

# G4S GUIDE TO FIRE DETECTION AND ALARMS

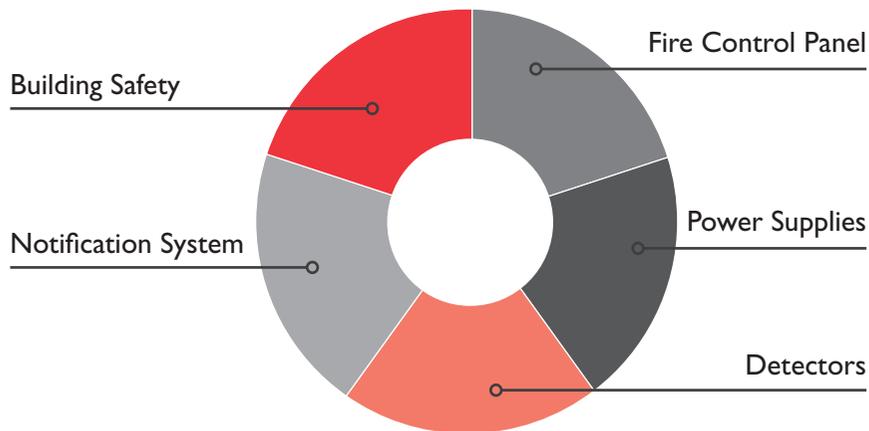


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Fire Detection is a critical system in any building, as early warning not only saves assets, but also saves lives

By law, Fire systems have to operate independently to ensure 24/7 reliability. However, providing a data link between the Fire system and an integrated system allows more effective monitoring by using the data to provide a more integrated response.

## A Modern Fire Detection System Should Include:



## This guide will:

- Help you understand what to look for in any new fire system project
- Explain why any fire system should form part of an integrated solution

## What That Leads To:

- Early detection of fire
- Early suppression, limiting damage and threat to life
- Quicker response to threat
- Possible automatic notification to relevant staff and services
- Tailored mass notification when a fire breaks out
- Fewer personnel suffering from smoke inhalation
- 24/7 monitoring of fire risk

## Which Means:

- Proactive fire detection
- Fire risk reduction
- Lives saved
- Better compliance
- A safer working environment
- Less damage to assets and data
- Increased effectiveness of fire marshals
- Lower insurance premiums

# WHAT IS A FIRE DETECTION AND ALARM SYSTEM?

Fire detection and alarm systems use a number of devices to detect and warn people through visual and audio appliances when smoke, fire, carbon monoxide or other emergencies occur.

- Alarms may be activated automatically from smoke and heat detectors or may also be activated via manual fire alarm activation devices such as manual call points.
- Alarms can be either detector based sirens, wall mountable sounders or horns, or mass notification messages.
- There are national codes in each European country for planning, design, installation, commissioning, use and maintenance of fire detection system. In the United Kingdom this is BS 5839 Part 1



# INTELLIGENT AND PROACTIVE FIRE DETECTION

## YOUR CHALLENGE

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Fire is one of the most destructive forces that a building faces through its life, endangering property and information, as well as being a major threat to life.

The speed with which a fire is detected makes a huge difference to the level of damage - literally every second counts.

However, how do you properly protect a building against the threat of fire?

## THE SOLUTION

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By law, fire detection and alarm systems have to operate independently.

However, signals and data can be taken from fire systems and linked to other systems such as security, mass notification and building management systems.

Combined with technological developments in the fire systems themselves, systems can be designed that are very effective in detecting fire to make sure everyone is safe.

## THE RESULTS

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Fire systems can and do save lives, as well as minimising damage to property and assets. In the event of fire, a well designed fire system will pay for itself many times over by:-

Minimising loss of life

Minimising damage to property, assets and data

Ensuring compliance and reducing fines

Reducing insurance premiums

# WHAT SHOULD YOU EXPECT FROM A FIRE SYSTEM?

## What You Should Expect From Your Fire System

<b>Accurate Fire Detection</b>	Fire alarms not only inform that a fire has been detected, but also shows which detector has triggered and where it is located. This makes locating the fire far quicker
<b>Accurate Smoke Detection</b>	Detectors are able to detect the difference between smoke and steam, making detections far more accurate, especially in industrial environments
<b>Accurate Carbon Monoxide Detection</b>	Carbon monoxide is a silent killer and is a big threat to human life. Early detection of its presence can make a huge difference in saving people's lives
<b>Quick &amp; Accurate Location Of Fire</b>	When a fire starts, seconds can count. A well designed fire system will identify, through the system's detector map, where the fire is located, significantly increasing speed of response
<b>Rapid Notification Of Alarm</b>	An alarm needs to notify people to evacuate quickly if a fire breaks out. Notification can be done via strobes, sirens, bells, voice messages, mass notification devices, and/or link to 3rd party monitoring
<b>Rapid Notification To Affected Personnel</b>	For large systems and campuses basic signalling, such as sirens, may not be enough. That is because, if fire breaks out in a localised area, people in the immediate area may need to be given separate instructions from those further away. A well designed fire system can do this.

# SYSTEM COMPONENTS

The main components in a fire system include:

- **Fire alarm control panel:** The hub of the system, monitors inputs and system integrity, controls outputs and relays information.
- **Primary power supply:** Commonly non-switched 230-volt alternating current.
- **Secondary (backup) power supplies:** Commonly consisting of sealed lead-acid storage batteries or other emergency sources including generators, used in the event of a primary power failure.
- **Initiating devices:** Act as inputs to the fire alarm control unit and are either manually or automatically activated. Examples would be devices such as heat detectors, duct detectors, and smoke detectors.
- **Fire alarm notification device (audible and visual):** Uses energy supplied from the fire alarm system or other stored energy source, to inform people nearby of the need to take action. This is done using a flashing strobe light, electromechanical horn, siren, electronic horn, chime, bell, or speaker. However, the standards require that only one type of sounder can be used across the whole site
- **Building safety interfaces:** This interface allows the fire alarm system to control aspects of the building environment, prepare the building for fire, and control the spread of smoke fumes and fire by influencing air movement, lighting, process control, lift controls and availability of exits



# CONVENTIONAL OR ADDRESSABLE?

There are two main types of fire detection system - conventional and addressable.

The biggest difference between conventional and addressable fire alarms is scale.

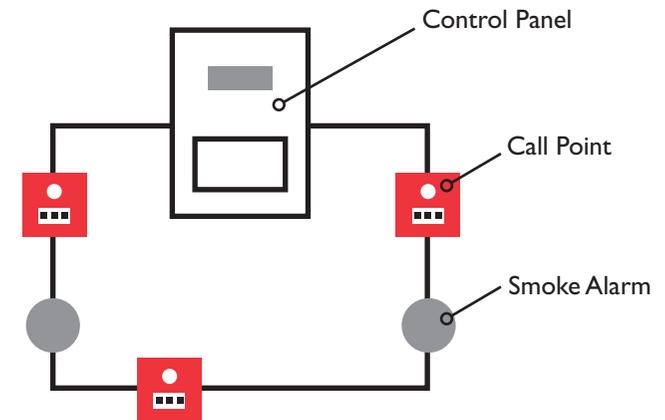
- Conventional fire alarms used to be ideal for small buildings, such as individual offices or retail shops. However, these are being phased out as the cost difference between conventional and addressable systems comes down
- Addressable fire alarms are a necessity for large building complexes or campuses

An addressable fire alarm is a system that is capable of identifying each device on the circuit, whether it be a detector, manual call point, sounder or relay unit. This information enables the user to both locate exactly the position of the potential fire, as well as the type of device that has activated

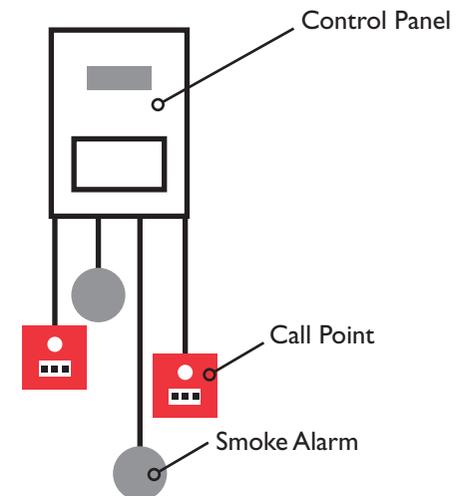
An addressable fire alarm connects each device or module to the main fire panel in a "loop", often by means of a singular wire 'daisy chaining' through each device.

Conventional alarm systems require wires to each zone, again connecting back to the main fire panel.

## ADDRESSABLE ALARM SYSTEM



## CONVENTIONAL ALARM SYSTEM



# DETECTORS

There are a number of different detector types that can be designed into a system and are used in different applications. Here is a summary of the different types and their usage.

## Heat Detectors

These can detect an increase in temperature and are insensitive to smoke. Heat alarms are best suited for kitchens, garages and lofts.



## Optical Detectors

These are effective at detecting larger particles of smoke from slow-burning, 'smouldering' fires, but are increasingly becoming all encompassing as the technology develops. These can be placed in most areas, but not too close to poorly ventilated bathrooms as they are liable to false alarm when exposed to steam.



## Multi-Sensor Detectors

Multi-sensor alarms provide optical and heat detection, as well as carbon monoxide detection in some models. As the unit monitors for two or more different by-products of fires (eg smoke, temperature, CO), its response to all types of fire is vastly improved vs single sensor alarms. They are also less prone to false alarms. Multi-sensor technology eliminates the need to fit separate single sensors and provides a faster reaction to both fast-flaming and slow smouldering fires in a single alarm. BS 5839-6 recommends the use of multi-sensor technology in all rooms except the kitchen, where a heat alarm is recommended instead



## Aspirating Smoke Detection

Provides very early warning of smoke, and is especially useful in areas where maintenance access is an issue (e.g. lift shafts). In addition they are used in areas where aesthetics are important



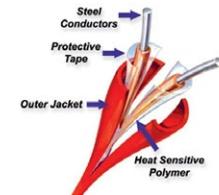
## Optical Beam Detectors

Optical beam smoke detectors are devices that use a projected beam of light to detect smoke across large areas. They are used to detect fires in buildings where standard point smoke detectors would either be uneconomical, or restricted for use by the height of the building. Optical beam smoke detectors are often installed in warehouses as a cost-effective means of protecting large open spaces.



## Linear Heat Detection Cable

Linear heat detection cable is a very commonly used method of fire detection. It can detect a fire anywhere along the length of the cable, and can be of lengths in excess of a kilometre. It is especially useful in large spaces such as car parks



## Detectors For Lithium Ion Batteries

Designed to detect potential fire from Lithium Ion batteries, providing an early warning by detecting the 'Off Gassing' that precedes any fire



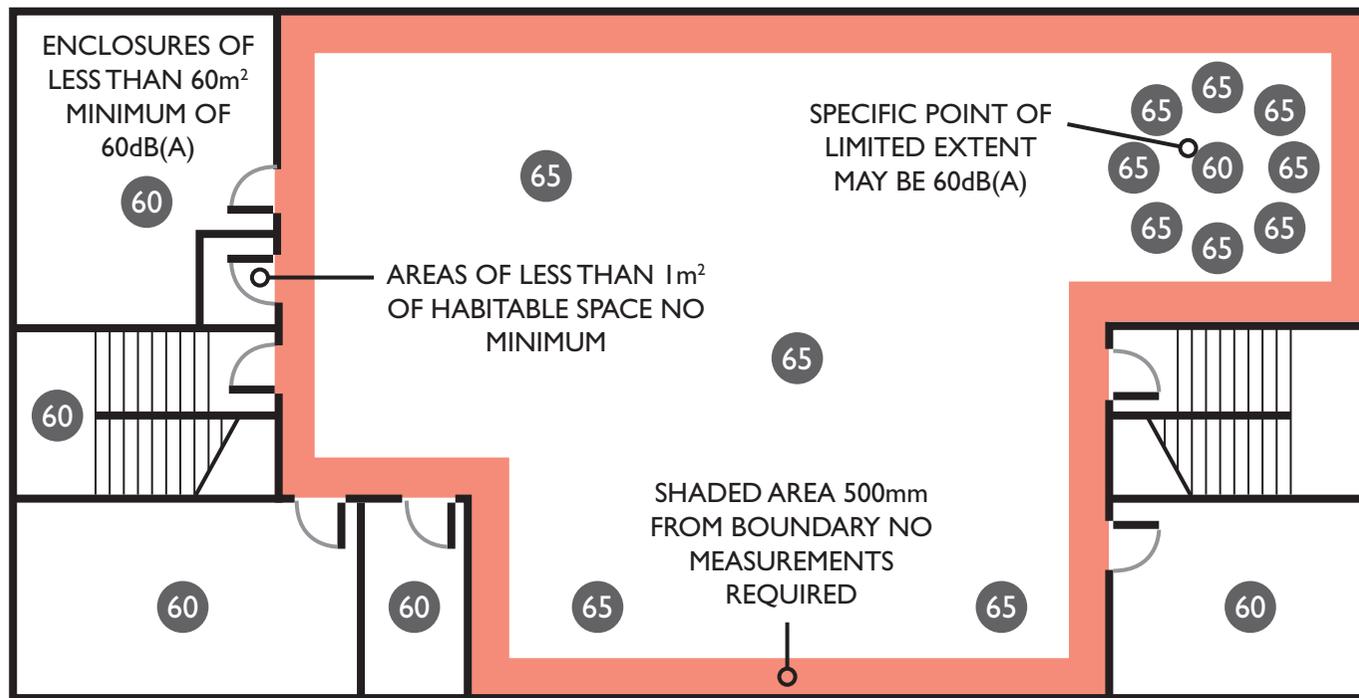
## Manual Call Points

These are stations spaced around a building, at regular intervals, where people can raise the alarm manually. These are designed to supplement automatic forms of detection



# SOUNDER GUIDELINES

- Audible alarm levels within buildings should be 65dB(A) or above throughout. However, the new standard does accept that in certain locations this can be as low as 60dB(A)
- To rouse sleeping persons one needs to achieve a minimum of 75dB(A) at the bedhead.
- For areas with high ambient background noise levels, the Standard recommends a sound level of 5dB(A) above the norm but maximum sound levels should not exceed 120dB(A) for health & safety reasons.
- It is essential that at least one sounder is placed within each fire compartment and the sounder choice should be common throughout the building
- Visual alarms are also a requirement in all sleeping accommodation where people with a hearing disability may be present.
- Research over last twenty years has proven that voice enhanced sounder is preferred to bell or electronic sounder as people pay more attention to spoken message

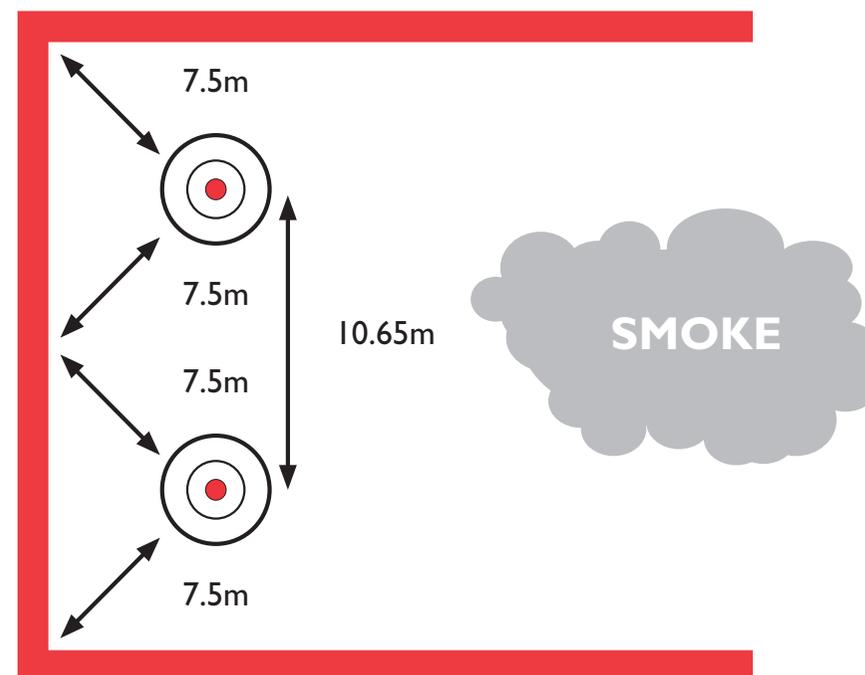


An important consideration when designing fire alarms is that of individual zones. The following recommendations are found in BS 5839 Part 1:

- A single zone should not exceed 2,000m<sup>2</sup> in floor space.
- A building may be viewed as a single zone if the floor space is less than 300m<sup>2</sup>.
- Where the floor space exceeds 300m<sup>2</sup> then all zones should be restricted to a single floor level.
- Stairwells, lift shafts or other vertical shafts (nonstop risers) within a single fire compartment should be considered as one or more separate zones.
- The maximum distance travelled within a zone to locate the fire should not exceed 60m.
- Also, the NFPA recommends placing a list for reference near the FACP showing the devices contained in each zone.

- For further advice please refer to clauses 21 & 22 of BS 5839-1:2013 or to a manufacturer's design guide.
- The objective in siting sensors is to select the correct sensor for the appropriate application to provide the earliest warning of fire without the risk of false alarm.
- It is therefore worth trying to visualise the type of fire that is likely to occur in a particular room or area and to familiarise oneself with the application and risks that could give rise to false alarm.
- One of most common mistakes is to mount a smoke sensor adjacent to an air conditioning intake or outlet grill. The minimum distance between the two should be at least 1 metre and further if possible. This is because smoke may have difficulty penetrating the sensor when an air conditioning intake is operating. Also there is a greater risk of the sensor becoming contaminated and giving rise to false alarms.
- Rules for siting beam detectors are similar to those for point detectors although a clear line of sight is required between the transmitter and receiver at all times.

## SMOKE DETECTOR SPACING (UNDER FLAT HORIZONTAL CEILING)



The design standards for Fire Systems are very strict and need to be very closely adhered to. Failure to do this can result in heavy fines, substantial compensation payments and even imprisonment. The laws require someone to sign off both the design and the installation.

Fire alarm systems in non-domestic premises are generally designed and installed in accordance with either BS 5839 Part 1 or BS6266 (which relates to design of systems where there is a high risk of electrical fire). There are many types of fire alarm systems, each suited to different building types and applications. A fire alarm system can vary dramatically in both price and complexity, from a single panel with a detector and sounder in a small commercial property to an addressable fire alarm system in a multi-occupancy building.

BS 5839 Part 1 categorizes fire alarm systems as:

- “M” manual system (no automatic fire detectors so the building is fitted with call points and sounders).
- “L” automatic systems intended for the protection of life.
- “P” automatic systems intended for the protection of property.

Categories for automatic systems are further subdivided into L1 to L5 and P1 to P2.

On the next page, we will go into what each of these mean.



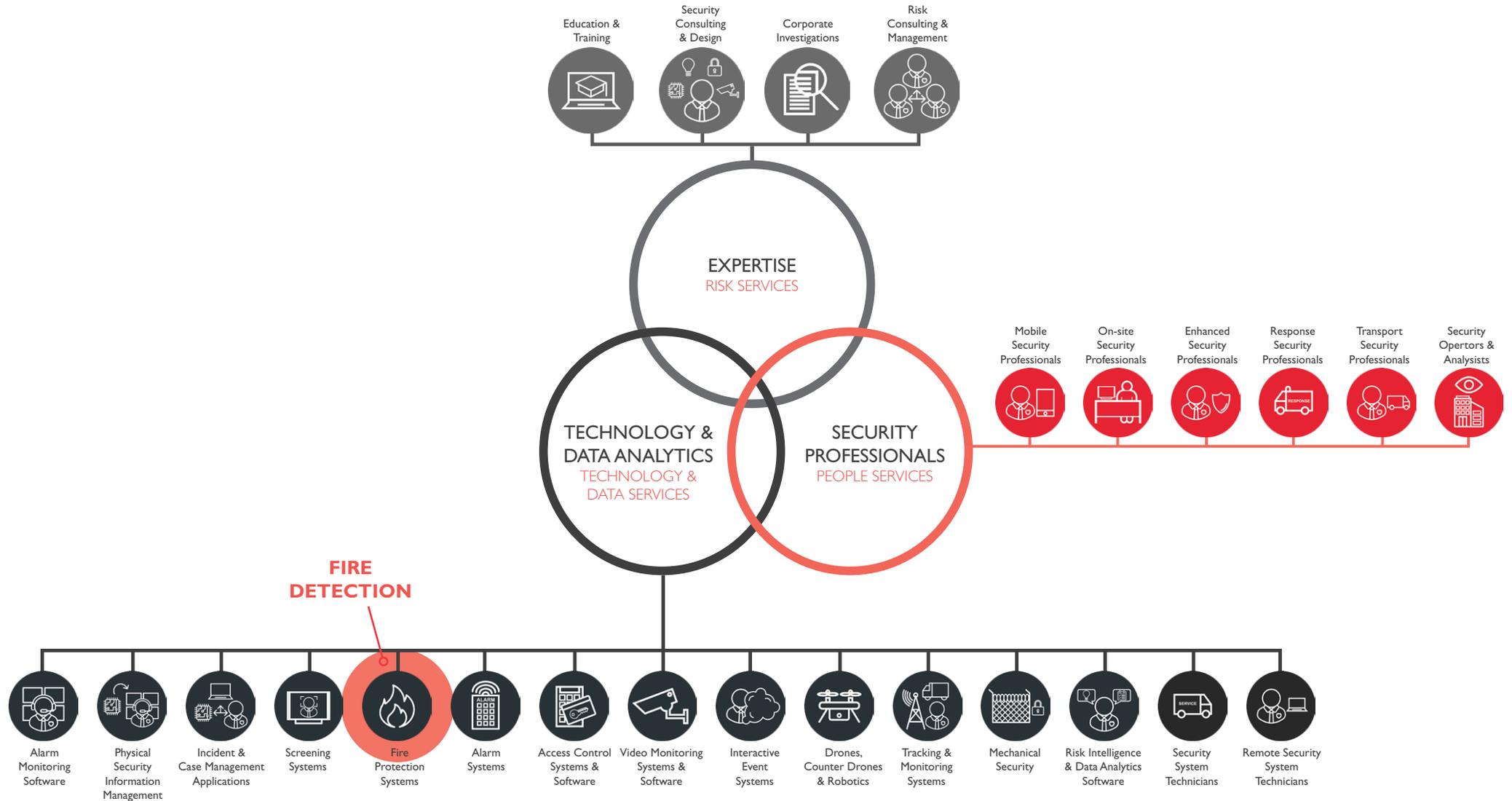
# DESIGN STANDARD CATEGORIES

- M Manual systems, e.g. handbells, gongs, etc. Purely manual or manual electric. Rely on the building occupants discovering the fire and acting to warn others. Such systems are a basic requirement for places of employment.
- P1 System installed throughout building – objective is to call the fire brigade as early as possible to ensure any damage caused by the fire is minimized. Small low-risk areas can be excepted (e.g. toilets and cupboards).
- P2 Detection provided in parts of the building where risk of ignition is high and/or the contents are particularly valuable. Cat 2 systems provide fire detection in parts of the building with high risk.
- L1 Designed for protection of life with automatic detectors installed throughout all areas of the building (including roof spaces and voids) with the aim of providing the earliest possible warning. Detectors need to be placed in nearly all spaces and voids. With category 1 systems, the whole building is covered.
- L2 Designed for protection of life with automatic detectors installed in escape routes, rooms adjoining escape routes and high hazard rooms. Ideal for medium-sized premises. Identical to L3 system but with additional detection in areas with high chance of ignition or where the risk to people is particularly increased
- L3 Designed to give early warning to everyone. Detectors placed in all escape routes and all rooms that open onto escape routes. Category 3 systems provide more extensive cover than category 4. Objective is to warn building occupants early enough to ensure all can exit building before escape routes become impassable.
- L4 Category 4 systems cover escape routes and circulation areas only. Therefore, detectors will be placed in escape routes, depending on the risk assessment. Detectors might be sited in other areas of building, but the objective is to protect the escape route.
- L5 This is the “all other situations” category, e.g., computer rooms. Category 5 systems are the “custom” category and relate to some special requirements that cannot be covered by any other category.

# HOW G4S CAN HELP



# WHERE DOES G4S FIRE FIT?



## WHY G4S FIRE?

- Simplify the supply chain by choosing the leading Fire & Security One-Stop-Shop
- Reduce Carbon footprint - consolidating maintenance means fewer visits
- Single point of ownership for security and fire monitoring
- Experience of working in high security environments with the correct clearances
- Only work with the world's leading fire detection and alarm manufacturers



## LET US MONITOR FOR YOU...

It is important that any fire detection and alarm system is constantly monitored to ensure a rapid response. This can be done manually by people on site, or can be monitored remotely by a company's control room or by a third party

### A service you can rely on

For those who cannot justify the investment in an in house control room, but want 24/7 cover, we offer our own surveillance services. Our Cat II NSI Gold Standard BS5979, BS8484, IS228 accredited continuous monitoring service, operates from a secure location 24 hours a day, 7 days a week, 365 days per year, protecting you, your assets and property.

Fully resilient, the site operates in partnership with a disaster recovery premises to ensure that our customers can rely on continuity of service whatever the unforeseen circumstance.

### How we do it

We use a permanent IP or GSM connection to remain in constant connection with your premises. Upon receipt of an alert or identification of an issue during surveillance, our teams will follow strict operating procedures in accordance with pre determined response times.

In many cases we liaise directly with a contact within your organisation, speak with emergency services or respond to site using our network of mobile security response professionals.

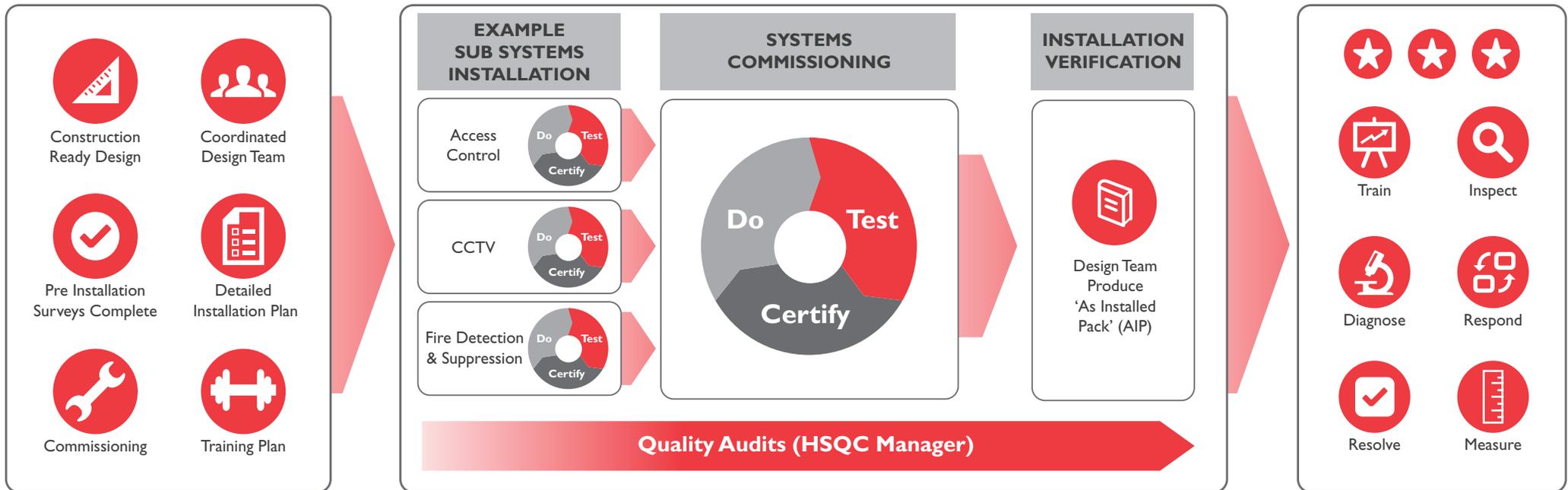
## WE SPLIT OUR PROJECTS INTO CLEAR STAGES

This provides early identification of risks and timeline challenges and ensures we meet the stringent operating conditions, safety controls and timelines required of your deployment

### Part 1 - **PREPARE**

### Part 2 - **EXECUTE**

### Part 3 - **OPTIMISE & SUPPORT**



# OUR PROJECT APPROACH - PART I PREPARE

We'll listen carefully to your requirements and produce the optimum design, plan carefully for installation and make provision for training.

We put risk and safety at the heart of what we do.



## CONSTRUCTION READY DESIGN

- Assessment of installation impact
- Risk assessments and method statements
- Compliance with fire and building standards
- Detailed drawings



## CO-ORDINATED DESIGN TEAM

- Subject matter experts for individual technologies
- Project team assembled to agree integrations
- Assess and communicate key considerations
- Involve client wherever possible



## PRE-INSTALLATION SURVEYS

- Site assessment audits
- Assess Delivery or installation constraints
- Complete visitor approval process
- Make access requests



## DETAILED INSTALLATION PLAN

- Signed by both parties
- Fully documented scope
- Highlighting roles and responsibilities
- Deployment and training timelines



## COMMISSIONING

- Led by experienced project lead
- Clearly define 'Do, Test, Certify' methodology
- Acceptance testing completed
- Formal handover



## TRAINING PLAN

- End user or Train the Trainer formats
- Detailed schedule provided
- Attendance monitored
- Pass / fail course completion

# OUR PROJECT APPROACH - PART 2 EXECUTE



A G4S Installation Project Engineer will lead the physical installation, supported by other G4S engineers and the G4S supply chain. In all cases, G4S will follow the appropriate Method statements, adopting the 'Do-Test-Certify' sequence:

**Do** - part of the installation work is undertaken e.g. pull cables, fix detectors. The appropriate Method Statement is used to identify the steps needed and quality requirements

**Test** - the work undertaken will be tested to ensure that it meets the design documentation and defined quality standards identifying and rectifying any shortfalls.

**Certify** - the work will be formally certified as having passed the design and quality checks. Each step of the installation is tested as the installation progresses, allowing any faults to be rectified as soon as possible - minimising any rework, the consequence of any rework on others and avoiding any latent errors. If a check fails we will halt the installation and rectification work is undertaken. Although very unlikely, this may include starting the installation again. As subsystems (i.e. part of a system) are installed, they will be tested as a sub-system. When entire systems are installed, the installation team will undertake end to end tests. All testing will be certified.

## COMMISSIONING



Once our project management team has validated that all equipment has been shipped as expected, our technicians will arrive on site with the correct skills and security clearance to ensure your installation takes place with minimum disruption.

Throughout the installation process, the Installation Team managed by the Project Engineer, provides relevant information to the Design Team who verify that the installation is progressing in accordance with the design. This approach maintains the 'golden thread' from Design documentation, to commissioned equipment, through to operational systems.

## VALIDATION



We run a series of validation exercises to ensure that the equipment is left in full working order and operating to maximum effect. These include:

Factory Acceptance Testing - this helps us prevent equipment being classed as dead on arrival.

Integrated Site Acceptance Testing - we'll validate systems integrate together successfully and operators are able to use equipment to maximum effect.

Testing validation - we'll perform formal documented user testing against the key operating criteria in order to prove equipment is working as intended.

# OUR PROJECT APPROACH - PART 3 SUPPORT

We support you to optimise your investment through an unrivalled Support programme driven by:-

- 24 x 7 customer support centre
- Contracted SLA's
- Rigorous Preventative Maintenance
- Comprehensive Spares Holding
- Incident Management Software
- Mission Critical



HIGHEST QUALITY SOLUTION DESIGN - SINGLE PLATFORM



HIGHEST SECURITY CLEARANCES



STRONG SAFETY PERFORMANCE



PROVEN TRACK RECORD



CUSTOMER CARE



STRONG SECTOR EXPERIENCE



INNOVATIVE TECHNOLOGY - MEETING BUDGET & PERFORMANCE



PROJECT MANAGEMENT EXCELLENCE



GLOBAL REACH

# POST INSTALLATION

Post installation, you will have access to our 24/7/365 support operation, which provides first line diagnostics and resolution triage and uses the latest software to route calls to our teams of remote service technicians.

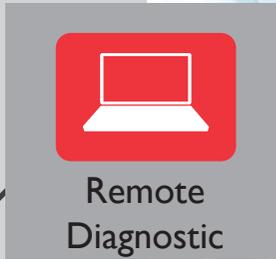
When appropriate, we run detailed planned preventative maintenance programmes to ensure that equipment is maintained in optimum working order and that your investment is fully leveraged.



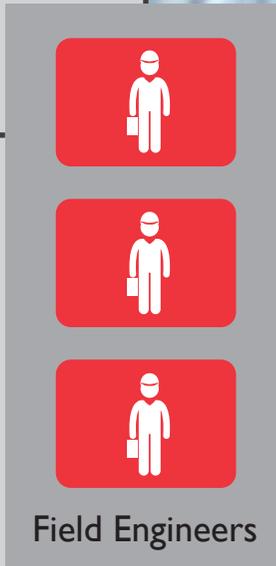
Customer Site



24/7/365  
Customer Support Centre



Remote Diagnostic



Field Engineers



# WHY PARTNER WITH G4S FOR FIRE SYSTEMS?

## We are the only Fire Systems provider that can offer:

- The opportunity to integrate technology procurement from multiple manufacturers to a single source - simplifying the supply chain and placing clear accountability for project delivery
- Experience in selecting the correct technology to suit budget and performance specification
- Clear evidence of successful national and international project delivery within the Fire System space
- Project delivery teams who are used to delivering within demanding timeframes and with the highest levels of security clearance
- Unrivalled global presence to support organisations who would like to replicate solution design, implementation and contract management across territories
- A commitment to use Suitably Qualified and Experienced Person (SQEP) staff to install and commission the systems
- A strong, safety culture embedded in our ways of working, coupled with well defined Safe Systems of Work (SSOW).

## More about us:

**Employing over 500,000 people in 85 countries worldwide, we are the world's leading security provider.**

We offer a broad range of security services combining people, process design and technology on a single, multi service and integrated basis.

Our UK and Ireland technology division, G4S Fire and Security Systems, employs over 150 Engineers, based from strategic locations across two regions

# OUR APPROVALS

We pride ourselves in delivering high quality work to exacting standards. Our work, processes and procedures are rigorously externally audited and follow best practices for our industry.

ISO CERTIFICATIONS
NSI GOLD (ISO9001)
NSI FIRE GOLD (ISO9001)
BAFE SP203-1
NSI ISO 14001 (SSUK)
NSI ISO 18001 (SSUK)

SSIP CERTIFICATIONS
SAFE Contractor
Achilles
Contractor Plus

## Our Approvals Include



# CASE STUDY - COMPREHENSIVE FIRE SYSTEM MAINTENANCE

## THE CLIENT

A leading Dublin hospital

Providing range of frontline and specialist services, both regionally and nationally

## CHALLENGES

### Client Challenged G4S to:-

Provide fully trained engineers for Gent and Ziton systems

Provide statutory preventative maintenance services on all life safety systems, including fire suppression and fire fighting equipment

Provide a programme of system upgrades, extensions and reprogramming

## SOLUTIONS

### G4S delivered:-

Engineers with specialist skills to fully maintain one of largest Gent Fire Alarm Networks in Ireland with approx. 40 panels

Use only approved parts for maintenance, repair and extensions  
Liaise with on site staff to provide training on responsibilities, ensuring full understanding of how systems work

Provide expert input into system design and commissioning and relevant Irish Standards

## RESULTS

### The results were:-

G4S have provided maintenance for life safety systems on site since 2013, to ensure 24/7 cover

Implemented extensive set of system upgrades in live hospital environment to increase system coverage and safety category

Additional services added over course of contract to include the fire fighting equipment, adding value to customer

Ensured full compliance with all Irish fire standards at all times

# OUR PARTNERS



# MORE THAN JUST SYSTEMS - G4S ACADEMY

The G4S Academy supports the continuous professional development and network expansion for anyone operating in the security industry through;

- **Specialists** – direct access to our industry, technology and solution design experts
- **Repository** – direct access to our white papers, webinars, vLOGs, seminars, events and more
- **Network** – register to discuss best practice with your peers
- **Forum** – exclusive events for industry thought leaders

Internally, the G4S Academy plays an important role too by;

- Building a consistent global training and development competency matrix
- Driving alignment and consistency of security, safety and risk concepts
- Focusing on innovation and product development

The G4S Academy is Led by Noah Price, Head of Academy UK&I, providing training and development for our specialist network as well as delivering a regular stream of networking and thought leadership material to our membership base.



**Listen to Noah's introduction and subscribe with our G4S Academy at**  
<https://www.g4s.com/en-gb/what-we-do/academy>





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