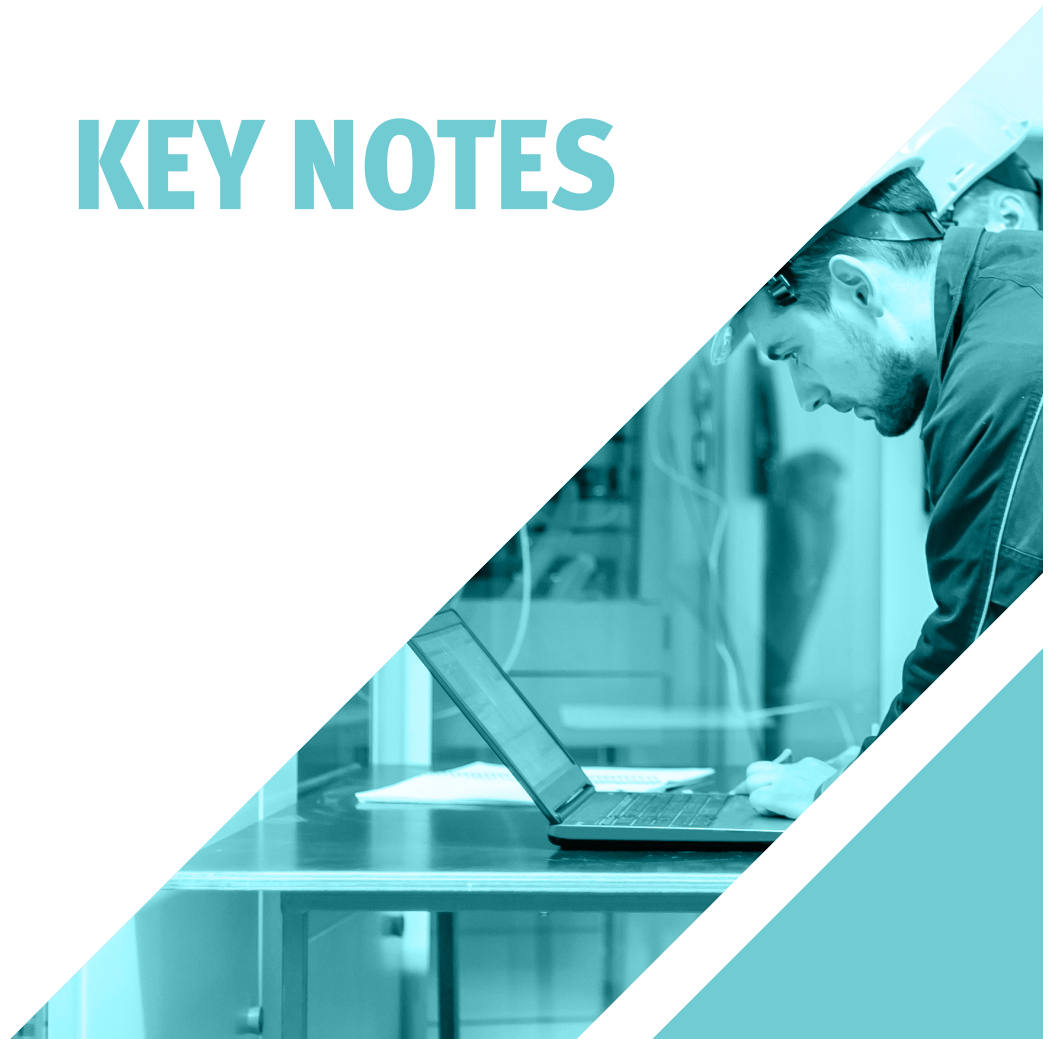




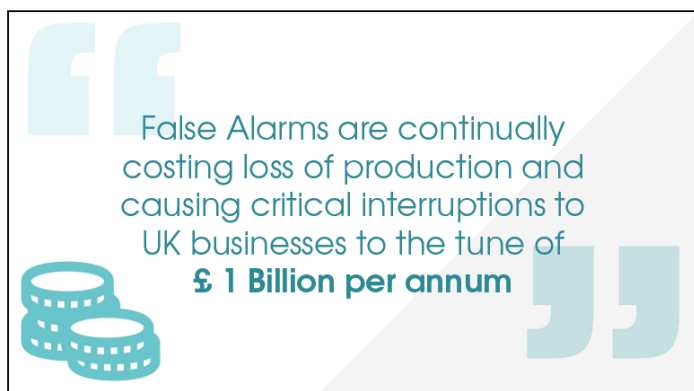
FALSE ALARM REDUCTION IN FIRE DETECTION SYSTEMS

KEY NOTES





False Alarms, Real Problems



- Figures published by the UK government previously, estimate that the cost of false alarms in the UK is around £1 billion a year.
- Much of this cost is borne by the commercial sector, from lost production and general interruptions to business.

Of the total fire incidents attended between 2016 and 2021,
662,261 (98%) were false alarms

- In 2022 the UK Government Home Office released this statistic, which confirms that false alarms continue to dominate our industry and the sectors we work in.
- So much so, that The London Fire Brigade (along with some other regional brigades) began fining building owners on average £290 for each false alarm visit, to encourage businesses and fire system designers to really

think about what they can do practically, to reduce false alarms.

- It's important to remember, that if a fire engine and its crew is attending a false alarm, it is not available to respond to a real fire, needlessly putting lives and property at risk.

Hochiki's Research into False Alarms

- We as manufacturers of some of the most reliable fire detection products on the market were naturally concerned with this growing trend of increased false alarms, so much so, that we commissioned our own research into how false alarms were affecting small businesses in the UK
- We surveyed 300 small to medium enterprises across the UK at the beginning of 2023 from sectors such as healthcare, public sector, manufacturing and education and there were some interesting statistics
- When you consider the costs that we previously highlighted, caused by false alarms and the resulting unnecessary stoppages to business and production, we found that 9 out of 10 false alarms resulted in a complete evacuation of the building. So, you can see exactly where those costs arise from
- We were also able to extrapolate those costs, and based on the data we acquired, we calculated that the cost of false alarms to UK SMEs alone amounts to just under £700 million per year.
- Apart from the commercial damage to businesses and the general economy caused by false alarms every year, there's also another threat to consider. We all know that regular false alarms can breed complacency in building.

Alarm Fatigue

- Occupants eventually they will simply ignore an alarm. This is known as “alarm fatigue” and can be a serious issue.

Students ignored a fire alarm in a blaze at a block of student flats because fire alarms go off **“almost every day.”**

- A prime example of the effects of this so called “alarm fatigue” can be seen in this press release
- A press release from 2019, a student accommodation block in Bolton that suffered from so many false alarms, the residents actually ignored the alarms sounding for a real fire. All of the students escaped the building before the fire took a hold, with only one person injured. It could of course, been far more serious.

Regulatory Reform (Fire Safety Order)

- Order from 2005 still remains the key legislation for our industry, and it states that the responsible person(s) or building management are responsible for the building’s compliance with fire safety regulations, unless otherwise stated
- The order was recently amended with the inclusion of The Fire Safety (England) Regulations 2022 under article 24, which came into effect in January 2023 and was as a direct result of the Grenfell Tower tragedy and the resulting enquiry. These new regulations add an additional list of fire safety responsibilities for responsible persons, particularly around high rise buildings
- Non-adherence to the order can result in penalties being directed at the responsible person or team for any non-compliance, and these can range from a £2000 fine to imprisonment.

System Category

According to BS 5839, the design of fire detection systems for all commercial properties can be categorised into those that primarily protect lives and those that protect the properties themselves.

P

Automatic Fire Detection
designed to primarily protect
property



P2

Automatic Fire Detection
installed only in specific areas



P1

Automatic Fire Detection
installed throughout all areas



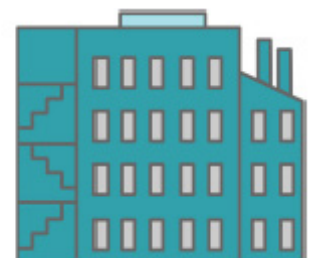
L

Automatic Fire Detection
designed to protect life



L5

Automatic Fire Detection
designed for unique or special
attention areas



L4

Automatic Fire Detection installed in circulation accessible areas such as corridors and stairways



L3

Automatic Fire Detection installed in escape routes and rooms leading to routes



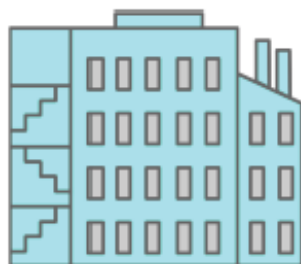
L2

Automatic Fire Detection installed in defined areas in addition to L3



L1

Automatic Fire Detection installed throughout all areas



M

A system designed to be operated manually

L1 to L4 categories include manual call points

P Systems can also contain manual call points for example P1/M



Non-Addressable Fire Detection Systems

- Non-addressable systems, normally referred to as Conventional systems, operate on spurs of cable from the control panel
- They are not intelligent systems, therefore individual devices are not identifiable, i.e. no locational data held at the panel. Instead the system is divided into Zones, and it is the Zone that is identified
- They shouldn't be used where there are more than 10 people that need assistance in evacuation.

Addressable Fire Detection Systems

- Addressable fire detection systems operate on loops, cables that start and finish at the control panel
- They are intelligent, providing a unique address and text description per device on the loop. This means that devices and their location can be identified at the panel during an incident
- They are recommended for buildings where more than 10 people need assistance in evacuating, for example, large care homes.

Benefits of Addressable

- There are a range of benefits associated with addressable, or intelligent fire systems:
- They tend to employ more sophisticated electronic methods of false alarm reduction
- Analogue addressable systems offer increased flexibility over conventional/nonaddressable systems.
- And these systems are wired in loops rather than zones – so a more economical use of wiring, for larger installations.
- Wiring in loops also offers a major benefit when it comes to redundancy. The loop is powered from each end, so that if the cable is damaged or broken at any point, no devices are lost. In addition, the use of addressable short circuit isolators, further minimises the area of coverage lost in the case of a short circuit
- And the key point to consider here is the term “addressable”, which basically means these systems are able to pinpoint the exact location of an incident, reporting this information back to the control panel, so that either first responders or the fire & rescue service can quickly locate a fire. The locations of devices in alarm condition can also suggest how a fire is spreading through a building.

Differences in Fire Detection Systems

When considering how to reduce false alarms, it's important to understand at a basic level the difference between the two main system technologies.

How Detectors Can Help

As a manufacturer of fire detectors and sensors, we of course have striven to improve our own products to help reduce unwanted alarms.

Detector Design

- Addressable detectors, or sensors as they are sometimes referred to, can perform much better than non-addressable when it comes to false alarm management and there are several factors to consider here.
- In regards to Detector Design, devices should feature sensing chambers that can reject dust, and small insects – both causes of false alarm activation
- The use of specific plastics helps minimise condensation within the device, which can interfere with the sensing elements
- Detectors should also be designed to employ software techniques to reject transient or short-lived signals, with algorithms that can determine real fire conditions
- In the case of devices that detect smoke, optical components that can differentiate between smoke and steam, or other air-borne pollutants, will help reduce unwanted alarms
- Drift Compensation features should be built-in, that allow the detector to cope with background contamination, over time.

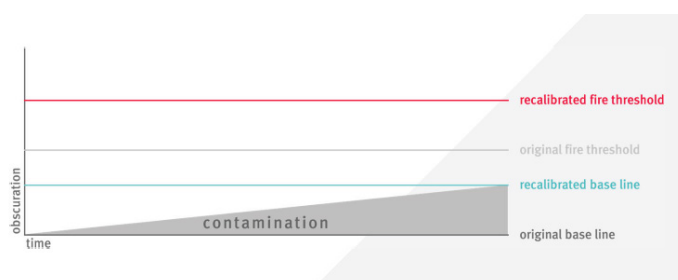
Detector Settings

- Detector settings can also be used to reduce the potential for false alarms, taking into consideration the environment type and building use
- Settings can be used to finely tailor each individual device for its immediate location
- By using the settings in this way, adjusting the device's operation, bearing in mind any obvious risks identified within the installation area, is a really good approach to minimising false alarms
- Installers need to be aware that a device, straight out of the box will of course work, but is it going to work to the best of its without considering making adjustments based on the obvious risks.

Detector Sensitivity

- Detector Sensitivity can be adjusted individually, usually set at the fire alarm control panel, and this can also help minimise the potential for false alarms.
- As a minimum, all detectors should be manufactured to conform to a set of basic sensitivity settings, when tested under a range of test fires.
- The specifications for these test fires are set out by the LPCB in the UK (The Loss Prevention Certification Board) and include various common burning materials, and the resultant smoke types.
- At 3% sensitivity, all of the LPCB test fires tests should be passed, i.e. the detector responds to each fire/smoke type within the prescribed time limit.
- Optical detectors, designed for smoke detection, are only LPCB approved if they can demonstrate adequate response for smoke density between 2%/m and 4.5%/m
- This sensitivity should be able to be applied at individual sensor level, so that each device can be tailored according to its location and risk, and this can be varied up to 4.5% and down to 1% (which is a +50% and a -66% variation) At extremes, sensors must still pass LPCB tests
- There are a number of measures that can be taken by fire detector manufacturers to make their products – even at the simpler end of the spectrum - as resistant as possible to false alarms, whilst still retaining detection capability.

Sensor Recalibration

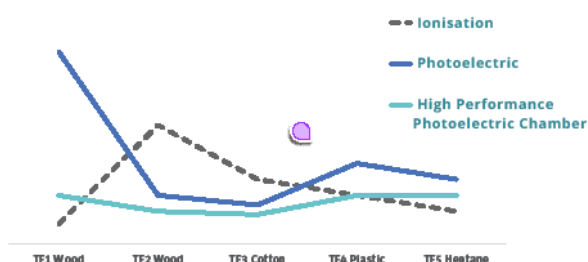


- Some analogue sensors are capable of Automatic Recalibration. This is where a sensor can adjust its sensitivity to compensate for any gradual contamination of its components which naturally occurs over time
- Through constant monitoring and, either at set periods, or at certain levels of contamination, the device's software will reset the base line and the fire threshold, to compensate for that contamination
- In this way, the sensor remains as sensitive as when it was first installed.

Selecting the RIGHT tech for the job

- Fire detection equipment is designed to respond during the early stages of a fire, however no single type of detector is suitable for all environments. So, it is therefore very important to understand your options, and install the technology most appropriate for the application
- For example, whilst traditional point detectors may be the perfect solution for offices and classrooms, they can fail to cope in more demanding environments, such as warehouses and factories
- Beam detectors are often ideal for large open spaces, for example in sports halls, warehouses, storage facilities, shopping centres, and large historic buildings.
- Aspirating detectors, those that continually sample the air for smoke particles, are ideal for clean rooms, or structures that will restrict access for general maintenance. Sampling pipework can often be hidden within existing structures, negating the laying of fire cables.
- Wireless products could be ideal for castles or cathedrals, where aesthetics can't be compromised. Or in out-buildings and remote structures spread over a large area such as on hospital, school or university sites.

Typical Smoke Detector Responses



- When looking at smoke detectors, different types of technology can respond differently to the previously mentioned LPCB test fire smoke.
- Ionisation detectors have in the main been phased out, due to their storage and disposal challenges - they employ a small radioactive element for smoke detection
- The latest smoke chambers have improved chamber designs and optical elements which enable them to respond equally well to a wider range of smoke types.

Understanding Annex E

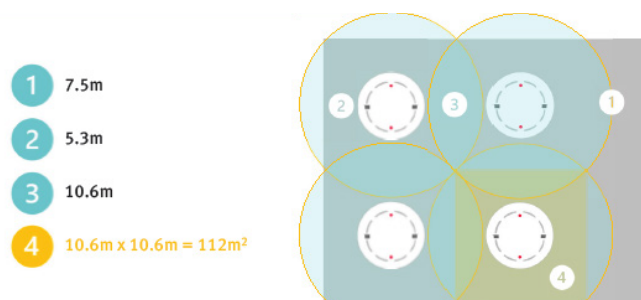
- What is the risk of fire developing in this area?

- Is a fire likely to be a rapidly-developing, high-energy type fire or a slowly developing, smouldering fire?
- Under normal conditions, will there be high ambient levels of smoke or steam present?
- Is the area a clean, dry environment or are there high levels of dust, dirt or moisture?
- Is there likely to be a high concentration of cigarette smoke?
- Are there any special risks?
- Is there a high ambient temperature or significant variations in temperature?

Detector Positioning

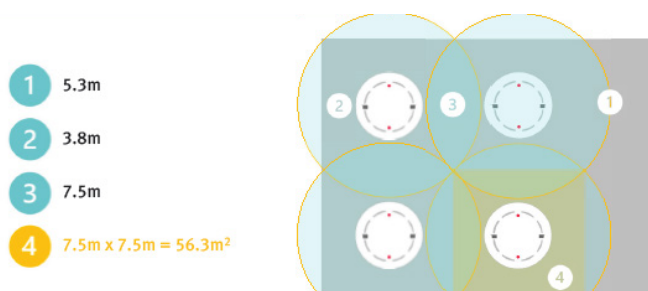
- Once you have selected which technology best suits the environment, you must ensure that the system is installed correctly. BS5839 provides a guide for best practice installation; from the spacing of point detectors, the position of call points, recommendations for voids, recommendations for apex rooves, recommendations for stairways, recommendations for lift shafts and much more.
- Positioning detectors in the wrong place could either (a) create false alarms, or (b) stop them responding properly in the first place
- Therefore, Hochiki highly recommends using an installation company whose competency has been independently verified, for example, a BAFE approved installation company.

Smoke Detector Positioning



- For smoke detectors, individual detector coverage is 7.5m radius, but because these radii must overlap, the actual distance between the detector and the wall must be 5.3m and between detectors must be 10.6m
- Therefore individual smoke detector coverage can be measured in abutting squares of 112 square metres (this is regularly approximated to 100 square metres).

Heat Detector Positioning



- For heat detectors, individual detector coverage is 5.3m radius, but again, because these radii must overlap, the actual distance between the detector and the wall must be 3.8m and between detectors must be 7.5m
- Therefore, individual heat detector coverage can be measured in abutting squares of 56.3 square metres (this is regularly approximated to 50 square metres)
- An important note on multi-sensors that can operate as either smoke or heat.
- According to the 2017 update to BS 5839-1, in section 21.1.6 - when used in a timecontrolled system such as those employing “day/night modes”, when the optical sensing element of a multi-sensor is disabled during the day, it is vital that the detectors are spaced as heat detectors
- Conversely, If there is no intention of disabling the smoke sensing element of a multisensor during normal operation, they can be spaced as smoke detectors.

Things to Consider

Installation

- These are factors that will need considering during installation, to reduce the possibility of false alarms, starting with the type of environment – as this will dictate the type of technology used
- Cable routes need considering – ensuring fire alarm cables are clearly marked and separated from other services to avoid electrical noise
- And building use – which category of detection system is right for this building.
- Loft spaces and bin stores are areas that are not regularly manned, but have their own unique risks and so may require extra monitoring
- Air ducts will interfere with smoke detectors, either drawing real smoke away or blowing contaminated air into detectors

- There will be unique circumstances where fire detection systems need to be very finely tuned to the environment, to avoid false alarms.
- When installing detection devices, are they out of reach from casual vandalism or direct tampering?



- For systems designers we recommend that you only specify products approved to the local standards, with up-to-date certification in place
- For building owners we also recommend that you trust your fire detection system installation and maintenance to a company that is BAFE registered.

Maintenance

- When it comes to maintenance, there are some obvious things to consider to reduce false alarms, such as removing and replacing obviously faulty detectors as soon as possible. Faults will be reported instantly at the fire control panel
- Similarly, any badly contaminated detectors should be either cleaned or replaced, again, a detector's maintenance status can be reported at the fire panel.
- The BS 5839 standard was updated in 2017 to include the recommendation of fitting mechanical covers to call points in public areas – to reduce the temptation for malicious activations. The idea being that to operate the call point, a person needs to lift the cover as well as press the button.
- Parts of a building may get repurposed over time, such as converting storage to an office. Building owners need to bear in mind that as these spaces change use, the detection system will need to be updated too.
- Devices can be relocated to accommodate a space's change of use or the introduction of a new risk, but this has to be carried out by a qualified fire system engineer, to ensure the device is still fit for purpose in its new location
- In some instances a device will no longer be suitable for its original location and a new type of device will need to be fitted. On most systems this is a simple task but again, should only be carried out by qualified fire engineers

- False alarms are often generated by poor quality devices and/or control equipment, and this can be rectified by only using recognised brands, and qualified engineers to install them. But the building owner also needs to ensure that the whole system is fit for purpose and complies with the local standards and laws.
- The overall age of the system is a contributing factor to false alarm activations. As the system and devices age over time their effectiveness at dealing with false signals diminishes.
- And as such, as a general rule, most system manufacturers recommend that their equipment has a 10 year life cycle, and so this should be factored in by building owners.
- Building owners or facility managers must also ensure that tenants understand the serious implications of a non-functioning fire detection system, and how tampering with detectors or manual call points can lead to false alarms or even worse, where no alarms are given at the outbreak of a real fire
- Be encouraged to report any sighted vandalism of equipment, and building owners should make it easy for them to do so.
- Some detectors can be fooled by cigarette smoke, so it is important that visitors or tenants understand the smoking rules and locations of designated smoking areas
- If the building has an e-cigarette or vaping policy, again, ensure that is clearly communicated – steam droplets exhaled during vaping can confuse some smoke detectors.

Other

- Fire Engineers can also help in reducing the potential for false alarms by employing a “coincidence” confirmation, set within the fire control panel software. This means that two separate detectors (or in the case of multi-sensors – two separate sensing elements within the same sensor) both need to activate – to confirm that the signal is a real fire
- Mechanical solutions are also available such as being able to lock detectors to their bases, to avoid tampering. Building works can often generate smoke, dust and heat and so steps need to be taken to isolate detectors within the working areas, to avoid false activations. Beam detectors are particularly vulnerable to ladders blocking the signal and activating an alarm, as another example
- Air conditioning units are to be avoided when siting detection equipment that relies on the presence of smoke – and this is detailed in BS5839-1
- In some areas such as kitchens, shower rooms and saunas - specialised extraction will need to be employed, to keep detectors free from steam or other contaminants.
- In nursing homes, with skin flakes and dust
- In event spaces, with smoke and steam
- In hotels, with aerosols and steam in the guests’ rooms
- And in restaurants, with flames and smoke from kitchens.
- Keeping buildings clean will not only prolong the lifecycle of your fire detection system, but will directly help reduce false alarms too
- For example, dust can have a short-term effect on smoke sensors, creating false alarms where dust clouds are dense and persistent
- Over the long-term, contamination of detectors from a continuously dirty environment may decrease their ability to respond to real smoke – despite recalibration features.
- In some systems, where the communication between the fire alarm control panel and the devices isn’t robust enough, electrical spikes can interfere with signals produced by devices
- In some instances, this might trigger a false alarm
- Ensure tenants are aware of this and are mindful when using heavy-duty electrical devices such as power tools.
- Large amounts of steam can confuse less sophisticated detectors, which then may mistake the water droplets inside the smoke chamber for smoke particles
- So ensure tenants and residents have been educated in keeping bathroom and shower room doors shut when in use.
- Monitoring activity will ensure that some false alarms can be avoided, depending on costs this could be in the form of on-site caretakers or electronic, remote monitoring through CCTV.

Practical Steps

- To avoid the generation of false alarms and also to deal with any occurrence efficiently and safely, building users and/or tenants should be given detailed up-to-date information on fire escape routes, the types of audible and visual alarm notifications in use, and the locations of fire fighting equipment and refuges.