

A photograph of a modern indoor pool and sauna area. The pool is filled with blue water and has blue mosaic tiles on the walls and floor. The surrounding area is a lounge with a stone wall, a large glass window, and a wooden bench. The lighting is warm and ambient.

Indoor Pools and Saunas

SecuriSmoke ASD, SecuriHeat ADW

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1 Introduction

Indoor swimming pools and related wellness areas are often part of wider recreation centres or leisure facilities. But while most of the building can generally be protected from fire using the same methods as other large public areas such as malls or transport terminals, wet areas and saunas each present unusual challenges to fire detection and therefore require specific approaches.

Given public use, the likely presence of children and surroundings which can prove confusing, early alarm of a fire situation can be of vital importance. Fire detection in such an 'assembly occupancy' environment serves not only to provide a reliable alarm for timely evacuation, but also to trigger power-down of motors and heating elements, or to engage exhaust fan systems, emergency lighting, the smoke management system, fire shutters and smoke curtains. The fire detection system is also critical for the actuation of a suppression or sprinkler system in areas where these are installed.

The use of Securiton SecuriSmoke ASD Early Warning Fire Detection (EWFD) system represents significant advantages over other conventional detection methods, particularly in large open spaces and where very sensitive yet reliable detection of incipient fires is desirable. When it comes to risk-based detection to supplement EWFD for recreation centres with swimming pools, spas, saunas and plant rooms, Securiton's SecuriHeat ADW line-type heat detector (LTHD) offers a robust, reliable and quick-acting fire detection system well suited for all types of harsh industrial and challenging environments.

The purpose of this Case Study is to provide fire safety and protection consultants, qualified fire system specifiers, design engineers or technicians, with recommendations for the application and use of both SecuriSmoke ASD and SecuriHeat ADW to protect indoor swimming pools, saunas and plant rooms, to a high standard (Early Warning fire Detection). A key design objective is to enhance fire detection methods to provide risk-based object and area protection within and around these facilities, mitigate risks through best fire prevention practices.

This Case Study also provides key requirements on Inspection, Testing and Maintenance (ITM) of SecuriSmoke ASD and SecuriHeat ADW; and world-class technical and application support offered by Securiton through its headquarters teams in Europe and its vast global network of local employees and distribution partners.

2 Aspects of fire safety and prevention

Indoor swimming pools and saunas are often found in community centres, sports facilities, and even repurposed industrial buildings. From building safety perspectives, they are classified as 'assembly occupancy' type where "a building or portion of a building used for the gathering of 50 or more people for purposes such as deliberation, worship, entertainment, eating, drinking, amusement, or awaiting transportation" per The Life Safety Code (e.g. NFPA 101 [1]). In essence, any area designed to hold a large group of people for social, recreational, or public events falls under this classification.

Fire risks in buildings containing swimming pools include structural hazards, such as outdated wiring or flammable materials in older buildings or complex HVAC systems in newer buildings being a source of ignition or spread fire. Once the fire starts, fire and smoke can also rapidly spread in high-ceiling open areas, while swimming pools or saunas could become death traps for drowning or inhalation of toxic smoke in the event of panic escape or rushed evacuation in the event of a fire. Equipment malfunctions, such as pool heating systems, electrical equipment, and other machinery can cause fires, lead to deadly consequences when in the close proximity of flammable materials commonly used for pool and saunas.

Additionally, fire detection around indoor swimming pools faces the following specific challenges, many of which are also common to saunas:

- High humidity and steam: moisture and condensation can trigger false alarms in smoke detectors.
- Corrosive environment: chlorine and other chemicals can damage sensors over time.
- Airflow and ventilation: strong ventilation systems can dilute smoke, thus delaying detection.
- Reflections and glare: water surfaces and lighting can interfere with optical detectors.
- Temperature variations: warm, humid air near the pool contrasts with cooler surroundings, affecting sensor calibration.

While good housekeeping can reduce the likelihood of a fire from happening, a high sensitivity Early Warning Fire Detection system is ideal for the large open spaces of indoor recreation centres, where smoke from an incipient smouldering fire will be quickly diluted in the pool or sport areas. Compartmentation, high ceilings, concealed or

often unmanned rooms and areas with high airflow due to air conditioning are further challenges which demand high sensitivity or localised protection from the chosen detection methods. A central element of best fire safety practices is therefore the use of Early Warning Fire Detection. This chapter highlights the following key aspects of fire safety and fire prevention.

2.1 Indoor swimming pools and saunas

Indoor recreation centres host unique combination of building uses, with varied safety hazards and fire risks. Although many areas such as reception, café and sports halls can be covered with fire detection methods similar to other large assembly occupancy buildings, swimming pools, spas and sauna are different. Not only are they often made of bare wood, but other flammable materials such as chemicals are also stored on-site. On the other hand, chemicals in warm swimming pool water become airborne and alongside damp conditions are potentially corrosive to electrical and electronic systems.

This Case Study looks at the following areas associated with buildings housing indoor swimming pools and related leisure facilities, as illustrated in Figure 1:

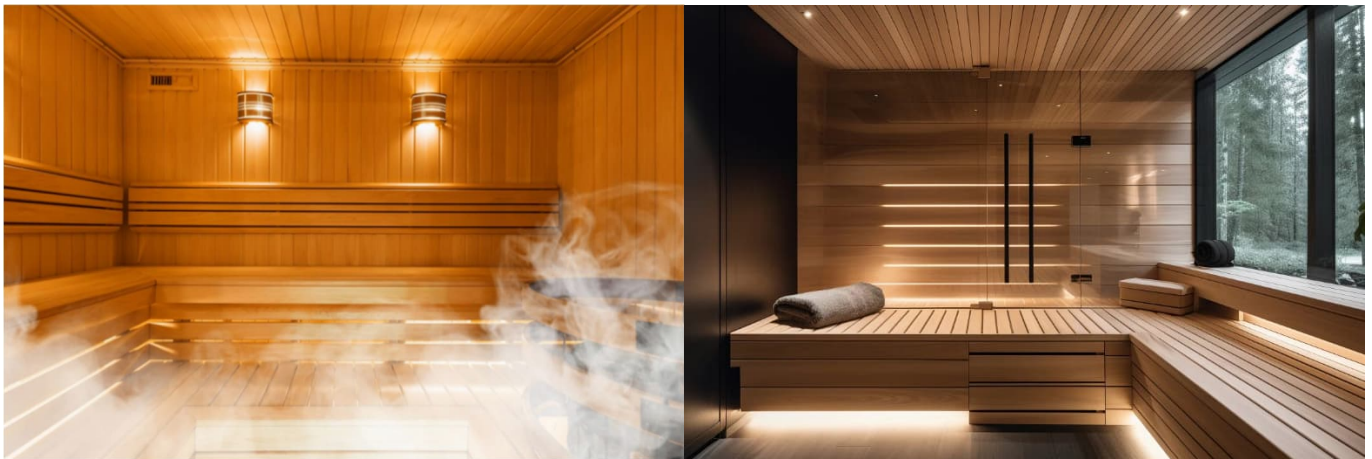
- (a) The swimming pool hall, typically a very large open area with a high ceiling of unique architectural design.
- (b) Smaller pools, such as diving pools, children’s pools or whirlpools, which are often secondary to the main pool.
- (c) Saunas are a fire risk and have specific detection challenges such as the presence of steam and rapid temperature changes.
- (d) Plant rooms. A typical plant room can include items like boilers, pumps, control panels, and other machinery for heating, water supply, ventilation, and more. Plant rooms are crucial for maintaining the functionality and safety of the entire facility.



(a) Large indoor swimming pool



(b) Secondary or smaller pools providing additional recreational facilities



(c) Saunas are a fire risk and have specific detection challenges such as the presence of steam and rapid temperature changes



(d) Plant or boiler rooms typically found in the basement of a recreation centre with indoor swimming pool

Figure 1 Indoor recreation centres

2.2 Fire risk, consequence and safety

Beyond building and asset safety, life safety in indoor recreation centres is paramount due to large number of building occupants, often with many young children as well.

Fire hazards and risks include:

- Outdated electrical wirings and flammable building materials in older facilities and complex HVAC systems in modern indoor recreation centres can be a source of ignition or spread fire.
- Like other commercial and industrial buildings, electrical and equipment risks associate with faulty electrical system is one dominant fire hazard. These hazards include swimming pool and sauna heating systems, electrical equipment, and other machinery can malfunction and cause fires.
- Flammable materials and dangerous chemicals such as swimming pool chemicals, cleaning supplies, and decorative materials could also be easily ignited or contribute to fire spread when located in close proximity of overheating sources.
- Smoke as result of a fire will not only possess danger for general evacuation but also put immediate danger to people who are in a swimming pool or inside an enclosed sauna. Panic and stampede with a high number of building occupants can lead to drowning. Smoke from burning materials can be deadly, especially when inhaled in a confined space like a swimming pool area or sauna rooms.
- Swimming pools limit egress options even while bodies of water can offer some temporary relief from heat. That means egress route distance to safe exits can be extended beyond the normal egress designs for other assembly occupancy buildings, such as libraries or shopping malls.

With all the possible fire hazards present, there is a range of fire preventive measures that mitigate the delayed detection of a fire at its incipient stage, spread of fire, and occupant life safety from injury or fatality. With a reliable aspirating smoke detection system for large open spaces, paired with SecuriHeat ADW line-type heat detection (LTHD) for localised protection, fire incidents can be avoided or minimised. Even as the fire situation progresses, fire services can be notified automatically and arrive at the scene much earlier before the fire spreads.

Figure 2 illustrates key aspects and advantages of using a reliable Early Warning Fire Detection system:

- How the intensity and destructive power of a blaze growing exponentially, from an incipient stage, through a growth period and into a fully-fledged fire which will rapidly cause a serious damage as well as being extremely dangerous to persons.
- How a reliable fire alarm can ensure the safe evacuation when required safe egress time (RSET) is minimised and the available safe egress time (ASET) is maximised.
- How operation interruptions and potential losses due to fire damage may be minimised by EWFD, compared to standard detection and the even greater damages when only sprinklers are used, with no prior detection.

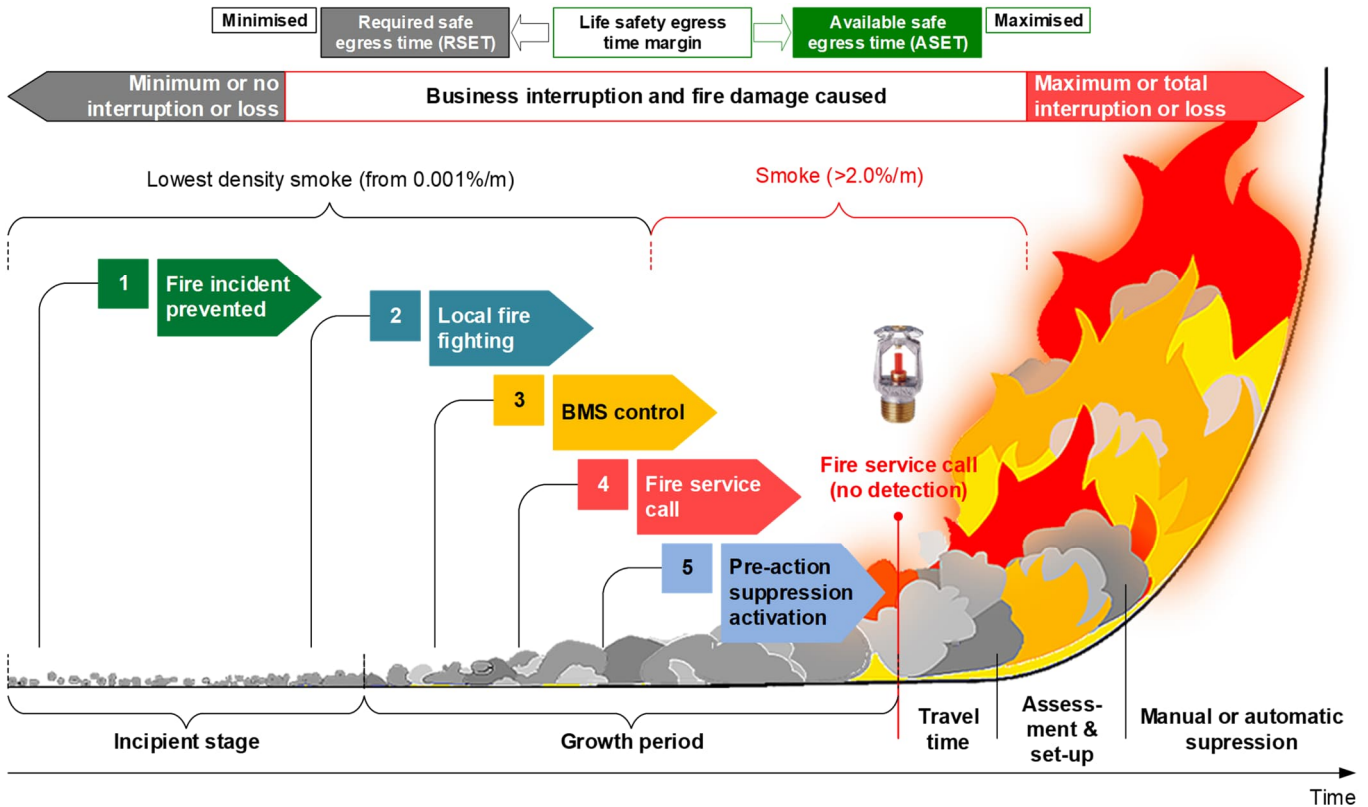


Figure 2 Impact of a detection system on life safety and loss due to fire damages

3 Challenges to Early Warning Fire Detection

Leisure centres require sound fire safety measures to address issues of extended egress travel distances, smoke and fire dispersion within large open areas with swimming pools, rapid detection and alarm to sauna users in fully enclosed enclosures where fire risks are often from inside the concealed spaces. Other factors such as timely fire service response and access, the desire to reduce operational disruption and maintain business continuity are also very important for facility operators.

Early alarm of a fire situation can be paramount to both life and building safety. Fire detection serves not only to provide a verifiable and reliable alarm for timely evacuation, but also other consequential events or actions such as power-down of heating and turn on exhaust fan systems, and the activation of emergency lighting, smoke management system, fire shutters and smoke curtain. A fire detection system is also critical for the actuation of a suppression or sprinkler system in areas where these are installed.

From a life safety perspective even false alarms, when not verified, will have major negative effects. False alarms interrupt business operation, inconvenience the public and cause unnecessary financial losses. Extensive research and validation indicate human behaviour in responding to a fire evacuation inside a large building complex with high occupancy are similar between various building types. However, the size and complexity of leisure centres, coupled with large swimming pools as the main fixtures of the building layout, means building occupants may find themselves moving into totally different sections of the building in moments of panicking. Most people are not familiar with the surroundings and don't know the way to a nearby safe exit, while large crowds in relative confined spaces without immediate visibility of exits or signage can create confusion or hesitation. Therefore, fire safety

measures need to support a much longer time to react to alarms and safe evacuation [2]. As fires develop and smoke builds up, any delayed evacuation can result in injury or even death when untenable conditions are reached before everyone can safely exit from the smoke/fire affected areas.

Early Warning Fire Detection can play a crucial role in fire prevention measures for safeguarding indoor recreation centres. While there are practical difficulties in choosing suitable detection products, SecuriSmoke ASD, working in conjunction with SecuriHeat ADW, can address all the key challenges to early and reliable detection of a fire throughout at swimming with various operational characteristics (see Table 1).

Challenge	Securiton advantages
Large open space or diluted smoke and heat dispersion due to forced ventilation	SecuriSmoke ASD active aspirating sampling with powerful fans and approval listings with very high, consistent detection sensitivity for incipient fires; position of sampling holes at a lower level. Flexible placement of sampling points and spacing between them; suitable for buildings with natural ventilation.
Challenging ambient conditions	SecuriSmoke ASD allows practically no limitation to detector installation location: operating temperature range is -30 to +60°C (22 to 140°F). Suitable accessories such as water retaining boxes can be used to address installation with ambient conditions such as high humidity, dusty, and corrosive environments.
Complex design considerations	SecuriSmoke ASD unique features such as 5-level of alarms, option of dual detection chambers, maximum number of sampling holes for all levels of sensitivity. Multiple levels of alert and alarm per detection zone, facilitate both earlier incident alert to tackle potential fires to minimise damage and disruption, and fire alarm to be integrated with fire suppression and extinguish system.
Risk-based detection	SecuriSmoke ASD flexible sampling pipe and sampling hole placement for detection across multiple areas. SecuriHeat ADW sensing tube can be positioned in virtually all environments, bent to shape to cater for object localised detection, include very tight and concealed spaces.
Obstructed or restricted access	SecuriSmoke ASD active sampling technology with detectors and testing points often located in areas easy to access or outside the protected areas or positioned at locations away from public traffic areas. SecuriHeat ADW sensing tubes are located in the protected areas while the control unit can be installed in a location convenient for maintenance access.
False alarms	Built-in features for false alarm rejection, redundancy design options (e.g., SecuriSmoke ASD 535 with two detectors, designed to cover one single protected zone). SecuriHeat ADW unique highly sensitive rate-of-rise detection combined with fixed threshold alarm for maximum reliability. The Dynamic Heat Watch feature allows the system to discern between ambient heat rises and a real fire system through verifying rate-of-rise anomaly after initial detection.
Low TCO and easy access for maintenance	SecuriSmoke ASD detector units are installed remotely in an easy access area with only sampling pipes run into the protected areas. SecuriHeat ADW control units are installed locally or remotely in an easy access area with only the sensing tubes running into the protected areas. Routine service and testing for SecuriSmoke ASD and SecuriHeat ADW are done from the main detector unit with no interruption to business operation.

Table 1 Challenges to and solutions for indoor recreation centres protection with Early Warning Fire Detection

4 Optimised design & Use case

When combining prescriptive and risk-based approaches to design a fit-for-purpose fire detection system for indoor swimming pools and saunas, it is important to select advanced [Securiton detection product portfolio](#), including SecuriSmoke ASD and SecuriHeat ADW for Early Warning Fire Detection. Using one or a combination of both products allow for a fully flexible design with quantifiable and reliable detection performance. Advantages include a wide range of models; a control unit that can be remotely installed outside the protected zone; and suitable accessories to cater for challenging ambient environmental conditions in indoor swimming pools and saunas.

4.1 Design codes of practices

Indoor recreation centres are generally classified as Assembly Occupancy under local/national building codes equivalent to those defined in NFPA 101 and NFPA 1 and [1] [3]. Life Safety codes (e.g., NFPA 101 [1]) stipulate detailed requirements on fire prevention and protection system design principles based on designated building occupancy and fire risk and hazard assessment with prescribed system placement, actuation (e.g., NFPA 13 [4]) and safe egress in various fire scenarios.

The use of a suitable sprinkler system plays a role in addressing fire safety issues from large open spaces for the compliance of relevant fire or life safety codes. These can be related to the maximum travel distance, or whether or not a large floor area is permitted for specific uses, or if a glass wall in a large open space forming a smoke partition is accepted [4]. Recognising the extreme importance of a suitable smoke management system for large open spaces, codes such as NFPA 92 [5] establish requirements for the design, installation and testing of smoke control systems used to mitigate the impact of smoke from fire. The control of certain elements of a smoke management system with EWFD is both necessary and practical to address the need to maintain tenable conditions for a safe evacuation from leisure centres.

Risk assessment is a very important process to devise a fit-for-purpose fire detection and protection solution for recreation facilities. Examples include the use of AS/NZS ISO 31000 Risk Management [6], government regulators' guidelines for large assembly [7], as well as insurers' requirements (e.g., FM Global and AXA XL Risk Consulting [8] [9]).

There are marginal differences from one country to another in prescriptive (DtS) building, fire and life safety code requirements on fire detection. However, a combination of DtS prescriptive and risk-based design approach is invariably the best engineering practice to meet prescriptive requirements as well as to satisfy facility operators' need for business continuity and property protection.

Modern indoor swimming pools and wellness areas increasingly incorporate architectural design to offer attractive, large open spaces. The structure of these spaces could directly contravene building or life safety regulations, whether due to an extreme high ceiling, extended emergency egress travel distance from the prescriptive code requirements, or seasonal increased number of occupants. It is important to consider the applicable guidance and legislation as well as how a Performance-based Design (PBD) approach, together with a suitable Early Warning Fire Detection system, can overcome these issues.

Performance-based Design (PBD) is typically implemented when elements of fire safety and protection system design are not covered in the prescriptive codes. This may be due to unique building structure, environmental conditions, added detection for early warning or extended egress considerations [10]. A PBD approach is commonly adopted for either of the following:

- As a means to determine equivalency to a prescriptive code or standard
- As an approach to achieve broadly defined fire safety goals and objectives

To select a suitable fire detection system, relevant design and alarm codes must be applied. Examples include NFPA 72 [11], BS 5839-1 [12], VdS 2095 [13], and others like AS 1670.1 in Australia [14], NEN 2535 in Netherland [15], R7 in France [16] and DBI 232 in Denmark [17]. Taking into account requirements from all relevant codes and standards, industry code of practices and government regulations, an approach combining risk and PBD is a fitting fire engineering methodology to devise a suitable fire detection solution for swimming pools and saunas.

An adequate fire detection system that automatically alarms local fire services can make a huge difference in minimising the damage that a potential fire can cause. The ability to detect and alert early also allows local building management or facility operators to control the initial outbreak or to remove potential hazards that would help the fire grow.

Table 2 illustrates how SecuriSmoke ASD systems perform (for smoke detection), as well as the fire safety goals and objectives, are defined.

Sensitivity	BS/EN 54-20 [18]¹	NFPA 76 [19]
Class A or VEWFD	Very high sensitivity: An ASD system is capable of providing very early warning of a potential fire condition, particularly in high-risk areas with the benefits of staged responses.	Systems that detect low-energy fires, before the fire conditions threaten mission critical service, benefits of staged responses with a sampling hole sensitivity alert of 0.66% obs/m (0.2% obs/ft).
Class B or EWFD	Enhanced sensitivity: An ASD system is for applications where an additional degree of confidence is required for the protection of a particular risk such as with unusually high airflow.	Systems that use smoke, heat, or flame detectors to detect fires before high heat conditions threaten human life or cause significant damage to mission critical service.
Class C or SFD	Normal sensitivity: An ASD system designed to give equivalent performance to standard point detection systems meeting the requirements of EN 54-7 [20].	Systems that use fire detection-initiating devices to achieve certain life safety and property protection, in accordance with applicable standards such as NFPA 72 [11].

Table 2 Similarity in Early Warning Fire Detection definitions for smoke detection

Table 3 illustrates how SecuriHeat ADW systems perform, as well as other design parameters such as environmental conditions and typical applications, are defined. Note that SecuriHeat ADW products meet all response classes and all environment groups per EN 54-22 [21]; and key temperature classes and the range of spacing options per NFPA 72 [11].

Design Parameters	BS/EN 54-22 [21]		NFPA 72 [11]	
Class vs. Detection Range	Response Class	Detection Range °C (°F)	Temperature Class	Response Temperature °C (°F)
	A1	54 - 65 (129 - 149)	Ordinary	58 - 79 (136 - 174)
	A2	54 - 70 (129 - 158)	Intermediate	80 - 121 (176 - 250)
	B	69 - 85 (156 - 185)	High	122 - 162 (252 - 324)
	C	84 - 100 (183 - 212)		
	D	99 - 115 (210 - 239)		
	E	114 - 130 (237 - 266)		
	F	129 - 145 (264 - 293)		
Environment Group	Environment Group	Temperature Range °C (°F)	n/a	
	(E)1	-5 to +40 (+23 to +104)		
	(E)2	-10 to +55 (+14 to +131)		
	(E)3	-25 to +70 (-13 to +158)		
Typical Applications and Boundary Conditions	E1: Indoor; Stable and Clean Conditions; Commercial and industrial E2: Indoor; Varying and polluted environment; Commercial and industrial E3: Outdoor; Harsh conditions			

Table 3 Design and performance parameters for LTHD per codes and standards

4.2 Design criteria

This chapter provides a summary of product design criteria for both SecuriSmoke ASD and SecuriHeat ADW. Table 4 below is a summary of SecuriSmoke ASD key performance parameters per EN 54-20 [18] (also its derivatives ISO 7240-20 [22] and AS 7240.20 [23]) with regards sensitivity of Class A, B and C, corresponding respectively VEWFD, EWFD or SFD per NFPA 76 [19]. In general, simply follow relevant codes and standards for the design of smoke/fire detection system to meet prescriptive requirements. SecuriSmoke ASD pipe network can be flexibly

¹ ISO 7240-20 and AS 7240-20 are derived from BS/EN 54-20.

installed for open space ceiling level protection or localised area protection in likely area of heat build-ups caused by overheating situation or incipient fires.

Model	Key performance parameters			
Sampling holes, pipe length, spacing/Sensitivity				
Class	Total # of holes (Class)			Aggregated pipe length
	A	B	C	
SecuriSmoke ASD 531	6	8	12	75 m (246 ft)
SecuriSmoke ASD 532	8	12	16	120 m (394 ft)
SecuriSmoke ASD 533	16	50	50	200 m (656 ft)
SecuriSmoke ASD 535-3	18	56	120	300 m (984 ft)
SecuriSmoke ASD 535-4	36	112	240	2 x 300 m (984 ft)
SecuriSmoke ASD 535 (HD)	2 x 36	2 x 112	2 x 240	2 x 300 m (984 ft)

Table 4 SecuriSmoke ASD performance parameters

A summary of SecuriHeat ADW products key performance parameters is shown Table 5 below.

Model	Key performance parameters	
SecuriHeat ADW classes and tube		
Classes	see Table 3	
Sensing tube length	EN 54-22: 2 x 10 - 140 m (33 - 459 ft) copper tubes NFPA 72: 2 x 10 - 200 m (33 - 656 ft) copper tubes	
Tube type	Copper (TU 5/4 Cu)	
Rating and operational data		
IP device approvals	IP65	
Operating temperature (main control unit)	-30 to +70°C (-22 to +158°F)	
Operating temperature (sensing tubes)	Copper: -40 to +300°C (-40 to +572°F)	
# of Relays: Built-in (Expanded – Module)	2 (10 – 2 x RIM 36)	
Product Type Approval Standards and compliance level		
EN 54-22	Classes A1I to GI	
UL 521 – ULC-S530-M91	per EN 54-22 Classes A1I to GI	
FM 3210 / NFPA 72	Classes: Ordinary, Intermediate, High	

Table 5 SecuriHeat ADW product key performance parameters

4.3 Application Scenarios

These scenarios describe SecuriSmoke ASD and SecuriHeat ADW used for Early Warning Fire Detection with a PBD approach to enhance detection performance and address specific risks from risk-based safety assessment to detect fire at its incipient stage, avoid property loss due to fire damages and ensure business continuity. This chapter describes the following main detection design methods:

- 1 Open indoor pool areas with SecuriSmoke ASD
- 2 Risk-based detection for saunas with SecuriSmoke ASD
- 3 Risk-based detection for plant rooms with SecuriHeat ADW

For more design information, Table 6 below is a list of Securiton industries and application design literature and references describe extensively how to design SecuriSmoke ASD and SecuriHeat ADW can be used to protect other areas commonly found around swimming pools and in indoor recreation centres.

Related Built Environment	Securiton Design Guide/Case Study
Large Halls/Public Assembly	Large Retail Outlets & Malls [24] Large Open Spaces [25]
Infrastructure	EWFD for Cable Pathway Spaces [26] Commercial roof-mounted photovoltaic (PV) systems [27]
Equipment & Object Protection	EWFD for Electrical and IT Cabinet Protection [28] Escalators, Travelators & Elevators [29]

Table 6 List of Securiton application design literature and references

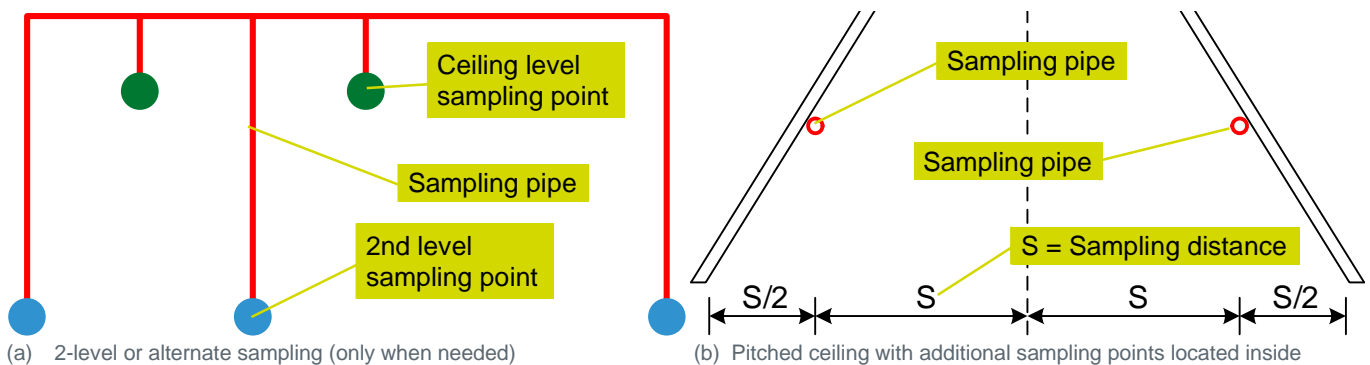
4.3.1 Open indoor pool areas

An indoor pool area can often be considered as a large open space with a ceiling structure that can be sloped, flat or irregular. Exposed ceilings are ceilings with all the structural and MEP² systems left exposed (see Figure 3). These ceiling structures, supported with steel beams and columns, are common for swimming pools. To maximise natural light, transparent roof panels or large wall glass panels are routinely used.

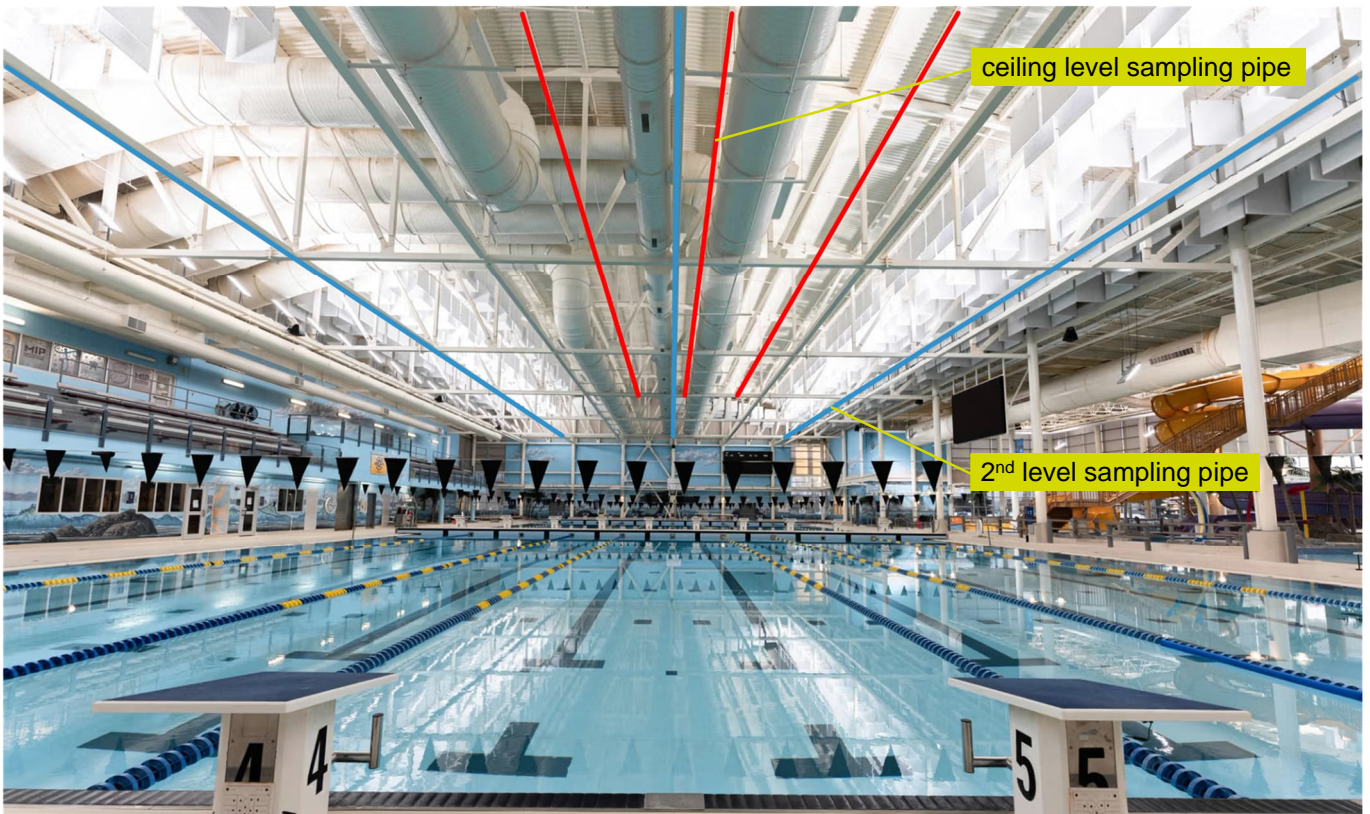
The objective of SecuriSmoke ASD design to effectively provide ceiling level detection in large open spaces is to take into account roof structure, potentially obstructed underside ceiling space, as well as smoke stratification and potential irregular smoke dispersion and propagation inside swimming pool halls in different ambient conditions. Because each ASD sampling hole in effect represents a single point type smoke detector, the key criteria or variables focus on SecuriSmoke ASD design with regards to sampling hole spacing, placement and orientation.

Figure 3 illustrates how SecuriSmoke ASD sampling holes are located under the ceiling or roof structure. The design can be applied to all general roof structures with a flat or slightly sloped ceiling, pitched roof or irregular roof structure, as follows:

- (a) Elevation view of 2-level or alternate sampling (only when needed)
- (b) Pitched ceiling with additional sampling pipes located inside
- (c) ASD pipe layout at ceiling level with exposed ceiling structure underneath the roof steel beams (red). ASD pipe layout for multi-level ceilings and supplementary detection (blue) using one detector unit is possible. In this design example ASD pipes run underneath the roof steel beams while the second level pipes run along lower level construction elements (blue).
- (d) ASD pipe layout at ceiling level (red) and second level sampling pipes underneath the suspended ceiling structure (blue).
- (e) ASD pipe layout at ceiling level (red) and second level sampling capillary heads installed through the suspended ceiling structure (blue).



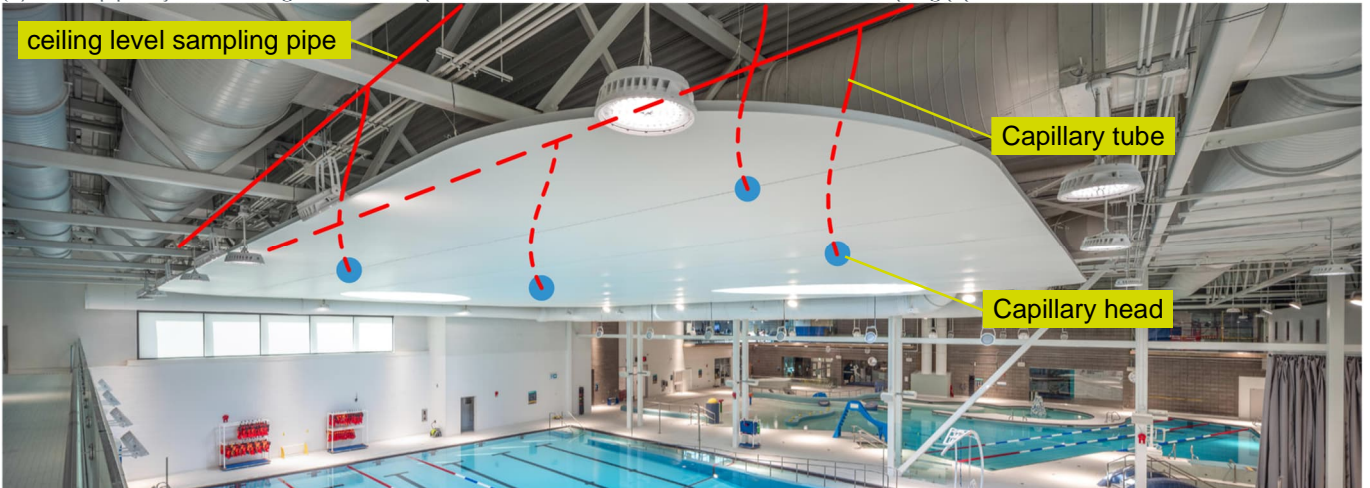
² MEP: Mechanical, Electrical and Plumbing



(c) ASD pipe layout at ceiling level with exposed ceiling structure



(d) ASD pipe layout at ceiling level with suspended roof structure and additional 2nd level sampling pipes



(e) ASD pipe layout at ceiling level with suspended roof structure and 2nd level sampling points (capillary heads)
 Figure 3 Fire detection placement ASD (underside ceiling and supplementary detection schemes)

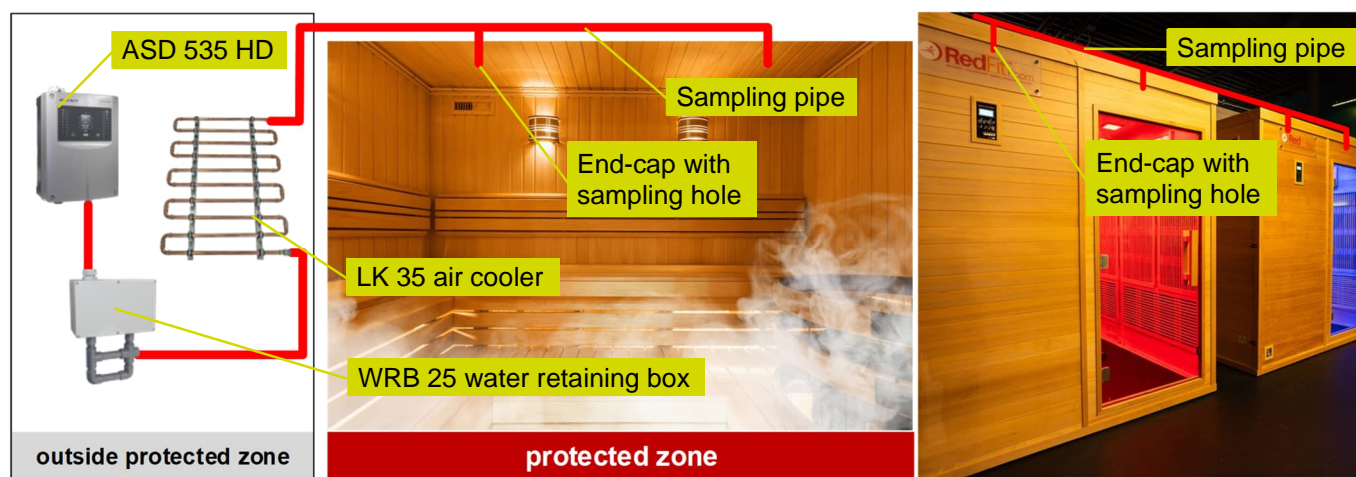
Variable	Design recommendation
Spacing	For ceiling level protection with SecuriSmoke ASD (scenarios described in Figure 3) refer to chapter 4.2 as references for detail design criteria in regards spacing.
Placement	SecuriSmoke ASD pipes can run along the underside of ceilings and/or suspended ceilings for 2 nd level sampling. Alternatively, when the sampling pipe runs above of the suspended ceiling, capillary heads mounted through the suspended ceiling can be used.
Orientation	SecuriSmoke ASD sampling holes to be perpendicular downwards (ceiling level), outwards (vertical).
Corrosive ambient environments	SecuriSmoke ASD products have high Ingress Protection rating (e.g., SecuriSmoke ASD 535HD is IP65), suitable for wet indoor installation in a possibly corrosive environment: <ul style="list-style-type: none"> ▪ Completely sealed sampling air path, separating the sampled air from detector electronics. ▪ Coating of PCBs³ for protection against chemicals, dust, etc. for enhanced long-term reliability of electronic assemblies.

4.3.2 Risk-based local detection: SecuriSmoke ASD

The concept of the risk-based protection method is to detect smoke or heat where it originates and propagates or where the protected areas pose very challenging environmental conditions. In the case of saunas, the ambient environment within them varies greatly in temperature and humidity, with clouds of steam forming during use and temperatures potentially resembling a fire situation from a detection perspective.

Made of wood and often with powerful heaters or even wood-burning stoves operating, saunas pose a clear fire risk in an area where members of the public could easily be disoriented and find evacuation challenging. Thanks to its ability to actively aspirate and detect smoke in very low concentrations, SecuriSmoke ASD is a very capable early warning detection system for such an environment. With suitable accessories such as a cooling section of pipe and a water trap, the HD (Heavy Duty) variant of SecuriSmoke ASD can offer a long service life in such an environment, while reliably discerning steam and other airborne particles from smoke and thereby avoiding false alarms.

Figure 4 illustrates how SecuriSmoke ASD is installed to protect saunas with high humidity, with Securiton's WRB 25 water-retaining box and LK 35 air cooler. The air cooler and water-retaining box should be deployed for both single sauna protection (left) and multiple units (right).



SecuriSmoke ASD with WRB 25 water-retaining box and LK 35 air cooler for single (left) or multiple saunas (right) protection
Figure 4 Aspirated smoke detection design to protect saunas within a leisure centre or wellness area

Table 7 below shows design features and variables such as hole spacing and orientation that should be taken into account. It also summarises the features required for a detection system to function and survive in a high humidity environment such as a sauna or wellness area.

³ PCB: Printed Circuit Board

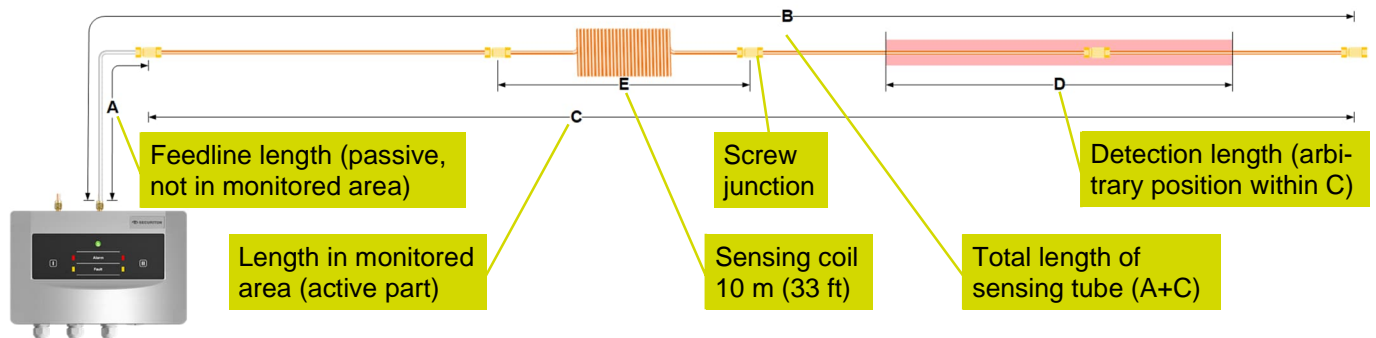
Variable	Design recommendation
Spacing	For ceiling level protection with SecuriSmoke ASD (scenarios described in Figure 4) refer to Chapter 4.2 as references for detail design criteria in regards spacing. Note that even for small size saunas, a minimum of 2 sampling holes is required.
Placement	SecuriSmoke ASD pipes can run along the top of the saunas, connected through the ceiling with a T-piece and an end-cap with a sampling hole drilled perpendicular downwards. Note that the end-cap should be mounted flush with the ceiling underside (inside the sauna) to prevent burns caused by accidental contact.
Orientation	SecuriSmoke ASD sampling holes to be perpendicular downwards.
High temperature environments	As temperatures inside the sauna space can be above the rated operating temperature range of ABS sampling pipes, the use of stainless steel is recommended. For long distance areas where there are number of smaller sauna booths next to one another, a single SecuriSmoke ASD can be applied with one LK 35 air cooler and one WRB 25 water retaining box (see Figure 4 left).

Table 7: Design variables and recommendations for ASD protecting saunas

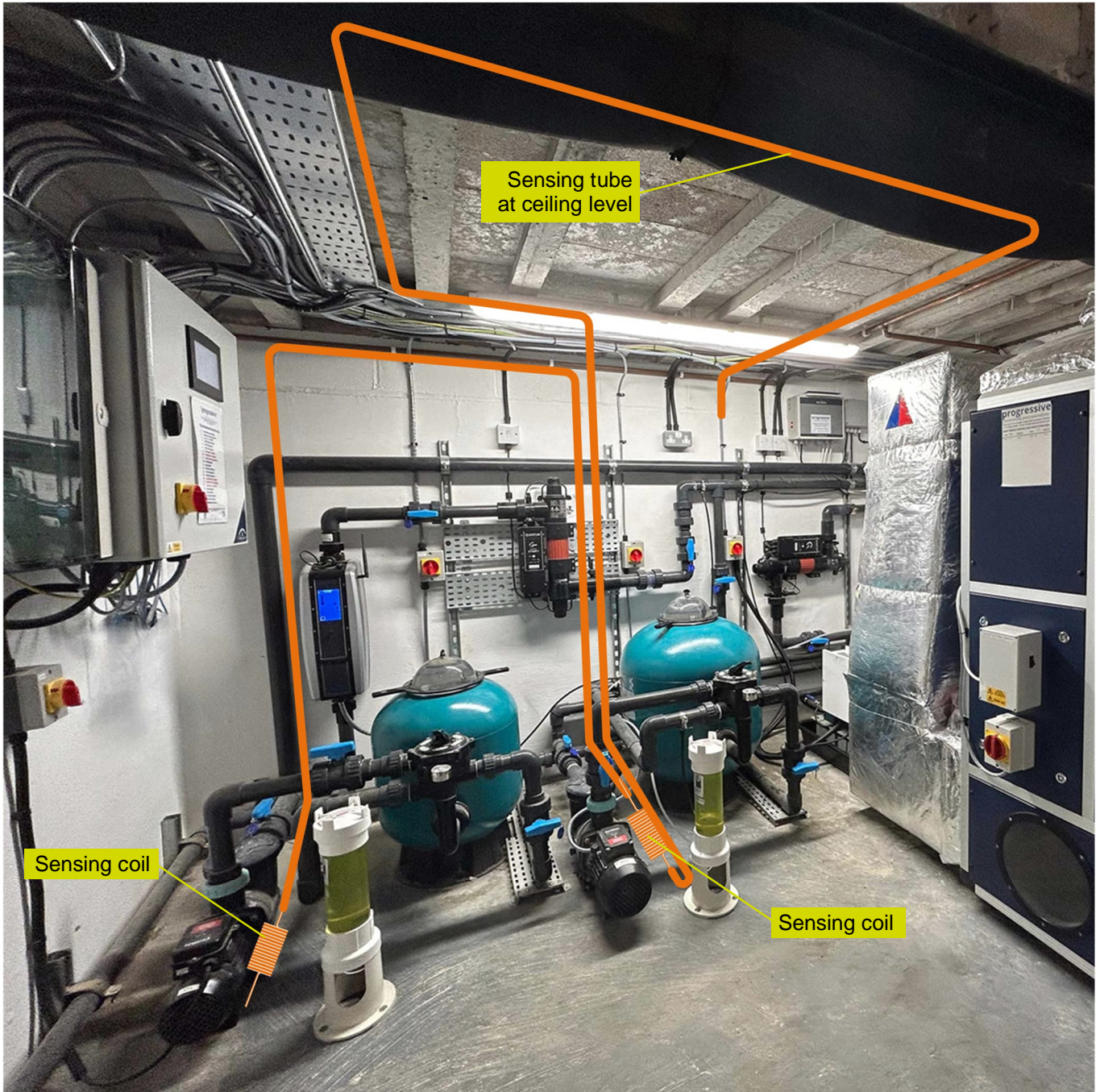
4.3.3 Risk-based local detection: SecuriHeat ADW

Most if not all indoor swimming pools and wellness areas rely on plant rooms for their operation. These will ensure a steady water temperature – in most parts of the world, by heating it – and will also provide pumping power to ensure circulation necessary to keep water clean and sanitary. As well as the boilers and pumps, there may be an element of electrical distribution, typically in an enclosed cabinet. These plant rooms often provide heating and power to all areas of the indoor recreation centre, not just the wet areas.

Pumps, boilers and electrical cabinets represent specific fire hazards and risks, and it is proposed to arrange detection on a risk-based approach. For specific object protection of boilers, heating elements, pumps or motors, SecuriHeat ADW is well suited. It offers a fire alarm per 10 - 200 m (33 - 656 ft) sensing tube length with two zones per detector unit – but sensitivity declines as more tubing is used. This can be compensated for by using sensing coils close to identified fire hazards (see Figure 5 (a)). Figure 5 (b) illustrates fire detection placement of SecuriHeat ADW in a plant room at ceiling level, as well as object protection (e.g. pump motors).



(a) Typical SecuriHeat ADW sensing tube arrangement



(b) Illustration of ADW sensing tube placement in plant room and object protection using sensing coils (pump motors)
 Figure 5: Risk-based detection design for in plant room protection

Additionally, it should be noted that:

- The ADW detector unit can be installed either in the same protected area or outside if a convenient utility area is available.
- In case there is a temperature difference between the protected area (where the sensing tubes are installed) and the mounting location of the SecuriHeat ADW control unit, an external temperature sensor should be installed to compensate for this difference.
- When use SecuriHeat ADW as the only fire detection for code compliance, the area of coverage includes the entire zone in accordance with relevant fire code requirements, such as compartmentation, fire alarm notification or need for fire extinguishing integration.
- Choice of Max-Alarm, Diff-Alarms threshold respectively; Integration Alarm to enable Pre-signal for early alert for rapid local site response.
- When integrating with other building control systems, only Securiton authorised accessories and modules, such as RIM 36, XLM 35 and SIM 35 can be installed.
- To avoid leaks in the sensing tube due to mechanical stress, use a length of flexible Polyamide tube as a feedline between the ADW unit and the sensing tube (see Figure 5 (a)).

4.4 Features and Benefits

Securiton AG as a whole is certified in accordance with ISO standards 9001, 14001 and 45001 and thus meets globally applicable standards with regard to quality management, environmental management, and occupational health and safety management systems. The table below provides a summary of the key benefits of choosing SecuriSmoke ASD and SecuriHeat ADW.

Features	Benefits
SecuriSmoke ASD	
Early and reliable smoke detection	Ensure safe egress for life safety.
ASD unit away from sampling holes	Easy access for services while ensuring operation continuity.
Automatic on-demand fault alarms	Minimal service required, hence low Total Cost of Ownership (TCO).
5-level of alerts and alarms	Enable fully integrated and orderly verify, control and response.
Optimal alarm settings supported with design tool for code compliance	Eliminate false alarms in challenging environments.
Dynamic use of aspirating technology to address unique operating conditions	Consistent detection performance in areas with pressure difference (e.g. in-duct sampling vs. room detection), high or low temperature or humidity.
Use for applications with vapours, fumes and dusty ambient environments	Aspects of SecuriSmoke ASD product design for use in applications with vapours, fumes or dusty ambient environments. It features high IP protection and wide temperature range; a sealed sampling air path that separates sampled air from detector electronics; conformal coatings of PCBs and special coating treatments to connectors and contacts.
Seamlessly integrated with fire alarm system (FAS) and building management system (BMS) components	SecuriSmoke ASD is designed as a key component of a total fire prevention and protection solution.
SecuriHeat ADW	
Copper tubing	Resistant to very harsh conditions, high operating temperature range.
Dynamic Heat Watch algorithm	Elimination of false alarms.
Fully automatic system monitoring	Minimal maintenance.
2-Level of Alarms	Pre-signal: Verify and control (manually initiate the suppression) Alarm: Initiate fire alarm; call fire brigade; initiate suppression.
Seamlessly integrated with fire alarm system (FAS) and building management system (BMS) components	SecuriHeat ADW is designed as a key component of a total fire prevention and protection solution.

4.5 Non-intrusive System Access for ITM

Another advantage of using SecuriSmoke ASD detectors is the non-intrusive access to the system while the protected areas, in this case indoor recreation centres with high occupancy loads and long operating hours, remain in full operation. Examples of relevant codes and standards for fire detection and alarm systems Inspection, Testing and Maintenance (ITM) include ISO 7240-14 [30], NFPA 72 [11], BS 5839 [12] and AS1851 [31]. In general, codes and standards also make references to the manufacturer's design, installation, and operation manual listed with relevant product-type approvals such as UL, EN or FM Approval. Testing methods refer to NFPA 76 [19], FIA CoP [32], or local applicable requirements.

Due to the advanced automatic sealing test and automatic self-test functions of SecuriHeat ADW 535, the detection system is largely maintenance free. However, local codes and standards may require a periodic function check or visual inspection. For a safe execution of the functional test without entering the potentially hazardous area or disrupting operations inside the protected areas, make use of the conveniently located test coil.

Table 8 below is a simplified ITM schedule for SecuriSmoke ASD product services. Refer to Securiton product manuals for more details.

Service Item	Fault/Alarm	Trimestral	Yearly
Cleaning the detector housing exterior (air outlet)	(√) ⁴	?	✓
Cleaning of sampling pipe tube network, accessory parts, airflow sensors	(√)	?	✓
Replacement of dust filters	(√)	✓ ⁵	✓
Cleaning of air flow sensor	(√)	✓ ⁵	✓
Check correct seating (no leakage)	(√)	?	✓
Check of fault and alarm release	✓	?	✓
Update maintenance protocol	✓	?	✓
Analyse event memory	✓	?	✓
Analyse airflow issues (caused by operational changes)	✓	?	✓

Table 8 Typical Inspection, Testing and Maintenance (ITM) schedule for SecuriSmoke ASD

4.6 Support with Peace of Mind

SecuriSmoke ASD and SecuriHeat ADW products are supported by the following range of software tools.

Support for	Support tool
SecuriSmoke ASD	
Design	SecuriSmoke ASD PipeFlow design of air sampling pipe network.
Install and commission	EasyConfig for simple systems. The practical ASD Config software tool is used for more complex systems and application-specific adaptations.
Monitor and manage	ASD PipeFlow and ASD Config. Extensive analysis functions and setting options ensure safe, cost-effective operation of your system.
SecuriHeat ADW	
Design	ADW HeatCalc allows the planning of security systems at a very early stage.
Install and commission	EasyConfig for simple systems. The practical ADW Config software tool is used for more complex systems and application-specific adaptations.
Monitor and manage	ADW HeatCalc and ADW Config. Extensive analysis functions and setting options ensure safe, cost-effective operation of your system.

Applications and design support includes mainly:

- Partner accreditation program.
- Application and field engineering support.
- Worldwide reach through a network of partners as well as subsidiaries and investment companies, with branch offices or local employees around the world.

⁴ ✓ indicates 'shall do'; (√) indicates 'as needed'; ? indicates 'only if required by local codes and standards'

⁵ As per manufacturer recommendation for protected areas with high level of dust present or natural ventilated areas subject to dusty air particulates.

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