Guide to Fire Detection and Fire Alarms in Houses Converted to Flats

FIA Guidance for the Fire Protection Industry

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Executive summary
This discussion document examines some of the advice given in BS 5839, the LACoRS guide to fire safety and other guidance. It discusses some of the problems and pitfalls and leads the reader to the selection of the most appropriate form of fire detection and alarm in buildings, particularly houses, converted to flats.

Introduction
It is widely accepted that Fire Detection and Fire Alarms (FD&FA) Systems are not required in general needs, purpose built blocks of flats. However there are vast numbers of buildings, typically Victorian and Edwardian town houses and large terrace houses, which are converted into separate dwellings. The separate dwellings range from studio apartments to flats and maisonettes and may have several bedrooms. Some buildings may also include retail or other non-domestic uses such as a shop on the ground floor. It is these converted buildings which this document is designed to address.

Very often enforcing authorities and fire risk assessors call for fire detection and alarm systems as part of the fire precautions in these buildings. Regrettably many of those involved are not particularly well informed about such systems and the available guidance is not particularly clear on this area. This can give rise to misunderstandings and may lead to an inappropriate system being installed.

This discussion document has been developed by the FIA in response to the significant number of enquiries received from installers, fire risk assessors and end users. Enquirers are often unaware of government guidance.

Many enquirers are attempting to install a system complying with BS 5839-1 without being aware of the limitations of the standard in this application. Often there is confusion about the purpose of detection in the common parts of flats. In some cases there is an assumption that the system is there purely to give warning in the common areas. In other cases, enquirers have been unaware that detection is there purely to operate other fire safety measures, typically Automatic Opening Vents (AOVs). A further complication is that many enquirers fail to grasp the distinction between a House in Multiple Occupation (HMO) and other forms of dwelling, frequently assuming that any form of building comprising flats is a HMO.

This guidance document stops short of giving specific advice, rather it explores some of the difficulties experienced by specifiers and contractors.

Mixed Use Premises
Where a building contains flats and other occupancies, such as a shop on the ground floor, the concern is often that the other occupancy presents a significant hazard to the tenants of the flats. Generally, the escape route from the flats and access to the other occupancies are independent of one another and there should be good fire separation between flat-flat, flat/common areas, flat/other occupancies and other occupancies/common areas. Where the fire risk assessment or the enforcing authorities determine that this is not the case and that a common evacuation procedure is necessary then the process for determining the appropriate FD&FA system is essentially the same as for a building consisting solely of flats. Smoke alarms are not normally regarded a suitable in non-
domestic situations. As with any other form of occupancy, the potential for false alarms should be considered when specifying the system, see false alarm control.

**Sheltered housing**
This document is not specifically about sheltered housing but buildings, converted from other uses, might be used for sheltered housing. Where the reader is involved in fire detection in sheltered housing they are strongly recommended to peruse BS 5839-6 clause 9.1.5, which contains a detailed discussion on the topic.

**Flats or a House in Multiple Occupation (HMO)?**
This document does not concern itself with FD&FA in HMOs. This is adequately covered in the ‘Sleeping Accommodation’ guidance documents to UK fire safety legislation, the LACoRS guide and BS 5839-6. A great many people, however, do not understand the distinction between a block of flats and a HMO. It is important to understand the distinction as this has a profound bearing on the extent and scope of any fire risk assessment and on the type and extent of the FD&FA System.

The broad definition of a house in multiple occupation (HMO) is any dwelling where three or more tenants form two or more households and share facilities such as bathrooms, toilets and kitchens.

- Almost any dwelling could be an HMO including houses, flats, bungalows and maisonettes.
- If three or more tenants of a flat form two or more households, the flat is a HMO.
- The tenant is the person who pays the rent. Where several tenants share a dwelling and pay their rent separately it is almost certain the dwelling is a HMO.
- A household is a group of people who live together as a family whether or not they are actually related. This could include a group of friends who choose to live together. Where several tenants club together and pay one rent for the whole dwelling it may not be a HMO.

A building converted into a block of self-contained flats is a HMOs if:

- The conversion did not meet the standard of the 1991 Building Regulations; and
- More than one-third of the flats are let out on short term tenancies (e.g. not on a long term lease).

The following are not generally regarded a HMOs:

- Just two people sharing a dwelling even if they are complete strangers;
- A household with one or two lodgers; or
- A building occupied entirely by freeholders or long leaseholders.

In short, blocks of flats (purpose built blocks and most converted buildings) are not generally HMOs though some individual flats within them may be.

The above is only a general overview. For a more detailed description visit [http://www.nationalhmonetwork.com/](http://www.nationalhmonetwork.com/) or consult a lawyer.
Building Regulation
The general concept behind the design of blocks of flats (purpose built or conversions) has been, and continues to be, to create fire separated flats where a fire could develop and decay within a flat without threatening people in other flats. Likewise any common area should be sterile (from a fire safety point of view) and also be separated from any flat. Where there is little likelihood of a fire breaking out in the common areas and the prospect of a fire in a flat breaking through to a neighbouring flat being equally unlikely, there is no need for any form of evacuation plan. There should be an emergency plan which should be disseminated to residents. Care needs to be taken when using the term ‘Stay Put’ in an emergency plan. While the term is well understood in fire safety circles, people less acquainted with fire safety terminology might take it as a direct instruction to residents to stay in their flat. This is not the case and residents are free to evacuate at their own discretion or if directed by fire fighters.

Many buildings converted to flats were converted before the current building regulatory regime was implemented. Some may have been converted more recently without the consent or involvement of the regulatory authorities. As a result the fire compartments (walls and floors) may be such that they cannot be regarded as having sufficient fire resistance to comply with accepted standards resulting in the need for an evacuation strategy. For more detail on complying with building regulations see the Approved Documents (England and Wales), the Technical Handbook - Domestic (Scotland) and DFP Technical Booklet E (Northern Ireland).

Building Control Bodies (Building Control Officers and Approved Inspectors) are often presented with buildings undergoing conversion to multiple tenanted buildings or buildings that have previously been converted undergoing further work. The Building Control Body will normally explore every possible way to upgrade such conversions to current standards.

Should an upgrade to the fire separation not be possible, one option would be to change to an evacuation strategy. This gives rise to the need for early warning which inevitably leads to fire detection and fire alarms being specified. The extent and type of FD&FA system would largely be a function of the size of the building and the number of people living in it.

Fire Risk Assessment
In England and Wales, it is a legal requirement to carry out a fire risk assessment on the common parts of blocks of flats. This is often the starting point for a requirement for a FD&FA system. The guidance given in the LACoRS guide, DCLG fire risk assessment in sleeping accommodation guide and Purpose Build Blocks of Flats Guides should be followed.

The fire risk assessor, either a landlord or a professional working on the landlord’s behalf, is faced with much the same dilemma as the building control officer. However, the situation is compounded by their inability to assess the effective fire separation without a highly intrusive inspection. Furthermore the assessor may need to give consideration to the nature of the people living there and their lifestyle as things like disabilities, substance abuse and poverty may have a profound impact on risk.

BS5839-6 clause 4 discusses the purposes of risk assessment and some of the issues but does not offer a detailed process or specific recommendations.
Evacuation strategy

Where the Fire Risk Assessment determines, or the authorities decide, that the tenants should evacuate in the event of a fire in any part of the building, it follows that there needs to be a reliable way to alert them. The specifier should think through the process which would lead to the desired conclusion; that is alerting everyone in the building in time for them to safely evacuate the building before the escape routes and the flats become untenable. That would mean automatic detectors in at least the common areas and alarms that would be audible throughout the building, particularly in the bedrooms as it is sleeping people who are at most risk from a fire. A sound pressure level (SPL) of 75dB(A) near the head, is recommended in BS 5839-1, or 85dB(A) in the bedroom doorway, as recommended by BS 5839-6. There will, commonly, be a need for detectors (preferably heat detectors) in the flat, linked to the landlord system, as well as smoke/heat alarms in each flat to give warning to the occupiers of a flat of a fire within their flat.

Access

A significant problem for fire risk assessors, surveyors, installers and maintainer is gaining access into private flats. Ongoing maintenance should be considered when specifying the system. The purchaser may have to accept that access may be difficult, particularly for servicing. Smoke and heat alarms within flats, part of the flat system, would normally be the responsibility of the occupier. Heat alarms, heat detectors or alarms within a flat on the landlord’s system may not be serviced for several years. However as in most cases these devices are very reliable this should not be a cause for major concern though every reasonable effort should be made to have them included in each service visit and tested at least once a year.

Periodic servicing of the landlord’s system would require the sounding of the alarms. This may cause disturbance of the tenants. Testing of BS 5839-6, Grade A systems can usually be done, for the most part, without sounding the alarms, though at least one test of the alarms should be done on each service. The problem then is proving that the alarms within flats actually worked. When testing Grade D systems it is not usually possible to do this without sounding other smoke / heat alarms in the same system.

False Alarm Control

In a commercial premises, where management have access to all parts of the premises and can control all the activities, false alarms can be relatively easy to control. In comparison, in a block of flats it is unlikely that there will be any management presence and the management will have no right of access to the flats or be in a position to exercise any control over the activities within the flats.

Where a system conforms with BS 5839-6 Grade A (and in principal Grade B and C) or with BS 5839-1 the only way to silence and reset the system normally is from the control panel (though some proprietary systems incorporate facilities that allow false alarms to be reset). The controls on the control panel can only be used after inserting a key or code, usually by someone with management authority. But with no on site management, who is going to do this? Where the controls are be located in another occupancy such as a shop the other occupancy may be unoccupied for a significant period of time and it may be some time before a key holder arrives to attend to the alarm.
In commercial premises false alarms could be a nuisance but in blocks of flats, particularly where the source of the false alarms is inaccessible, false alarms could cause serious disputes between tenants and between tenants and the landlord which could spill over into damage to the system. Thus the potential for and the consequences of false alarms should be considered when specifying the system.

Where one or more smoke alarms form a discrete system within a dwelling, false alarms, from burnt toast and the like, are only going to be a nuisance to the occupants of that dwelling. However a smoke detector within a flat that is connected to a FD&FA system that extends into other flats could well cause significant disturbance to other tenants. It is common practice therefore not to put smoke detectors within a flat which is connected to a common FD&FA system.

Call points in common areas may become a problem but this depends on the nature of the people who may have access to them. Access to the premises and the behaviours of tenants need to be considered. Where the need for call points is low but there is a significant risk of malicious operation omission of call points may be desirable. Reasons for any such omission would need to be clearly expressed in the specification.

**Specification**

To ensure that the FD&FA System provided satisfies the purchaser’s needs it is important that the system is correctly specified by the purchaser. The fire alarm provider may be expert in the design and installation of FD&FA Systems but is unlikely to be expert in all aspects of fire safety and building regulation. It is, therefore, essential that the purchaser understands precisely what they need and gives the provider clear instruction as to what is required. The specification does not have to be technically detailed. All that is required is for the purchaser to indicate the appropriate standards, the scope of the work (broadly what parts of the building are to be considered) and what the system is supposed to achieve. It is often advantageous to include a simple statement about the purpose of the system, for example ‘If a fire breaks out in any flat or in the common areas a sleeping person in any flat will be alerted in time to evacuate the building’. A sound starting point is the LACoRS guide, and the Purpose Build Blocks of Flats Guide both of which the purchaser and the provider should be conversant with, see Guidance. These documents were intended for England and Wales, however the principles are equally applicable in Scotland and Northern Ireland.

**Guidance**

The Local Authorities Coordinators of Regulatory Services (LACoRS) guide ‘Housing – Fire Safety Guidance on fire safety provisions for certain types of existing housing’ is the accepted guide to fire precautions in a variety of building types used as dwellings. LACoRS has been dissolved but the website continues to be maintained. The guide can be downloaded, free, from [http://www.lacors.gov.uk/](http://www.lacors.gov.uk/) or [https://knowledgehub.local.gov.uk/](https://knowledgehub.local.gov.uk/)

The LACoRS guide provides general guidance as well as a series of case studies of certain types of buildings including buildings converted to flats. These case studies provide details of the extent and type of FD&FA Systems that should be used. Case studies that are relevant to this document are:

Case study D10: Two-storey building converted into self-contained flats
Case study D11: Three- or four-storey building converted into self-contained flats

Case study D12: Five- or six-storey building converted into self-contained flats

The case studies refer to BS 5839-6. Elsewhere in the document it refers to BS 5839-1. Both standards have been significantly updated since the guide was written, nevertheless the references to Grades and Categories remain valid. The case studies refer to ‘mixed systems’ conforming to BS 5839-6. A mixed system, essentially, comprises a discrete system in each flat (Flat System) and a general system to the whole building (Landlord System). Neither the LACoRS Guide nor BS 5839-6 give precise details of the location of detection and alarm devices, call points and purpose of the mixed system in buildings converted to flats. BS 5839-6 comes close but only in the context of a HMO. The following paragraphs discuss typical mixed systems as used in buildings converted to flats.

Flat system
This usually comprises a self-contained smoke alarm in the principal circulation area of the flat. Other smoke or heat alarms may also be connected to it within the flat, for example in the lounge and kitchen. In this document it is referred to as the flat system but others may give it a different name. The purpose of this is to alert people in the flat that there is a fire in the same flat so that they may escape at a very early stage. This smoke alarm would not communicate the alarm anywhere else in the building thus minimising the disruption from false alarms from dust, aerosols and cooking fumes.

Landlord system
For two storey buildings (case study 10), FD&FA usually comprises of a System specified to BS 5839-6 grade D with smoke alarms in the common areas (stairs and landings) and heat alarms within the flat and close to the front door. For buildings greater than two storeys (case study 11 and 12) FD&FA usually comprises a system specified to BS 5839-6 grade A. This would have a control panel, smoke detectors in the common areas (stairs and landings), a heat detector within each flat close to the front door, an audible alarm near the principal bedroom door in each flat and may have manual call points at storey exits and at the final exits from the building. In this document it is referred to as a landlord system but other may give it a different name. The purpose of the system is to give all tenants of the building early warning of a fire elsewhere in the building so that they have sufficient time to escape from the building. In comparison to smoke detectors, heat detectors are substantially less prone to giving false alarms but will reliably respond to an established fire. The philosophy behind the heat detector in the flat lobby is that it would reliably warn the neighbours in the event of a real fire whilst avoiding the nuisance of false alarms. Even if the fire separation between the flat and other areas is less than perfect it should still contain the fire long enough for the heat detector to give adequate warning.

Audibility
Within the case studies, the LACoRS guide does not clearly indicate how the alarm should be raised. The Flat system, conforming to BS 5839-6, comprising principally a smoke alarm, would require 85dB (A) at the door to the bedroom(s). A typical smoke alarm provides 85dB (A) at 3m. Therefore the smoke alarm should be positioned no more than 3m away from the bedroom door(s). The landlord’s system, also conforming to BS 5839-6, should also provide 85dB (A) at the doorway to the bedroom(s). If the landlord’s system uses heat alarms within the flat, these should be positioned as
described above for the flat system. If the landlord’s system uses electronic sounders or bells, these should also be positioned to give 85dB (A) at the bedroom door(s). Neither the LACoRS guide nor BS 5839-6 give clear indication of the sound pressure levels that should be achieved in the common areas but as both of these documents make reference to BS 5839-1 it is reasonable to assume that the sound pressure level should be not less than 65dB (A) on any corridors and not less than 60dB (A) on the stairs. Neither the LACoRS Guide, nor BS 5839-6 indicate the SPL that should be achieved in parts of the flat other than the bedroom. As in most cases all the principal rooms of the flat are likely to communicate directly with the principal circulation area (usually the entrance/lobby of the flat, it is reasonable to assume that SPLs achieved are likely to be similar to those of the bedroom(s). To avoid doubt and to avoid costly disputes, the purchaser or supplier should clearly indicate the minimum SPL that should be achieved.

**Call Points**

The LACoRS guide implies call points should be provided but doesn’t specifically refer to them in the Case Studies. BS 5839-6 discusses the need for call points but only recommends them in large houses which a block of flats is not. The fire risk assessor and the purchaser need to give careful consideration for their need and purpose. Arguably, with the number of automatic detectors in the building and the highest risk being a fire which breaks out at night, the likelihood of a call point being used first in a genuine fire may be very small. Furthermore the risk of false alarm due to malicious operation may be relatively high. This guide does not advise whether or not to provide call points but would advise the specification be clear about what the purchaser requires.

**Other Guidance**

The purpose built flats guide provides guidance on a range of fire safety issues. It generally advises against installing FD&FA in the common parts of purpose built flats. However much of the guidance may be relevant to converted buildings, particularly where the completed building complies with or comes very close to complying with current building standards. It also contains guidance which may be relevant to sheltered housing and where parts of the premises are used for purposes other than dwellings.

Further guidance to fire safety legislation can be found in ‘Fire safety risk assessment: sleeping accommodation’ (England and Wales), ‘Practical Fire Safety Guidance for Small Premises providing Sleeping Accommodation’ and ‘Practical Fire Safety Guidance for Medium and Large Premises Providing Sleeping Accommodation’ (Scotland). Guidance on complying with building regulation can be found in the Approved Documents B (England and Wales) and the Technical Handbooks (Scotland).

Where there is disagreement between these guides the more recent is generally accepted as most appropriate.

**BS 5839 Fire detection and fire alarm systems for buildings**

BS 5839 is the accepted code of practice for fire detection and fire alarm systems. It gives advice on how FD&FA systems should be designed, installed, commissioned and maintained. It does not advise on where and when they should be used. Both standards give some examples of how they might be used in some typical situations but neither give an example of a building converted to flats.
BS 5839 Grades and Categories

BS 5839-1 describes a system of categories for FD&FA systems. The category provides a clear indication of the scope and extent of the system, particularly the type and location of fire detectors and call points. These categories are a kind of shorthand that allow interested parties such as the authorities (e.g. building control/approved inspector and F&RS inspectors), the fire risk assessor, the purchaser and the supplier to communicate quickly and unambiguously. There are categories for the protection of property (Category P) and categories for the protection of life (Category M and L). The categories we are most interested in are Categories L and M. Category M comprises a system of call points (sometimes referred to as break glasses), alarms (usually bells and sounders) and a control panel (usually referred to as Control and Indicating Equipment or CIE). Category L describes systems that also comprise automatic fire detectors and is sub divided into sub categories numbered 1 through 5. L4, L3 and L2 can be seen as building up on Category M as follows: L4 is as M with the addition of detectors on escape routes, L3 is as L4 with the addition of detectors in areas that open on to escape routes and L2 is as L3 with the addition of detectors in areas of high fire risk (which in commercial buildings are often plant rooms and kitchens). Category L1 also builds on Category M but adds detection to all parts of the building. Category L5 calls for a control panel and alarms throughout and detectors ‘where specified’ but does not call for call points. BS 5839-1 permits combining categories. In this context category L5 could be combined with any of the others such as L5/M which would provide controls, alarms, detectors in specific areas and call points. Note: Category M is not normally used in flats and is only mentioned here for information.

BS 5839-6 has categories but also has grades. The categories for life safety are LD1, LD2 and LD3. LD3 requires detection on escape routes (usually stairs and lobbies), LD2 also requires detection in areas of high fire risk (usually kitchens and lounges) and LD1 requires detection in all parts of the building. None of these categories require controls or Call Points. BS 5839-6 describes six grades from A to F. The grades of system essentially refer to the level of sophistication of the system. Grade A is broadly a system like the type described in BS5839-1, with controls, detectors (rather than smoke alarms) and alarms. Grade B and C are similar but with simpler controls and may use smoke alarms or discreet detectors and alarms. Category D, E and F describe systems comprising one or more smoke alarms, usually within one dwelling (e.g. one flat). Grade F refers to battery operated smoke alarms. Grade E refers to mains only smoke alarms. Grade D refers to mains operated smoke alarms with a reserve power supply such as batteries (rechargeable or non-rechargeable) or capacitor which is capable of supporting the smoke alarm if the mains electricity fails. Grade D is generally preferred and Grade E and Grade F may not be acceptable to the authorities in many situations.

Comparison of Grade A, BS 5839-6 and a BS 5839-1 System

It is not uncommon to find purchasers or providers specifying a landlord system conforming to BS 5839-1. It is important to realise that there are significant differences between a BS 5839-1 system and a BS 5839-6 Grade A system. The first clue is in the title:

- BS 5839-1 Code of practice for ... systems in non-domestic premises
- BS 5839-6 Code of practice for ... fire alarm systems in domestic premises

Part one clearly is not intended for any form of domestic application and neither was intended for the common parts of flats. This inevitably requires careful specification so that all parties understand what is required.
If a landlord system was simply specified as BS 5839-1, L3 (which is not uncommon), this would imply that some form of smoke detection should be installed within the entrance lobby of the flat as this is, arguably, part of the escape route. Furthermore as this is an L3 system, detectors would be required in all rooms opening onto the escape route resulting in a very extensive system that is intrusive to install and full of potential for false alarms. The specification would, therefore, need to clearly delineate the type and location of detectors and it would be necessary to document the agreement of interested parties. Specifying a BS 5839-1 system without further qualification would require sound pressure levels of 75dB (A) near the bed head which is normally only achievable by fitting an alarm device in each and every bedroom. Whereas in a system specified to BS 5839-6 the requirement is for 85dB (A) in the door way to the bedroom which, in most flats, is achievable with an alarm device in the entrance lobby. In order to limit the system to something a little more manageable and economical, when specifying a landlords system there would need to be some clarification such as ‘The escape route should be regarded as the common areas, detection within the flats should be limited to a detector within the entrance lobby and sound levels within the flats should be in accordance with BS5839-6 (85dB(A) within the doorway of the principal bedroom)’.

A BS 5839-6 Grade A system should be fitted with a minimum Battery Standby of 72 hours. Many installers are unaware of this, assuming it to be the same as for a BS 5839-1 system, and fit Battery Standby of 24 hours.

Call Points are recommended in most life safety categories in BS 5839-1 but in BS 5839-6 they are only required in ‘large houses’ and a block of flats, as said earlier, is not considered a large house. If a BS 5839-1 system has been specified then it may be appropriate to omit Call Points. However, as this deviates from the recommendations of the standard then the agreement of interested parties, such as enforcing authorities would be necessary.

**Maintenance**

The maintenance of systems comprising domestic smoke alarms conforming to BS 5839-6 is relatively straightforward requiring only:

- Weekly operation of the test button (which can usually be done by the occupier);
- Where necessary, periodic replacement of the battery or the whole unit following the manufacturer’s instructions (this may require someone with electrical competence where the smoke alarms has a mains supply); and
- While not recommended in any guidance document or standard it may be prudent to check the smoke alarms during a change of tenancy.

Where the system conforms to BS 5839-6 grade A, B or C or to BS 5839-1:

- Systems with call points should undergo a weekly test using a different call point each week;
- At intervals no greater than six months the system should be inspected and tested by a competent person; and
- At intervals no greater than 12 months, every device such as call points, detectors, sounders or ancillary devices (anything that uses a fire signal from the FD&FA system such as automatic door closers) should be inspected and tested by a competent person.

The foregoing is only a brief outline. There is more detail to be found in BS 5839.
Summary

Typically each and every flat should have one or more smoke alarms to alert the occupants of a fire within the flat. Where there is more than one smoke/heat alarm, these should be interlinked. These smoke alarms should not normally be interlinked with any landlord’s system or any other flat. As a minimum the system should conform to BS 5839-6 Grade D, Category LD3. Where the occupants are at particular risk the system would typically be LD2 which would, in addition, require smoke alarms in areas of high fire risk, such as lounges, and heat alarms in kitchens. Note where there is a risk of false alarms, such as in kitchens, heat alarms may be substituted for smoke alarms although this does not apply to smoke alarms on circulation routes (lobbies and corridors).

Where general evacuation of the building is considered necessary the landlord’s systems would generally conform to BS 5839-6, Grade A, LD2; comprising generally of smoke detection in the common areas and heat detection and audible alarm in each flat in the room/lobby opening onto the escape route. Audible alarms to provide 60 to 65dB(A) in common areas with audible alarms in flats to provide 85dB(A) in the doorway of each bedroom (usually one alarm in the entrance lobby).

General guidance can be obtained from BS 5839-6 and the LACoRS Guide, Case Study 11, 12 and 13

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Fire safety in purpose-built blocks of flats

Approved Document B Parts 1 and 2 – England and Wales

Technical Handbooks - Statutory Guidance to building regulations – Scotland

Technical Booklet - Building Regulations (Northern Ireland) 2012 – Northern Ireland

BS 5839-1:2013 Fire detection and fire alarm systems for buildings Code of practice for design, installation, commissioning and maintenance of systems in non-domestic premises

BS 5839-6:2013 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