected by the fire to use the escape routes. A detector shall be sited in each room that opens directly onto any stairway (see 6.10.3.1.2.2).

6.10.3.3.2 A Category L3 system shall be so designed that in any fire an alarm is given at a sufficiently early stage to allow time for the escape routes to be used before they are blocked by smoke. The latest time by which the alarm should have been given depends on the layout of the building and on the abilities of the occupants to respond to an emergency.

6.10.3.3.3 Where, for the purposes of compliance with a category L3 system, detectors are sited in adjoining spaces or rooms that open on to stairways or escape routes, then the maximum floor area covered by a single detector shall be as set out in 6.10.4 or alternatively, at least one detector shall be sited not less than 500 mm and not greater than 1,5 m from each doorway which opens onto the escape routes.

Where it is not possible to ceiling mount detectors then wall mounted detectors should be sited such that the top of the detection element is between 150 mm and 300 mm below the ceiling, and the bottom of the detection element is above the level of the door opening. The device manufacturer should be consulted to confirm use of the device in this orientation is permissible.

A1 A1

A1 **6.10.3.3.4** A1 A Category L3 system may not provide adequate protection in the area of the source of the fire. It is intended to provide protection of escape routes only.

6.10.3.4 Category L2 systems: Vulnerable areas

6.10.3.4.1 In general, the most vulnerable areas in any building are the circulation areas, since once these are blocked it will be difficult for the occupants to carry out any of the pre-planned actions of the fire routine. Hence the first step in any Category L2 system shall be to comply with the requirements for a Category L3 or L4 system throughout the protected premises, for escape route protection.

6.10.3.4.2 An L2 system consists of an L3 or L4 system in the entire building augmented by additional protection in specified areas and such systems shall be defined as L2/L3 or L2/L4 category installation. It should be noted that there is no such classification as "L2" without the additional "/L3" or "/L4" qualifier.

6.10.3.4.3 In addition to the coverage of the L3 or L4 system, the other areas to be protected by a Category L2/L3 or L2/L4 system will normally fall into the following two classes:

a) those areas in which the normal occupants are especially vulnerable to fire starting in their vicinity, and

b) those areas having a particularly high probability of ignition and from which fire or fire products could spread to affect the building occupants.

The additional areas to be protected shall be decided in conjunction with the consultation parties described in 6.2.8.4 and the development of the Fire Safety Strategy (see 5.4.2 and 6.2.2), and shall be clearly laid down in the system specification. Advice on the protection of specific areas is given in 6.10.7, but all areas of the premises shall be considered when deciding where detectors should be sited. If detectors are installed for the protection of room occupants, then smoke detectors should be used. If they are installed in order to give warning of fire before it spreads to other areas of the premises, then either smoke, heat or other detectors may be used.

6.10.3.5 Category L1 system: Total coverage

6.10.3.5.1 The highest level of protection requires automatic fire detection in all areas of the premises.

6.10.3.5.2 In premises where people congregate, or where sleeping accommodation is provided, or in large or complex buildings where a greater than normal time is required to evacuate the premises, or where other risk factors have been determined during the Fire Safety Strategy development, then an enhanced level of automatic fire protection is required. Such a case might arise, for instance, in hospitals or residential (institutional) facilities where the routine does not ensure immediate availability of adequately trained staff members or occupants to take charge in an emergency, or where the occupants require assistance to evacuate the premises.

It could also be applied where occupants might be unfamiliar with the premises and/or where there may be a high financial or operational risk in the event of a fire.

If the required level of fire protection is not achieved by the construction of the premises, then in the above circumstances, a more comprehensive automatic fire detection system will be needed to complement the construction by providing an early alarm of fire. A Category L1 system should achieve the required level of protection.

6.10.4 Spacing and siting of detectors (see also 6.10.6 and 6.10.7)

6.10.4.1 Minimum number of point-type detectors: For open areas under flat horizontal ceilings the minimum number of point type detectors fitted shall be not less than the area in m^2 of the protected space divided by 100 for smoke/carbon monoxide detectors and by 50 for heat detectors. Maximum horizontal spacing of detectors is noted in Table 2.

6.10.4.2 Maximum mounting height of point-type detectors: The time taken to activate automatic detectors increases rapidly as the height of the ceiling above the fire increases. The maximum heights are given in Table 3.

6.10.4.3 Siting of point-type detectors: Heat and smoke detectors generally should be sited at the highest point of enclosed areas. Other than in shallow horizontal voids (see 6.10.5.9), detectors shall be sited so that their sensitive elements are not less than 25 mm or more than 150 mm below the ceiling or roof for heat detectors, and not less than 25 mm or more than 10% of the finished floor to ceiling room height up to a maximum of 600 mm below the ceiling or roof for smoke detectors (see also Figure 5).

〚A1〉 **6.10.4.4** Smoke detectors shall be sited on the ceiling at the top of any stairway, and on each landing ceiling such that the vertical distance between adjoining detectors does not exceed 10,5 m. 〈A1〛

6.10.4.5 Limits of ceiling heights: Except as set out in 6.10.4.6 and with the exception of lift shafts, detectors shall not be mounted on ceilings or locations higher than the general limits of Table 3.

6.10.4.6 If small sections of the ceiling (not exceeding in total, 10 % of the ceiling area) exceed in height the general limits of Table 3, those higher sections may be considered adequately protected by detectors complying with Table 3 where no part of the ceiling height in the protected space exceeds the limits shown in "permitted variations" in Table 3.

Where ceiling heights exceed the requirements of Table 3 or the exceptions set out above, then special solutions should be implemented .

NOTE 1 For sensitivity parameters for smoke detectors see Table 4.

NOTE 2 If using multi-sensor detectors, where different sensing elements are intended to be used separately e.g. in a time related system, then the height restrictions which apply are those for the least sensitive element.

Table 2 — Limits for siting point detectors

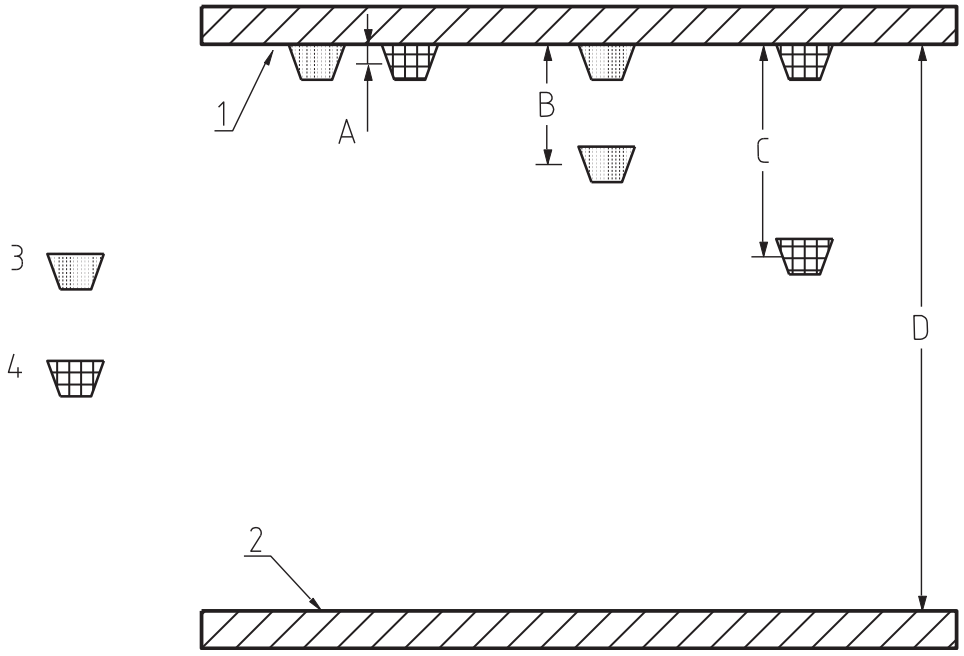
Type of detector	**Maximum floor area to be covered by one detector** (m^2)	**Maximum horizontal distance between centres** (m)	**Maximum horizontal distance of detector from walls or partitions** (m)
Heat Detector	50	10	5
Smoke/Carbon monoxide Detector	100	12	6
IMPORTANT — These limits are subject to the minimum number of detectors as defined in 6.10.4.1.			

Table 3 — Limits of ceiling heights

Detector Type	Ceiling height – general limits (m)	Permitted variations as per 6.10.4.6 (m)
Heat Detectors conforming to I.S. EN 54-5 class A1	9	10,5
Other classes	7,5	N/A
Point Smoke detectors (as 6.8.3)	-	
Normal sensitivity	10,5	12,5
Enhanced sensitivity (as set out for aspirating smoke detection systems below	12	14
Optical Beam Smoke Detectors as I.S. EN 54-12	25	28
Optical Beam Smoke Detectors with enhanced sensitivity (i.e. ≤ 35% attenuation)	See Note	See Note
Aspirating Smoke Detection System as FIA CoP	-	
Any ASD system approved to EN54-20	10,5	12,5
ASD system with at least 5 Class C holes or at least 2 Class B holes	15	18
ASD system with at least 15 Class C holes or at least 5 Class B holes	25	28
ASD system with at least 15 Class B holes	40 See Note	43 See Note
Other Fire Detectors	-	-
Multi-sensor	See Note 2 to 6.10.4.6	-
Carbon monoxide	10,5	12,5
Flame	As specified by the manufacturer	-
Video		
Other		
NOTE For application of enhanced sensitivity optical beam smoke detectors or aspirating systems at heights greater than 25 metres the manufacturer's recommendations should be followed and the use of supplemental detection is highly recommended.		

Table 4 — Sensitivity of Smoke detectors

Sensitivity	Range (obscuration per metre)	Class
Normal	> 2 % (within limits of I.S. EN 54-7)	C
Enhanced	0,8 % to 2 %	B
Very high	> 0,8 %	A



Key

1	Ceiling
2	Finished floor level
3	Heat detector
4	Smoke detector
A	25 mm minimum (heat and smoke)
B	150 mm maximum (heat detector)
C	600 mm maximum (smoke detector)
D	Maximum allowable height in accordance with Table 3

Figure 5 — Height and clearance below ceilings

6.10.5 General (structural) considerations

6.10.5.1 Pitched roof or north-light roof

If a protected space has a pitched roof or north-light roof, then detectors shall be installed within each apex. If the difference in height between the top and bottom of an apex is less than the maximum depth allowed between the roof and the detector (150 mm for heat detectors or 600 mm for smoke detectors) then the roof may be treated as if it were flat.

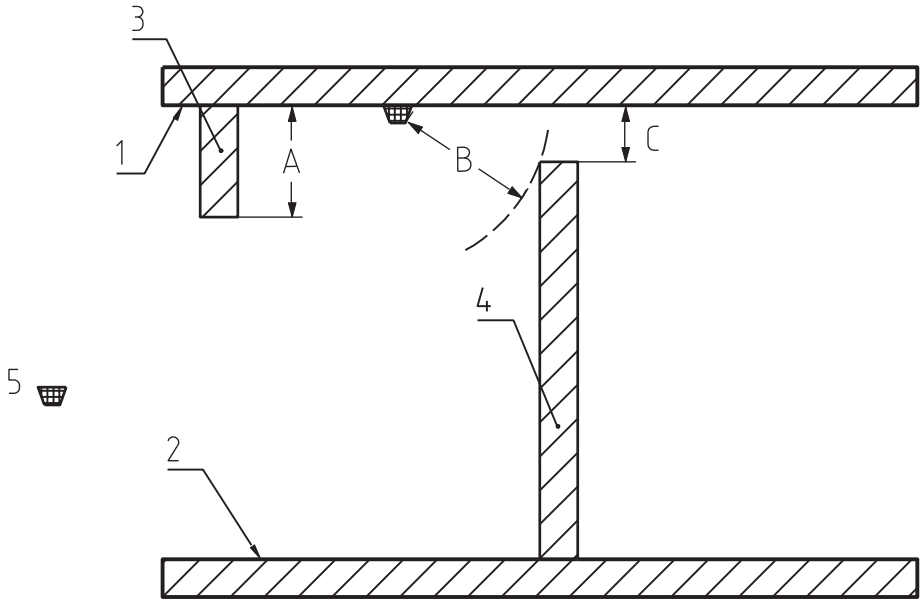
For detectors mounted in the apex of a pitched or north-light roof, the requirements of 6.10.4 and Table 2 for the horizontal distance from the point to the detector may be increased by 1 % for each degree of slope of the roof up to a maximum increase of 25 % and the area limits per point-type detector given in 6.10.4 and Table 2 may be increased in proportion to the square of the increased distance. For example, if the roof slopes at 10° the distance may be increased by 10 % to 1,1 times the given distance, and the area covered may be increased to 1,21 times the given area subject to the height limitations given in Table 3.

6.10.5.2 Corridors

In a corridor less than 5 m wide, the horizontal distance given in 6.10.4 and Table 2 may be increased by half the difference between 5 m and the width of the corridor, e.g. in a corridor 3 m wide the distances may be increased by 1 m. This amendment shall not apply to a category L4 or L2/L4 installation where detectors are not installed in all adjoining rooms. A corridor wider than 5 m should be treated as an open area as recommended in 6.10.4.1.

6.10.5.3 Walls and partitions

Detectors (other than optical beam smoke detectors) shall not be mounted within 500 mm of any walls or partitions. Where rooms are divided into sections by walls, partitions or storage racks reaching to within 300 mm of the ceiling, the dividers shall be considered as if they reached the ceiling and the sections shall be considered as separate rooms (see Figure 6 and 6.10.5.4).



Key

1	Ceiling
2	Finished floor level
3	Structural beam
4	Wall, partition, rack etc
5	Detector
A	If > 10 % of room height or a maximum of 600 mm, then treat as a wall
B	Clearance 500 mm minimum
C	If < 300 mm, then treat as a wall

Figure 6 — Obstructions

6.10.5.4 Obstructions

If the passage of smoke or hot gas from a point to a detector is likely to be disturbed by a ceiling obstruction (such as a beam) having a depth greater than 600 mm or greater than 10 % of the finished floor-to-ceiling height such obstructions shall be treated as walls, and the requirements of 6.10.5.3 shall

be followed. Detectors shall not be mounted within a distance of 500 mm from any such obstructions (see Figure 6).

6.10.5.5 Lantern-lights/domes/damper wells/light wells

6.10.5.5.1 Lantern-lights/domes/damper wells

A detector shall be sited in any lantern-light/dome/damper well or similar used for ventilation. Detectors fitted in lantern-lights/domes/damper wells are liable to rapid temperature variations due to solar and/or internal heating. Where heat detectors are used they should not include rate-of-rise elements and should be protected from direct sunlight.

NOTE For maximum mounting heights, see 6.10.4.5 and 6.10.4.6.

6.10.5.5.2 Lightwells

A detector shall be sited in any lightwell having a height above the ceiling of greater than 800 mm unless the total area of the lightwell(s) is less than 10 % of the ceiling area of the protected space.

6.10.5.6 Low ceiling areas

In low ceiling areas, care in the choice and siting of smoke detectors is necessary to avoid nuisance operation by toasters, tobacco smoke and other small nuisance sources.

6.10.5.7 Honeycombs/Coffers

The following specifies the requirements for the siting and spacing of detectors in Honeycombs/Coffers.

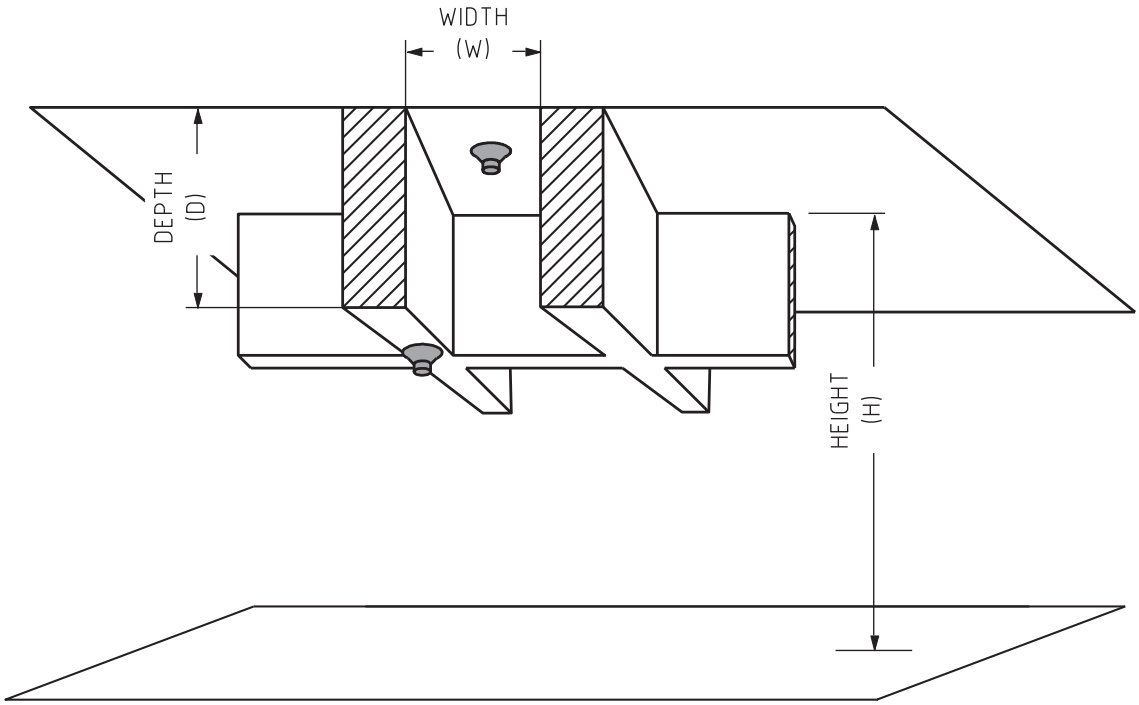
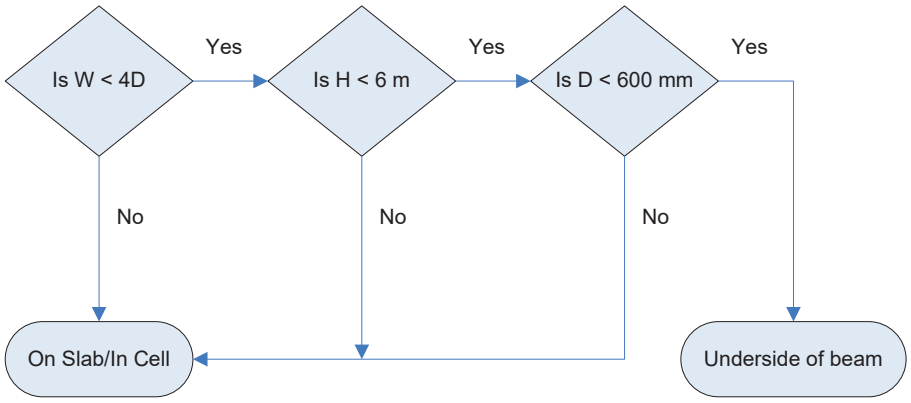


Figure 7 — Typical Honeycomb Detail

The following flow chart shall be used to determine the location of the detectors.



NOTE If detectors are to be mounted on the underside of beams and the Depth (D) of the beam exceeds 600 mm i.e. maximum permitted distance from a ceiling/roof, the Fire Risk Analysis should consider the most suitable location and spacing.

Figure 8 — Siting of Smoke (Heat) Detectors

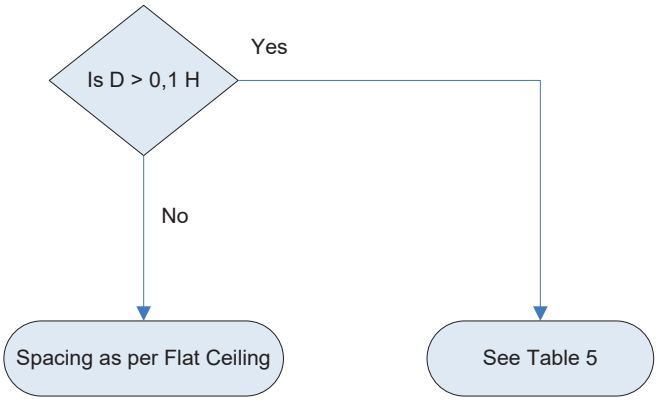


Figure 9 — Spacing of Detectors

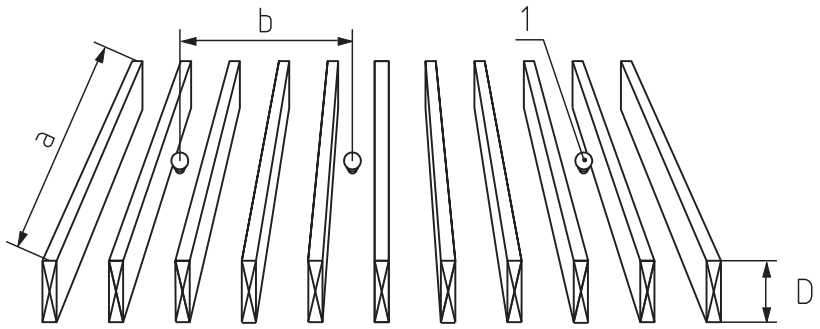
Table 5 — Spacing of Detectors on Honeycomb/Coffered Ceilings

Height (H) (m)	**Max Distance between any point and the nearest Smoke (Heat) Detector** (m)	**Spacing of Smoke (Heat) Detector** (m)
≤ 3,0	4,0 (3,0)	8,0 (6,0)
≤ 4,0	5,0 (4,0)	10,0(8,0)
≤ 5,0	5,5 (4,5)	11,0(9,0)
> 5,0	6,0 (5,0)	12,0(10,0)

6.10.5.8 Closely Spaced Beams/Joists

Where there are a number of closely spaced beams/joists on a ceiling/roof e.g. floor joists, the cells created between the beams/joists are elongated. The detector spacing between the cells shown in Figure 10 should be used where the length (a) of cell formed by the beam does not exceed 10 m (7,5 m for Heat Detectors). Where this distance is exceeded the cell should be subdivided to ensure the length of each cell does not exceed 10 m (7,5 m for Heat Detectors).

The following flow chart shall be used to determine the maximum smoke (heat) detector spacing, where the height (H) is the overall ceiling height from the floor to the structural slab.



Key

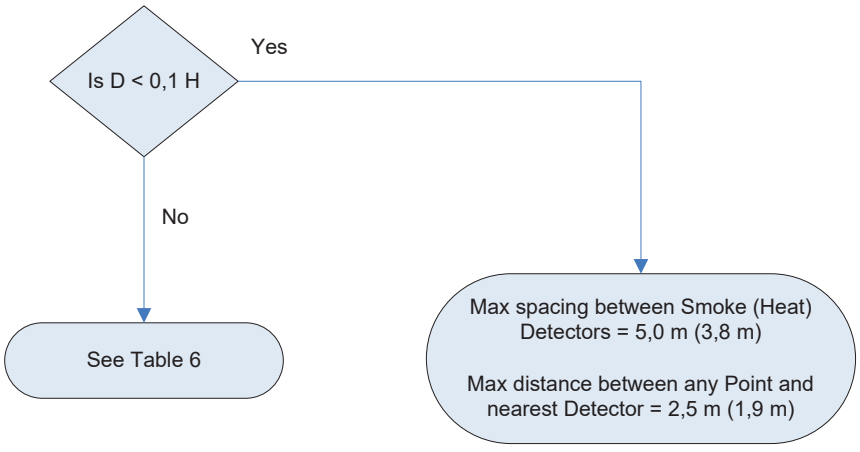
a Length

b Maximum space between detectors

D Depth of beam

1 Detector

(a) Typical closely spaced beams/joists



(b) Maximum detector spacing

Figure 10 — Closely spaced beams/joists

Table 6 — Spacing of detectors on ceilings with closely spaced structural beams/joists

Height (H) (m)	Max Distance between any point and the nearest Smoke (Heat) Detector (m)	Max Distance between Smoke (Heat) Detectors (m)
≤ 3,0	1,1 (0,75)	2,3 (1,5)
≤ 4,0	1,4 (1,0)	2,8 (2,0)
≤ 5,0	1,5 (1,1)	3,0 (2,3)
> 5,0	1,6 (1,2)	3,3 (2,5)

6.10.5.9 Horizontal voids

6.10.5.9.1 General

For L1 systems all horizontal voids ≥ 800 mm in height should be treated as normal spaces and should be protected according to the category of system chosen.

If the fire risk within a horizontal void of ≥ 800 mm is considered to be low, consideration may be given to the omission of fire detection from the void, subject to the agreement of the interested parties (see 6.2.8.4), but this shall be recorded as a variation on the relevant system certificate. This might arise, for example, if the probability of ignition and development of fire in the void were very low, or if the void were limited in extent so that spread of fire beyond the room of origin, via the void, is unlikely.

On the basis of the Fire Risk Assessment, horizontal voids ≤ 800 mm in height need not have independent coverage if the void is such that extensive spread of fire or fire products, particularly between areas, rooms or compartments, cannot take place within it before detection.

Spacing and siting of detectors within horizontal voids shall take account of any obstructions that could interfere with their operation, servicing or maintenance. Precautions against the deposition of dirt or dust should be considered. All concealed detectors shall be readily accessible for servicing and maintenance purposes.

6.10.5.9.2 Voids in escape routes

Ceiling and floor voids in designated corridor escape routes and lobbies shall be protected as per 6.10.3.1.2.2.and 6.10.3.1.2.3.

6.10.5.10 Vertical shafts and ceiling openings

When stairways, enclosed chutes through fire compartments, or shafts for utility risers, lifts, hoists or escalators penetrate ceilings leaving an opening at ceiling level, smoke detectors shall be sited on the ceiling of each level within 1,5 m horizontally of:

a) unenclosed floor openings,

b) openings to enclosed elevators, lifts, hoists, escalators, chutes through floors, staircases and similar openings (but excluding suitably protected emergency means of escape stairs),

c) where several vertical risers (lift shafts/utility risers, etc) open onto an enclosed lobby the maximum number of smoke detectors required need not exceed one per 25 m^2 of ceiling space even if the requirement for additional detectors is required by 6.10.5.10 a) or b), (i.e. detectors at openings from risers).

A smoke detector shall also be sited at the top of each stairway, enclosure or shaft. If an elevator or stairway has a sloping ceiling, then there may be a need for smoke detectors to be sited on that ceiling.

Remote fire detection (e.g. aspirating) shall be used for the protection of vertical shafts where access for installation or maintenance presents hazards to personnel.

6.10.5.11 Perforated ceilings/grid type floors/open mesh decking

6.10.5.11.1 Detectors above a perforated false ceiling or mesh decking (open grid type floor as used in plant-rooms) may be used for protection of the area below the ceiling or decking if:

1) the perforations are substantially uniform, appear across the complete ceiling or decking and make up more than 40 % of the surface, and

2) the minimum dimension of each perforation in any direction is 10 mm, and

3) the thickness of the ceiling or decking is not greater than three times the minimum dimension of each perforation.

6.10.5.11.2 In all other cases, detectors shall be mounted below the false ceiling or decking and if protection of the void above or below is necessary, further detectors shall be installed to protect that void.

6.10.5.11.3 Detectors should not be mounted in positions where air flow will adversely impact on the detector either by causing contamination of the device or preventing the sensed phenomena (products of combustion, heat, gases, etc.) reaching the device.

Detectors should not be mounted within 1 m of any air inlet of a forced ventilation system.

Where air is forced through a perforated ceiling the area around the detector should be imperforate for a radius of at least 600 mm around each detector.

Where air flow or extract are horizontal, then the recommendations as set out in BS 6266 should be followed.

6.10.5.11.4 Air conditioning and ventilation systems may adversely affect the response of detectors by drawing away heat and smoke, or by cooling the hot gases produced by a fire. Allowance should be made for the different circumstances which may arise when such systems are or are not functioning. In these conditions the siting and provision of detectors will require special consideration. In general, if the room ventilation rate exceeds four changes per hour then additional and or alternative detectors may be required. For applications in computer suites or electronic data processing areas, BS 6266 should be consulted and the relevant spacings therein applied.

6.10.5.12 Detector clearances

Detector siting should be such that a clear space of 500 mm is maintained around and below each detector.

NOTE For maximum mounting heights refer to 6.10.4.5 and 6.10.4.6.

6.10.5.13 Enclosed stairways

In enclosed stairways detectors shall be sited on each main landing (see also [A1] [A1] 6.10.5.10).

6.10.5.14 Stratification

6.10.5.14.1 Stratification of the plume from a small fire may occur, particularly in a room that is being heated.

6.10.5.14.2 Because of the variables associated with different heating patterns, it is usually difficult to predict with certainty the level at which stratification will occur, (although it generally occurs at the level at which heat is being introduced, e.g. by room heaters, hot pipes, or the sun). If detectors are mounted at an expected stratification level, and stratification does not occur or occurs at a higher level than the detectors, then detection may be dangerously delayed.

6.10.5.14.3 If ceiling level detectors are used, as the fire grows and releases more heat the plume will break through the stratification layer and the detectors will operate. Thus, ceiling level detectors should always be used, even where supplementary detectors are mounted at an expected stratification level.

6.10.5.14.4 Since the normal ceiling temperature is unlikely to approach the operating temperature of a heat detector, stratification is unlikely to affect the response of heat detectors, and even in the presence of stratification smoke detectors are likely to operate before heat detectors.

6.10.5.15 Remote indication of operation

If a detector is concealed, for example in a void, then it may be desirable to provide a remote indication of its operation. If necessary a label should be provided at the indicator to show the location of the detector. A remote indicator (with labelling) shall be considered mandatory for conventional systems and with the exception of the requirements of 9.2.3.3 optional for addressable systems

6.10.5.16 Additional detectors

The use to which any room, space, area or void is to be put, or its structural features, may necessitate the installation of detectors additional to those otherwise recommended.

6.10.5.17 Adverse environments

Where possible, detectors should not be mounted in places where they are subject to local adverse environmental conditions, e.g. on a machine producing high levels of vibration, shock or pollution. If it is not possible to avoid such conditions, or if the adverse environment is general in the area, then the manufacturer should be consulted.

6.10.6 General detector use and siting considerations

6.10.6.1 Use and siting of heat-sensitive detectors

6.10.6.1.1 Rapidly changing ambient temperatures

Where sudden changes in temperature are likely, e.g. in kitchens, boiler houses, furnace or kiln rooms, the risk of false alarms caused by rapidly rising temperatures should be minimised by the use of heat detectors without a rate-of-rise element.

6.10.6.1.2 High temperatures

Ambient temperatures greater than those set out in I.S. EN 54-5 are unlikely to be encountered in a normal building and particularly in applications for protection of life.

Where ambient temperatures exceed the capabilities of devices set out in I.S. EN 54-5 then this should be considered as a special application and, subject to consultation with the relevant authorities, alternative heat detection devices may be used.

6.10.6.1.3 Heat-sensitive line detectors

6.10.6.1.1 Heat-sensitive line detectors may be particularly suitable for protecting items of plant or cabling. When used for these purposes, the detector should be mounted as close as possible to the place where fire or overheating might occur, and either be mounted above the risk or in thermal contact with it.

6.10.6.1.2 Where heat sensitive line detectors are used for space protection, these should be installed such that they satisfy the siting and spacing requirements for point heat detectors.

6.10.6.1.3 Care shall be taken when positioning the heat sensing element to ensure that the passage of hot gases to the sensing element is not subject to obstruction by any structural element (beams, partitions etc.) or items of plant and machinery (ductwork etc.).

6.10.6.2 Use and siting of smoke detectors

6.10.6.2.1 General

Among other factors that can establish temporary or permanent conditions having an effect on the siting of smoke detectors are the following:

a) the various forms of fan-assisted overhead heating or cooling systems (see 6.10.5.11.3),

b) air-cooled equipment with the exhaust air blowing out into the room or factory area,

c) ambient air currents which may cause false alarms or inhibit correct operation,

d) roofs or ceilings of unusual shape or special construction, deep beams or smoke curtains,

e) lofty buildings, e.g. buildings with ceiling heights exceeding 10,5 m,

f) stairways,

g) rooms with cooking equipment,

h) some boiler rooms and plant rooms,

i) areas where vehicles powered by internal combustion engines (particularly those with overhead or vertical exhaust outlets) may be used,

j) areas where hot work is carried out or may be carried out.

6.10.6.2.2 Smoke detectors in ventilation ducts

6.10.6.2.2.1 Consideration should be given to the provision of smoke detectors to monitor smoke within ventilation supply and extract ducts.

6.10.6.2.2.2 Although they may be connected to the fire alarm system, these smoke detectors shall not be considered as constituting on their own a satisfactory fire detection system.

6.10.6.2.2.3 Smoke detectors or probes shall be installed in a straight stretch of ducting, at a distance from the nearest bend, corner or junction of at least three times the width of the ducting or in accordance with the recommendations of the manufacturer.

6.10.6.2.2.4 The probes of the unit shall be correctly aligned and arranged to cover as much of the duct as possible and shall be within the recommendations of the manufacturer.

6.10.6.2.2.5 If placed in high or variable speed air flows, some designs of smoke detector may malfunction. Manufacturers of such detectors will usually provide ancillary sampling tubes or windshields, and these should be installed where necessary. Aspirating or air sampling detection systems in which air is drawn into the sampling point at a controlled rate by a pump are generally independent of the rate of air flow near the sampling point and may offer significant advantages over conventional smoke detectors where the air speed in the duct is likely to vary widely.

6.10.6.3 Use and siting of Optical Beam Smoke Detectors

Optical beam smoke detectors shall be installed in accordance with the manufacturers' instructions, with not more than 3 m of the beam length running within 500 mm of any wall, partition or obstruction. Those parts of the beam within 500 mm of the beam's transmitter, receiver or reflector(s) need not be counted in the 3 m restriction.

The manufacturers' recommendations on beam length shall be adhered to and the limits for siting point detectors as per Table 2 shall be followed.

6.10.6.4 Use and siting of Flame Detectors

6.10.6.4.1 Some types of flame detector respond to the instantaneous level of radiation received, while others depend on the level received over a period. In either case the response will depend on the distance between the flame detector and the fire.

6.10.6.4.2 A clear line-of-sight to the area being protected is preferred although reflected radiation of sufficient intensity can activate a flame detector.

6.10.6.4.3 Advice on distances, spacing and siting to be used should be given by or sought from the manufacturer.

6.10.6.5 Use and siting of carbon monoxide Fire Detectors

The siting and spacing of these devices shall follow the manufacturers' instructions but in no case shall they exceed the siting and spacing requirements for smoke or heat detectors as set out in 6.10.4 and Table 2 (see also 6.8.5 and 6.9.5).

6.10.6.6 Use and siting of Multi-sensor Fire Detectors

6.10.6.6.1 In a fire detection system incorporating multi-sensor detectors each multi-sensor fire detector contains more than one sensor, each of which responds to a different physical and/or chemical

characteristic of fire. The purpose of combining sensors in this way is to enhance the performance of the system in detection of fire, or its resistance to at least certain categories of false alarm, or both.

6.10.6.6.2 The method (if any) of combining the signals from each sensor varies between different proprietary multi-sensor fire detection systems. In some such systems, there is significant potential for reduction of many types of false alarm.

6.10.6.6.3 With some multi-sensor fire detectors it is possible to disable an individual detection sensor. This might be used in a time related system to reduce false alarms. For example, with a heat and optical multi-sensor detector the optical sensor might be disabled during the day. If this is the case, it is vital that the detectors are spaced for the least sensitive sensor, in this case, heat.

6.10.6.7 Use and siting of video detection detectors

Advice on siting and application should be given by or sought from the manufacturer (see also 6.9.6).

6.10.7 Use and siting of detectors in specific areas (see 6.10.3.4.3)

6.10.7.1 General

For FDAS in residential buildings refer to Clause 10 of this Standard.

Where the possibility of fire spread is not eliminated by structural means, for example in ceiling voids, detectors should be sited either in the area where fire might start or in the areas through which the fire products might reach the escape routes. Where detectors are hidden the use of remote indicators as described in 6.10.5.15 should be considered.

6.10.7.2 Sleeping accommodation

All categories of systems shall provide protection in sleeping accommodation and the requirements of 6.10.4 shall be followed for the siting of detectors therein.

6.10.7.3 Day accommodation

In rooms not intended for sleeping accommodation the safety of the room occupants shall be considered. In some types of premises (such as nursing homes) people using a day lounge will frequently be asleep, and such rooms may need to be treated as sleeping accommodation. Smoke detection shall also be considered where the room occupants will have difficulty in raising an alarm or need assistance in escaping from a fire.

Fires starting in day accommodation may grow while the room is unoccupied until they endanger people elsewhere in the building. In this case either heat or smoke detectors should be installed in the room.

6.10.7.4 Store rooms

Detectors should be considered for all store rooms.

6.10.7.5 Kitchens

Fires starting in kitchens are unlikely to endanger normally active occupants of the kitchen but may endanger occupants of the remainder of the building. In general smoke detectors should not be used in kitchens. Where detection is considered necessary, heat detectors should be preferred.

6.10.7.6 Bathrooms

The installation of fire detectors in bathrooms shall be subject to Fire Risk Assessment and assessment of any potential for false alarms (see 6.11 〚A1〛 and 7.1.2 a) 7) 〚A1〛).

6.10.7.7 Service ducts

Where service ducts are large enough to be regularly entered, for instance for maintenance purposes, then consideration shall be given to the safety of persons who might be in the duct when a fire starts. Such consideration shall include the following:

a) the installation of detectors in the duct in case of fire starting in the duct,

b) the audibility and visibility of alarms in the duct,

c) the means of escape for persons in the duct.

6.10.7.8 Covered car-parks

Car-parks, open-sided or enclosed, whether at ground level, underground or multi-storey, shall have as a minimum, a category L4 system but excluding the car-parking areas.

The Fire Safety Strategy shall determine the need for fire detection in any **car-parking area** (see definition) not protected by sprinklers. In the absence of any Fire Safety Strategy determination on this, detection shall be provided. This standard recognises that smoke detection may not be appropriate for use in car-parking areas. However protection for these areas may be provided by heat detectors complying with 6.10.4, or flame detectors complying with 6.8.4 and 6.9.4, and all escape routes and identified fire risks shall be protected by smoke detectors to 6.10.3.3 (L3) as minimum.

Where car-parks not protected by sprinklers are directly accessible from a building above by stairways or lifts, the installation of detection in the car-parking area is mandatory (see also 10.2.3.4).

6.10.7.9 Toilets/WCs

6.10.7.9.1 Single toilet/WC

In Category L1 and L3 systems, any toilet/WC with one access door which opens directly on to an escape route shall be treated as a room and protected accordingly, regardless of size.

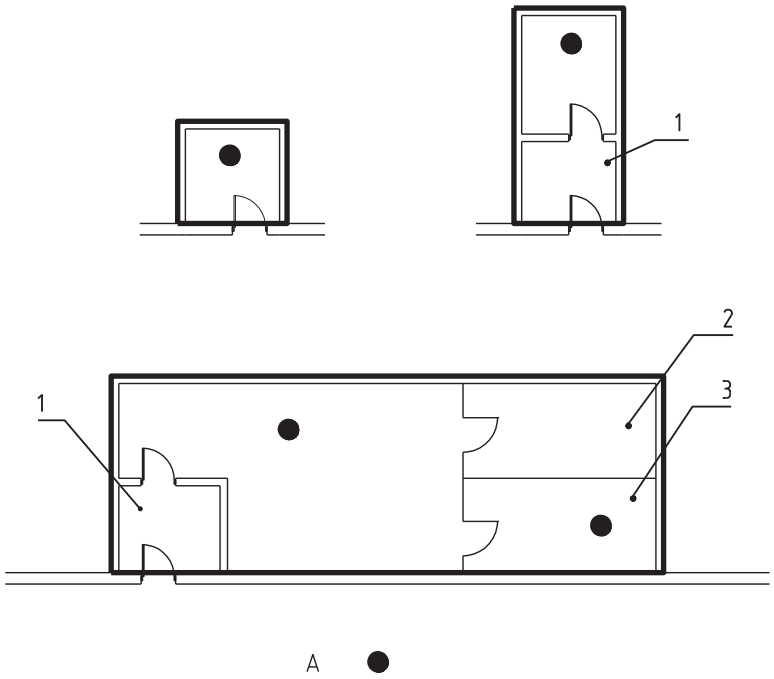
6.10.7.9.2 Air-lock entries

In Category L1 and L3 systems, toilets/WCs with two access doors (air-lock style) shall have protection in the toilet/WC area. Additional detection will not be required in the air lock provided the Fire Risk Assessment has ascertained that there is no fire risk associated with the air lock and the air lock is less than 2 m^2.

6.10.7.9.3 Toilets/WCs with multiple cubicles

The common space shall be protected. In calculating the density of detectors required the floor space of each cubicle shall be included unless the cubicle is also protected.

Cubicles whose walls do not extend to within 300 mm ceiling height need not have individual protection. For Category L1 systems, totally enclosed cubicles shall each be individually protected.



Key

1	Area < 2m^2
2	Open cubicle
3	Sealed cubicle, L1 Category
A	Detector

Figure 11 — Toilets/WCs with multiple cubicles

6.11 False alarms

6.11.1 General

False alarms can be a major hazard to any fire alarm system since they lead to loss of confidence in the system. It is important that any alarm from the system is treated as an alarm of fire until it can be proved to be false rather than being treated as false until proved to be a fire. It is essential that the utmost care should be taken by System Designers, Installers and Users to reduce the incidence of false alarms.

Detailed requirements for the 〚A1〛 prevention of false alarms are set out in Clause 7 and are required as 〚A1〛 part of the review and implementation of the design process.

6.12 Control and Indicating Equipment (CIE)

6.12.1 General

CIE may comprise equipment for the reception, indication, control and relaying of signals originating from detectors or call points connected to it, and for the activation of alarm sounders and alarm signalling devices.

6.12.2 Choice of equipment

CIE for fire alarm systems shall comply with I.S. EN 54-2.

6.12.3 Siting

6.12.3.1 CIE shall be sited so as to be readily accessible to building occupants and the fire service at all of the following:

- the primary entrance/exit,
- the designated fire service access point(s),
- secondary entrance(s)/exit(s) that will be used when the primary entrance/exit is out of service,
- any additional entrances/exits deemed necessary.

Where CIE is required at more than one location, Repeater Panels with control facilities and detection zone indication shall be used. Repeater Panels without control facilities are not acceptable at these locations.

6.12.3.2 Access to the location of the CIE should not be restricted unless there is a security or vandalism risk. Where the equipment is not clearly visible at the entrance(s) then indication as to the location shall be clearly displayed at the entrance(s). This shall take the form of an unambiguous notice at the entrance, and a flashing strobe unit adjacent to the CIE location activated in a fire condition, and visible from the entrance(s).

6.12.3.3 Due care shall be taken in the location of the CIE and its power supply to facilitate access for maintenance purposes.

6.12.3.4 The CIE shall be located at a height which allows all indications to be viewed and control functions to be operated without the use of mechanical access equipment.

The height of the display and indications shall be, for desktop applications, a minimum of 890 mm from the floor level. For all other applications, the height of the display and indications shall be a minimum of 1,4 m and a maximum of 1,8 m from finished floor level. Due care shall be taken to ensure that the viewing angle allows easy readability by all operators and responsible persons (including special needs requirements). Where a special needs requirement exists, the provision of duplicate controls and displays should be considered.

6.12.3.5 In multi-storey and mixed/multi occupancy buildings where occupiers have independent fire detection systems/sub-systems, the CIE for these systems shall be located at the entrance to the occupier's premises. These systems shall be interconnected with the general fire detection and alarm system for the building such that a minimum of one Detection Zone identification is displayed on the general alarm system for each sub system. Particular requirements for residential/domestic premises are set out in Clause 10.

6.12.3.6 In a complex building the CIE may be located in a permanently manned control centre having personnel who will respond to the fire alarm activation and take control of the situation and direct the fire services to the location of the fire without need of recourse to the CIE.

6.12.3.7 Where a number of buildings form a single complex on a campus then each building having more than one Detection Zone shall have its own CIE or repeat indication/control equipment from a common campus-wide system.

6.12.3.8 The entrance through which access is gained to the CIE shall have an audible and visual indication mounted externally to draw attention to the entrance. The signal devices shall be red in colour

and clearly labelled 'FIRE'. The visual indication shall emit a red flashing light of sufficient intensity to be visible in a clear line of sight of at least 20 m (see also 6.6.1).

6.12.3.9 In a building in multiple occupancy it is essential that the siting of the CIE is in compliance with 6.12.3.1 and 6.12.3.5, and that access to the equipment is available to all the occupants (see also 6.2.5).

6.12.4 Lighting level

The ambient lighting level in the vicinity of the CIE and all Repeater Panels (see 6.12.3) should be such that any visual indications can be clearly seen, and any instructions for use easily read. Where necessary, additional lighting shall be provided to give the appropriate lighting levels. Emergency lighting in accordance with I.S. 3217 shall also be provided on access routes to and at the CIE and Repeater Panels.

6.12.5 Sound level

The ambient sound level adjacent to the CIE shall not be such as to prevent the audible indications (such as the fault warning sounder) from being heard (see also 6.6.2).

The CIE shall incorporate, or have located adjacent to it, an audible device that sounds in the event of the operation of the first detector or call point in any Detection Zone. This signal may, but need not, be the same as the general fire alarm sounders. The signal may be manually silenced but shall sound again when the first detector or call point in another Detection Zone operates.

The operation of a silencing switch, either for the general fire alarm sounders or for the signal described above, shall cause a visual and/or audible signal to be given at the CIE. This audible signal, which may be the same as that for a fault warning, is intended to act as a reminder that the silencing switch has been operated. It should give a distinctive sound different from that of any other alarm sounder used to give a fire alarm and different from that of the signal described above.

The signals described above should not be so loud as to interfere with voice communication to the fire services (see 6.5.3) or safe use of the CIE controls (i.e. fire sounders should not be mounted too close to the CIE).

The operation of the sounder silencing switches shall not affect the alarm or fault visual indicators (see 6.6.11 (e)).

6.12.6 Fire risk

CIE should be sited in areas of low fire risk, so that the equipment is unlikely to be involved in a fire before adequate warning has been given. If the system uses automatic detectors, then the area in which the control unit is sited shall be covered by the detection system.

6.12.7 External siting

If it is necessary for practical reasons to mount the control and indicating equipment outside the building, then adequate precautions shall be taken to protect the equipment from the effects of weather, vandalism or unauthorised interference. Similar precautions may be necessary if the equipment has to be installed in a severe environment within a building. The requirements of 6.12.3.2 and 6.12.3.3 shall also be taken into account.

6.12.8 Indications of origin of alarms

6.12.8.1 Purpose

The fire alarm system shall indicate the origin of the alarm in such manner as can be easily, quickly and unambiguously interpreted by occupants, members of staff and fire service personnel.

6.12.8.2 Indications

a) The primary indication of the origin of the alarm shall be an indication of the detection zone (see 6.4). The form of detection zone indication shall be the specific detection zone number in text and/or a separate and distinct illuminated indicator.

b) In very large premises a graded series of displays may be needed, with a central indicator panel specifying the sector of origin, and a further panel within the sector to show the detection zone of origin.

c) On or adjacent to the CIE shall be a diagrammatic representation of the building (zone chart), showing at least the division into detection zones, and the Access and Egress points to the building.

d) The responsibility for the provision of the zone charts shall be clearly set out in the system design specification (see 6.2.9). Appropriate drawings indicating at least the division into detection zones and the Access and Egress points to the building shall be provided by the System Designer/Specifier and shall form the basis for the preparation of the required zone charts.

6.12.8.3 Method of indication

In a system capable of giving identification of response from individual detectors and/or manual call points i.e. an addressable system several methods of providing supplementary information are possible by one or more of the following methods of display a:

a) display of letters and numbers (alpha-numeric) providing an English text description of the location of origin,

b) zone chart as set out in 6.12.8.2 (c) located on or adjacent to the CIE and at any Repeater Panel locations as required in 6.12.3.1,

c) mimic diagram located on or adjoining to the CIE and at any location of repeated indications,

d) display of a mimic diagram on display screen equipment (e.g. visual display unit (VDU)),

e) printer. In the event of paper, ink or ribbon being exhausted, indications will be lost. Printers, therefore, should preferably be considered as a back-up to other displays used,

f) by other suitable means as agreed.

Where accurate and unambiguous information about the location of fire is critical to the evacuation process and the safety of life e.g. in health care premises, residential care homes or hospitals, an addressable system shall be employed.

NOTE In an addressable system an address location directory should be kept permanently at the CIE location.

6.12.8.4 Power

Any power required for any display in 6.12.8.3 shall be derived from the fire alarm system normal and standby power supply or may incorporate its own normal and standby power supply compliant with I.S. EN 54-4 (of equal duration) and shall be taken into account when assessing the capacity of the power supply.

6.12.9 Accessibility of Indications and Controls (refer also to Annex A in I.S. EN 54-2:1999)

6.12.9.1 Four access levels shall be provided on the CIE from access level 1 (most accessible) to access level 4 (least accessible). Manual controls and other functions shall be grouped on the appropriate access level, as specified in I.S. EN 54-2.

6.12.9.2 All mandatory indications shall be visible at access level 1 without prior manual intervention (e.g. the need to open a door).

6.12.9.3 Manual controls at access level 1 shall be accessible without special procedures.

6.12.9.4 Indications and manual controls which are mandatory at access level 1 shall also be accessible at access level 2.

6.12.9.5 Entry to access level 2 shall be restricted by a special procedure.

6.12.9.6 Entry to access level 3 shall be restricted by a special procedure, differing from that for access level 2.

6.12.9.7 Entry to access level 4 shall be restricted by a special means which are not part of the CIE.

6.13 Power supplies

6.13.1 General

The vast majority of fire alarm systems rely for their operation on electrical power. No source of electrical power is totally reliable. Every source will at some time fail, even if only for a limited period. The general principle on which the requirements for fire alarm power supplies are based is that the reliability with which a fire alarm system responds to a fire should as far as possible be unaffected by the unreliability of its main supply source. The main supply shall be backed up by an emergency supply able to support the system while the main supply is corrected.

The duration and power required from the emergency supply will depend on the purposes of the system, the extent of the facilities and the method of monitoring the normal supply. In most cases, emergency supplies complying with 6.13.3 and 6.13.5 will be satisfactory, but there may be cases in which greater capacities would be required, for example premises in remote areas where more than 24 h might be needed to locate and repair a fault in the main supply.

If provision is made for a normal supply and an emergency supply, then each shall be capable of supplying the largest load to be placed on it under normal, fire and fault conditions. Care should be taken in the design of the power supply to ensure continuity of supply to the fire alarm system. Transition between supplies shall not cause momentary interruptions. Where devices such as fuses are fitted in order to protect power supplies, the operation of a single protective device shall not interrupt both power supplies and cause the system to fail.

The condition of the normal supply shall be indicated by a green lamp, lit when the normal supply is on.

All power supply equipment employed on a FDAS shall comply with the requirements of I.S. EN 54-4.

6.13.2 Connection of a fire alarm system to a public or private power distribution supply

The wiring and installation of the normal supply to a fire alarm system shall comply with ET 101.

It is important that the normal supply to the fire alarm system should be [A1] arranged to ensure continuity of supply as reasonably practicable. [A1]

The normal supply to a fire alarm system should be connected as close as practicable to the incoming normal supply to the premises.

The main disconnecting device for this supply should be secure from unauthorised operation and shall be fitted with a permanent notice using the colour red and stating, “FIRE ALARM: DO NOT SWITCH OFF”. It may be desirable for the main disconnecting device to be contained in a securely closed box with a frangible cover.

Where appropriate a warning notice of similar construction should be fixed to the main disconnecting device of the general service installation giving warning that its operation will disconnect the supply to the fire alarm system – “WARNING: THIS SWITCH DISCONNECTS THE FIRE ALARM SYSTEM”.

Particular arrangements should be provided where it is the practice to switch off the supply to the premises, for example during maintenance, when unoccupied, or for economy in consumption of electricity, to ensure continuance of the normal supply to the fire alarm system. Any disconnecting device which can disconnect the normal supply from a fire alarm system should be secure from unauthorised operation and shall be fitted with a permanent notice using the colour red and stating, “FIRE ALARM: DO NOT SWITCH OFF”.

In some systems more than one power supply unit may be provided, i.e. distributed power supplies. With these systems the condition of all power supplies (other than those that "fail-safe" on mains failure) shall be indicated at the CIE.

6.13.3 Types of power supply

6.13.3.1 Normal supply

The normal supply for the system should be derived from the public supply system, transformed or modified as necessary.

Where no public supply system is available, privately generated power may be used. The possible frequency and duration of breaks in such supplies should be investigated and taken into account in assessing the necessary capacity of the emergency supply.

6.13.3.2 Emergency supplies

6.13.3.2.1 Standby supply batteries

The most commonly used type of emergency supply is a standby supply battery with an automatic charger. Where such a battery is used it shall be of a type having a life of at least four years under the conditions of use likely to be experienced in the fire alarm system. Automotive lead-acid batteries (e.g. the type normally used for starting service in cars) are not generally suitable for fire alarm service and shall not be used.

The standby battery capacity calculated to satisfy the requirements of 6.13.5 shall be increased by a minimum of 20 %.

Because the life of the battery is frequently dependent on its charging conditions, care shall be taken that the battery charger satisfies any requirements specified by the battery supplier. Where replacement batteries or battery chargers are used, similar care shall be taken to ensure charging compatibility. Replacement cells shall be compatible with the existing cells in both charge and discharge characteristics. A method of test likely to predict the failure of the battery in the interval between routine tests shall be provided by the system supplier.

Requirements and recommendations for battery capacities are given in 6.13.5. The charging rate of the battery shall be such that, having been discharged to its final voltage, the battery can be charged sufficiently to comply with the requirements and recommendations of 6.13.5 after a charging period of 24 h.

Recommendations for the siting of batteries are given in 6.13.6.

6.13.3.2.2 Standby supply batteries with standby generators

In some premises, in addition to supplies taken from the public mains, a generator is provided which generates power continuously as part of the normal operation of the building. In other premises a standby generator may be provided which should be automatically started on failure of the normal supply. Generators of either type may be used to replace partially the capacity recommended in 6.13.5 provided that in the event of failure of both the public mains supply and the locally generated supply the normal operation of the building cannot continue unless a supply is connected from some other source (such as a portable generator).

6.13.4 Maximum alarm load

6.13.4.1 General

The maximum alarm load is the maximum load imposed by the fire alarm system on a power supply under fire conditions. It will include the power required to operate the alarm devices, detectors, fault warning devices, the illumination of any ancillary services powered by the fire alarm system (see 6.16) etc. normal and emergency supplies shall each be capable of supplying the maximum alarm load irrespective of the condition of the other supply.

The load imposed on the power supply by the simultaneous operation of detectors and/or manual call points shall not cause an existing fire alarm to cease. In systems using microprocessors or stored programs, the imposition of the maximum alarm load shall not cause incorrect operation.

6.13.4.2 All systems

The maximum alarm load for an automatic system is the power required to operate all the alarm devices simultaneously, together with any visible or audible indications at the control and indicating equipment, any power drawn for the operation and/or indication of ancillary systems and the transmission of signals to remote manned centres. Because of the possibility of the spread of fire products throughout the building, the system shall be able to support the maximum number of detectors that can simultaneously give signals indicating fire, and the operation of manual call points in all Detection Zones.

6.13.5 Requirements and recommendations for duration of the emergency supply

6.13.5.1 Purpose

The fire alarm system shall be in an operating condition at all times people are present on the premises. The emergency supply shall have sufficient capacity to maintain the necessary protection until the cause of the failure of the normal supply has been investigated and the supply restored, or until other measures have been taken for the safety of the occupants. The type of emergency supply shall comply with 6.13.3.2.

6.13.5.2 Supervised systems

Premises in which the fire alarm system will be supervised at intervals of not more than 12 h, or that have a link over which a warning of failure of the normal supply can be given to a remote manned centre, shall have an emergency supply capable of maintaining the system in operation for at least 24 h, after which sufficient capacity shall remain to provide an evacuation alarm in all Detection Zones for at least 30 min.

6.13.5.3 Unsupervised systems

In premises not supervised as described in 6.13.5.2 the emergency supply shall be capable of automatically maintaining the system in normal operation for a period of not less than 24 h after the detection of a fault in the normal supply and the initiation of remedial action.

If the building is likely to be unoccupied and the fire alarm system unsupervised for periods longer than 24 h, then the standby power supply shall have a capacity of 48 h after which time the system shall have sufficient capacity to sound an evacuation alarm in all alarm Zones for at least 30 min.

On reoccupation the emergency facilities shall be provided to give protection for a period of at least 24 h. This facility may be manually connected, e.g. a spare fully charged battery could be manually switched on.

6.13.5.4 Standby generators

In systems using standby generators (see 6.13.3.2.2), the initial 24 h emergency supply recommendations of 6.13.5.2 and 6.13.5.3 can be reduced to the period which would be required to bring in and connect another source of power in the event of failure of both mains supply and local generator. In general, a period of not less than 6 h shall be allowed, after which sufficient capacity shall remain to provide an evacuation alarm in all alarm zones for at least 30 min.

6.13.5.5 Other systems

In premises other than those described in 6.13.5.2, the emergency supply shall be capable of maintaining the system in operation for at least 24 h longer than the maximum period for which the premises are likely to remain unattended, after which sufficient capacity shall remain to provide operation of the alarm sounders for at least 30 min.

If unusually long unattended periods may occur, for example during a long holiday, the duration of the emergency supply necessary to satisfy the recommendation above may be reduced by arranging for regular inspections of the premises at intervals such that in the event of failure of the normal supply at least 24 h emergency supply capacity remains at the time of the next inspection. Thus, if daily inspections are made, and assuming that failure occurs immediately after one inspection, it will take 24 h to detect the fault, at which time a further 24 h supply will remain. Hence a total duration of 48 h will be needed.

6.13.6 Siting

6.13.6.1 Central batteries

Accommodation for central batteries shall comply with I.S. EN 50272-1.

If unsealed standby supply cells are used, then provision shall be made for adequate ventilation.

For large battery installations consideration should be given to the provision of a separate battery room or locked cabinet, preferably not containing any other services. The battery room or locked cabinet may also accommodate batteries of a similar type used for other purposes, but in such cases all equipment and wiring associated with the different systems should be separated so as to prevent a fault on one system from jeopardising another.

Where there is a risk of flooding, precautions shall be taken to prevent flooding of the battery room.

Care shall be taken to ensure that the structure can support the weight of all equipment. A battery room or cabinet should be secured against unauthorised admission and should display notices indicating its purpose, the importance of not smoking, the need to use insulated tools and the removal of metallic personal adornment (including wrist-watches with metal bracelets) to avoid accidental short-circuits.

6.13.6.2 Fire risk

To reduce the probability of the equipment being involved in a fire before adequate warning has been given, batteries and power supply equipment shall be sited in areas of low fire risk. If the system uses automatic detectors, then the areas in which the equipment is sited shall be covered by the detection system.

Consideration should be given to the use of suitably rated hazardous area equipment (Intrinsically Safe (IS) or Explosion protected (EEX)) in battery storage areas.

6.13.6.3 Multiple occupancy buildings

If separate occupancies with a common fire alarm system exist in a building, then arrangements should be made for the continuity of power supplies and for rectification of any failure. These arrangements may require equipment to be sited in an area of common access.

6.14 Cables, wiring and other interconnections

6.14.1 General

The electrical installation of a fire alarm system shall comply with the current edition of the ET 101 and conform with good electrical practice in design and construction and any other rules relevant to the particular installation.

Reliable interconnections between the components of a fire alarm system are essential for the satisfactory operation of the system.

The components of most fire detection and alarm systems are connected by cables and wiring but it is possible to connect by other means such as radio or fibre optics.

The requirements for radio linked systems are given in 6.15.

Where fibre optic cables are used the installation should meet at least the resistance to fire and the resistance against mechanical damage requirements for the equivalent electrical installation. Fibre optic installations will require the use of special techniques in design and construction. Components of such a system shall operate within their manufacturer's ratings and should where possible be certified or approved for the application under a recognised certification or approval scheme.

In practice no system can have absolute reliability, but one of the objectives of good system design is to reduce the probability of the system being inoperative in the area of fire when the fire occurs. This probability has three elements:

1) the probability that a fault occurs,

2) the amount of the system it puts out of operation,

3) the time taken from its occurrence to its repair (the 'down time').

The probability of a wiring fault can be reduced by:

a) the selection of cables with adequate electrical and physical characteristics,

b) the method of installation,

c) the positioning of cable runs,

d) the provision of additional mechanical protection at vulnerable points.

A margin of safety should be applied to the design. The amount of the system put out of operation depends on the extent of the division of the system into individual circuits.

Monitoring of connections does not ensure that the fire alarm system will remain effective at all times but helps to reduce the 'down time'. It gives warning that damage has occurred, and thus allows the repair process to be initiated and hence reduces the period for which the system is inoperative. Monitoring of circuits and mechanical protection are complementary features rather than alternatives.

In cases of trunk circuit routes, the provision of detection along such routes is advisable.

In some systems data flowing between components may be transmitted by one of a variety of data transmission methods. The environment within which these signals are passed may have a significant effect on the permissible types of interconnections. Examples of possible problem areas are:

i) Electro-Magnetic Interference (EMI) corrupting transmitted data,

ii) incorrect choice of cable for the speed of data transmission,

iii) fracturing of fibre optic cable due to vibration, etc.

6.14.2 Resistance to fire

6.14.2.1 All cables used in Fire Detection and Alarm systems shall comply with one of the following standards/specifications:

— I.S. EN 60702-1, Mineral Insulated Cables and their terminations with a rated voltage not exceeding 750 V - Part 1: Cables,

— BS 7629-1, Electric cables - Specification for 300/500 V fire resistant screened cables having low emission of smoke and corrosive gases when affected by fire - Part 1: multicore and multipair cables,

— BS 7846, Electric cables - Thermosetting insulated, armoured, fire-resistant cables of rated voltage 600/1000 V, having low emission of smoke and corrosive gases when affected by fire - Specification.

6.14.2.2 In addition to 6.14.2.1, all cables used in Fire Detection and Alarm systems shall, as a minimum, also meet the classification for standard PH 30 cable when tested in accordance with I.S. EN 50200 including Annex E.2.

6.14.2.3 All cables used in Fire Detection and Alarm systems shall comply with 6.14.2.1 and, in the following applications, enhanced fire resisting cable of PH 120 classification when tested in accordance with I.S. EN 50200 and BS 8434-2 shall be employed:

— where the Fire Risk Assessment cannot adequately determine that the Fire Safety Strategy can guarantee the safe evacuation of the building within the limits acceptable to the authority having jurisdiction,

— where phased evacuation of a building is included in the Fire Safety Strategy,

— where essential circuits are routed through one area to other areas which may remain occupied during the course of a fire,

— in buildings of greater than 30 m in height,

— in places of assembly where the Fire Risk Assessment dictates.

6.14.2.4 All cables shall be Low Smoke Zero Halogen type (LS0H).

6.14.2.5 Cables from fire alarm systems to ancillary equipment, devices or functions which would "fail safe" to a fire condition need not be fire rated.

NOTE For cable systems used for interconnecting Smoke/Heat Alarms in Residential Buildings see 10.4.

6.14.3 Data/voice cables

Data/voice cables used for the transmission of alarms to an Alarm Receiving Centre (ARC) from the control and indicating equipment (CIE) to the public switch telephone network (PSTN) service point at the perimeter of the premises shall comply with 6.14.2 (see also Annex B).

6.14.4 Cable systems

6.14.4.1 Electrical characteristics

The electrical characteristics of all cables, such as voltage drop for the extra low voltage supply from an external power supply, current carrying capacity, impedance and, where appropriate, ability to transmit data, shall be suitable for the system.

6.14.4.2 Mechanical strength

Cables used in FDAS shall possess inherent high resistance to physical damage, or should be enclosed in suitable conduit, trunking or channel so as to obtain the necessary mechanical strength.

To avoid the risk of mechanical damage to fire alarm cables, they shall not be installed within the same conduit as the cables of other services. Where fire alarm cables share common trunking, a compartment of the trunking, separated from other compartments by a strong, rigid and continuous partition, shall be reserved solely for fire alarm cables.

6.14.4.3 Segregation

It is essential that the wiring of a fire alarm system be exclusive to the installation and segregated from the wiring of other circuits so that the fire alarm system is protected against damage that may be caused by faults on other circuits and against interference that might occur during maintenance or alteration of other services.

Segregation may be achieved by:

a) the installation of wiring in separate conduit, ducting, trunking, cable tray, or,

b) mechanically strong, rigid and continuous partitions of non-combustible material in multi-compartment trunking systems, or,

c) the use of cable having a continuous metallic sheath such as mineral insulated copper sheathed cable, or,

d) a spacing in air of at least 300 mm from the runs of cables of other services. This spacing applies along the length of cable runs and may be reduced to 15 mm at 90° crossovers.

Ducting, trunking or channel containing fire alarm system cables should be marked to indicate its use.

The mains supply cable to any control, indicating or power supply equipment shall not enter the equipment through the same cable entry as cables carrying extra-low voltage. Within the equipment, low voltage and extra-low voltage cables should be kept separate to the extent practicable.

Multi-core cables serving fire alarm system circuits shall not be used for any other service. This recommendation does not preclude the multiplexing of signals of other systems with those of the fire alarm system.

6.14.4.4 Protection against electromagnetic interference (EMI)

In order to prevent damage and false alarms, equipment (including cabling) should not be sited in places likely to have high levels of electromagnetic interference (EMI), i.e. levels higher than those for which the equipment has been tested. Where this cannot be achieved, then adequate electromagnetic protection should be provided.

6.14.4.5 Methods of cable support

Methods of cable support should be non-combustible and such that circuit integrity will not be reduced below that afforded by the cable used and should withstand a similar temperature and duration to that of the cable, while maintaining adequate support. In effect, this recommendation precludes the use of plastic cable clips, cable ties or plastic conduit/ trunking/ cableways, where these products are the sole means of cable support.

Compliant installation of the cable and means of support can be achieved by direct fixing to the structure using manufacturers' approved method of fixings.

However, where this is not practical, it may be necessary to run fire alarm system cables within or on appropriate cable carrying systems. Where this method is adopted, the highest practical level of cable system integrity shall be achieved. For example:

— Installation of cables within properly secured screwed steel conduit,

— Mounting on upper side of steel cable carrier (tray), using non-combustible fasteners,

— The use of girder clips (non-combustible).

6.14.5 Joints, terminations and glanding

All terminations shall be such as to minimise the probability of early failure in the event of fire. Cables should be installed without external joints. Any joints, other than terminations within system components, shall be enclosed within junction boxes and labelled with the words "FIRE ALARM" to avoid confusion with other services. Examples of suitable terminals include suitably fire rated metal components mounted in ceramic terminal blocks.

Suitable cable glands [A1] , as recommended by the cable manufacturer, shall be used on all cable joints where closed mechanical protection is not provided (e.g. steel conduit). [A1]

Terminations within system components such as control and indicating equipment, manual call points, fire detectors and sounders should be constructed of materials that will withstand a similar temperature and duration to that of the cable. There shall be no joints other than component terminations within system components.

IMPORTANT —

a) Ring circuits forming loops of detectors or sounders shall employ a separate and distinct route for the feed and return paths, i.e. four-core or multi-core cable shall not be employed to carry both the feed and return cable cores.

b) Loop cables shall be dedicated to the purpose of providing interconnection of the loop devices and additional cores shall not be included for any other purpose.

6.14.6 Cable size

All conductors shall have a cross-sectional area of at least 1 mm^2, except for data communication cables.

6.14.7 Colour coding

All fire alarm cables shall be of a single, common colour preferably one that is not used for cables of general electrical services in the building, to enable these cables to be distinguished from those of other circuits. The colour red or orange is preferred. Where modifications to an existing fire alarm installation are being carried out, a uniform colour coding shall be adopted.

6.15 Radio-linked systems

6.15.1 General

6.15.1.1 Radio links

Some alarm systems are available in which some or all of the interconnections between components are made by radio-links. Because of the special properties of radio signals, some of the recommendations applicable to wired systems are unsuitable for, or cannot be applied to, radio-linked systems.

Components of Radio-linked systems shall comply with I.S. EN 54-25.

6.15.1.2 System Variations

Radio-linked systems may employ full wireless equipment throughout such that all devices are radio-linked to the CIE or may be hybrid systems where a limited number of radio-linked devices report to a hub or interface unit installed on a hard wired intelligent detection loop.

6.15.1.3 Choice of system

Radio-linked systems have both advantages and disadvantages. Before adopting such a system for any specific application, the advantages and disadvantages should be carefully considered so that a correct choice of system can be made.

6.15.2 Power supplies

6.15.2.1 Power supplies for CIE

Power supplies for control and indicating equipment (other than repeater panels) shall comply with the requirements of 6.13.

6.15.2.2 Power supplies for repeater indicator panels, range expander units and alarm devices (excluding alarm devices in 6.15.2.3)

Power supplies for repeater indicator panels, range expander units and hard wired alarm devices (powered from a common source) shall comply with the requirements in 6.13 except that the normal supply may be derived from the local mains supply (see 6.13.2). Failure of the normal supply shall give a fault warning at the main control and indicating equipment.

6.15.2.3 Power supplies for detectors, manual call points, alarm devices and interface units

These components may use batteries as the normal power supply and shall be powered in accordance with the requirements of I.S. EN 54-25. It is recommended that they should be supplied from at least two independent autonomous power supplies.

These can be either:

a) the normal mains supply plus a reserve battery (primary or continuously charged standby supply), or

b) a primary battery plus a secondary battery, or

c) a primary battery plus a reserve second primary battery. If intended to be replaceable by the user the battery should be of a type readily available from electrical suppliers.

NOTE 1 Power supplies having one or more primary batteries shall give at least 30 days warning of impending failure of any primary battery. This warning shall be as a low battery indication at the CIE.

NOTE 2 Where "secondary" batteries are specified, capacitors with an appropriate specification may be used as an alternative.

NOTE 3 At the point at which the power supply to any radio-linked component can maintain the component in normal operation for no more than 30 days and, in addition, in the case of fire alarm devices, 30 minutes in the alarm condition, a fault warning shall be given at the CIE.

NOTE 4 Primary power supplies shall have a minimum normal operating life of 3 years over the temperature range of + 15º C to + 35º C before the low power condition is signalled.

6.15.2.4 System testing

When conducting system testing, evacuation drills, training or similar activities care shall be taken to comply with the manufacturer's instructions/recommendations which are designed to ensure that the operational life of alarm device battery packs is fully utilised. Automatic silencing of wireless sounders may be employed to overcome the potential for undue discharge of sounder batteries. However, sounders with this facility need to reactivate with any new fire or phased evacuation command. Such a facility ought not to impair the system's ability to provide an adequate audible warning to the occupants of the building in the event of fire.

6.15.3 Radio links

Systems in which radio links are used to connect together part or all of the components shall be identified by an individual identification code (in such a way as to prevent interaction between separate systems) and should operate on frequencies allocated by the Commission for Communications Regulation. Equipment shall conform to the appropriate I.S. EN 54 standards.

Links should be monitored in such a way that the failure to receive a signal from a detector, call point, sounder or other remote component will be indicated at the CIE.

6.15.4 Installation

6.15.4.1 Initial signal strength

During installation steps shall be taken to ensure that devices produce adequate signal strength at the relevant receivers.

The manufacturer shall specify methods by which it can be assured that the signal strength is adequate and the signal type suitable for reliable operation in the environment in which the system is installed, including any possible interfering signals of similar type, either from within the protected premises or from other premises.

Installation of a radio-linked system shall only take place after a comprehensive radio survey has been undertaken to ascertain the following:

a) there are no other sources of radio transmission that could interfere with or block radio communication between the control and indicating equipment and other components of the system;

b) there is adequate signal strength for communication both to and from components as appropriate in all areas of the building(s) in which radio-linked components are to be located. This should take into account the minimum acceptable signal level defined by the manufacturer in respect of the level of background radio "noise" at the time of the survey;

c) where the system is networked it should be established that the communication conditions described in b) are achieved throughout the network;

d) records of signal strength readings for each radio device taken at the time of the survey and of the background noise level shall be kept for future reference and shall form part of the handover documentation.

e) only radio survey test equipment that has been approved by the manufacturer and regularly calibrated in accordance with manufacturer's instructions shall be used to carry out the survey. A record of the date of calibration and the date when the next calibration is due should be marked on the survey equipment.

At the time of commissioning and after the installation of all equipment, including remote antenna(e), the following records relating to the radio data shall be recorded:

— the system coding (i.e. system address) which should where possible be unique to avoid the possibility of interference from similar systems on the same frequency;

— details of the signal level being received at each of the receiver units. This data shall include the received signal levels of all the radio devices and the background noise level. In the case of a networked system (i.e. multiple panel system), this shall also include the signal levels for the radio-links between panels. In addition to other servicing recommendations in other parts of this standard, this should be undertaken at each routine service visit.

The signal levels recorded shall be within the specifications set by the manufacturer of the radio system. If not within the specification, appropriate remedial action shall be undertaken.

A copy of the signal levels shall be kept on site preferably with the system logbook.

6.15.4.2 Variations of signal strength

Changes in the building structure or layout after installation can cause fluctuations in the received signal strength, particularly where the changes include the introduction of large areas of metallic screening across the signal path.

Therefore, prior to installation, it is essential that a detailed radio site survey be carried out, using approved specialist equipment supplied by the system manufacturer.

This survey should ensure that device signal strength throughout the building is sufficient to overcome any normal changes in structure or layout. Where changes do occur, resulting in a variation of signal strength, a follow up radio site survey should be carried out, and the installation of transponder/range expanders may be required.

6.15.4.3 Cabling (excluding antennae)

Where cables are used in the system, for instance for power supplies or hard wired alarm device circuits they shall comply with the requirements of 6.14.

6.15.4.4 Antennae and associated cabling

Cables of antennae that are external to components of a radio-linked system shall be monitored for open and short circuits. A fault condition shall be indicated at the control and indicating equipment within 100 s of the occurrence of such a condition.

Cables of antennae that are external to components that form part of the critical signal path should satisfy the recommendations of 6.14. However, cables that do not comply with 6.14 may be used provided they are routed through areas of low fire risk, and are protected against exposure to fire by separation from any fire risk by materials that would afford a fire resistance of at least 30 min if tested in accordance with the relevant part of BS 476.

Antennae shall be so arranged that special tools are required for disconnection or removal of the outer housing.

6.16 Ancillary services

A1 The FDAS may be designed so that detectors and/or call points, in addition to giving an alarm and calling the emergency services, close or open circuits of ancillary services by means of relays or similar devices. A1

6.17 Radio and electrical interference

6.17.1 Generated interference

Alarm systems shall be so designed and installed that they do not cause radio interference in excess of the limits specified in Publication CISPR 14-1, "Electromagnetic Compatibility - Requirements for Household Appliance, Electric Tools, and Similar Apparatus - Part 1: Emissions" and CISPR 14-2, "Electromagnetic Compatibility-Requirements for Household Appliances, Electric Tools, and Similar Apparatus - Part 2: Immunity-Product Family Standard".

6.17.2 Received interference

Particular care should be taken in the design and installation of the fire alarm system to avoid interference from other equipment (including radio transmitters such as portable telephones), external sources such as lightning or power transients. Such interference may affect the normal operation of the fire alarm system.

7 A1 Prevention A1 of false alarms(see definition)

7.1 Categories of false alarms

7.1.1 General

In summary, there are 4 categories of false alarms:

1) undesirable false alarms,

2) equipment false alarms,

3) malicious false alarms,

4) false alarms with good intent.

7.1.2 Undesirable false alarms

Undesirable alarms in which the system has responded, either as designed or as the technology may reasonably be expected to respond, to any of the following:

a) fire-like phenomenon or environmental influence, e.g.:

1) build up of dirt or dust within a detector (whether built up over a period of time or released from an industrial process),

2) entry of insects,

3) processes that produce smoke or flame,

4) environmental effects that can render certain types of detector unstable, (e.g. rapid air flow/high air velocities, etc.),

5) ambient conditions (e.g. heat, high humidity, smoke or flame from cooking or work processes, fumes from engine exhausts, etc.),

6) electrical transients, radio interference or electromagnetic interference,

7) steam (from bathrooms, shower rooms and industrial processes),

8) tobacco smoke or cosmetic smoke (e.g. in discotheques and theatres),

9) aerosol spray (e.g. deodorants and cleaning fluids),

10) cutting, welding and similar 'hot work',

11) incense and candles,

12) water ingress,

13) substantial fluctuation in temperature,

14) high intensity light flashes,

15) change of use or changes within the building.

b) accidental damage, e.g.:

— impact damage (particularly to manual call points), etc.,

c) inappropriate human action, e.g.:

i) operation of a system for test or maintenance purposes without prior warning to building occupants and/or alarm receiving centre or without prior disablement of the system,

ii) work being carried out in a protected area without knowledge of, or in neglect of the necessary precautions (e.g. cutting, welding and similar 'hot work'),

iii) communication faults arising from servicing or testing work carried out without prior notification to the ARC,

iv) failure to carry out User responsibilities (e.g. inadequate servicing, etc.).

7.1.3 Equipment false alarms

Equipment false alarms occur when the false alarm has resulted from a mechanical and/or electrical fault in the system.

7.1.4 Malicious false alarms

Malicious false alarms occur when a person operates a call point or causes a smoke detector to initiate a fire signal, whilst knowing there is no fire.

7.1.5 False alarms with good intent

False alarms with good intent occur when a person operates a manual call point or otherwise initiates a fire signal in the belief that there is a fire, when no fire actually exists.

7.2 Causes of false alarms

7.2.1 General

False Alarms in many premises are most frequently caused by environmental influences in the building, accidental damage or inappropriate action by people. Such false alarms are now referred to as "undesirable false alarms" to distinguish them from those arising from equipment malfunction which are now described as "equipment false alarms" (see 7.1.3).

7.2.2 Recommendations/Action

The recognised causes and categories of false alarms are set out in 7.1 and any person responsible for Specification, Design, Installation, Commissioning, Maintenance and Use of the fire alarm systems should be conversant with these major causes of false alarms so as to take appropriate action to eliminate them.

7.3 Responsibility for prevention of false alarms

7.3.1 Designer responsibility

The System Designer shall carry out a Fire Risk Assessment to establish the appropriate system design. Full details of the design process to [A1] prevent [A1] false alarms are given in 7.4.

The System Designer shall ensure compliance with the requirements of 7.4 and as evidence of such compliance, the Designer shall record on the Certificate of Design the specific measures incorporated to achieve this objective (see Annex C 1).

The System Designer in conjunction with the system supplier shall at handover provide the User (or his representative) with sufficient information to limit false alarms under normal operating conditions.

The action to be taken by the User after a false alarm is given in 9.2.3.3. It shall be confirmed on the appropriate certificate that this information has been provided to the User as required in Annex C 6.

7.3.2 Installer responsibility

Although Installers simply install the system to the requirements of the System Designer, they shall have a good understanding of the requirements of Clause 7.

Any conditions identified during installation as having the potential to cause false alarms shall be brought to the attention of the Designer (or User or other responsible person) so that any modifications to the installation can be considered at that time.

Such conditions would include any variations to the requirements and recommendations of this Standard which were not clearly documented in the Certificate of Design or which might not have been known to the Designer e.g. structural features that might affect detector numbers or siting, or conditions or changes of use in the building which might result in an unacceptable rate of false alarms.

7.3.3 Responsibility of parties involved in Commissioning/Handover/Verification

The process shall include an assessment to ensure that there is no obvious potential for generation of false alarms.

Any significant potential for false alarms shall be brought to the attention of the Designer (or User or other responsible person) so that modifications to the system can be considered at that time.

Any identified residual false alarm potential shall be brought to the attention of the User and shall be recorded in the System Documentation (Operating Manual or Design Documentation).

Any party responsible for handover of a fire alarm system shall ensure that the User is made aware of the need to limit false alarms and how to achieve this (see 7.5).

Any party responsible for verification of compliance with this Standard shall include verification that suitable steps have been taken to limit false alarms.

This will include verification that the System Supplier has provided the User with sufficient information to understand and limit the potential for false alarms (see 7.3.4).

[A1] [A1]

[A1]

7.3.4 [A1] User responsibility

It is the responsibility of the User, after handover of a compliant system, to ensure that the system and the building are suitably managed to avoid unnecessary false alarms and also to ensure appropriate action is taken in the event of false alarms (see 7.5).

An essential element in such management is for the responsible person to record each and every event of false alarm in the system Logbook.

This record shall include:

- date and time of event,
- location of device,
- category of false alarm,
- reason for false alarm,
- activity in area (if reason not known),
- action taken,

— name of the person responsible for recording information.

All such events shall be brought to the attention of the Servicing/Maintenance organisation (see [A1] 7.3.5 [A1]) in order to obtain suitable advice and/or resolution.

[A1]

7.3.5 [A1] Servicing/Maintenance organisations

On appointment, the Servicing/Maintenance organisations should be given access to the System Handover Documentation and Certification.

It is the responsibility of the Servicing Organisation at every service visit to consider the number and rate of false alarms recorded in the System Logbook and to recommend appropriate action to the User (see 7.5).

The criteria to be established are:

— the rate of false alarms for the previous 12 months compared to Table 7,

— whether two or more false alarms have occurred from any single manual call point or detector since the last service visit (excluding false alarms with good intent, see 7.4),

— whether any persistent causes of false alarms can be identified.

7.4 Design process for [A1] prevention [A1] of false alarms

7.4.1 Risk Assessment/Analysis of false alarm potential

The Designer shall review the Fire Safety Strategy (see 5.4.2 and 6.2.2) and identify likely conditions that could give rise to false alarms from the form of detection proposed for the particular risk under consideration (see also 7.3.1).

Table 7 highlights the Special Risk Considerations which need to be reviewed for the different types of buildings listed, and in addition sets out the guidelines for the maximum false alarm rate per annum.

Table 7 — False alarm considerations

Building type	General characteristics	Special risk conditions							
		Environment	Activities/Processes	Degree of control over 3rd parties	Strong electromagnetic fields	Occupancy	Malicious actions	Target	Max.
Small systems	Less than 40 detectors							< 2	2
General office	Little or no dust, fumes, insects and good management			X		X		1 per 150 detectors *	2
Apartments	Living		X			X		1 per 150 detectors *	2
Department stores, Retail stores, Food stores	Mainly used by general public. Some facilities provided for employees.		X	X	X	X	X	1 per 100 detectors *	4
Hotel	Mainly used by general public. 24 hour operation			X		X	X	1 per 100 detectors *	4
Large restaurant, Large pub, Large night club	Storage and preparation of food/drinks, serving areas, seating areas etc.	X	X	X	X		X	1 per 100 detectors *	4
Cultural activities	Museum, art gallery or other public building with normal occupancy.			X	X		X	1 per 150 detectors *	3
Entertainment hall	Large assembly and seating areas, with associated ticket offices, bars, circulation, etc.		X	X	X		X	1 per 150 detectors *	3
Leisure centres, Swimming pools, Sports halls.	Fumes possible from swimming pools. Used by general public.	X	X	X			X	1 per 150 detectors *	3
Car parks	Provision for car parking and access.	X		X	X	X	X	1 per 150 detectors *	3
University campus	Lecture theatres, offices, workshops, eating places, laboratories.		X	X		X	X	1 per 100 detectors *	4
Schools	Classrooms, sports halls, teaching facilities.			X			X	1 per 150 detectors *	3
Hospital, Nursing home, Long term residential	Large number of bedrooms and associated catering, dining facilities, lounges and circulation spaces.	X	X	X	X	X	X	1 per 150 detectors *	3
Laboratories, Pharmaceutical plants		X	X	X		X		1 per 150 detectors *	3
Airport terminals, Bus stations, Railway stations	Waiting areas, concourse areas, ticket offices	X		X	X	X	X	1 per 100 detectors *	4
Workshops	Light engineering works and associated staff facilities	X	X	X				1 per 100 detectors *	4
Storage facilities	Warehousing with associated office space and facilities for employees			X				1 per 150 detectors *	3
Industrial site	Generally, would include shift work	X	X	X	X	X	X	1 per 75 detectors *	5
Severe environmental conditions	Fire engineering principles and considerations should be applied to find a stable yet safe system (e.g. "Filtration" of alarms – see 7.4.2 and 7.5.2 regarding in-depth special investigation.)								

NOTE 1 The Service Organisation should investigate and advise the responsible person/User if the rate of false alarms in the previous 12 months has exceeded the guideline false alarm rate per annum.

NOTE 2 False alarms originating at manual call points are usually the result of human action and should be fully investigated.

* Denotes detection device i.e. aspirating, flame, optical beam etc.

7.4.2 Action by Designer

7.4.2.1 The Designer shall take account of the Special Risk Considerations referred to in 7.4.1, and shall incorporate any necessary changes in the system design which will limit the anticipated false alarms.

Examples of such system design changes would be:

- Consider alternative types or combinations of detection principles.
- Relocate Manual Call Points, or incorporate hinged covers, etc. (see 6.7.2).
- Filtration of alarms:
  - specialised “staff alarm” (see 6.6.10),
  - “coincidence operation” of detectors (“double-knock”),
  - time related systems (see 6.3.10 and 6.8.6.3).
- Other based on Fire Engineering principles.

7.4.2.2 Following the decision on the appropriate amendments to the system, the Designer shall:

- record the changes on the Certificate of Design (Annex C1),
- ensure the specification includes the requirements for the User to be provided with the following information:
  - the need for System Performance Monitoring as in 7.5.2 and 7.5.3,
  - the need for special system management procedures as in 7.5.4,
  - the need for special service/maintenance procedures as in 9.2.3.

7.5 Action by the User to limit false alarms

7.5.1 General

False Alarms disrupt normal business and undermine the credibility of the Fire System. From the perspective of the User and the Fire Service all false alarms are undesirable.

From time to time however events take place which, when detected, are not considered "real fires" and might therefore be defined as "false alarms" but which if left unattended could become a danger to life or property and are therefore legitimate alarms. Where large numbers of automatic fire detectors are installed in buildings, the complete elimination of all the false alarm categories set out in 7.1 becomes difficult.

Table 7 sets out the Special Risk Considerations that need to be reviewed when implementing measures to reduce false alarms.

7.5.2 Monitoring to reduce false alarm rates

The responsible person shall record all false alarms and periodically monitor and analyse the rate of such alarms and their categories (see 9.2.3).

The Service Organisation shall investigate and advise the responsible person/User if the rate of false alarms in the previous 12 months has exceeded the guidelines as set out in Table 7.

For higher rates of false alarms than set out in Table 7, the User (responsible person) shall undertake an in-depth special investigation which can be carried out by the Servicing Organisation, the Manufacturer, or a competent third party.

7.5.3 Performance monitoring of newly commissioned systems (User responsibility)

The User shall implement 7.3.5 (Servicing/Maintenance Organisation), and should consider the need for an Operational Audit (8.5.11.1) and/or the need for Verification (8.5.11.2).

7.5.4 System management (User responsibility)

Refer to 7.3.4 (User Responsibility) and Table 7 (False Alarm Rates) and implement 9.1.4 (Prevention of False Alarms) and 9.2 (Servicing and Maintenance).

8 Workmanship, installation and commissioning

8.1 Work off-site - Packing

The materials and components should be protected and packed suitably for the method of transport to the site and storage on site. Equipment containing radioactive materials shall comply with Annex F. Corrosive liquids or other hazardous materials shall be clearly labelled to emphasise the risk of damage during transportation or storage on site.

8.2 Work on-site

The work on site should consist of the following:

a) siting and accommodation of control equipment, power supplies, audio/visual alarms, detectors, manual call points and ancillary equipment,

b) cabling and wiring, including the provision of channels, ducts, conduits and trunking,

c) installation of equipment,

d) inspection, initial testing, commissioning, handover and certification,

e) verification.

8.3 Siting of equipment

8.3.1 General

Siting of equipment should comply with the relevant recommendations of 6.6, 6.7, 6.10, 6.12 and 6.13.

Care should be taken in planning the accommodation for the equipment to ensure that the structure can accept the necessary loadings, and that heavy or bulky equipment can be readily transported to or from its installed position. Access to equipment in service should be provided to allow it to be kept in a clean condition, and to be easily maintained.

Where provision is not made on the control equipment, provision shall be made adjoining to it for the following items:

a) the diagrammatic representation of the building (zone chart) as 6.12.8.2, and 6.12.8.3,

b) operating instructions for the appropriate action to be taken in the event of a fire or fault event.

8.3.2 Protection against lightning

All metallic parts of the system, including conduit, trunking, ducting, cabling and enclosures, should be well separated from any metalwork forming part of a lightning protective system. Further guidance is given in I.S. EN 62305 parts 1 to 4.

8.3.3 Areas which contain hazards

Siting of equipment and routing of cables should take account of any special hazards which might exist in the area when the building is occupied. Such hazards might imperil either the system or personnel working in the area.

In locations having a potentially explosive atmosphere the requirements of 6.2.7 and
〚A1〉 I.S. EN IEC 60079-0 〈A1〛 shall be followed.

8.3.4 Structural accommodation

When fire alarm systems are to be installed in buildings the provision of ducts, channels and openings may be required for the accommodation of the system wiring. They should be sited with due consultations regarding other installations and should, where practicable, be arranged as early as possible during the design of the building. Ample facilities should be provided for the installation of cables, conduits or trunking and, where necessary access should be provided by means of suitable removable or hinged covers for maintenance or extension.

8.3.5 Precautions against spread of fire

Openings provided in floors, walls, partitions or ceilings to take fire alarm system wiring should be as small as reasonably practicable and should be made good with certifiable fire stopping material so that the resistance of the construction to smoke or fire spread is not impaired, and the specified structural fire resistance is maintained.

8.4 Installation of equipment

8.4.1 Delivery and storage

To reduce the risk of damage and deterioration, equipment, apparatus and materials shall not be delivered until the installation can proceed, unless suitable storage accommodation has been arranged by the installer.

8.4.2 Protection

Adequate steps should be taken by the installer at all times to protect the finish of equipment during the construction and installation period. Particular attention should be paid to protection of equipment enclosures and detectors against ingress of dust, moisture or other contaminants.

Where systems are required to provide protection prior to handover or occupation of a building then the person having control of the building shall be responsible for the protection of the equipment

8.4.3 Radioactivity

If detectors contain radioactive material, then there are additional statutory responsibilities which shall be complied with in full (see Annex F).

8.5 System commissioning, testing and handover

8.5.1 New systems

On completion of the installation of a new system or a major modification to an existing system the entire works shall undergo Commissioning in accordance with the requirements set out herein and the whole system shall be certified in accordance with the requirements of this Standard.

NOTE Where systems form part of a network of control and indicating units, and it is agreed by all parties, it is acceptable to limit the commissioning of the new and existing equipment to that equipment which is connected to the local satellite control and indicating equipment, provided it can be guaranteed that there is no impact on the existing network and any cross panel functions are fully tested and proved to be operational.

Prior to the commencement of the works, and ideally at tender stage, the System Designer shall specify the extent to which the system/network should be subject to the commissioning process.

8.5.2 Modifications (extensions and alterations)

Systems which undergo modifications (extensions and/or alterations), where the whole of the system is not subject to the full commissioning process, shall be commissioned and certified for those parts of the system which have been modified.

Normal design and installation procedures in accordance with this Standard shall be followed and documentation/certification issued.

Due consideration shall be given to the impact of the modifications on the original system and adequate precautions shall be taken to ensure that there is no adverse impact on either the original system or the modification.

Commissioning certification shall be in the format specific for “Modifications, Extensions and Alterations to a System” as required in Annex C 4.

The Certificate of Design [A1] in Annex C.1 shall contain a declaration [A1] that the impact on the existing system has been considered and that there will be no adverse impact as a result of the works undertaken.

The full commissioning process as detailed shall, as far as is reasonably practicable, be applied to all modifications (extensions and/or alterations).

8.5.3 Wiring

Prior to the commencement of any commissioning process, the completed wiring installation shall be tested and inspected by the electrical installer in accordance with the ET 101, and a certificate shall be issued by the installer confirming completion and compliance of the installation with the requirements of ET 101.

In addition the electrical installer shall install, inspect, test the wiring and keep all records as necessary and shall issue a Certificate of Installation as required in Annex C.2 to confirm that the installation has been carried out in accordance with the requirements of this Standard and the System Designers specification.

NOTE The testing of wiring can damage items of equipment which are connected to the wiring. Testing should be carried out prior to the connection of the component(s) or the components should be disconnected before the wiring is tested.

The results of all tests shall be recorded and made available to the organisation responsible for commissioning the system.

8.5.4 Processes

The Commissioning process shall include the following:

- inspection,
- testing/configuration,
- certification,
- documentation,
- handover,
- supplementary processes (optional):
  - i) operational audit,
  - ii) verification.

8.5.5 Parties

The Commissioning/Handover process should involve the following parties:

- Specifier/Designer,
- Installer,
- Commissioning Provider/System Supplier,
- User (purchaser) or their appointed representative,
- providers of ancillary (interfaced) systems.

8.5.6 Responsibilities

Responsibilities shall be in accordance with Annex H.

8.5.7 Inspection

The inspection shall be carried out by the Commissioning Provider.

8.5.7.1 Documentation

The Commissioning Provider shall be supplied with the following documentation/information to enable him/her to carry out an initial inspection:

a) Installation ("As Installed/As built") drawing(s) showing the location of all components of the system, wiring routes and where appropriate cable sizes, junction boxes (including connection diagrams) and access points.

b) Location and identification of the mains power supply for the system(s).

c) A copy of the design specification/requirements to include the Certificate of Design (Annex C 1).

d) A copy of the Certificate of Installation (Annex C 2) issued by the Installer (to include records of insulation resistance, loop continuity and resistance and appropriate earth loop impedance). The electrical Installer shall have tested and verified that the work complies with the requirements of 6.14 and Clause 8 of this Standard.

8.5.7.2 Inspection process

The inspection process shall confirm:

a) the work has been carried out in a satisfactory manner and the methods, materials and components comply with the requirements and recommendations of this Standard and the requirements of the Design specification. Inspection by the Commissioning Provider will be limited to a visual inspection of those parts of the installation which are reasonably accessible and does not absolve the installer from responsibility for the wiring installation or transfer any responsibility for the wiring installation to the Commissioning Provider.

b) the following have been inspected for compliance with this Standard or where not specifically set out in this Standard, that they comply with the relevant manufacturers' instructions:

    1) the siting of CIE, indicating and power supply equipment,

    2) the siting and visibility of Manual Call Points including maximum search distances,

    3) the siting, spacing, height and area of coverage of point heat, smoke and carbon monoxide sensors,

    4) the siting, spacing, height, area of coverage and sampling piping configuration/piping installation of aspirating smoke detection systems,

    5) the siting, spacing, height, area of coverage and mechanical support/protection of linear heat sensors,

    6) the siting, spacing, height, area of coverage, line of sight and mounting integrity of linear beam detectors,

    7) the siting, spacing, height, area of coverage and application of any other component of the system.

8.5.8 Testing/Commissioning

8.5.8.1 The testing and commissioning shall be carried out by a competent person who has adequate knowledge, experience and training in the requirements of this Standard, the system components and the configuration software. Commissioning providers shall be able to formally demonstrate competence in commissioning procedures (see Foreword).

8.5.8.2 In addition the Commissioning Provider shall possess such manuals, tools and equipment as are necessary for the process.

8.5.8.3 The testing of devices should be carried out in accordance with the manufacturers' recommended procedure and, in the absence of a manufacturer's specific procedure, industry standard practice shall be employed. This includes the following;

- Each device shall be functionally tested in situ using the procedures set out in 9.2.4,
- Manual call points shall be tested by operation of the frangible element or insertion of the test key,
- Every heat detector shall be tested by the application of a suitable heat source (see 9.2.4.2),
- Every smoke detector and aspirating device shall be tested by application of simulated smoke or aerosol (see 9.2.4.3 and 9.2.4.6),
- Every carbon monoxide fire sensor shall be tested by application of test gas (see 9.2.4.4).

8.5.8.4 The Testing and Commissioning Process shall confirm that the entire system and system components operate satisfactorily and include:

a) The activation of each and every detection and input device to confirm:
   - operation of device functions,
   - operation of the integral device indicators (LED's, etc.),
   - operation of the correct control equipment indications,
   - operation of the correct control equipment functions,
   - display of the correct zonal information,
   - where applicable, display of the correct text information,
   - where applicable, printing of the correct information.

b) The activation of each alarm sounder to confirm that:
   - each device is operational,
   - each device operates within the maximum allowable sound and frequency levels (manufacturer's data in relation to the device characteristics will suffice for frequency levels) (see 6.6.4.1 and 6.6.4.3),
   - sound pressure levels throughout the relevant area are adequate and recorded,

— in relation to Voice Alarm systems, an acceptable level of intelligibility is achieved.

c) The activation of each Visual Alarm or ancillary alarm device (alert device for impaired hearing, etc.) to confirm that:

— each device is operational,

— each device operates within the maximum frequency levels (manufacturer's data in relation to the device characteristics will suffice for frequency/ strobe rates),

— as far as is reasonably practicable, to ascertain the purpose of each device is adequately achieved.

d) The test of any facility for remote transmission of fire and/or fault or other signal to a remote alarm receiving centre.

e) The configuration and test of any "cause and effect" detailed in the system specification or agreed thereafter.

f) The test and recording of quiescent and alarm loading and confirmation of capacity of normal and standby power supplies (including secondary batteries acting on duty alone) to support the loads for the required durations in accordance with the requirements of this Standard. Secondary batteries shall be clearly labelled to indicate the date of installation.

g) It is recommended that each addressable device be labelled to indicate at least its unique address and where possible, the appropriate loop/circuit number should also be indicated.

h) In radio-linked systems, the testing and recording of radio signal strengths to ensure that they are adequate throughout all areas of the protected premises. The recorded signal strengths shall form part of the handover documents.

i) On completion of the commissioning process the engineer shall issue a Certificate of Commissioning complying with Annex C3, C4 and C5 as appropriate. The certificate shall record any variations or deviations from the original Design specification and this Standard.

j) On completion of the commissioning procedure and, prior to handover of the system, suitable Zone charts shall be provided in accordance with the requirements of the Design specification and this Standard.

k) The zone chart should be fixed [A1] 〈A1〉 adjacent to the CIE.

l) Where the scale of the project is such that it would necessitate a zone chart which is impractical in complexity or size then a "Flip Chart" or similar style arrangement may be provided with easy cross reference from data provided by the CIE.

m) Where systems are networked then the zone chart adjacent to each control/indicating unit need only refer to those areas controlled by that specific unit.

n) Systems incorporating Mimic Diagrams which duplicate the Zone chart need not have independent Zone Charts.

8.5.9 Commissioning, testing and handover documentation

8.5.9.1 General

On completion of the commissioning all relevant Certificates and documentation shall be handed over to the person(s) currently responsible for the use of the premises (see Annex H).

All certificates shall be in the format set out in Annex C1 to Annex C6, and no changes to these formats are permitted except that the Header and Footer of each certificate may be used to display relevant Certification Marks and Company Logo.

NOTE The issuing of false or misleading information in these certificates is an offence under the Fire Services Act 1981 and 2003 [A1] 〈A1▌.

It is essential therefore that the persons who sign these certificates are authorised and competent to verify whether the recommendations of this Standard in respect of the process to which the certificate refers have or have not been satisfied. The User (or responsible person) may subsequently rely on these certificates as, for example, evidence of compliance with legislation.

8.5.9.2 Documents

8.5.9.2.1 Certificates shall include:

- Certificate of Design (Annex C 1),
- Certificate of Installation (Annex C 2),
- Relevant Certificate of Commissioning from the following:
  - i) Final Certificate of Commissioning (Annex C 3),
  - ii) Certificate of Modifications – Extension or Alteration to a system (Annex C 4),
  - iii) Certificate for Early Handover for Beneficial Use (Annex C 5).
- Certificate of Handover (Annex C 6).

8.5.9.2.2 Record "As Installed/As built" drawings as at 8.5.7.1.

8.5.9.2.3 The operation and maintenance manual specific to the installed system shall include:

a) an explanation of the System CIE and the function of each indicator, switch, button and/or keypad where applicable,

b) a cause and effect configuration of the system,

c) a device and zonal text and addressing information as applicable,

d) such support structures and instruction manuals that would be necessary to allow a competent third party to maintain the system and carry out modifications to the system configuration,

e) a record of any agreed variations to the system specification or this Standard or any specific system requirements,

f) details of the System CIE and fire detection field equipment (input and output devices),

g) documentation should draw attention to the limitations and correct application of the system components such as:

   — environmental limitations (temperature, humidity, etc.),

   — clearances,

   — avoidance of contamination (during renovations/cleaning, etc.).

h) routine testing procedures to include daily, weekly, monthly or other periodic testing of the system to be carried out by the user or his appointed agent,

i) direction to the requirements of this Standard in relation to:

   — ⟦A1⟩ prevention ⟨A1⟧ of false alarms (see Clause 7),

   — user responsibility (see Clause 7 and Clause ⟦A1⟩ 9); and, ⟨A1⟧

   — service and maintenance of the system (see 9.2).

j) a Logbook suitable for the recording of all events including alarm activations, system faults, system modifications, routine tests, planned maintenance and emergency attendance and any other information required under User Responsibility (see 9.1.2.2). See also Annex E (Model Logbook),

k) any other documentation set out in the system specification.

8.5.10 Handover

8.5.10.1 General

The system specification should define the procedures to be undertaken and the demonstrations to be carried out at Handover. Details of the witnessing procedure should also be detailed.

The issue of the documentation and handover of the system shall be recorded in writing and recorded on the Certificate of Handover (Annex C 6).

8.5.10.2 Normal handover

a) When commissioning and certification are complete, the system should be formally handed over to the User (purchaser). The responsible person (see 9.1.1.1) should assure themselves that all the necessary documentation has been completed and made available and should satisfy themselves of the following:

   — that the works appear to be satisfactory,

   — that the system is capable of providing a fire alarm signal,

   — that all relevant tests set out in the specification have been witnessed by the specifier or his appointed representative,

   — that any facilities for remote transmission of signals (fire, fault or other) are operating correctly,

b) Where a remote monitoring facility operated by a third party is accepting the remote signal then the User will be required to enter into a contract for the provision of this service. The User (Responsible Person) shall be responsible for the establishment of this facility and for ensuring that:

1) The requirements of 6.5.and Annex B are met,

2) The necessary access to the User functions are available e.g. door key, access to controls or password/ number for controls,

3) The documentation detailed in 8.5.9 is provided at Handover where possible. Handover may proceed provided the following documentation as a minimum is presented and the balance documentation due is noted on the Certificate of Handover and follows within a reasonable period to be determined by the person responsible for the co-ordination of the process:

   — "as installed" drawings,

   — certificates of Design, Installation and Commissioning,

   — operation and maintenance manuals/instructions,

   — system Logbook.

4) The system operators have received proper instruction in the operation of the basic functions of the system or, in the absence of such training (e.g. where operators are not appointed or for small/basic systems), that the manuals and documentation provided are sufficient for the correct operation of the system by reference to same.

NOTE Where operator training is not formally provided at handover the User should consider the arrangement of suitable operator training at the earliest opportunity during the routine maintenance with the service provider.

8.5.10.3 Early handover

8.5.10.3.1 General

If the fire detection system is to be handed over, in whole or part, to be used before the building is finished or installation works completed, then:

a) the User (purchaser) or their appointed representative shall take responsibility for the system,

b) the system, and particularly those parts of the system which are required to perform a Life Safety or Property protection function, shall be commissioned, as far as is reasonably practicable, in accordance with the requirements of this Standard and certification issued in accordance with 8.5.10.3.3,

c) if the system is to perform in a Life Safety or Property protection role prior to building completion, then provision shall be made for regular testing. The system Logbook shall be properly kept by the User from the date on which the system is first put into operation,

d) the suppliers' recommended maintenance programme shall be instituted from the date of handover to the user as in 8.5.10.2 and 9.2.

8.5.10.3.2 Adverse effects

If ongoing work or the work of other trades is likely to produce environmental conditions more severe than those expected in normal usage, then consideration shall be given to an increased frequency and extent of maintenance. The user shall take responsibility for protection of the components of the system from any adverse effects due to the ongoing works.

8.5.10.3.3 Early handover certification

8.5.10.3.3.1 Where early handover takes place and the system is at that time required to thereafter perform a Life Safety or Property protection function (Early handover for beneficial use) then preliminary certification shall be issued as in 8.5.10.3.4.

8.5.10.3.3.2 As far as is reasonably practicable, the system shall be commissioned in accordance with the requirements of this Standard and any deviations from the Standard at the time of the commissioning shall be noted on or added to the certification.

NOTE As will often be the case in large or complex systems or "Shell and Core" installations part commissioning/completion may take place prior to a formal Handover.

In such installations the Purchaser or User or their appointed representative shall take responsibility for the system.

8.5.10.3.4 Certification

8.5.10.3.4.1 The Certificates of Design and Installation shall be issued for the extent of the works which are to be put into service.

8.5.10.3.4.2 A Certificate of Commissioning in the format for "early handover for beneficial use" shall be issued in accordance with Annex C 5 and shall include indication of the intended design category and an assessment of the category to which the system as being handed over complies. The Commissioning certification shall clearly state that it is not a Certificate of Final Commissioning.

8.5.10.3.5 Early handover documentation and training

Full documentation as required under this Standard may not be available at early handover. At minimum all documentation and training necessary for the correct operation of the system shall be provided at early handover and the handover certification shall indicate what additional works, documentation and/or modifications are required to convert from early handover to final handover.

8.5.11 Optional processes

8.5.11.1 Operational audit

In large or complex systems, it may be desirable that an operational audit is made after the system has been in operation for a period of time. This may particularly apply to installations where the initial user is in a temporary position and ownership/responsibility passes to a permanent occupier who assumes the position of "responsible person". This audit should cover the functioning and performance of the system, including such items as the ability of the operators to use the controls and indications, the logging of events and the efficiency of maintenance.

8.5.11.2 Verification

8.5.11.2.1 The User (purchaser) may wish to independently satisfy themselves that the system as presented to them is in compliance with this Standard and the Design specification. This may particularly arise where responsibilities for the various processes have been divided between a number of parties or where the system has been constructed on a staged basis.

The prime objective of the verification process is to independently assess, as far as is reasonably practicable, that the system as installed meets the standard set out in the Design, Installation,

Commissioning and Handover certification. Thereafter the verification process may be employed to satisfy any further requirements of the User (purchaser).

8.5.11.2.2 Verification shall be carried out by a competent person who possesses the knowledge and skills pertinent to the task and in particular is fully acquainted with the requirements of this Standard, relevant installation and commissioning practices.

8.5.11.2.3 Prior to undertaking the verification process, the organisation responsible for the verification shall be supplied with copies of the Design, Installation, Commissioning and Handover Certification (where the Handover Certification is available) and the scope/extent of the verification shall be documented and agreed with the User (purchaser) of the system. The agreed scope of works shall form an addendum to the Certificate of Verification in compliance with Annex C 7.

The process should, at a minimum, ensure the following:

— that as far as is reasonably practicable to ascertain, the installation complies with best engineering practice and appears to be satisfactory,

— that the system has been installed in accordance with the specification,

— that the system design as set out in the Certificate of Design has been adhered to and is in accordance with the requirements of this Standard,

— that as far as is reasonably practicable to ascertain, the system as installed has been commissioned in accordance with this Standard. To achieve this, selected elements of the system should be activated and the system response compared to the design criteria and any "cause & effect" strategy,

— that the correct documentation has been handed over to the User (Purchaser),

— that the operators of the system are competent in the use of the system and its functionality,

— Where the Handover Certification is not available a new system design and commissioning process will be required.

8.6 Certification of verification

The person/organisation undertaking the verification shall issue to the User (or responsible person) a Certificate of Verification (Annex C 7). This certificate shall contain a declaration confirming the competence of the person/organisation to carry out the verification audit.

9 User responsibilities

9.1 General

9.1.1 Supervision

9.1.1.1 Responsible person

The person having control over the premises shall ensure that work necessary to maintain the system is carried out and that records referred to in 7.3.4, 7.5 and 9.2, are maintained. This should be done by appointing a **responsible person** (see definition) to supervise the system. The responsible person should have sufficient authority to ensure that the above measures are taken.

9.1.1.2 Procedures

Procedures shall be laid down for dealing with alarms of fire, fault warnings or taking part or all of the system out of service. Advice in relation to these procedures may be given by the Fire Authority to any person having control over the premises (or to the owner or occupier).

9.1.1.3 Training

The responsible person shall ensure that users of the system are instructed in its proper use. Any occupants or members of staff who will be concerned with first aid fire-fighting shall be instructed in the correct interpretation of the indications given and their relationship with the building layout and shall be instructed and practised in the proper actions to be taken in the event of fire.

9.1.1.4 Liaison

The responsible person shall establish a liaison with those responsible for changes in or maintenance of the building fabric (including redecoration, etc.) to ensure that their work does not cause faults on, or otherwise interfere with, the operation of the fire alarm system. If structural or occupancy changes occur or are planned, then the responsible person shall ensure that any necessary changes to the fire alarm system are considered at an early stage.

9.1.1.5 Freedom from obstruction

The responsible person shall ensure that a clear space is preserved in all directions below every detector (see 6.10.5.3 and 6.10.5.4) and that all manual call points remain unobstructed and conspicuous.

9.1.2 Records

9.1.2.1 Drawings and instructions

The ▌A1⟩ as built ⟨A1▌ drawings and operating instructions supplied in accordance with the requirements of 8.5.9 shall be kept up-to-date ▌A1⟩ by the responsible person, and be ⟨A1▌ available for ▌A1⟩ ⟨A1▌ reference and inspection by authorised persons.

9.1.2.2 Logbook

The responsible person shall ensure that a logbook Book (see Annex E) is kept in which the following shall be recorded:

a) the name of the responsible person,

b) brief details of any servicing arrangements,

c) dates and times of all alarms (genuine, practice, test or false) together with their causes where known. If alarms have been caused by the operation of a detector or manual call point, then the location of the device shall be recorded,

d) dates, times and types of all defects and faults,

e) dates and types of all tests,

f) dates and types of all servicing or maintenance (routine or special),

g) dates and times of all periods of disconnection or disablement,

h) all alterations to the system.

The logbook shall be available for inspection by an authorised person.

NOTE 1 The reset switch shall not be used as a method of silencing the alarm sounders, since this may destroy the indication of the location of a fire (see 6.6.11).

NOTE 2 In some microprocessor or computer-based systems, an automatic log may be generated, either locally (e.g. on a printer) or remotely. Such logs can be of great assistance in tracing and correcting system problems.

9.1.3 Radioactivity

If detectors contain radioactive material, then there are additional statutory responsibilities which shall be complied with in full (see Annex F).

9.1.4 Prevention of false alarms (see 7.3.4, 7.3.5 and 7.5)

9.1.4.1 General

Many false alarms are caused by operations in the vicinity of detectors, carried out either negligently or in ignorance. The responsible person shall ensure that staff and visiting contractors are aware that the building is fitted with a FDAS.

[A1] 〈A1〉

[A1] NOTE Refer to 7.5. 〈A1〉

9.1.4.2 Notices

Where possible, permanent notices should be displayed at the entrance to all areas in which detectors are sited. A suitable text would be:

— 'This area is protected by automatic fire detectors. Before undertaking any work involving heat, flame, dust or sparks, clearance shall be obtained from the responsible person.'

9.1.4.3 Tenders and contracts

Tender documents for contract work to be carried out in a protected area should contain a clause making the contractor responsible for informing his staff of the presence and purpose of the FDAS, and the precautions to be adopted when working.

9.1.4.4 Precautions against dust and smoke

Where temporary work involving the generation of dust, smoke, paint spray, etc. is to be carried out in an area protected by automatic detectors, precautions should be taken to prevent fire alarms or damage to the detectors by contamination. Suitable measures may include the following:

a) temporary replacement of smoke detectors by heat detectors (not possible with all systems),

b) provision of a temporary screen between the work area and the detectors or by the positioning of temporary covers. It shall be ensured that these are removed, and the system made operational as soon as the work is completed (see 9.1.4.5).

All of these measures will, to a greater or lesser extent, impair the sensitivity of the system to fire. Experience has shown that the risk of fire is higher during periods of construction or maintenance, and

therefore the provision of manual surveillance should be considered while such measures remain in force.

9.1.4.5 Completion of work

The responsible person shall ensure that when the work is completed:

a) any temporary screening or covering is removed,

b) any residual dust is removed,

c) any substituted detectors are replaced,

d) the system is properly reinstated.

After reinstatement, an operational check of the system shall be made by a competent person.

9.2 Servicing and maintenance

9.2.1 General

[A1] [A1]

The responsible person shall ensure that a FDAS is inspected, maintained and serviced by a competent person in accordance with this Standard.

[A1] [A1]

[A1] For fire alarm systems in residential buildings see Clause 10.

The responsible person(s) should be satisfied as to the competence of the appointed service and/or maintenance provider(s). The appointed service and/or maintenance provider(s) shall have adequate knowledge, experience, and training in the requirements of this Standard, and should be able to demonstrate their competence.

Servicing/Testing (tests and reports) and maintenance shall be undertaken following commissioning of the FDAS whether the building (premises) is occupied or not. [A1]

A Schedule of Servicing/Testing (0 2) shall be prominently displayed adjacent to the main CIE to indicate the service provider, the service planning and confirming completion of the planned service in compliance with the requirements of this Standard. The service provider shall confirm [A1] the status of the system on completion of each service visit on the periodic engineers work report.

NOTE The issuing of false or misleading information in Certificates of Servicing/Testing is an offence under the Fire Services Act 1981 and 2003. [A1]

9.2.2 Routine procedures

9.2.2.1 General

[A1] [A1]

A guide to the routine that should be adopted to ensure the continuing satisfactory operation of the system is given in 9.2.2.2 to 9.2.2.6. The routine to be adopted in individual premises may vary with the use of the premises. For example, equipment installed in corrosive or dirty conditions will need to be

checked more thoroughly and at more frequent intervals than that in clean and dry situations; buildings which are unoccupied normally or are unoccupied at week-ends, holidays, etc. may not receive the attention prescribed in 9.2.2.3 every day.

Provisions shall be made to ensure that all equipment is properly reinstated after testing. [A1] Particular attention shall be paid to any connection to a remote manned centre and any such connection shall be tested and confirmed prior to departing the site. [A1]

9.2.2.2 Prevention of false alarms of fire during routine testing

It is important to ensure that operation during testing does not result in a false alarm of fire.

[A1] [A1] If a link to a remote manned centre is to be used during the test, then it is essential to notify the centre before undertaking the test unless a recognised test procedure is regularly carried out at an agreed time.

The occupants of the premises [A1] shall be notified in advance by the responsible person of any planned test of the FDAS. [A1]

Similarly, a system should not be left in a disabled state during any suspension in routine testing or maintenance unless adequate alternative arrangements are put in place (e.g. alarm devices should not be isolated without monitoring of the panel by a competent person who could take appropriate action to raise the alarm in the event of a genuine alarm being received at the panel).

9.2.2.3 Daily attention by the user

A check shall be made by the user every day to ascertain [A1] :

a) the CIE [A1] indicates normal operation, or if not, that any fault indicated is recorded in the logbook and that the other actions recommended in 9.2.3.4 have been taken [A1] ; and [A1]

b) [A1] [A1] any fault warning previously recorded has received attention.

If any connection to a remote manned centre [A1] or alarm receiving centre (ARC) [A1] is not continuously monitored then it should be tested daily in accordance with the supplier's instructions.

[A1] [A1]

In buildings not in continuous or daily occupation it may not be practicable to carry out the check every day. In such circumstances the check should be carried out on each occasion that the building is [A1] occupied [A1].

9.2.2.4 Weekly attention by the user

[A1] For all FDAS the operation of all alarm devices shall be tested weekly by the user to ensure that the system is capable of operating under alarm conditions.

Any defects shall be recorded in the logbook and reported to the responsible person who shall initiate remedial action. [A1]

9.2.2.5 [A1] Annual [A1] servicing/testing

9.2.2.5.1 [A1] The responsible person shall ensure that the following checks and tests are carried out every year by a competent person:

a) each input device (as outlined in Figure N.1 Key A and D), shall be checked for correct operation in accordance with the manufacturer's recommendations (see also 9.2.4) and, with respect to manual call points, the test shall confirm the correct operation of the indicator device on the call point and that the response time is within the parameters set out in 6.7.1;

b) each output device (as outlined in Figure N.1 Key M, G, E, J, N and C), shall be checked for correct operation in accordance with the manufacturer's recommendations and that the required audible device sound levels are achieved;

c) a visual inspection shall be conducted to check whether structural or occupancy changes have affected the requirements for the siting of manual call points, detectors and alarm devices;

d) visual inspections shall confirm that a clear space of at least 500 mm is preserved in all directions below and around every detector, that the detectors are sited in accordance with 6.10, and that all manual call points remain unobstructed and conspicuous;

e) visual inspections, as far as is reasonably practicable, shall be made to confirm that all cable fittings and equipment are secure, undamaged and adequately protected; and

9.2.2.5.2 Periodic service visits shall be scheduled to occur at least four times in the year at intervals of no greater than 4 months, except where specified in 9.2.2.5.3, recorded on the Annex D2 Certificate; [A1]

During each of the periodic service visits the following checks and tests shall be completed:

1) Entries in the logbook shall be checked and any necessary action taken.

2) [A1] Batteries, including reserves, for CIE and power supplies for inputs and outputs shall be tested as specified by the manufacturer to verify that they are satisfactory for a further period of use by taking measurements that are indicative of the conditions of each cell by the use of a proprietary load test meter specific for the purpose.

3) Batteries shall be replaced within the period of the service life stipulated by the battery manufacturer. Batteries shall be indelibly marked with the date of installation.

4) All functions of the CIE shall be tested. The alarm functions of the CIE shall be checked by the operation of an input device in each Alarm Zone as described in 9.2.2.4. The operation of the alarm devices and any link to a manned centre or an alarm receiving centre (ARC) shall be tested. The CIE shall be visually inspected for signs of moisture ingress and other deterioration.

5) The fault monitoring of power supplies serving inputs and outputs by the CIE shall be tested.

6) Attention should be made to areas where alterations to the system have been carried out since the last service.

1), 2) and 3) need not be applied to batteries which power individual items of equipment (such as wireless input devices and wireless output devices) and which have provision for monitoring as required. [A1]

It is recommended that during the periodic service visits a percentage of the [A1] input devices shall [A1] be tested such that at the end of the annual period all devices have been tested and adequate records have been maintained to guarantee that 100 % of the devices have been suitably tested, The operation of alarm devices/visual alarm indicators shall be checked such that at the end of the annual period 100 % of all devices have been tested.

Any defect shall be recorded in the logbook. These shall be reported to the responsible person for appropriate corrective action.

[A1] On completion of the periodic inspection, a service report shall be issued to the responsible person. [A1]

[A1] **9.2.2.5.3** [A1] For non-residential systems of 4 Detection Zones or less which incorporate a combination of 20 or less automatic detection devices and call points, the periodic sequence can be reduced to occur at least two times in the year at intervals of no less than 4 months, or no greater than 8 months, provided the user/responsible person carries out the daily and weekly checks as detailed in 9.2.2.3 and 9.2.2.4.

9.2.2.6 Annual [A1] Certificate [A1]

[A1] On completion of the servicing as set out in 9.2.2.5.1 and 9.2.2.5.2, an Annual Certificate of Servicing/Testing (see D1) shall be given to the responsible person.

The Certificate shall be based on the service reports issued under 9.2.2.5.1 and 9.2.2.5.2 for the previous 12 months. [A1]

9.2.3 Special servicing

9.2.3.1 General

The routine attention described in 9.2.2 is intended to maintain the system in operation under normal circumstances. There may, however, be special circumstances in which other attention is needed:

a) action by the user after any fire (9.2.3.2),

b) action by the user after any false alarm (9.2.3.3),

c) action by the user following a fault (9.2.3.4),

d) action by the user following an early warning (9.2.3.5),

e) prolonged periods of disconnection/not maintained (9.2.3.6),

f) other non-routine attention (9.2.3.7).

9.2.3.2 Action by the user after any fire (whether detected automatically or not)

The responsible person should ensure that the following work is carried out as soon as possible after any fire, and that normal use of the area is not resumed until the work is carried out.

a) If the fire was not detected by the system, or if detection occurred at an unexpectedly late stage of the fire, then the reasons for this should be investigated, and if necessary, consideration be given to the system modifications to prevent any repetition thereof.

b) The organisation responsible for servicing the system shall be instructed to carry out a check of the system to include the following:

1) Each detector call point and system device which may have been affected by the fire shall be inspected for fire damage and tested in accordance with 9.2.4 and in accordance with the manufacturers' instructions.

2) Each fire alarm device in the affected area shall be tested.

3) A visual examination shall be made of any other part of the FDAS which lies within the fire area or which might have been damaged by the fire e.g. power supplies, control equipment and interconnections.

4) Inspect and test the CIE and associated batteries and chargers.

5) All defects shall be recorded in the logbook. These shall be reported to the responsible person for appropriate corrective action.

c) The organisation responsible for system maintenance shall be informed of the fire and of any system defects, and instructed to carry out appropriate corrective action:

1) If the system includes detectors containing radioactive material, then any actions required to deal with contamination should be taken (see Annex F).

2) The area affected by the fire shall be re-commissioned and certified in accordance with this Standard.

9.2.3.3 Action by the user after any false alarm

The User shall be made aware of his/her responsibility to carry out the following (see also, 7.3.5, 7.5.2, 7.5.3, 7.5.4):

a) Identify the particular detector, call point or device which has initiated the alarm. If detectors having individual indicator lamps are in use, any indications will be cancelled by resetting, and hence it is important that the detectors are examined before the system is reset,

b) Where possible, establish the cause of the false alarm. It is possible that the actual cause of the alarm will have been lost in the operations resulting from the alarm. Where this is so, a note of any events or activities near the detector, call point or device immediately prior to the alarm shall be kept,

c) Record the false alarm in the logbook. If any device or group of devices gives repeated false alarms, then the organisation responsible for servicing shall be informed and required to investigate and take appropriate action.

d) Implement the requirements of 7.3.5, 7.5.2, 7.5.3 and 7.5.4.

9.2.3.4 Action by the user following a fault

After a fault, the user should carry out the following:

a) determine the area affected by the fault and decide whether special action (such as fire patrols) are needed in that area,

b) if possible, determine the reason for the fault, or note the activities immediately prior to the fault in the area affected,

c) record the fault in the logbook, inform the organisation responsible for servicing and arrange for testing and take further action as appropriate.

9.2.3.5 Action by the user following an early warning (pre-alarm)

After an early warning, the user should carry out the following:

a) determine the detector and area from which the warning has come,

b) inspect the area thoroughly to ensure that there is no fire; if a fire is found, then carry out the pre-planned fire routine,

c) if no fire is found, record the warning in the logbook.

NOTE On some systems an early warning is given if the output from a detector is drifting towards the alarm level.

9.2.3.6 Action by the user following a period of disconnection/non-service/maintenance

The responsible person shall ensure:

— that the system is fully operational,

— the original system certification e.g. as in Annex C1, C2, C3 etc. are available. In the event that original certification is no longer available the responsible person shall appoint an organisation/s with the appropriate qualifications to provide the necessary certification,

— a competent contractor or competent in-house resource is appointed to provide routine service (see 9.2.1) and that the requirements of 7.3.5 are implemented.

9.2.3.7 Non-routine attendance

Other occasions on which attention may be required beyond that of routine servicing and maintenance include the following:

a) extensions or alterations to the premises (see 6.2.8.5 and 8.5.2),

b) changes in occupancy or activities in the area covered by the system,

c) changes in the ambient noise level or sound attenuation such as would impact negatively on the sounder requirements,

d) environmental changes,

e) damage to the installation, even though no fault may be immediately apparent,

f) any change to ancillary equipment.

9.2.3.8 Recommendations on appointment of a new servicing organization

a) When a new servicing organization is appointed to provide service for an existing system, the existing records should be examined to obtain sufficient information for effective future servicing of the system i.e. original certificates as in Annex C 1, C2, C3, etc. and all available previous service records

b) In the event that original certification is not available the responsible person should appoint an organisation/s with the appropriate competence to provide the necessary certification.

c) If no logbook suitable for enabling compliance with Annex E1 exists, a suitable logbook should be provided by the servicing organization.

d) Any areas of non-compliance with this standard identified during servicing should be documented and identified to the responsible person who should take the necessary corrective action in consultation with the appropriate authorities. The following may be regarded as examples of non-compliance (non-exhaustive):

   1) an inadequate number of call points to conform to 6.7,

   2) inadequate provision of fire detection to conform to this standard for the category of system that the system was designed to meet,

   3) sound pressure levels that fail to conform to the recommendations of 6.6.4,

   4) standby power supplies that fail to conform to 6.13.3.2,

   5) cabling with fire resistance that fails to conform to 6.14.2,

   6) monitoring of circuits that fail to conform to 6.3.5,

   7) the absence of life safety system documentation,

   8) exposure to, or experience of, false alarms, such as to preclude compliance with Clause 7 and in particular 7.3.4, 7.3.5 and 7.5,

   9) changes in the use, layout and construction of the protected premises that may impact on the effectiveness of the system,

   10) the absence of a zone chart or other suitable diagrammatic representation of the premises (see 6.12.8.2).

9.2.4 Detector servicing and testing

9.2.4.1 General

It is essential that routine tests are adequate to ensure that the requisite degree of sensitivity to fire is maintained, and the responsible persons should satisfy themselves on this point. If it is found that the sensitivity of detectors is adversely affected by harsh environmental conditions, then arrangements should be made to increase the frequency of the inspections. Any detectors which have shown continued signs of instability should be replaced. All detectors should be visually examined for damage or other conditions, such as any coating of paint, likely to interfere with correct operation.

9.2.4.2 Heat detectors

[A1] Every heat detector, that does not require replacement of the detector or any element of the detector following operation, shall be tested at least annually by the application of a suitable heat source. [A1]

Heat detectors which require replacement of the device or any element of the device following activation which cannot be tested by the application of a heat source should be tested at least annually in accordance with the manufacturers' instructions.

Care should be taken to ensure that the heat source has been designed for the application and is not likely to damage any part of the detection device or be a cause of ignition of fire. Naked flames shall not be used.

9.2.4.3 Point type smoke detector

Every detector shall be tested at least annually by a method which confirms that smoke can enter the detection chamber and activate the device. The product employed for the test of the detector (simulated smoke or aerosol) should be suitable for the application and should not cause damage to the device or impair its future detection ability. Test products recommended by the manufacturer should be employed or the manufacturers' approval should be sought for the use of alternative products.

The use of magnets, remote switches, other electrical/electronic tests or interrogation of devices by software methods will not be acceptable.

9.2.4.4 Carbon monoxide point detectors

Each detector shall be tested as per 9.2.4.3 but employing carbon monoxide gas in accordance with the manufacturers' recommended concentration as the test medium. Alternatively, any test medium recommended by the manufacturer which can simulate the reaction of the cell to carbon monoxide may be employed provided it also correctly simulates the ability of the carbon monoxide to enter the detection chamber.

9.2.4.5 Multi-sensors

Each device shall be tested annually to confirm its correct operation. Testing should be undertaken in accordance with 9.2.4.2, 9.2.4.3, 9.2.4.4 and the manufacturers' instructions and each sensing element shall be confirmed as being responsive to the medium being sensed i.e. smoke sensor shall react to smoke, heat sensors to heat and carbon monoxide sensors to carbon monoxide. In addition to the testing of the device it shall also be confirmed that where multi-sensors are applied to detect single phenomena (smoke, heat or carbon monoxide only) that the detector spacing, and coverage complies with the spacing relevant to the fire phenomena.

9.2.4.6 Air sampling/aspirating systems

Each detector shall be tested annually in accordance with the manufacturers' instructions and by a method which confirms that smoke can enter the detection chamber and activate the device. Each device shall be tested to confirm that smoke entering the furthest sampling hole is sensed at the detection chamber. The air flow monitoring capability of each device should also be confirmed by the restriction of the appropriate volume of air to trigger the flow monitoring circuit. The use for which the device is being employed shall be considered and appropriate test procedures initiated.

9.2.4.6.1 Use as a point detector substitute

Each sampling hole designed to represent a point detector shall be tested to ensure it is clear and that smoke entering the hole is sensed at the detection chamber.

9.2.4.6.2 Use for equipment protection

Each device shall be tested by the application of smoke or simulated smoke into at least one sampling hole in each protected equipment enclosure. Where access to the equipment enclosure presents a hazard (e.g. high voltage, etc.) then provision shall be made for the application of smoke or simulated smoke into a blanked off sampling point located outside the enclosure, but which has similar characteristics (opening size, etc.) to the sampling hole(s) within the enclosure.

9.2.4.6.3 Use in Electronic Data Processing applications

The guidelines as set out in BS 6266 should be followed.

9.2.4.7 Beam detectors

Linear beam detectors shall be tested at least annually in accordance with the manufacturers' instructions. Where optical filters are used to test the device, the filter shall be of the correct obscuration for the particular device. Alternatively, smoke or simulated smoke may be employed.

9.2.4.8 Flame detectors

The flame detector shall be checked for correct alignment for the hazard protected and tested in accordance with the manufacturers' instructions annually. Where UV or IR test torches are used they should match the detection characteristics of the sensor and in hazardous areas the test devices should also be suitably rated for the hazard area.

9.2.4.9 Other detectors

Detectors other than those listed above shall be checked for correct operation and sensitivity in accordance with the manufacturer's instructions.

9.2.4.10 Remounted detectors

If detectors, alarm devices or alarm indicators are removed from their mounting or circuit for any test, then a final verification check shall be carried out to confirm correct operation after remounting.

9.2.4.11 System disconnection during testing

Care should be taken to minimise disruption of the normal use of a building by alarms sounding during detector testing. It is preferable that during testing of detectors as much as possible of the remainder of the system should continue to function normally. If detectors are removed from the system for testing or servicing, replacement detectors should be immediately provided to keep the system in normal operation, or separate provision should be made for surveillance of the unprotected area.

9.2.4.12 Systems using addressable detectors

Care should be taken during the servicing of systems in which the detector is itself coded. False information in respect of the origin of alarms could occur if individually coded detectors were incorrectly replaced.

9.2.5 Standby supply batteries

The test specified by the manufacturer under 6.13.3.2.1 shall be carried out at the intervals specified.

9.2.6 Spare parts

The responsible person shall ensure that adequate spare parts are available for the system by holding the manufacturers'/suppliers' recommended quantities on site. If a service/maintenance contract is in force, and the service/maintenance provider holds or has guaranteed access to adequate parts suitable in type and manufacture for the support of the system within 24 hours then the site spares may be confined to fuses, frangible elements for manual call points and any other consumables recommended by the system manufacturer/supplier.

Where equipment undergoes manufacturers' upgrade resulting in the new equipment being unsuitable for incorporation into the existing system (redundancy) then the responsible person shall arrange for the holding of suitable spare parts to maintain their system for the anticipated life cycle (refer to 6.2.10.2)

10 Fire alarm systems in residential buildings

10.1 Assessing the risk

[A1] A risk [A1] assessment should be carried out by a competent person to determine the potential fire risk and consequences of fire on occupants of the building [A1] [A1].

For individual dwellings with no unusual risks, the provisions set out in 10.2.2.1 will meet the requirements of this Standard.

For more complex buildings a fire risk assessment should determine what fire safety systems are required, what functions they have, and what management and communications systems/procedures will be required to maintain and operate these safety provisions during the lifetime of the building.

The main items to be considered in the Risk Assessment/Fire Safety strategy development process are provided in 6.2.1 and 6.2.2.

[A1] [A1]

10.2 Fire protection in dwellings

10.2.1 General

Fire protection in dwellings should be appropriate to the size of the dwelling, the number of storeys and the fire risk.

10.2.1.1 Grades

The following Grades of system are relevant to domestic/residential Fire Detection and Alarm:

1) Grade A: A system of detection and alarm devices incorporating Control and Indicating equipment (CIE), designed, installed, commissioned and maintained in accordance with Clauses 5 to 9 of this Standard.

2) Grade B: Systems incorporating Fire Detectors, Fire Alarm Sounders & Control & Indicating Equipment (CIE) as specified in BS 5839-6:2004.

3) Grade C: System incorporating Fire Detectors and Alarm Sounders (which may be combined in the form of Smoke Alarms) connected to a common Power Supply with stand-by supply and an element of Central Control.

4) Grade D: An installation of self-contained mains-powered smoke or heat alarms each provided with an integral standby power supply. Where multiple units are provided all devices shall be interconnected so that detection of fire by any one unit will provide an audible alarm from each.

NOTE 1 For Grade D installations interconnections may be by radio or wiring. Where radio interconnection is used, manufacturer's recommendations on testing of signal strength/reception at each device (generally as clause 6.15.4.1 paragraphs one and two) shall be carefully followed and records kept.

NOTE 2 Reference to self-contained smoke/heat alarms in this Standard includes Smoke Alarms, Heat Alarms, carbon monoxide (CO) Fire alarms, multi-sensor alarms, (or other) as appropriate.

The appropriate device for the particular risk should be decided by the risk analysis and specified for the particular installation (see also Annex J).

10.2.1.2 Categories

Where a Grade B, C or D system is specified, one of two Categories (types) shall be chosen – Category LD1 or LD2.

a) Category LD1: Interconnected self-contained mains powered/battery backed smoke/heat alarms (as Grade D above) shall be suitably located:

   1) throughout the dwelling, including all circulation areas that form part of the escape route and,

   2) All rooms and areas (including attics/lofts/other spaces) in which a fire might start, other than toilets, bathrooms and shower rooms.

b) Category LD2: Interconnected self-contained mains powered/battery backed Smoke/Heat Alarms (as Grade D above) shall be suitably located in:

   1) all circulation areas that form part of an escape route within the dwelling, and

   2) all high fire risk areas/rooms e.g. kitchen, living rooms, garages, ▌A1⟩ utility rooms ⟨A1▐, and

   3) all bedrooms.

NOTE See definition for **fire risk**. For detailed guidance on Risk Assessment for dwellings see BS 5839-6:2004, Clause 4 and Annex A.

10.2.1.3 Maximum and minimum levels of protection

The highest level of protection would be a Grade A installation conforming to an appropriate category as set out in 6.10 of this Standard.

The minimum level of protection is as set out in 10.2.2.

All smoke alarms shall comply with I.S. EN 14604 and all heat alarms shall comply with BS 5446-2.

Battery only or mains only smoke/heat alarms are not acceptable, except as set out in 10.9.

10.2.2 Individual Dwellings

10.2.2.1 The minimum level of protection for dwelling houses up to three storeys or for any individual apartment/flat or maisonette shall be a Category LD2 installation as set out in 10.2.1.2.

This level of protection is applicable to individual dwellings with no unusual risks, with no floor greater than 200 m^2 and, where not a single family dwelling, intended to be shared by no more than 6 persons.

10.2.2.2 For dwellings larger than set out in 10.2.2.1, or higher than three storeys, or where the fire risk so warrants, then a Category LD1 Installation as set out in 10.2.1.2 shall be installed in each individual dwelling.

Where the Fire Risk Assessment determines that detectors are to be installed in roof voids/attics or other areas difficult to access for testing or monitoring purposes, then all detectors should have remote control functionality to allow Alarm Testing, Alarm Location and Alarm Silence functions to be controlled from one remote control location. Alternatively, a fully monitored Grade A, B or C system should be installed as appropriate (see 10.2.1.1).

10.2.2.3 Guidance on location and spacing of Detection and Alarm devices is given in Annex J.

10.2.3 Buildings containing apartments/flats and/or maisonettes

10.2.3.1 Where groups of individual dwellings are so arranged that they are separated/fire compartmented and not interconnected by any enclosed access route or stairway and their final exit opens directly to a place of safety in the open air, then each individual dwelling shall be protected as set out at 10.2.2.

10.2.3.2 If such a grouping of dwellings sits over a basement or underground car park, whether naturally ventilated or not, then a minimum Category L4 system shall be installed in that car park (see 6.10.7.8).

10.2.3.3 Where dwellings are accessible only via enclosed common corridors and access stairways, then the individual dwellings shall be protected as in 10.2.2, and the common/communal areas shall be protected by a category [A1] 〈A1] L3X system [A1〉 as a minimum 〈A1] (see 5.2, 6.2.5 and 6.10.3.3).

There shall be no interconnection between the devices required under 10.2.2 and the L3X system as set out herein.

The L3X system shall incorporate alarm devices capable of providing the sound levels as 6.6.4 in each dwelling but the Fire Risk Assessment will determine how the sounders shall be configured and activated (for example, total simultaneous alarms, progressive evacuation alarms or other appropriate to the building (see Annex M).

This sounder configuration and any communication with, and the operation of sounders in any other occupancies/dwellings (as set out in 6.2.5) shall be defined in the Fire Strategy and implemented in the system configuration to suit the appropriate response.

A heat detector and sounder connected to the L3X system shall be installed inside the final exit from each dwelling to the communal corridors/stairways and a remote lamp unit from this detector shall be installed outside the final exit door of the dwelling.

The sounder inside the final exit door of each dwelling may be eliminated if the sounder(s) at the bedhead(s) (6.6.4.1) is deemed sufficient.

10.2.3.4 Where the common/communal areas referred to in 10.2.3.3 interconnect by stairway or lift with any covered ground level or lower ground floor or multi-storey car park, then any car parking areas not protected by sprinklers shall be protected by heat detectors complying with 6.10.4, or flame detectors complying with [A1〉 6.8.4 〈A1] and [A1〉 6.9.4 〈A1] and all defined escape routes and identified fire risks shall be protected by smoke detectors as 6.10.3.3 (L3) minimum.

10.2.3.5 Any such car park fire detection system should report to the Fire Alarm Panel in the blocks above, but in the case of multiple blocks rising off a common extensive basement it may only be necessary to give early warning to the particular block/blocks immediately over the part of the basement involved.

10.2.3.6 Any category L3X system will require that a pre-planned Fire Strategy and Response procedure based on the Risk Assessment (see 10.1) is produced and communicated to all the residents/occupiers (see 5.4.1, 6.2.3 and 6.2.5). In order to ensure effective communication and appropriate response by occupants (and to minimise the risk of false alarms (see 7.1)), appropriate management, operation, response and control of the system, and service/ maintenance routines, will be essential. These controls and routines will best be established through the Apartment Owners Management Company (OMC) which together with the Multi-Unit Development Act are the statutory mechanism controlling the ownership of individual dwellings in an apartment block.

Any L3X system shall be designed, installed, commissioned and certified as laid out in Clauses 5, 6, 7, 8,and 9 of this Standard.

10.2.3.7 All dwelling owners shall be provided with a copy of the fire strategy and response procedure and all the FDAS documentation relevant to their dwelling complex. (see 10.6 and Annex K of this Standard).

10.2.3.8 All dwelling owners shall provide each and every tenant with a copy of the fire strategy and response procedure and include mandatory compliance with same in their Tenancy Agreement.

10.2.4 mixed user building (see definition)

A mixed user building requires a fire detection and alarm system appropriate to each type of risk. Such systems shall:

a) comply with the requirements of 10.2.2, for residential sections,

b) have a system appropriate to the nature of occupancy and size of risk and as a minimum a Category L3X system for all other sections (e.g. communal areas).

NOTE Interfacing or interconnection between separate systems in any suffix X system may be necessary (see 5.2 and 6.2.5 and 10.2.3.3).

10.2.5 Residential (Institutional) buildings

Such buildings shall be provided with a Category L1 fire detection and alarm system complying with this Standard (see 6.10.3.5).

In systems for this type of risk the Designer shall exercise particular care in establishing and considering the category of occupants, evacuation procedures and agreed means of alerting the emergency services (see 5.4, 6.2 and Annex B).

10.3 Audibility of smoke/heat alarms

10.3.1 Audibility of smoke/heat alarms shall be such that the sound pressure level of a fire alarm signal, if measured at the doorway of each bedroom (with the door open), shall be at least 85 dB(A), irrespective of where fire is detected in the dwelling.

10.3.2 The recommendations in 10.3.1 apply to many dwellings of limited size and with straightforward means of escape. A higher level of sound pressure may be necessary if occupants have

hearing impairments or other disabilities and the provision of Visual, Tactile or other alarm signals may be necessary (see also 6.6.7)

NOTE Consideration should be given to achieving appropriate sound levels on any balcony or external terrace on which persons might become trapped by fire or smoke.

10.4 Cables for interconnecting smoke/heat alarms

Any cables suitable for domestic mains wiring are acceptable for interconnecting Grade D devices in dwellings but should be readily distinguishable from other mains cables e.g. by colour coding.

NOTE Interconnection may be by radio or cables (see 10.2.1.1 (4) Note 1)

10.5 Installation, testing, commissioning and certification of smoke/heat alarms

10.5.1 Installation

Detection and Alarm devices shall be rigidly fixed. All interconnecting wiring should comply with 10.4 and shall comply with ET 101.

As installed drawings shall be supplied to the User.

10.5.2 Testing and commissioning

The entire system shall be inspected and tested to verify correct operation. All Detection and Alarm devices shall be functionally tested to ensure satisfactory operation of each unit and all interconnections.

10.5.3 Certification

A Certificate of Commissioning shall be issued, see Annex K of this Standard.

10.6 Documentation/User instructions/completion/handover of smoke/heat alarm systems

The installer of smoke and heat alarms shall provide written information on operation of the system and including:

- details of interlinking and importance of the interlinking facility,
- action in the event of a fire alarm signal, including silencing procedures,
- information on avoidance of false alarms,
- action in the event of a false alarm,
- routine testing Service/ Maintenance procedures/proposals,
- the need for a clear space around detectors and to ensure detectors are not covered or subject to accumulation of dust, dirt or paint,
- all the information required by 10.2.3.7.

10.7 Routine testing, servicing, of smoke/heat alarm systems

Smoke and heat alarms should be tested every week by the User in accordance with the manufacturers' instructions. Detection devices should be cleaned periodically in accordance with manufacturers' instructions.

Where the User employs a Service/ Maintenance provider to carry out routine testing and servicing, that provider shall give the User a Certificate in accordance with Annex L of this standard.

10.8 Existing multiple-occupancy residential buildings

For existing multiple-occupancy residential buildings where inadequate or no detection and alarm has been provided then, subject to an adequate risk assessment by a competent person and subject to written communication/consultation with the relevant Local Authority's Fire Authority, radio interconnected smoke and heat alarms each incorporating a ten year battery may be employed in the individual dwellings only.

The location and operational performance of such devices shall comply with all other requirements of Clause 10.

In the communal areas an L3X system is required in accordance with 10.2.3.

10.9 Existing dwelling houses

For existing dwelling houses (built prior to the introduction of Building Regulations which required mains powered interconnected smoke and heat alarms in all new dwellings) where inadequate or no detection and alarm has been provided, radio interconnected smoke and heat alarms, each incorporating a ten year battery may be employed.

NOTE In circumstances of very low fire risk (see 10.1), self contained battery operated smoke alarms may provide an acceptable level of protection, provided batteries are not interfered with and are replaced as required.

Annex A
(informative)

Compatibility requirements

All the components of a fire alarm system shall be mutually compatible and in accordance with I.S. EN 54-13. In relation to compatibility of system components, the following at least should be considered:

a) for all devices:

   1) the requirements of the system in order to meet electrical safety,

   2) any provision for earthing,

   3) the earth insulation resistance,

   4) the method of resetting the device after an alarm,

   5) any preferred method(s) for monitoring line continuity,

   6) whether the current taken or delivered has an appreciable reactive component,

   7) the characteristics of any signals passing between components,

   8) the ability of the control and indicating equipment (CIE) to operate in conjunction with the number of devices to which it will be connected,

   9) any software provided for programming the system or its components, and the compatibility of other components with the software,

   10) any limitations on the numbers, types, sizes or other parameters (such as impedance) of wires that can be connected.

b) for fire detectors:

   1) the form of output provided,

   2) the operating voltage (including tolerances),

   3) the quiescent current,

   4) the alarm current or maximum permissible alarm current rating,

   5) the method of resetting the device after an alarm,

   6) the states of the detector which indicate normal, fault and fire conditions,

   7) any requirements for indications of operation to be provided in the vicinity of a detector, together with any resultant changes in system conditions, e.g. reliability or power consumption,

8) the number of conductors required.

c) for alarm devices:

1) whether polarised connection is required,

2) whether precautions may be required in order to suppress any interference generated by the device,

3) what methods for monitoring the interconnections can be employed,

4) whether the power supply arrangements can provide sufficient power,

5) whether a high starting current is required.

d) for manual call points:

1) whether of open or closed circuit operation,

2) whether of polarised operations,

3) the method of discrimination between alarm and fault conditions,

4) the method of resetting the device after an alarm.

e) for power supplies:

1) the correct voltage for the type of battery (i.e. lead acid or alkaline types),

2) the correct charging characteristics of the type of battery (i.e. constant current or constant voltage),

3) the relationship between polarity and earth, or if the potential is earth free,

4) the current rating in relation to calculated maximum demand,

5) the permissible limits of ripple,

6) the degree of stabilisation,

7) the formula for power capacity for the system, including the storage capacity of the standby supplies and the required standby duration,

8) the permissible range for the supply voltage,

9) whether the standby power supplies are able to provide the necessary current for the specified duration.

f) for automatic fire protection equipment:

1) whether the energy required by the automatic fire protection equipment is available from the Control and Indicating Equipment or whether additional power supplies will be required,

2) whether the voltage(s) required by the automatic fire protection equipment are compatible with those available from the CIE,

3) whether compatible with proposed monitoring facilities,

4) whether requiring positive or negative switched input,

5) whether normally energised or normally de-energised.

g) for remote indication and control panels:

1) the functions provided,

2) the signal conditions for each function,

3) the terminal connections.

h) equipment for transmitting fire alarms and fault warnings to alarm receiving centres (ARC) shall be compatible with the equipment at the ARC.

Annex B
(informative)

Automatic connection to the Alarm Receiving Centre (ARC)

B.1 General

There are several methods by which alarms of fire can be transmitted automatically from the protected premises to the fire brigade.

The availability, reliability and means of testing the connection to the fire brigade should be discussed with the installer of the fire alarm system, the communications officer of the local fire brigade and, where communication is via the alarm receiving centre (ARC), with its operator.

Connection of a system to fire brigade mobilising controls may be the subject of a licence or agreement between the installing engineers and the fire authority concerned. Contact with the local fire authority on this matter is advised.

B.2 Communication via a private line

Some methods of communication with the fire brigade necessitate the renting of a public telecommunications operator private line or other landline, together with equipment to the transmit and receive the signals. Correct functioning of the line and the equipment may be monitored. The amount of information which can be transmitted will vary depending on the equipment used, but as a minimum facilities should be available for transmitting fire and fault signals. Test facilities are normally available, and the user would normally be expected to initiate test calls at regular intervals. The procedure for making a test call will depend on the system used but should be carefully laid down and followed in order to prevent a test call being mistaken for a fire alarm.

Although a number of different systems are available, in practice the system used often depends on the arrangements made by the fire authority for connections to the fire brigade control. Available systems include the following:

a) direct connection to an alarm receiving centre (ARC). The User will have to bear the full cost of the dedicated private line, in addition to the remote manned centre operator's charges. The remote manned centre should have a direct telephone connection to the appropriate fire brigade,

b) some companies provide local 'collectors' to which direct line connection may be made. Signals from a number of premises can be connected to the same 'collector', where the signals are multiplexed together and transmitted over a common line to a remote manned centre. In this type of system, the costs may be reduced, since the price of the line between the 'collector' and the remote manned centre is shared between several users.

B.3 Communication via a Public Switched Telephone Network (PSTN)

A number of systems are possible by which alarm signals may be transmitted over the public switched telephone network (PSTN). In general, these may be classified into the following:

a) carrier and similar systems, in which the fire alarm signals are carried on the same wire as voice signals but are separated from the voice signals in the exchange before entering the switching system. These systems are usually operated by the telecommunications operator, but are not universally available,

b) systems using the 999 emergency system, 999 calls are given an automatic priority over other calls, but can only be used for communication with the local emergency services. It is thus impossible to use the 999 system to communicate with a remote manned centre, or for a remote manned centre outside the local area to use the 999 system to send the alarm to the local fire brigade. Further, since the 999 system depends on voice communication, it can only accept signals which are intelligible to the operator, such as recorded or synthesised speech,

c) systems using the normal switching system. Commercial systems are available that automatically 'dial' the remote manned centre using the public switched telephone network. Once contact is made, a coded signal is sent identifying the type of alarm (fire, fault, test, etc.) and the address from which the alarm originates. Most such systems allow for multiple retries in the event of failure to connect initially, but it should be appreciated that dialling a 10-digit number will take about 30 s for each try. Four tries may thus absorb 2 min in simple dialling time, without any other delays. Where the alarm is sent to a remote manned centre outside the local fire authority area, the method of communication between the remote manned centre and the fire brigade becomes important. The most reliable method is a direct line fire telephone, but private lines over long distances are expensive. The 999 system cannot be used, since it is for local alarms only. Some fire brigades have a control room telephone with an ex-directory number which can be given to remote manned centres. The fire brigade's administrative number should not be used, since at busy periods there may be considerable delays in answering it.

B.4 Automatic signalling to an ARC via a Digital Communicator

Automatic signalling of a fire alarm conditions to an ARC can be achieved by the installation of a digital communicator between a fire alarm system and an ARC. Digital communicators operate by sending a coded message to an ARC via the digital communicator. The digital communicator can monitor the status of the fire alarm system and on receipt of a fire alarm signal from the fire alarm system can automatically send a signal to the ARC. The ARC on receipt of this signal will contact the relevant parties as detailed in the fire safety strategy. Digital communicators are available that will operate on one or a combination of PSTN (landline), GPRS and GSM mobile networks and are ideally suited for buildings where no landline telephone lines are available and also in buildings where the installation of fire rated cabling for the telephone lines is not possible or cost prohibitive.

B.5 Connecting to an Alarm Receiving Centre (ARC)

In buildings which are likely to be unoccupied for any period of time or where adequately trained persons are not always likely to be present the most reliable method may be over an automatic link to an alarm receiving centre (ARC).

Alarm Receiving Centres should be able to access the ECAS (Emergency call answering service) 112 or 999 Service located in the jurisdiction in which the premises is situated as all emergency calls shall be made within the state.

Alarm receiving centres should comply with I.S. EN 50518 or an equivalent standard.

Each premises which connects to an Alarm Receiving Centre (ARC) shall forward details of a "Responsible person" or "Competent person" to that ARC. These details should be confirmed or updated when this person changes and/or at 3 monthly intervals.

The Pre-determined contact person for the premises (either the Responsible person or the Competent Person), shall possess a thorough knowledge of the premises, shall be available on the premises during normal working hours and be in a position to attend the premises within 20 minutes outside normal working hours. This is to facilitate the Emergency services in the event of an alarm activation.

In the event of a fire alarm activation during working hours, the ARC should contact the pre-determined person to check out the premises for signs of fire. If there is a fire the emergency services should be contacted by phoning 999 or 112.

When a fire alarm activates outside normal working hours, the ARC should contact the pre-determined contact person who shall meet the emergency services at the premises to provide the assistance required.

The ARC shall provide a comprehensive Dataset of information at the time of an emergency to the Regional Fire Control Centre to assist the emergency services.

The Dataset information to be provided is detailed in B.6.

Provision may also be made for communications with other off-site bodies, including service/maintenance parties and key-holders.

If a building is divided into separate occupancies, then tenants or occupiers shall make additional reliable arrangements to call the fire service. The responsibility for calling the fire service shall be both clearly specified and clearly understood. Consultation with the fire service is advisable for systems serving buildings of multiple occupancy.

If public telecommunications lines are used in the transmission of fire alarms, then it is desirable to limit the risk of the lines being damaged by fire before the alarm has been transmitted. The lines for fire alarm transmission should be discussed with the public telecommunications operator so that, where practicable, the use of overhead lines can be avoided near the building.

If a special telephone line is provided for the transmission of emergency calls (either automatic or manual) through a switched network, then the line shall be barred from receiving incoming calls. It shall never be used for outgoing calls other than emergency calls, unless emergency calls can be transmitted despite the presence of other signals.

Alarm signals should not be routed through private exchanges which may themselves be involved in the fire or which may be automatically closed down in the event of fire.

Where there is no alternative to the use of a private exchange then consideration should be given to the exchange equipment being protected e.g. by an automatic fire extinguishing system.

B.6 Data set information to be forwarded to regional control centre by the ARC

- Name of premises (business name or property name),
- Street Number of premises,
- Name of Street,
- Name of location or estate,
- Approximate town/village name or townland name,
- Post code,
- Geocode (each building has individual geocode),
- Name of contact in alarm monitoring company,

— Contact number of alarm company including area code,

— Reference: number of incident.

Regional control centres will require data to be formulated in English and communicated clearly and concisely.

Annex C 1
(normative)

Fire detection and alarm system – Certificate of Design

Page 1 of 2

[this certificate may be printed on company headed paper]

Certificate number: .....

Name of Company and or Person responsible for design:.....

Address of above:.....

New System: ☐ Modification to existing: ☐

Name of protected premises or Owner:.....

Address of Protected Premises:.....

Protected Area.....

Designer's Name .....

Reference Drawings.....

System Category:..... Variations: No ☐ Yes ☐ (listed as attached)

〚A1〛 Prevention 〚A1〛 of False Alarms

1) Having reviewed 6.11, 7.2, 7.3 and 7.4, the following potential for false alarms has been identified:

☐ No significant or identifiable potential for false alarm exists.

☐ The potential for false alarms exists due to the following conditions, processes or activities (listed as attached).

2) The System Design includes the following measures to limit false alarms:

☐ Manual call points have been sited appropriately and protected where necessary to prevent misuse, as per guidance in 6.7.2.

☐ Appropriate detection choice and siting have been specified for the risks identified at 1) above.

☐ An intelligent system has been specified.

☐ Appropriate sensors (multi-sensors, carbon monoxide detectors/other) have been specified for specific areas (as in 7.4.2).

☐ "Filtration" of initial alarms will be achieved by the use of:

	Yes	No
Staff alarms (6.6.10)	☐	☐
Time-related system (6.3.10 and 6.8.6.3)	☐	☐

☐ Other means as follows:.....

Annex C 1
(normative)

Fire detection and alarm system – Certificate of Design

Page 2 of 2

I/We hereby certify that, to the best of my/our knowledge and belief, the Fire Detection and Alarm system at the above premises as set out on the listed drawings has been designed by me/us in accordance with the requirements and recommendations of I.S. 3218:2013+A1:2019 to the system category above except as stated on the attached variations (if any).

I/We confirm our competence to carry out this design and further certify that we have incorporated all reasonable measures to [A1] prevent [A1] false alarms taking into account Clause 7 of this Standard (see checklist, page 1 [A1] of 2 [A1]).

I/We further confirm that, where the works are limited to Modifications of an existing system, that I/we have given due consideration to the impact on the original system and I/we have taken adequate precautions to ensure that there is no adverse impact on either the original system or the modifications.

Comment:……

……

Signature of Authorised Person responsible for design of the system:

Name:(Print):…… Position: ……

Signed:…… Date:……../……../……..

Telephone number:……

Annex C 2
(normative)

Fire detection and alarm system – Certificate of Installation

[A1] [this certificate may be printed on company headed paper] [A1]

Certificate Number:……

Name of Company and or Person responsible for installation:……

Address of above:……

New System: ☐ Modification to existing: ☐

Name of protected premises or owner:……

Address of protected premises:

……

Protected Area;……

……

Reference Drawings:……

……

I/We hereby certify that the Fire Detection and Alarm installation at the above premises has been installed by me/us in accordance with the System Designer's specification and the System Designers' drawings above and with the requirements of Clauses 6 and 8 of I.S. 3218:2013+A1:2019. I/We confirm my/our competence to undertake this work and to the best of my/ our knowledge and ability the installation works comply with I.S. 3218:2013+A1:2019.

I/We confirm that, where work has been undertaken to add to or modify an existing system, that due consideration has been given to the impact of this work on the existing system and there will be no adverse effect brought about by my/our work.

I/We also certify that, in accordance with the Designers' specification and Clause 8 of this Standard, all [A1] as installed [A1] drawings and installation certificates required have been provided and testing/inspection carried out and certification issued.

[A1] As installed [A1] Drawings:……

……

Certification Issued:……

Comment:……

Signature of authorised person responsible for the installation of the system:

Name:(Print):……Position:……

Signed:…… Date:……/……/……..

Telephone number:……

Annex C 3
(normative)

Fire detection and alarm system – Final Certificate of Commissioning

[this certificate may be printed on company headed paper]

Certificate number:.....

Name of Company or Person responsible for commissioning:.....

Address of above:.....

Name of protected premises or owner:.....

Address of protected premises: .....

.....

Protected Area(s):.....

.....

Description of Works:.....

.....

Reference Drawings:.....

.....

.....

System Category: .....

Variations to I.S. 3218:2013+A1:2019 and/or the Specification: No ☐ Yes☐ (listed as attached)

I/We hereby certify that the Fire Detection and Alarm system at the above premises, and as detailed above, has been inspected, tested and commissioned by me/us in accordance with the requirements of I.S. 3218:2013+A1:2019.

I/We confirm my/our competence to undertake this work and to the best of my/our knowledge and ability the commissioned works outlined above comply with the Standard for the system category stated above except as outlined on the attached variations (if any).

Comment:.....

.....

Signature of Authorised Person responsible for commissioning of the system:

Name:(Print):..... Position:.....

Signed:..... Date:...../...../.....

Telephone number:.....

Annex C 4
(normative)

Fire detection and alarm system – Certificate of commissioning for modification, extension or alterations to a system

〚A1〛 **[this certificate may be printed on company headed paper]** 〚A1〛

Certificate number:.....

Name of Company or Person responsible for commissioning:.....

Address of above:.....

Name of protected premises or owner:.....

Address of protected premises:.....

.....

Existing System:..... .....

.....

Extent of Modifications:.....

.....

.....

Reference Drawings:.....

.....

System Category: .....

Variations to I.S. 3218:2013+A1:2019 and /or the Specification: No ☐ Yes ☐ (listed as attached)

I/We hereby certify that the modifications to the Fire Detection and Alarm system at the above premises, and as detailed above, have been inspected, tested and commissioned by me/us in accordance with the requirements of I.S. 3218:2013+A1:2019.

I/We confirm my/our competence to undertake this work and to the best of my/our knowledge and ability the commissioned works outlined above comply with the Standard for the system category stated above except as outlined on the attached variations (if any).

Comment:.....

.....

Signature of Authorised Person responsible for commissioning of the system:

Name:(Print):..... Position:.....

Signed:..... Date:...../...../.....

Telephone number:.....

Annex C 5
(normative)

Fire detection and alarm system – Certificate of Commissioning for early handover for beneficial use

NOTE This is NOT a final Commissioning Certificate

〚A1〛 **[this certificate may be printed on company headed paper]** 〚A1〛

Certificate number:……

Name of Company and or Person responsible for commissioning:……..

Address of above:……

Name of protected premises or owner:……..

Address of protected premises:……

……

Protected Area:……..

……

Description of Works:……..

……

Reference Drawings:……..

……

Design System Category: System Category at Early Handover:……

Variations: No ☐ Yes ☐ (listed as attached)

I/We hereby certify that the Fire Detection and Alarm system at the above premises, and detailed above, has been inspected, tested and commissioned by me/us in accordance with the requirements of I.S. 3218:2013+A1:2019.

The system has been commissioned for the purpose of Early Handover for the beneficial use of the interested parties and full and final certification will be issued as follows and/or as attached (delete as applicable):

……..

……..

I/We confirm my/our competence to undertake this work and to the best of my/our knowledge and ability the commissioned works outlined above comply with the Standard for the system category stated above except as stated on the attached variations (if any).

Comment: ……

……..

Signature of Authorised Person responsible for commissioning of the system

Name: …….. Position:……..

Signed:…… Date: ……../…… /……

Telephone number:……..

Annex C 6
(normative)

Fire detection and alarm system – Certificate for Handover

Page 1 of 2

〚A1〛 **[this certificate may be printed on company headed paper]** 〚A1〛

Certificate number:……

Name of Company and or Person responsible for Handover:……

Address of above:……

Name of protected premises or owner:……

Address of protected premises:……

……

Extent of system covered by this certificate:……

……

The extent of liability of the signatory is limited to the system described below.	*	**Initial**
The system is capable of giving a fire alarm signal		
The facility for remote transmission of alarms to an alarm receiving centre operates correctly		
The following information has been received by the user:		
Records of any agreed variations or specific system requirements		
Certificate of Design		
Certificate of Installation		
Certificate of Commissioning		
Operation and maintenance manuals specific to the installed system		
As installed drawings of the system indicating the positions and locations of all parts of the system		
Cause and effect configuration for the system		
Detection Zone Listing and Address information for the installed system		
Proposal for a Service Contract Agreement for the system		
System Logbook		
All relevant tests, defined in the purchasing specification, have been witnessed		
Sufficient representatives of the user have been properly instructed in the use of the system including, at least, all means of triggering fire signals, silencing and resetting the system and the avoidance of false alarms as set out in 7.5.3 (Performance Monitoring) and 7.5.4 (System Management)		

* **N** **No** **Y** **Yes** **N/A** **Not Applicable**

NOTE All fields shall be completed

Annex C 6
(normative)

Fire detection and alarm system – Certificate for Handover

Page 2 of 2

The following information has been omitted and shall be provided to the Purchaser/User of the system by the Project Supervisor Design Process or his/her nominated responsible person to validate this certificate:

……

……

……

……

……

I/We being the competent person(s) responsible (as indicated by my/our signatures below) for the acceptance of the fire alarm system, particulars of which are set out on this certificate, accept the system on behalf of:

……

……

Name (in BLOCK CAPITALS):……

Position:……

Signature:…… Date:……

For and on behalf of:……

Address:……

……

……

Annex C 7
(normative)

Fire detection and alarm system – Certificate of Verification

[A1] [this certificate may be printed on company headed paper] [A1]

Certificate number:……

Name of Company and or Person responsible for verification……

Address of above……

Client:……

Address:……

……

System Location:……

……

System description:……

……

	Verification Work Undertaken	Satisfactory? Yes	Satisfactory? No	Refer to Report Note(s)
	Visual Inspection of the Overall Installation			……
	System Compliant with Specification			……
	System Compliant with the Design Certification			……
	Functional Testing carried out			……
	System Documentation adequate			……
	Users competent in System Operation/Management			……
	Any obvious potential for false alarms			……
	[A1] Handover Certification is not available therefore a new system design and commissioning process is required. [A1]			……
	Other as attached			……

I/We hereby certify that the verification process as set out in the agreed scope of works (attached) and in accordance with I.S. 3218:2013+A1:2019 has been undertaken, and as far as is reasonably practicable to ascertain,

The system complies with the requirements of the specification, the certification as issued and the requirements and recommendations of I.S. 3218:2013+A1:2019 (with exceptions/ exclusions as noted on the Design and Commissioning certification).

Signature of Authorised Person responsible for verification of the system

Name:(Print):…… Position:……

Signed:…… Date: ……/…… /……

Telephone number:……

A1

Annex D 1
(normative)

Fire detection and alarm system- Annual Certificate of Servicing/Testing

Page 1 of 2

[to be given to the user after completion of service]

[this certificate may be printed on company headed paper]

Certificate number: ……

Name of premises:……

Address of premises:……

Protected area(s) covered by this certificate:

……

……

System Details

	Yes	No
Details of the ''responsible person'' for the system have been issued to system Service Provider	☐	☐
Has the system Certificate of Design been made available to the Service Provider for inspection	☐	☐

System Category (tick as appropriate)

	1989	2009	2013	2019
I.S. 3218:	☐	☐	☐	☐

P1	P2	M	L4	L3	L2/L4	L2/L3	L1	X	Unknown

	Yes	No
Does the Certificate of Design note any system design variations?	☐	☐
Are the system ''as installed'' drawings available for inspection?	☐	☐
Are the Certificate(s) of installation available for inspection?	☐	☐
Are the Certificate(s) of commissioning available for inspection?	☐	☐

Site Inspection Records

Date Tested	
Periodic Service Inspection and Test	
Periodic Service Inspection and Test	
Periodic Service Inspection and Test	
Annual Service Inspection and Test	

NOTE Page 2 of this certificate shall be completed, signed, and dated.

Annex D 1
(normative)

Fire detection and alarm system- Annual Certificate of Servicing/Testing

Page 2 of 2

Declaration

I/We hereby certify that the Fire Detection and Alarm System installed in the protected area at the above premises has been serviced & tested in accordance with the requirements of I.S. 3218:2013+A1:2019 and as detailed in the relevant service reports.

I/We confirm my/our competence to undertake this work and to the best of my/our knowledge and ability the Annual Inspection and Test works have been completed and the system is currently operational and any ongoing works and/or deviations from the system design and/or annual service, inspection and test requirements have been notified to the responsible person for the system and recorded in the system log book.

With the following variations:

……

……

……

……

……

Service Provider Details

Name (Print): ……

Position: ……

Signature: …….. Date:……..

For and on behalf of Service Provider: ……..

Address:……..

Telephone Number: ……

A1

Annex D2
(normative)

Fire detection and alarm system: schedule of servicing/testing

A1

[this certificate may be printed on company headed paper and shall be affixed adjacent to fire alarm control panel]

Name of Company and or Person responsible for Servicing/Testing……

Address of above……

SCHEDULE OF TESTING OF FIRE ALARM SYSTEM AT:

Name of premises ……

Address of premises .....

.....

System:

Protected Areas	

Planned Servicing Frequency					
Weekly	Monthly	2 Monthly	Quarterly	6 Monthly	Other

This is to certify that the detection and alarm system(s) as outlined above have been serviced and tested on the latest date indicated below in accordance with the requirements of I.S. 3218:2013+A1:2019 and as set out in the relevant detailed report.

The system(s) are in acceptable working order and any ongoing work or exceptions are noted in the system logbook on the relevant date.

The responsible person has been notified of all such entries.

Next service due within 4 weeks of	Engineer's Name	Signature	Date
/ /			/ /
/ /			/ /
/ /			/ /
/ /			/ /

A1

Annex E 1
(informative)

Model logbook for fire alarm systems – Front page

Protected Premises/Area:			
Address:			
Log Number		Commencement Date	/ /

Responsible Person	Date: From:	To
	/ /	/ /
	/ /	/ /
	/ /	/ /

System Designer*

Name:	
Address:	
Telephone:	email:

Installer *

Name:	
Address:	
Telephone:	email:

Service Provider*

Name:	
Address:	
Telephone:	email:

Maintenance provider*

Name:	
Address:	
Telephone:	email:

* Append extra pages to the logbook if additional or alternative providers become involved.

THIS LOGBOOK TO BE KEPT AT:	

Annex E 2
(informative)

Model logbook for fire alarm systems – General register

Log No.	Date	Time	Device	Event & Detail					Date Complete	Signed
				Test	Fire	Fault	Other	Detail/ Action		

Annex E 3
(informative)

Model logbook for fire alarm systems – False alarm register

Log Ref.	Cause of Alarm/Notes	Action Taken or Needed/Comments	Date Completed	Signed

Annex F
(normative)

Ionisation chamber smoke detectors

Ionisation Chamber Smoke Detectors (ICSDs) use an ionisation chamber and a source of ionising radiation to detect smoke particles. ICSDs contain a low activity americium-241 source (typically less than 37 kBq) and can be battery-operated or mains operated with a battery backup. These products are included in the scope of the current Waste Electrical and Electronic Equipment and Batteries Regulations. Products containing radioactive sources, including ICSDs, are also controlled by legislation on ionising radiation, and specifically the Radiological Protection Act, 1991 (Ionising Radiation) Order, 2000 (S.I. No. 125 of 2000) which gives effect to Council Directive 96/29/Euratom laying down basic safety standards for the protection of the health of workers and the general public against the dangers arising from ionizing radiation. For information on the management of waste ionisation chamber smoke detectors refer to Environmental Protection Agency www.epa.ie or the Radiological Protection Institute of Ireland www.rpii.ie

Annex G
(informative)

Fire alarm systems integrated with other systems

G.1 General

Although this Standard does not cover fire alarm systems integrated with systems for other purposes, such systems should generally comply with its requirements and recommendations, and with the guidance given in this Annex.

G.2 Priorities

In general, priorities within the system should not allow fire alarms to be prevented or delayed by the state of any other function. Any other order of priority should only be adopted following consultations between all interested parties. Any interactions between system outputs should be clearly defined.

G.3 Sounders

The alarm sound following a fire alarm should be distinct from any other alarm sound given by the system, although common sounders may be used. Where control sounders are used, they should be such that no confusion might arise from sounders used for other functions.

G.4 Manual controls

The layout of any control panel should be such that confusion will not arise between controls operating the fire alarm system and controls for other functions. Manual controls provided for other functions should not affect the operation of the fire alarm system.

G.5 Time-related systems

Where means are provided to vary the response of systems at different times of day, care should be taken that no undesirable interaction occurs between the fire alarm response and that of other systems. Where means are provided for delaying or changing responses from systems (e.g. so as to prevent false alarms), any effect on the fire alarm system should be fully considered.

G.6 False alarms

Care should be taken that the integration of different systems does not lead to an increase in the number of fault warnings or false alarms. In particular, facilities for servicing and testing of systems should be considered.

G.7 Signals to Alarm Receiving Centre (ARC)

Where signals to an alarm receiving centre (ARC) are transmitted over a single link, care should be taken that faults affecting the fire alarm system can be separately identified. Faults affecting more than one system should be shown as such.

G.8 Power supplies

Where the power supply to the fire alarm system is also used to supply power for other functions, the capacity of the power supply should satisfy the requirements and recommendations of this Standard for the fire alarm system in the presence of the maximum demand from all the other systems sharing that supply. Excessive power demands due to faults on other systems should not reduce the capacity available to the fire alarm below the requirements and recommendations of this Standard.

G.9 Faults

Faults in other functions should not affect the response of the system to fire. Multiple faults in another function need not be considered if a single fault in the other function is indicated as a potential fault on the fire alarm system and would not immediately affect the response of the fire alarm system.

G.10 Multiplexed conductors

Conductors may be used to carry signals for more than one function. Failure of the multiplexing system should be indicated as a fault on the fire alarm system if that system is affected.

G.11 Interconnections

Interconnections essential to the operation of the fire alarm system should be protected as recommended in 6.14.

G.12 Segregation of cables

Cables carrying fire alarm signals (even where multiplexed with other signals) should be segregated from other cables as recommended in 6.14.

G.13 Siting of control and indicating panels

Fire alarm control and indicating panels should be sited as recommended in this Standard and not be dependent on the siting of panels for other purposes.

G.14 Commissioning and servicing

All personnel concerned with commissioning or servicing any part of the system which might affect the fire alarm function should be properly trained.

G.15 Extensions or alterations

Care should be taken that extensions or alterations to the system do not adversely affect the fire alarm system either during or subsequent to the work.

G.16 Isolation

The fire alarm system should not be adversely affected by provision made for the isolation of other parts of the system.

Annex H
(informative)

Responsibilities

	Specifier	Designer	Installer	Commissioning Provider	Maintenance Provider	Verifier	User
Structural Drawings	S	S					
Specification	S	S					
Cause & Effect Strategy	E	E					
Pre-project Meeting	E	E					
Co-ordinate Handover Documentation	S	S					
Design Certificate		R					
Modification - Compatibility Old & New	S	S					
Installation & ETCI Certificate			R				
Commissioning Certificate				R			
As Installed Drawings			R				
Test Wiring			R				
Test CIE				R			
Test Devices				R			
Test Audible/Visual Alarms				R			
Test Cause & Effect				R			
Zone Charts		S		S			
Supply Operating Manuals				R			
Supply Equipment Data				R			
System logbook				R			
System Configuration Record & Text				R			
User Training				R			
Witness system testing	S	S	S	S			S
Maintenance Agreement					R		
Appoint Service Provider							R
Appoint Maintenance Provider							R
Handover Certificate	S	S					S
Specify Verification Required							O
Verification Certificate						R	
Monitoring Contract (ARC)							O
Telephone line (to ARC)							O
R = Responsible : S = Shared responsibility : E = Either Responsible : O = Optional							

Annex I
(informative)

Guide to recommendations applicable to specific types of premises

The information provided in this Annex is for illustrative purposes only, it is not intended to constitute recommendations. The information reflects current "best fire safety practice" and the conventional interpretation of fire safety legislation.

The final decision regarding the appropriate category of the system for any specific building rests with the fire authority having jurisdiction.

Types of Premises	**Category**	**Comments**
Hospital, Nursing Homes & similar premises used for the care, maintenance & treatment of persons	L1	Detailed guidance on areas to be protected & possible variations is provided in HTM Firecode 05-03 .
Hotels, hostels, guesthouses[1] and similar premises	L1	Detailed guidance – ⟩A1⟩ DHPLG ⟨A1⟨ Guides
Guesthouses[2] & accommodation, Bed & Breakfast and similar establishments	(see clause 10)	Detailed guidance – ⟩A1⟩ DHPLG ⟨A1⟨ Guides
Flats, bed-sits and apartments & similar premises	L3X	L3X for protection of escape routes areas adjoining the escape routes. In addition automatic heat detection in each flat or apartment – see ⟩A1⟩ DHPLG ⟨A1⟨ Guide and clause 10.
Pre-schools	L2/L3 or L2/L4	Single storey more than 20 children, multi-storey premises.
Other buildings	L1 to L4	L1 systems are often provided in large or complex buildings.
Dwellings	(see Clause 10)	Detailed guidance – ⟩A1⟩ DHPLG ⟨A1⟨ Guides Technical Guidance Document "B" (TGD B)
[1]Guesthouses with more than 6 bedrooms [2]Guesthouses with less than 6 bedrooms		

Annex J
(normative)

Guidance on layout of smoke/heat alarms in dwelling houses, apartments or maisonettes

J.1 Installation of smoke/heat alarms

J.1.1 The Grade, Category and location of smoke and/or heat alarms is as set out in 10.2.2, 10.2.3 and 10.2.4. The maximum floor area covered by Smoke or Heat Alarms shall be as [A1] 6.10.4. [A1] and Table 2. Where necessary, additional devices shall be installed.

J.1.2 In circulation areas, no door to a habitable room should be further than 6 m from the nearest smoke alarm, and no door to a bedroom should be further than 3m from the nearest smoke alarm.

J.1.3 The layout should ensure that the sound levels set out in 10.3 are achieved.

J.1.4 Multi-sensor or optical smoke alarms should be used in living areas, circulation areas and escape routes. Heat alarms should be used in kitchen areas. Ionization or optical detectors should be used in bedrooms (all interlinked, mains powered and battery backed).

J.1.5 Where living rooms/kitchens are contained within one single compartment, heat alarms should protect the cooking area, and multi-sensor or optical smoke alarms should protect the living area.

J.1.6 To minimise the risk of nuisance alarms a good extraction fan system, venting to atmosphere, should be installed in any area where cooking takes place.

[A1] [A1]

Annex K
(normative)

Model certificate of design, installation and commissioning of smoke/heat alarm systems in dwellings

This certificate shall be printed on the design company's headed paper, clearly showing the design company's details.

Certificate of Design, Installation and Commissioning* of smoke/heat alarm system at:

Premises Name or Owner ……..

Address of premises ……..

Grade and Category of Installation as per Clause 10……..

The entire system as required by Clause 10 of I.S.3218:2013+A1:2019 has been tested for satisfactory operation and commissioned in accordance with the requirements and recommendations of 10.5.

Documentation and instructions in accordance with 10.2.3.7 and 10.6 have been supplied to:

Name ……

Address:……..

……

I/We hereby certify that the smoke/heat alarm system at the above premises has been Designed, Installed and Commissioned* in accordance with I.S. 3218:2013+A1:2019.

I/We confirm my/our competence to undertake this work and to the best of my/our knowledge and ability, the works outlined above comply with this Standard, for the system category stated above except as outlined on the attached variations sheet (if any).

Comment/Variations (attach additional sheet(s) if necessary):……

……

Name:(Print):…….. Position:……..

Signed:…… Date:……../……../……..

For and on behalf of:……

* If the design or installation or commissioning are undertaken by different parties, then the appropriate words shall be deleted and certificates shall be completed by each relevant party, and issued to the User in compliance with 10.2.3.7.

Annex L
(normative)

Model certificate of servicing/testing of a smoke/heat alarm system in dwellings

[to be given to the user after completion of service]

This certificate shall be printed on the service provider's headed paper, clearly showing the service provider's details.

Certificate of servicing/testing of smoke/heat alarm system at:

Address of premises:.....

.....

The Servicing/Testing work covered by this Certificate is as set out below (tick appropriate box).

Routine Inspection & Test	☐	Special Servicing following a fault	☐
Special Servicing following a fire	☐	Other non-routine attention	☐
Special Servicing following a false alarm	☐		

Alarm functions and controls have been checked.	☐
Smoke/Heat Alarms are sited in accordance with 10.2 and Annex J for the risk in question.	☐
Smoke/Heat Alarms are operational and their interconnections are in good condition and functioning correctly.	☐
A clear space is maintained around each detector, and no detector is covered or contaminated by dust, dirt or paint.	☐
The User is in possession of information on the operation of the system and action in the event of fire or fault signals.	☐
The User has information on the avoidance of false alarms	☐

I/We hereby certify that the Smoke/Heat Alarm system at the above premises has been Serviced and Tested in accordance with 10.7 of I.S. 3218:2013+A1:2019.

I/We confirm my/our competence to undertake this work and certify that all necessary items have been checked during the works indicated above, and that consequently the system is operational and compliant in relation to these works.

Name:..... Position:.....

Signed:..... Date:...../...../.....

For and on behalf of:.....

Annex M
(informative)

Staged (Phased) Fire Alarms

M.1 General

The primary function of a fire alarm system is to give an early alarm (warning) of fire (see 5.1).

The success of any system of staged or phased alarms and evacuation depends to a large extent on the satisfactory functioning of the measures outlined below. Arrangements for the proper maintenance of the systems are necessary, as are arrangements for proper management and training. These matters are not appropriate for control under Building Regulations, but satisfactory arrangements may be sought under other legislation relevant to the occupancy.

Any system of staged/phased alarms should be decided as a result of due consideration of 6.2.2 and 6.2.3.

The escape strategy to be adopted in a particular building will normally be based on one of the following:

1) Simultaneous evacuation (total evacuation).

2) Two stage fire alarms.

3) Phased evacuation.

4) Progressive horizontal evacuation.

5) Restricted Alarms/Staff alarms.

M.2 Simultaneous (Total) evacuation

In simple buildings of a limited size a single stage procedure is more than likely to be sufficient. This system initiates immediate 'simultaneous' (total) evacuation of all occupants by the operation of a manual call point or an automatic fire detector. – see also clause 6.6.4.4

M.3 Two-stage fire alarms

In a widely spread range of low rise buildings, such as an industrial complex, there might be no need for evacuation of occupants in one area of the complex even in the event of a confirmed fire of limited size some considerable distance from those occupants.

For further considerations see 6.6.9.

M.4 Phased evacuation

The concept of phased evacuation is based on evacuation of occupants on a sequential basis.

In large or high rise buildings it is desirable to evacuate first those areas closest to the fire and immediately adjacent to it; other areas are evacuated thereafter. In this case, conventionally, the floor of fire origin plus the floor immediately above (and often, any below ground areas), are evacuated as a first phase. Thereafter, each subsequent phase involves evacuation of two floors at a time until all floors are

evacuated in a number of such phases. This arrangement may enable the number and/or widths of stairways to be reduced but under these circumstances it is important that appropriate procedures will inhibit evacuation of the entire building in a single phase, as there will be insufficient stairway capacity for simultaneous evacuation of all occupants.

Phased evacuation is also sometimes used in other types of buildings irrespective of whether there are reduced stairway capacities (e.g. leisure complexes, shopping centres and transportation terminals). In these cases, the initial phase of evacuation may be horizontal, into a place of relative safety within the building.

M.5 Progressive horizontal evacuation

In hospitals, a system of 'progressive horizontal evacuation' is used in which patients closest to a fire are moved horizontally to an adjacent fire compartment. In a large hospital further evacuation might again involve only horizontal movement, without the need for more difficult vertical evacuation.

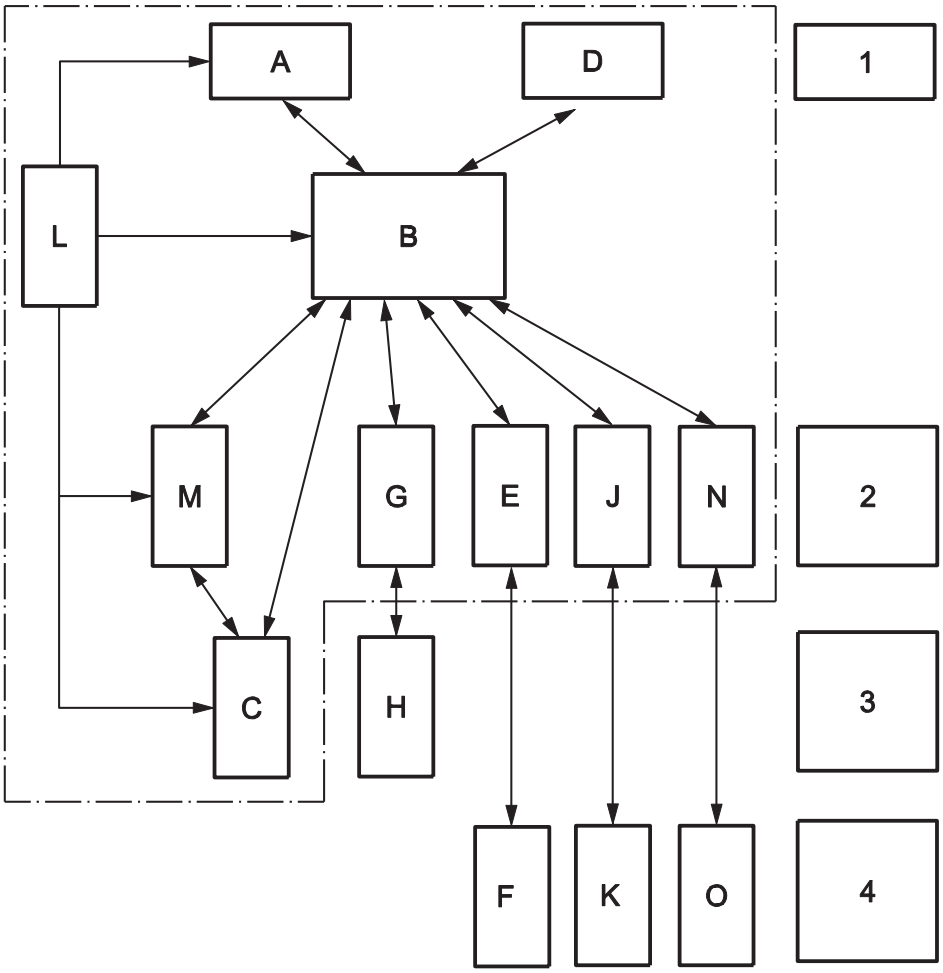
To minimise disruption from false alarms, signals triggered by automatic fire detectors might be restricted in the first instance to staff, who investigate before any general evacuation signal is given; alternatively, the area of initial evacuation might be restricted in extent (see restricted alarms).

M.6 Restricted alarms/staff alarms

In certain public buildings, such as places of public entertainment, healthcare & residential care homes, hospitals, department stores, airports etc an initial warning of fire is sometimes restricted to staff in order to avoid incorrect reaction by members of the public; staff are then responsible for controlling the evacuation, often by use of a voice alarm system (for more details of Staff Alarms see 6.6.10).

Annex N
(informative)

Inputs/Outputs



Key

1	detection and activation functions	G	control function for fire protection system or equipment
2	control functions for actions	H	fire protection system or equipment
3	local associated functions	J	fault warning routing function
4	remote associated functions	K	fault warning receiving function
A	automatic fire detection function	L	power supply function
B	control and indication function	M	control and indication function for alarm annunciation
C	fire alarm function	N	ancillary input or output function
D	manual initiating function	O	ancillary management function
E	fire alarm routing function	⟷	exchange of information between functions
F	fire alarm receiving function		

NOTE The functions that are included within the FDAS are shown inside the dotted line

Figure N.1 — Fire detection and fire alarm system and associated systems, functions and equipment

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[4] I.S. EN 62305-2: 2006, Protection against Lightning – Part 2: Risk Management

[5] I.S. EN 62305-3: 2006, Protection against Lightning – Part 3: Physical damage to structures and life hazard

[6] I.S. EN 62305-4: 2006, Protection against Lightning – Part 4: Electrical and Electronic systems within structures

[7] I.S. EN ISO 9000:2005, Quality Management Systems – Fundamentals and Vocabulary

[8] BS 5588-1:1990, Fire Precautions in the Design, Construction and Use of buildings - Part 1: Code of Practice for residential buildings

[9] BS 6266 Fire protection for electronic equipment installations - Code of practice

[10] BS 9999: ▌A1⟩ 2017 ⟨A1▐, Code of Practice for Fire Safety in the Design, Management and Use of buildings

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[12] HTM Firecodes, Firecode Health Technical Memoranda

[13] FIA code of practice for aspirating smoke detection

[14] BS 5446-2 Fire detection and fire alarm devices for dwellings - Part 2: Specification for heat alarms

[15] BS 5839-1 Fire detection and fire alarm systems for buildings - Part 1: Code of practice for design, installation, commissioning and maintenance of systems in non-domestic premises

[16] ▌A1⟩ BS 5839-6:2004, Fire detection and fire alarm systems for buildings. Code of practice for the design, installation, commissioning and maintenance of fire detection and fire alarm systems in domestic premises. ⟨A1▐

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[18] Irish Building Regulations 2006, Technical Guidance Document B – Fire Safety

[19] Irish Building Control Act

Acknowledgements

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GIVEN under the seal of the National Standards Authority of Ireland

This 13th day of September 2019

L. S.

Geraldine Larkin

Chief Executive

Patrick Bracken

Secretary to the Board of the NSAI

The Minister for Business, Enterprise and Innovation hereby gives his consent under Section 16 of the National Standards Authority of Ireland Act, 1996 to the above declaration.

Conor Verdon

13 September 2019

An Officer of the Department of Business, Enterprise and Innovation duly authorised under Section 15 (4) of the Ministers and Secretaries Act, 1924, to authenticate instruments (under the National Standards Authority of Ireland Act, 1996) made by the Minister for Business, Enterprise and Innovation.

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