Smoke alarms are self contained devices that incorporate a means for detecting fire (smoke detector) and giving a warning (alarm). They are about the size of a hand and are normally fitted to the ceiling. They can detect fires in their early stages and give you those precious minutes to enable you and your family to leave your house safely.

Where smoke or heat alarms are required to be fitted under the Building Regulations they should be mains-operated and conform to BE EN 14604:2005, smoke alarm devices or BS 5446-2:2003, Fire detection and fire alarm devices for dwellinghouses, Part 2 Specification for heat alarms, respectively. They should have a standby power supply, such as a battery (either rechargeable or non-rechargeable) or capacitor. If more than one alarm is required in the house they should be inter-linked using hard wiring or wireless network so that when one detector goes off they all go off.

It is important that any mains fed detectors are installed by a competent electrician.

When are detectors required?
All new dwellings built in England require automated fire detection be fitted, but you may also be required to fit detectors if you add a habitable room to a dwelling by alterations, extension or loft conversion, or if you carry out works that make the property less compliant with Fire Safety (i.e. removing walls between living rooms and the staircase)

How many detectors do I need?
- If you have a flat or a bungalow, one smoke detector is the minimum cover required to provide you with early warning in case of fire, and would usually be placed between the living rooms and bedrooms.
- In a standard sized dwelling house with a protected staircase you will be looking to increase the number of detectors to one per storey, placed in the circulation space on each storey of the building.
- Where the design of the property deviates from conventional layouts, or if the occupants are at a special risk from fire, it may be appropriate to provide a higher standard of protection, e.g. additional detectors.
- Where a kitchen area is not separated from the stairway or circulation space by a door, there should be a compatible interlinked heat detector or heat alarm in the kitchen, in addition to whatever smoke alarms are required.
- Large houses (where any storey exceeds 200m²) may require a higher specification of fire alarm system.

Choosing a suitable Smoke Alarm
Smoke alarms use various methods of detection and it is important to select the most appropriate. The most popular smoke alarm models are:
1) Ionisation smoke alarms: These are the cheapest alarms to purchase. They are sensitive to small particles of smoke produced by flaming fires such as chip pans, and will detect this type of fire before the smoke gets too think. They are marginally less sensitive to slow burning and smouldering fires which give off larger quantities of smoke before flaming occurs. Ionisation alarms require a small amount of radio-activity to work.
2) Optical smoke alarms (also called photoelectric): detect fire with a small light beam within a chamber. There is no radio-activity in optical alarms and optical alarms are best suited for rooms with soft
furnishings such as bedrooms, lounges and also halls. Optical smoke alarms are less likely to give false alarms from burnt toast.

3) **Combined alarms**: These detectors are effective at detecting slow-burning as well as flaming fires – which are both common types of fire.

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Smoke alarms should not be fitted in or close to kitchens or bathrooms as they could be set off accidentally by cooking fumes or steam.
Garages should not contain smoke alarms as they can be easily set off by exhaust fumes
Alarms should not generally be placed on damp or dusty surfaces or on false ceilings as there is a risk they will fall down.

**When to specify Heat Alarms**
These alarms detect excessive temperatures in a kitchen or garage. Some heat detectors also detect an unusual speed of temperature rise. These alarms are the answer to false alarms in your kitchen or garage. They are not suitable for the hall or the rest of the house!

**Further Considerations.**
Many of the manufacturers of Smoke Alarms have a range of products, including Alarms with built in Escape Lights, Alarm systems for people with visual or hearing disabilities, and you can even get alarms that plug into light sockets. Even if the Building Regulations haven’t insisted on your home requiring mains operated fire detection, this is what we would most advise, but you are able to get battery operated smoke detectors which are also a good life saving device.
It is crucial that if you have fire detection fitted in your house you follow the manufacturer’s instructions for replacing the batteries or units, as they have a limited lifespan.
Always choose a smoke or heat alarm that has the CE marking, so you can be sure it has been stringently tested to current standards.

**Carbon Monoxide Detectors?**
A carbon monoxide detector or CO detector is a device that detects the presence of the carbon monoxide (CO) gas in order to prevent carbon monoxide poisoning.

The Building Regulations recommends the use of audible carbon monoxide alarms. It should be marked to EN 50291 and also have the British Standards' Kitemark or another European approval organisation's mark on it. CO alarms usually have a battery life of up to 5 years.
Fit an alarm in each room with a gas appliance. Always follow the alarm manufacturer’s instructions on siting, testing and replacing the alarm.
Siting of smoke alarms

The positioning of your smoke and heat alarms is important in order to ensure effective detection in the event of fire. Each smoke and heat alarm will have positioning instructions that come with it; however please follow these useful tips, and ensure the detector locations comply with the applicable Building Regulations.

The alarms should be fitted where they can best be heard throughout the house, and in any case should be no more than 7.5 metres away from the doors to every habitable room. It is also important that the detectors are located somewhere they can be reach for testing and to change batteries, therefore areas immediately over stairways should be avoided.

Smoke alarms should ideally be installed in the centre of a flat ceiling, but they should not be placed within 300mm of a wall or light fitting. This is because air does not circulate effectively in corners, and objects such as light fittings can obstruct smoke and heat entering the sensor chamber.

As hot smoke initially rises then spreads out, smoke alarms should be located on the ceiling. This is so that smoke can reach the detector’s sensor chambers as early as possible. If it is not possible to install the smoke detector on the ceiling, the unit can be installed on the wall up to 575mm below the ceiling. A heat detector should also be located directly onto the ceiling; however if this is not possible, the unit can be installed up to 125mm below it.

Downstands and vaulted ceilings will need to be taken into consideration when siting alarms also, and it may be that additional detectors are required.

Whilst dwellings that may beams should have the detectors located at the base of the beams rather than in between them.
Please note that all the measurements stated above are general guidance. Different manufacturer’s recommendations may vary.
Specifying Fire Detection System in Dwellings.
Levels of Protection

BS 5839: Pt.6 grades fire detection systems from Grade F up to Grade A. Generally speaking, the greater the fire risk and the more demanding the application, the more comprehensive the system needs to be.

- **Grade F** - System of one or more battery powered smoke alarms (and heat alarms if required)
- **Grade E** - System of interlinked mains powered smoke alarms (and heat alarms if required) with NO stand-by supply. The interlink can be hardwired or radio-interlinked.
- **Grade D** - System incorporating one or more interlinked mains powered smoke alarms (and heat alarms if required), each with an integral stand-by supply. The interlink can be hardwired or radio-interlinked.
- **Grade C** - System consisting of fire detectors and alarm sounders (which may be smoke alarms) connected to a common power supply, comprising normal mains and stand-by supply, with central control equipment
- **Grade B** - Fire detection and alarm system comprising fire detectors (other than smoke alarms), fire alarm sounders and control and indicating equipment to either BS EN 54-2 (and power supply to BS EN 54-4), or to Annex C of BS 5839: Pt.6
- **Grade A** - Fire detection system incorporating control and indicating equipment to BS EN 54-2, and power supply to BS EN 54-4, installed to BS 5839: Pt.1 with some very minor exceptions

As the overwhelming number of residential applications in the UK will fall into the D or F categories, this is the area on which this guide will naturally focus. If you are particularly interested in unusual grades of protection, you are invited to look further at the relevant clauses of the Code.

Battery Operated Smoke Alarms - Grade F

BS 5839: Pt.6 acknowledges the advantages of the single, battery operated smoke alarm. They are simple to install and offer protection at very low cost. Battery operated smoke alarms conforming to BS EN 14604:2005 are recommended. Battery operated smoke alarms are typically suitable for owner-occupied buildings (existing buildings) with up to two storeys.

Mains Powered Smoke Alarms with Backup Battery - Grade D

The problems outlined above can be overcome by using mains powered alarms that incorporate, within each alarm, a stand-by supply such as a primary or rechargeable battery. The alarms have to be interconnected either through wiring or radio-interlink. The mains power supply can come from a dedicated power supply directly from the fuse box or from the nearest permanently powered light fitting, as long as the smoke alarm heads can be removed without removing the base as well.

Grade D is required for new, owner-occupied buildings of up to three storeys, two storey rented properties and existing, owner-occupied buildings of more than two storeys. Very large storeys (>200m²) might require Grade B alarm system.

The minimum back-up duration recommended is 72 hours, and the Code acknowledges that there could well be circumstances where a longer stand-by period is justified e.g. tenants’ inability to pay their electricity bill.

Fire Detectors supplied with Power from a common Power Supply Unit - Grade A, B, C

More expensive high specification systems can offer connection of all fire detection devices to a common power supply via low voltage transformers, or interlinked fire and security systems. Again, a minimum 72 hour back-up is recommended by the Code. Due to the complexity of A, B and C Grades, we have omitted the descriptions from this short guide.

Levels of Protection - Categories of System

This relates to the level of protection afforded by the system.

Within the A - F grades defined earlier, the standard identifies three different categories of protection:
- **LD1** - A system installed throughout the dwelling, incorporating detectors in all circulation spaces that form part of the escape routes from the dwelling, and in all rooms and areas in which fire might start, other than toilets, bathrooms and shower rooms
- **LD2** - A system incorporating detectors in all circulation spaces that form part of the escape routes from the premises, and in all rooms or areas that present a high risk of fire to occupants
- **LD3** - A system incorporating detectors in all circulation spaces that form part of the escape routes from the premises

It is noted that an LD3 type system is intended to protect escape routes for those not directly involved in the fire and may not save the life of anyone in the immediate vicinity of the fire.
Only by quoting Grade and Category can a meaningful and effective alarm system be specified, e.g. Grade D, Category LD2.