

Fire Detection and Alarm Systems for Residential Premises

including licensable Houses in Multiple Occupation (HMOs) and other dwellings

Legislative Background

The Housing Act 2004 makes fundamental changes to the provisions made previously under the Housing Act 1985 in as much as there is a different method of assessing deficiencies in dwellings by assessing the risk to health and safety.

The Act also brings in the mandatory licensing of certain houses in multiple occupation (HMOs). The term 'licensed premises' will not necessarily mean that a building straight away meets a satisfactory standard with regard to fire safety provision. It may be granted a licence but be subject to an inspection by the council within a five year period to ensure satisfactory provisions are met in accordance with HHSRS.

The term 'HMO' has a new complex definition and can include other types of buildings not previously included and in turn exclude others. *For example properties termed 'shared houses' where a group of unrelated people live and share facilities will now be HMO's.*

The Housing Act 2004 makes the assessment of the hazard of fire in relation to health and safety applicable across all dwellings not just HMO's (whether licensable or not). This is achieved by applying the principles of the Housing Health and Safety Rating System (HHSRS or Rating System). *Currently Guidance Version 2.*

Prescribed standards with little or no flexibility will not be acceptable. However some guidance on standards to be expected in considering the 'Ideal' to be achieved will be necessary to maintain a degree of consistency of approach and provision. This will help to avoid the situation whereby a challenge to our requirements might result in a 'watered down' provision that may not maintain the standards found acceptable for the safety of the building occupants.

Risk elements will be more variable than previously encountered, as purpose-built blocks of flats or commercial buildings now used for residential accommodation will often have different structural elements to contain fire than those of houses converted into flats.

In addition to the HHSRS specific requirements will apply to licensable HMOs. Although the regulations have not been confirmed it seems that there will be a requirement for the provision of fire precautionary facilities. However, the draft requirements are very vague and will require some sort of guidance as to what would be acceptable. Licensed HMO will carry mandatory conditions in relation to smoke alarms.

When the Fire Safety Order (enforced by the fire authority) comes into force, the fire authority will also have powers in relation to the commonways of HMOs.

In any case before taking action (e.g. serving an improvement notice) under Part 1 of the Act, local authorities must consult with the fire authority. Although the council is not obliged to follow the advice of the authority it is clearly appropriate to carefully consider their views.

Hazard Profile 'Fire' – Provision of 'smoke alarms' in every dwelling

(Note: this council considers that the word "smoke alarms" in the Housing Act 2004 refers to automatic fire detection and alarm systems generically and not a specific reference to single point smoke alarms only).

Within the HHSRS Guidance (Version 2) under the Hazard Profile 24 – 'Fire', in considering 'preventative measures and the ideal' it states "there should be sufficient properly designed and appropriately sited smoke and/or heat detectors with alarms in every dwelling". It also states that they should be properly maintained and regularly tested.

It is a requirement for licensing HMO's under the Housing Act that a condition applies under Schedule 4.1(4) to ensure "smoke alarms" are installed and kept in full working order and for the responsible person to keep a record of when they are fitted.

It is clear from the guidance that the important principal is that some form of fire detection and alarm system must be present in all dwellings to give the occupants early warning of fire. Neither documents have a definition of what 'alarms' are expected but in HHSRS it does refer an officer in making their assessment to Building Regulation Approved Document B and British Standards BS 5588, BS 5839 and BS 5446.

The council having taken all of these references into account does acknowledge that the type and coverage of devices must be appropriate to the risk and that both smoke alarms and/or a fire detection and alarm systems with an element of central control, can be used where considered necessary for protection in either licensable HMO's or other dwellings.

A fire detection and alarm system cannot reduce the incidence of fire but it can help lessen greatly the resultant loss in terms of injury to occupants. However, the system should be regarded as just one component of a properly engineered approach to fire safety. System choice and design should take into account the contribution of all other fire precautions to the reduction of risk.

HHSRS requires each dwelling to be assessed separately together with any associated common areas. This breaks down further to suggest that individual rooms should be assessed separately. However, when considering what type of fire detection and alarm system to provide it is important to consider the whole building. When assessing multi-occupied buildings and HMO's, individual dwellings should not be assessed in isolation but all dwellings and associated commonways/shared areas of the building should be included in any assessment in determining the choice of system. In purpose built blocks you might consider the fire separation meets BS 5588 and that in this case only the flat or dwelling in question should be checked and inspected on its own.

Types of Fire Detection and Alarm System for Dwellings

The British Standards covering fire detection and alarm systems for buildings and in particular residential accommodation, are BS 5839 : Part 6 : 2004 & BS 5839 : Part 1 : 2002 and these are the documents to refer to when considering the choice and specification of system. When considering the category of system suitable in relation to HMO Licensing and the HHSRS hazard of fire, we will normally only be considering systems for the protection of life (Category LD or Category L depending on the Part of the Standard).

- BS 5839 : Part 6 : 2004 'Code of practice for the design, installation and maintenance of fire detection and alarm systems in dwellings'. The recommendations in this code apply to both new dwellings and existing dwellings including houses in multiple occupation comprising a number of self-contained units designed to accommodate a single family. It is not intended to apply to hostels, caravans or boats (except house boats) or the communal parts of purpose-built sheltered housing and blocks of flats or maisonettes.
- BS 5839 : Part 1 : 2002 'Code of practice for system design, installation, commissioning and maintenance'. Although this standard is intended for buildings other than dwellings it can be used for those classifications that are excluded from the recommendations of Part 6 described above and possibly certain other buildings.

The above standards detail the various Categories and Grades of fire detection and alarm system, which can be used in residential properties.

There are a relatively few different types of system that suit the large majority of different HMO'S and other residential buildings. These are considered in more detail below. However, this does not mean other categories of system cannot be considered suitable upon risk assessment or the application of HHSRS principles.

Single Point Battery-Powered Smoke Alarms – BS 5839 : Part 6 Grade F System

Whilst battery smoke alarms have been promoted for many years and still have a part to play they do have some serious drawbacks.

Advantages

- a) As they are only battery-powered they are quick and easy to fit by unqualified persons and are inexpensive.
- b) They are proven to have saved many lives over the years.
- c) Because they are very sensitive and providing they are fitted in the correct position they will detect fires quickly during the early stages.

Limitations

- a) They are very sensitive and very often lead to persons ignoring the alarm warning because of repeated unwanted false alarms and this may lead them to eventually sabotage the device or remove/disconnect the battery to avoid nuisance.
- b) They are only as good as the persons they protect. Even though they are fitted with an audible fault warning to alert low battery level and test buttons they are often found to be out of action through flat or removed batteries.
- c) They only provide an audible alarm in the immediate area via a built in speaker of limited output. Persons in other parts of the dwelling or building may not be aware of the operation.
- d) The ability of battery-powered smoke/heat alarms to detect a fire some years after initial installation is not considered to be high.

Recommended Primary Use

They should not be recommended but if they are already installed and operating satisfactorily this will need to be considered in any HHSRS assessment.

The devices may be appropriate for certain single occupancy single or two-storey dwellings or within purpose-built flats constructed in accordance with current Building Regulations.

Mains-Powered Smoke Alarms with Standby Supply - BS 5839 : Part 6 Category LD2 Grade D System

This system is made up of either a single mains-powered smoke alarm ('stand alone') or more usually a number of mains-powered smoke/heat

alarms, in either case an integral standby supply (usually battery) is incorporated. If more than a single alarm is provided within a dwelling or building they will usually be interconnected together (except possibly as part of a mixed system solution) so that when one device activates, the alarm is sounded by the other alarms linked to it.

Advantages

- a) Require less attention by the user. They do not rely on occupiers to change the battery.
- b) Can be connected relatively simply and cheaply to a lighting circuit, which has the advantage that the circuit is unlikely to be disconnected for a prolonged period of time.
- c) They are very sensitive and will detect fire in early stages.
- d) They can be used to cover separate parts of the building in small groups giving localised or if required total alarm sounding.
- e) They have the advantage of not needing a suitable communal area to site a control/indicator panel.
- f) They are self-setting after a period of time should they be activated accidentally by an unwanted alarm activation caused by a fire-like phenomenon such as steam or dust.
- g) Both smoke and heat alarm devices can be used on the same system.

Limitations

- a) There is no monitoring of wiring or power supplies and so faults can exist undetected although each alarm must incorporate a power supply indicator, which must be continuously illuminated when mains power is present.
- b) Experience shows that the alarms can be interfered with or removed without any indication or warning being given too or noticed by other interconnected dwelling users.
- c) They are not covered by such strict advice for servicing/maintenance.
- d) They are highly subject to unwanted false alarms as they are very sensitive (false alarms can lead to persons disconnecting them) and can lead to 'cry wolf' syndrome.
- e) There is some limitation on the size of building and the number of alarms that can be connected together, as they cannot be zoned.

- f) A fault on one can affect the whole system in as much as excessive false alarms may occur.
- g) Manual call points are not provided to escape routes or exits.

Recommended Primary Use

- a) Small single or multi-occupied well managed buildings (up to 2 stories).
- b) Coverage to a maisonette to give early warning to occupiers of the upper floors to traverse the stairway to the entrance door.
- c) Two-storey multi-occupied building/HMO, but probably not accommodation with shared facilities unless extremely well managed and low risk occupants.
- d) Multi-occupied building/HMO with no suitable internal communal area to site a control/indicator panel.
- e) Within converted flats where the whole building has been satisfactorily converted and completed in accordance with the current Building Regulations.
- f) Within purpose-built flats constructed and completed in accordance with past Building Regulations and still compliant with regards fire separation.
- g) As part of a mixed system (detailed later in this document) covering a single room to give early warning to the occupier. For example, bedsit or studio room where only a heat detector may be provided as part of a Category LD2 Grade A system due to the presence of cooking facilities within the room. The smoke alarm ('stand alone') should be installed on the ceiling as far from the cooking area as possible (or on the wall) to minimise activations due to cooking fumes. Whilst giving early warning (heat detector would not activate very quickly) to the occupant it would not affect or annoy other residents in the building if occasionally triggered by cooking.

Fire Detection & Alarm System – BS 5839 : Part 6 Category LD2 Grade A System

This system comprises fire detectors (as opposed to smoke or heat alarms) and fire alarm sounders, designed and installed in accordance with BS 5839 : Part 1 : 2002 (with the exception of certain clauses) and requires fire-proof cable. The system is monitored for faults and has control and indicating equipment. Manual call points are also a requirement appropriately sited at final/principal exits and on escape routes at most storey levels. The detection coverage of this system defined by the Category LD2 includes commonways all rooms entered off

the commonways and all other risk rooms and areas where early warning is considered necessary.

Grade A systems are also subject to servicing in accordance with the requirements and recommendations of BS 5839 : Part 1. This type of system has been very successful and what is now termed a Category LD2 Grade A system under Part 6 : 2004 has been used extensively in many HMOs.

Advantages

- a) The size of the system is almost infinite and can be used for all buildings.
- b) The indicator panel gives a degree of control over evacuation procedures and enables persons (plus fire officers) to identify quickly where the incident has occurred in the building.
- c) The alarm will remain working even if suffering the effects of fire.
- d) They can be zoned and, therefore, the whole system does not have to be turned off for maintenance or repair.
- e) Sound levels are easily achieved throughout the whole building.
- f) They should be subject to regular testing and maintenance to ensure any faults are found and rectified.
- g) They are provided with a secondary standby power supply, which compensates for power cuts or the effects of an electrical fire.
- h) They are not as susceptible to unwanted alarm activations as the more sensitive smoke alarms used in a Grade D system.
- i) The system is capable of being used with peripheral equipment such as automatic fire door closing devices operated by the smoke detection, lighting probes for those with impaired hearing or vibrating pillows, etc., for those with impaired sight.

Limitations

- a) They are more complicated to install.
- b) In most cases they will be hard wired systems and will therefore require Listed Building Consent. They are unsightly if surface wired and only look as good as the engineer who is installing them.
- c) They are slightly more costly than other lesser grades.
- d) An accessible position needs to be found for the control/indicator panel, normally an internal communal area of the building.

- e) They are only as good as those that install them and what equipment is used. For example, there are "over the counter" systems that have heads with a variety of settings. Very often the persons purchasing these have difficulty in making the correct settings. These systems are "Badged under various names but the problem is only certain settings meet the requirement of BS. These systems are not come across very frequently.

Addressable & Radio-Linked Systems

There are various additional methods other than the basic hard-wired system that can be used and which will still conform to the Category LD2 Grade A system. The most common sub-categories are.

- **Addressable Systems**

These are still a hard-wired system in which signals from each detector, sounder, manual call point or other device are constantly monitored and individually identified at the control/indicating equipment. Should an incident occur or a fault develop the system will identify which component has triggered the system and indicate its precise location.

They are used mainly in larger buildings. They are more expensive but very reliable. They can be useful to eradicate repeated false alarms and reduce time spent on maintenance due to faults and greatly aid the manager of the building.

- **Radio-Linked Systems**

These systems as suggests are linked by radio connection rather than hard wired.

Advantages

- a) Reduced disturbance to the fabric of the building, good for Listed Buildings as wires are not required.
- b) Quicker to install.

Limitations

- a) They are considerably more costly to maintain and test and install.
- b) Detectors can be removed from the positions required but will not show fault.
- c) Radio survey/test of building is required before installation.
- d) Batteries in all equipment need to be replaced every ten years.

Recommended Primary Use for Grade LD2 "A" Systems

1. Any complicated building where identifying the location of an incident would save time in attacking the fire and initiating rescue or other actions.
2. Buildings of three or more floors, particularly those that have been converted and do not comply to current Building Regulation standards.
3. For enhancing the provision of a protected route in the building. Buildings over 300 m² floor area where zoning is considered appropriate as described in the British Standard.
4. Buildings where the construction gives concern that there may be hidden voids or combustible construction that cannot be rectified or completely eradicated by any other action or precautions.
5. For buildings where there is poor management and the system may require regular monitoring or fault indication. This may help to identify early if the system is interfered with. This may be most appropriate for bedsit accommodation with shared facilities or where there is a transient tenanted population.

Fire Detection and Alarm System – BS 5839 : Part 1 Category L2 System

These installations are very similar to the BS 5839 : Part 6 : 2004 Category LD2 Grade A system, which incorporates control and indicating equipment and standby supply with detectors linked with sounders throughout the building. The areas of detector coverage are essentially the same as for a BS 5839 : Part 6 Category LD2 system, as are the Advantages and Limitations.

Recommended Primary Use

For hostel type accommodation and communal parts of purpose-built flats and sheltered housing which are excluded from the recommendations of BS 5839 : Part 6 : 2004. The degree of compartmentation between occupancies in purpose-built flats and sheltered housing is normally sufficient to ensure that fire is contained in the dwelling of origin for a prolonged period and so provided early warning is provided within each dwelling this should be sufficient. If however detection is considered desirable reference should be made to guidance contained in BS 5588 : Part 1 and the council's Building Control section.

Mixed Systems

A mixed system is an arrangement whereby two separate fire detection and alarm systems are provided within one dwelling for the purpose of achieving different objectives.

A mixed system covers a whole house with similar areas being detected as those covered by a Category LD2 Grade A system described above.

However, it comprises a L3 system described in BS 5839 : Part 1 : 2002 within the commonway escape route and additional detection, which may only be heat type in all rooms off of the commonway. This element of the system will secure the commonway escape route from fire within any flat or room flat and give early warning throughout the building.

The second element of a mixed system is the provision of mains powered linked smoke alarms and heat alarms within the circulation areas and risk rooms (normally kitchens) of each self-contained dwelling unit. These may be interconnected within each dwelling and not only protect the occupants of the dwelling but not sound the alarm throughout the building.

Advantages

- a) False alarms due to such activities as cooking do not disturb the whole building particularly if the L3 element is heat detection within the flat.

Limitations

- a) The individual or interlinked alarms of the Grade D system within the flats are not monitored and may be subject to interference without any warning to the owners or management.
- b) A fire can grow to greater proportions within a flat if occupants are out before the building heat detector activates.
- c) If the building is suspected of having hidden voids, false ceilings, etc., detection may be delayed in warning the whole building compared with the installation of a Category LD2 Grade A system.
- d) Maintenance could be problematical to enforce if there is a mixture of owner-occupied and tenanted dwellings, as each owner would need to ensure his Grade D system is operational.

Recommended Primary Use

Well constructed HMO's with fully tenanted occupation. The building should not be suspected of having hidden voids, etc., where fire may spread and only be detected early by the Grade D within the flat and not alert all occupants in the early stages.

Factors to be Considered in Choosing the Type of System and Specific Coverage or Indeed Enforcement Measures

Firstly the hazard of 'fire' has to be assessed for each dwelling in accordance with the principles of the HHSRS (this process takes into account the 'relevant matters affecting the likelihood' of a fire starting and then how likely the fire will go undetected and spread) and if it is concluded that there is either, no existing fire alarm system to give adequate early warning to the occupant, or the existing provision is less than the ideal, it will be necessary to determine the most suitable type of system for the dwelling (or building as a whole if comprising multiple dwellings) in conjunction with other fire safety provisions. Systems differ widely in cost, complexity, reliability and self-monitoring for faults.

The siting of detectors would be determined on the risk based assessment made under HHSRS principles BS 5839 ; Part 6 : 2004 outlines the importance of fire risk assessment in determining the most suitable system. Basically the following factors should be considered to determine the type of system and positioning of detectors within the dwelling/building.

1. The probability of a fire occurring (this can be within the room, flat, or commonways/shared areas).
2. The probability of a fire causing injury or death.
3. The probability of the system operating correctly at the time of the fire (success rate will help determine the category/grade of system, due to features reliability of the power supply and control/indicating equipment in alerting faults).
4. The probability of early detection warning the occupants.

The score attained using HHSRS takes into account and reflects principally the first two of these probabilities and is reflected in the score and band attained and will govern whether or not enforcement action will be taken. However the last two probabilities relate to a large extent on the characteristics, reliability and coverage of the different systems, particularly in relation to multi-occupied buildings/HMO's, together with the behaviour of the occupants. The following factors are also important and should also be taken into account in the choice made:

1. Is it a multi-occupied building/HMO with or without commonways/shared parts or a single occupancy dwelling.
2. If a multi-occupied building/HMO, the type of accommodation provided, for example self-contained flats or studio units, rooms with shared kitchen/bath & wc, rooms with cooking and shared bath & wc
3. The size, number of storeys and overall height of the building.
4. The age and construction of the building and when the last conversion/modernisation took place in accordance with Building Regulations. *(Note : fire separation and stopping that are inherent or the possibility of hidden voids between walls and floors, etc. The type of construction could range between a five storey Regency building with timber construction and hidden voids to a monolithic purpose-built block with 60 minutes fire separation between dwellings and communal means of escape routes).*
5. Is there already an existing fire detection and alarm system. Has it been maintained, is it adequate and still appropriate if changes have been made to the layout and use of the building since it was installed.
6. The standard of management apparent and type of occupation
7. Is there any on-site supervision or live-in staffing arrangements.
8. Is there any excessive fire loading over and above that usually encountered, or unusual hazards, design defects or characteristics peculiar to the building or its occupants or individual dwellings.
9. The cost of the system. Expenditure on the most complex might be inappropriate for low-risk dwellings.
10. Are there any other factors such as sprinklers or alternative escape routes for all dwelling.

Summary of Types of Dwelling/HMO/Multi- Occupied Building

The vast majority of existing dwellings encountered during inspections will not meet the current structural fire precautions standard recommended in BS 5588 Part 1 or the guidance given in Approved Document B which supports the national Building Regulations. The following list covers most of the dwelling types that are likely to be encountered and give a guide to the type of system that should be considered to meet this ideal. The information is based on the recommendations given in Table 1 on page 16 of BS 5839 : Part 6 : 2004 and takes into consideration the changes in definition of HMO given in the Housing Act and joint experience of council officers dealing with enforcement of fire safety measures in HMO's.

Single-Family Dwelling

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Bungalow, or other single-storey building.
Consider Grade D

Two or three-storey house, or other building.
Consider Grade D

Four-(or more) storey house or other building.
Consider Grade A

HMO with Shared Facilities (*includes what was previously known as a 'shared house or 'student house'*)

Comprising whole building up to two-storeys.
Consider Grade D

Comprising the whole of three-(or more) storey building.
Consider Grade A (plus maybe Grade D 'stand alone')

Comprising two-storey maisonette within a larger building.
Consider Grade A

Converted Multi-occupied Building/HMO comprising self-contained Dwellings

One and two-storey or building with no commonways.
Consider Grade D

Over two-storey and with commonways.
Consider Grade A (plus maybe Grade D 'stand alone') or Mixed (Comprising Grade A & Grade D)

Purpose-built Blocks of Flats or Maisonettes

Purpose-built blocks constructed before the current Building Regulation Approved Document B came into force, may only be deficient in relatively minor areas for example, absence of combined intumescent fire and smoke seals to flat entrance doors and separate mains-operated 'smoke alarms' (e.g. Grade D) within each dwelling. Building Control should be consulted to confirm what measures in a particular case they would expect to be incorporated to ensure a building meets a level of overall fire safety/means of escape that they consider acceptable. Presumably upgrading to Approved Document B standard will be sufficient.

Consideration should be given to ensure all dwellings are separately covered by mains-operated smoke alarms (a Category LD2 Grade D system), which would normally be a requirement of current Building Regulation Approved Document B.

If there are doubts over the structural fire separation between flats and communal areas meeting the current standards of Building Regulation Approved Document B, then following discussion with Building Control officers consideration should in addition be given to providing say a Category L4 system to protect the communal areas or even a single Category L2 system to protect both flats and the communal areas. It should be remembered that some early blocks of flats are of traditional constructions (e.g. timber floors) etc and do not have adequate fire separation. They should be considered the same category as traditionally built homes.

Hostels

All

Category L2

Notes:

- 1. Grade A & Grade D systems would normally be Category LD2 to BS 5839 : Part 6 : 2004.*
- 2. Category L2 & other L systems are to BS 5839 : Part 1 : 2002.*
- 3. Single-family dwellings and HMO's/Multi-occupied Buildings with one or more floors (storeys) greater than 200m² in area may require special consideration when deciding the most appropriate choice of system and may need modification from the preferred type given above depending on the assessed risks.*