SecuriSmoke ASD

EARLY WARNING FIRE DETECTION FOR ESCALATORS, TRAVELATORS & ELEVATORS

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Introduction

Evolution of escalators and elevators

When in 1857 the world's earliest modern 'safety elevator', powered by a steam engine, went into service in New York City, USA, it climbed at a – then staggering – rate of 0.2 m/s (40 ft/min). Since then, technology advanced the development of the modern built environments from residential apartments, shopping malls to skyscrapers became practical for their occupants. The world's biggest elevator, at AngloGold Ashanti's Mponeng Gold Mine in South Africa, drops in three minutes an astonishing 2'283 m (7'490 ft) in its first single descent and then further to 3'597 m (11'800 ft) in a second elevator. Both run at speeds of almost 18 m/s (40 mph). The current world's tallest elevator at 660 m (2'165 ft) in the tallest commercial building, the Kingdom Tower in Saudi Arabia, which stands a full kilometre in height, runs at speeds up to 10 m/s (over 22 mph). The fastest commercial elevator can reach a speed of 20 m/s (44 mph) at the Guangzhou CTF Financial Centre, means it will take just 43 seconds to travel 95 floors up the 440 m (1'444 ft) shaft.

Mixed-occupancies and Separated-occupancies

The first escalator (then known as an incline elevator) was also installed in New York City in 1893. It elevated passengers on a conveyor belt at a 25-degree angle and travelled only a little over 2 m (7 ft). Contrary to faster travel speed for elevators in skyscrapers, escalator speeds are very slow and vary a great deal depending on the use. For instance, those in shopping centres in London tend to run at about 0.5 m/s (100 ft/min), whilst the London Underground standard is 0.75 m/s (150 ft/min). For city metro and transit networks in different countries, the escalator speed can vary from 0.6 m/s up to 0.8 m/s (120 ft/min up to 160 ft/min) at MTR in Hong Kong. But the basic design principle of average waiting time and handling capacity is similar. As such, to compensate for relatively slow-moving escalators in crowded public buildings like metro stations, the length of escalators and travelators is increased. Some of the longest escalators are commonly installed in metro or rapid transit networks. Examples include 138 m (453 ft) in length (69 m (226 ft) of elevation change) in St. Petersburg Metro, Russia, 120 m (400 ft) in length (60 m (200 ft) of elevation change) in Istanbul Metro, Turkey or 112 m (367 ft) in length (53 m (173 ft) of elevation change) in Chongqing Metro, China.

Extensive construction and design standards

Safety of escalators and elevators is paramount. One of the oldest Safety Codes for Elevators, first published in 1921, evolved to be known as ASME A17.1/CSA B44 [1] and A17.7/CSA B44.7 [2]. Similar codes and standards for escalators and elevators for instance EN 81-20/EN 115-1 [3], ISO 8100-32 [4] or AS1735.12 [5] ensure the conformity to health and safety regulations. These codes generally outline the requirements that are associated with the construction and the design of the elevators and also cover installation, testing, inspection, maintenance and the operation of the elevator.

Using elevators and escalators as means of egress

When escalators and elevators are designed within a specific building occupancy, for example large sport stadia or mix-use transportation hubs, building and life safety codes such as NFPA 101 [6], NFPA 5000 [7] and the International Building Code [8] often reference and mandate the use of the A17.1 expert consensus code on elevators. Others such as ABCB Handbook of Lifts Used During Evacuation [9] provide further details on the use of elevators in the event of an emergency evacuation. In the context of building and life safety, the design principle of average waiting time and handling capacity for escalators and elevators is no longer just a comfort factor of the occupants and efficiency for business operation. It is also affecting how early a fire or smoke incident can be detected and the quickest safe egress for orderly evacuation.

Technological and behavioural challenges

When escalators, travelators or elevators are used as part of the egress route, a fire incident starting from these areas can present both technological and behavioural challenges when not detected early. Such challenges are for example, how escalators or elevators should be managed when a fire or smoke incident is detected, how to avoid potential stampede on crowed escalators or how to ensure tenable conditions of these parts of egress routes with the proper control of smoke management systems.

Early Warning Fire Detection of fire or smoke incident from escalators, travelators and elevators

Use of Early Warning Fire Detection is a critical part of best practices of a fire engineering solution to address these challenges. This is particularly relevant as far as safe evacuation of very large numbers of building occupants is concerned. A well-designed and reliable Early Warning Fire Detection system provides risk mitigation to potentially prevent a fire from happening or developing out of control before an orderly evacuation can be put in motion. An early alarm can also facilitate the fire services response well before the situation develops into a life-threatening situation. A suitable fire detection system can also be used to operate the smoke management system and actuate pre-action and co-incidence (or interlock, double interlock) suppression systems.

This Case Study focuses on design recommendations for escalators, travelators and elevators using Securiton advanced Aspirating Smoke Detection (ASD) systems, related fire detectors and their integration with key control elements such as smoke management and fire suppression systems.

Risk, Consequence and Fire Prevention

Early Warning Fire Detection systems help safeguard routes of egress

Escalators, travelators and elevators are essential building components which enhance building occupants' mobility, comfort and movement efficiency. Escalators and travelators are advantageous for moving large amounts of people over long distances at once and elevators are extremely efficient for moving people across greater vertical heights. Such facilities can be found in large public structures such as shopping malls, railway and rapid transit hubs, airports, exhibition centres and tall commercial buildings. The critical importance of evacuating large numbers of occupants, the continued monitoring of tenable conditions within egress routes to safety and ensuring the time required to evacuate before untenable conditions arise, underpin the significant advantages of using an Early Warning Fire Detection system.

Escalators, travelators and elevators as part of the egress route

Escalators and travelators can form part of the egress routes, particularly in places such as underground stations and platforms where routes and passageways to safety above are often limited. The use of elevators for occupants' evacuation is permitted in case where OEE[1] and OEO[2] protocols for emergency evacuation are provided and these protocols are in line with local jurisdiction and codes and standards in force, such as the International Building Code [8].

Avoiding panic is a key risk management strategy

On the other hand, potential fire risks from the escalators, travelators and elevators themselves are real, due to the constant moving of mechanical parts with oily dirt build-up over time and potential motor overheating that can lead to a smoke and fire event. Although the overall risk of fatality from such a fire is low in these environments, the key risk management strategy is to avoid crowd panic and stampede. A potential fire or smoke incident resulting from overheating underneath an escalator or from within an elevator shaft may not be immediately deadly but can lead to panicking if not detected and managed early. A fire in these areas not detected early can render routes of egress untenable, thus pose a threat to life safety. SecuriSmoke ASD is an ideal solution for early detection of a fire in such challenging operational environments.

Fire Safety

Fire safety system design incorporates Early Warning Fire Detection to achieve two objectives:

1. Early and reliable fire alarm to ensure safe evacuation when required safe egress time (RSET) is minimised and the available safe egress time (ASET) is maximised.
2. Avoid operation interruptions and potential losses due to fire damage.

Figure 1 illustrates these two key aspects.

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[1] OEE: Occupant Evacuation Elevator
[2] OEO: Occupant Evacuation Operation

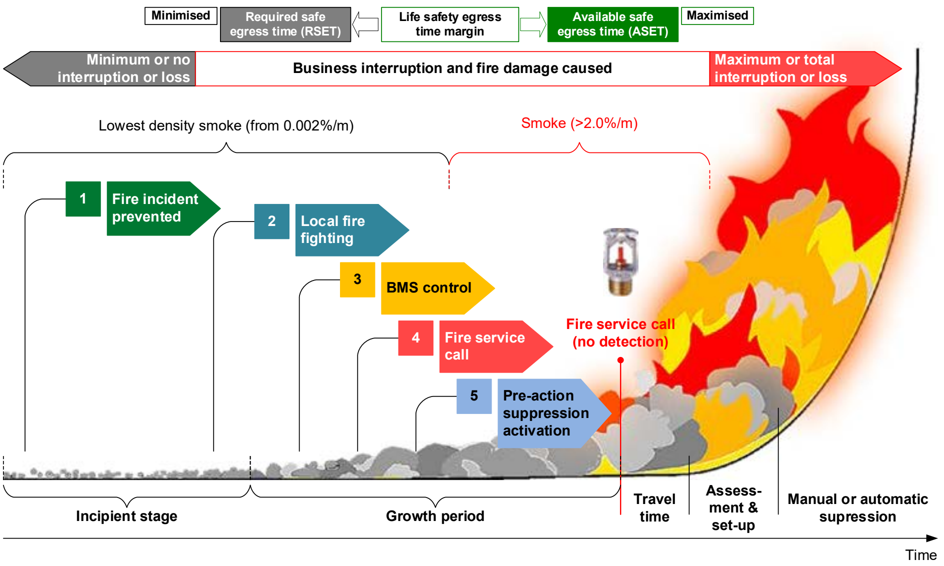


Figure 1 Fire safety system design incorporating Early Warning Fire Detection

Quantitative requirements to achieve objectives of both life and building safety

Apart from building and life safety codes and standards, quantitative requirements of egress paths and time to safe evacuation are required in large and often mix-use occupancies such as railway and rapid transit hubs. NFPA 130 [10] for example, stipulates the maximum time allowed to evacuate a platform (e.g. 4 min) and then to a point of safety (e.g. 6 min). The required safety evacuation time is calculated based on egress route options, air ventilation operation and escalators movement control against maximum travel distance to an exit from a platform with designed occupancy load.

Fire can cause deaths unacceptable loss and downtimes

While King's Cross underground fire on 18 November 1987, killing 31 people and injuring 100, is one of the worst fires started from underneath the escalators, other small fire or smoke incidents involving escalators and elevator shafts are not uncommon. Furthermore, false alarms from fire detectors are unwanted in protected areas as they can present risks to life safety from panicking. All this leads to an unacceptable extended service downtime to customers and direct and consequential losses in revenue and productivity as a whole.

Delayed detection of fire incidents can lead to life threatening situations

Faults in high-current electrical equipment with large amounts of equipment and cabling installed in compact spaces or concealed areas such as underneath the escalators and travelators, or inside the elevator shafts present significant risks of fires. Lint and oil build-up inside these spaces can lead to friction fires caused by mechanical equipment failure. Unnoticed incipient fires in enclosed spaces increase the risk of a much-delayed emergency evacuation. In the case of escalators, travelators and elevators, such a risk of delayed detection can lead to life threatening situations, in particular when egress routes become untenable for evacuation.

Challenges to Early Detection

Balance of early with reliable detection

Statistically, the collective risks to operation interruption, property damage and life loss due to fire incidents remains a real threat across large public gathering places such as transit hubs, airports, sports stadia, office buildings and shopping malls. While providing early detection of smoke or fire in and around escalators, travelators and elevators is critically important, the reliability of such an early detection and its effectiveness in combination with other building control systems can be reduced due to challenges in the environmental conditions within the protected space:

- Dust, lint, oil grease build-up over time and vapours from abrasive wear
- Irregular airflow pattern from piston effect in pressurised elevator shafts or turbulent flow under an escalator with fast air circulation

- Escalators can be indoor, semi outdoor or outdoor, hence exposed to a wide range of temperature and change of other ambient conditions
- Hot smoke from a building fire propagating into elevator shafts, or concealed spaces underneath escalators or travelators can become a source of ignition
- Actuation of other building or fire protection systems, such as a smoke management or fire suppression systems, depend on a timely and reliable detection to be effective

Non-intrusive access and minimal maintenance requirements are key to low TCO

Obstructed or difficult access is always a challenge when using conventional smoke detectors. In addition, because escalators, travelators and elevators are important building elements to ensure continuous efficient and orderly movement of people and goods, unnecessary operation interruptions are highly undesirable and must be avoided. The frequency of the maintenance regime and the need to access a fire detection system are also important considerations. Non-intrusive access and low maintenance requirements of a fire detection system can keep TCO[3] low.

Range of product variants optimise cost and detection performance

Escalators, travelators and elevators come in various sizes and are installed in different configurations. Wider choices of fire detection system variants can ensure that both design and cost of the fire detection system are optimised while consistent detection performance is achieved.

Risk and Performance-based design quantify impact on safety when using Early Warning Fire Detection

Codes and standards may not prescribe how exactly a smoke detection system is designed for escalators, travelators and elevators. When Performance-based design (PBD) is applied to assess life and building safety, fire detection performance needs to be quantified, from alert, alarm, initiating an evacuation procedures, to controlling of other building systems and actuation of suppression systems.

With a risk management process in place, risks of a fire in areas unique to the use of the building or the characteristics of building equipment can be identified. Specific yet flexible fire detection system design needs to be applied to always allow for dependable detection at the right level of detection sensitivity. In this context, how to quantify a fire detection system remains a challenge.

Code Compliance and Optimal Design

Risk and Performance-based Design are key to safe evacuation and mitigate issues affecting uninterrupted business operation

Fire engineering professionals work within the prescriptive constraints of applicable building codes and standards such as NFPA 101 [6] and the International Building Code [8] while applying the best engineering practices to address industry and building occupancies specific needs[4]. In particular, the risks and uninterrupted business operation requirements together with critical safe egress of high numbers of occupants in and around large public spaces shall be adequately addressed. In this regard, Performance-based Design (PBD) together with a risk-based approach to the optimisation of fire detection, fire protection and human interaction to supplement prescriptive baseline design, is the key to meeting the requirements for building and life safety as well as risk management for instance described in NFPA 551 [11], ISO 16732-1 [12] and BS 9992 [13], as well as applicable local AHJ's directives.

PBD is typically implemented when elements of fire safety and protection system design are not covered in the prescriptive codes, among others due to unique building structures, environmental conditions, added detection for early warning or extended egress considerations. With reference to internationally recognised

[3] Total Cost of Ownership

[4] Each country or state/province might have its own (or adopted) building and fire code or directives. Examples are the Muster-Verwaltungsvorschrift Technische Baubestimmungen (MVV TB) in Germany, The Regulatory Reform (Fire Safety) Order 2005 in the UK and National Building Code of India 2016.

guidelines such as SFPE Engineering Guide [14], a PBD approach is commonly adopted for either of the following:

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

Table 1 illustrates how Early Warning Fire Detection system performance, as well as the fire safety goals and objectives are defined.

Table 1 Similarity in Early Warning Fire Detection definitions

VEWFD/EWFD

Sensitivity	BS/EN 54-20#1 [15]	NFPA 76 [16]
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 0.656%/m (0.2%/ft), alarm of 3.28%/m (1.0%/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.	Systems that use fire detection-initiating devices to achieve certain life safety and property protection, in accordance with applicable standards such as NFPA 72.

#1: ISO 7240-20 [17] and AS 7240-20 [18] are derived from BS/EN 54-20 [15].

This Case Study focuses on Securiton Early Warning Fire Detection (SecuriSmoke ASD and REK portfolio) systems.

Table 2 SecuriSmoke ASD and REK products

Model	Key performance parameters #1					
EN 54-20 sensitivity	Total # of holes (Class)			Aggregated pipe length (m)		
	A	B	C	A	B	C
SecuriSmoke ASD 531	6	8	12	75		
SecuriSmoke ASD 532	8	12	16	120		
SecuriSmoke ASD 533	16	50	50	200		
SecuriSmoke ASD 535-1/3	18	56	120	300		
SecuriSmoke ASD 535-2/4	36	112	240	2 x 300		
SecuriSmoke 535 HD	36	112	240	2 x 300		
REK 511-1S	1.2% obs/m (0.366% obs/ft)			Point type addressability for sampling holes located downstream to REK		
REK 511-3S	0.3% obs/m (0.091% obs/ft)					
Rating	IP54 (IP66 for SecuriSmoke ASD 535 HD)					

#1: Highlight performance parameters as per EN54-20 Approvals

Application Scenarios

A wide range of products is advantageous

When combining Performance-based Design (PBD), together with the prescriptive and risk-based approaches to design a fit-for-purpose fire detection system for escalators, travelators and elevators, selecting advanced SecuriSmoke ASD detection products is important.

SecuriSmoke ASD products allow for a fully flexible design with quantifiable and reliable detection performance. Advantages include a wide range of models, the maximum number of sampling (detection) holes with each sensitivity class, long aggregated pipe length, 5-levels of staged responses and signal interfaces to suppression, and BMS components. In addition, they offer pinpoint high sensitivity addressable detection when incorporating REK in-line smoke detectors.

Design Criteria

Key terminologies

The use of an Early Warning Fire Detection system represents significant advantages over other conventional detection methods. Proper design of an Early Warning Fire Detection system for specific fire risk mitigation is of fundamental importance to ensure operation continuity and to prevent property loss, paired with enhanced life safety for building occupants. While there are practical difficulties in choosing suitable detection products, SecuriSmoke ASD and REK Early Warning Fire Detection systems address all the key challenges in order to deliver early and reliable fire detection for escalators, travelators and elevators.

Key design criteria

Table 3 Key design criteria (SecuriSmoke ASD)

Model	**Key design criteria**		
NFPA/FM Global [19]	VEWFD	EWFD	SFD[#1]
Hole sensitivity	3.28% obs/m (1.0% obs/ft)	4.92% obs/m (1.5% obs/ft)	Point type over number of holes
Hole coverage	18.6 m^2 (200 ft^2)	37.2 m^2 (400 ft^2)	83.6 m^2 (900 ft^2)
Transport time	<60 sec	<90 sec	<120 sec
EN/AS/ISO/BS	Class A	Class B	Class C[#1]
Hole sensitivity[#2]	0.4% obs/m (0.12% obs/ft)	1.16% obs/m (0.35% obs/ft)	6.67% obs/m (2.0% obs/ft)
Hole coverage[#3]	15-25 m^2 (166-269 ft^2)	25-35 m^2 (269-388 ft^2)	Up to 7.5 m (25 ft) radius
Transport time[#4]	<60 sec	<90 sec	<120 sec
Reaction time[#5]	<60 sec	<60 sec	<60 sec

#1: SFD/Class C refer to point type detectors, usually tested to an alarm sensitivity of 2.0 dB/m (36.9% obs/m (11.247% obs/ft)).

#2: For Securiton ASD products. Individual hole sensitivity can be determined using SecuriSmoke ASD Pipe Flow design tool.

#3: Hole spacing is more a mixture of Deemed-to-Satisfy DtS (per point type detectors in BS 5839-1 [20] or VdS 2095 [21]) and PBD (BS 6266 [22], FIA Code of Practice [23] or VdS 2095 Appendices) provisions with adjustments based on airflow and design to required sensitivity Class A, B or C.

#4: Transport Time of AS7240-20 [18] conformed Class A, B and C are 60 sec, 90 sec and 120 sec respectively per the AS1670-1 [24].

#5: Reaction Time of 60 sec after End of Test EOT refers to EN54-20 test requirements for relevant tests to Class A, B or C sensitivity.

Key design variables

The key SecuriSmoke ASD design variables predominantly focus on:

1. Sampling hole spacing
2. Sampling hole placement
3. Sampling hole orientation

Risk-based Detection Design Schemes

Detection part of routes of egress

Due to the critical importance of evacuating large numbers of building occupants from crowded transit hubs, large commercial buildings or shopping malls, continued monitoring of the condition of routes of egress to safety and ensuring the time required to evacuate before untenable conditions arise, underpin the significant advantage of using an Early Warning Fire Detection system.

Figure 2 and Figure 3 illustrate examples of SecuriSmoke ASD detector use in escalators, travelators and elevators.

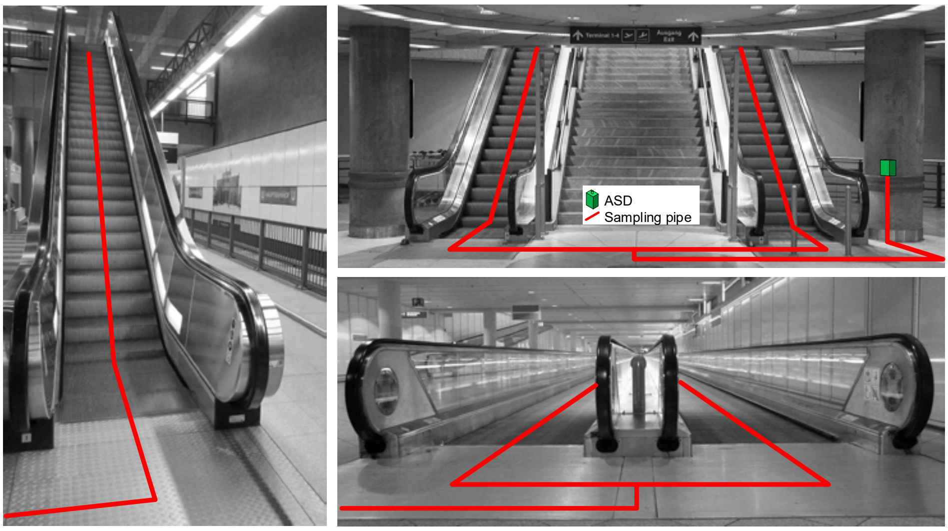


Figure 2 Fire detection placement (escalators and travelators)

Escalators and travelators detection

SecuriSmoke ASD units can be conveniently located inside a MEP[5] service columns near protected escalators or travelators, or in adjacent equipment rooms without the need to interrupt operation for ITM[6] tasks (see Figure 2 top right).

Sampling Holes

Variable	Design recommendation (SecuriSmoke)
Spacing	Generally, 1.5 m (5.0 ft)
Placement	(i) Simple I-shape pipe for a single escalator or travelator (ii) U-shape pipes for double escalators or travelators with one pipe along centre line of each escalator or travelator
Orientation	Downward or 90° inward to the centre line

Use of SecuriSmoke Accessories

Accessory	Description
DFU 911	Dust filter unit increases the service life of the smoke sensors used in the ASD and greatly reduces the likelihood of false alarms
ADB 500	automatic blow-out device 1 sampling pipe is automatically blown out and cleaned, to prevent fault messages caused by clogged aspiration points and to avoid false alarms
ASD Housing Ex	IP54 Steel used to protect the ASD from unauthorised manipulation in case it is installed in locations accessible to the general public

[5] MEP: Mechanical, Electrical and Plumbing
[6] ITM: Inspection, Test and Maintenance

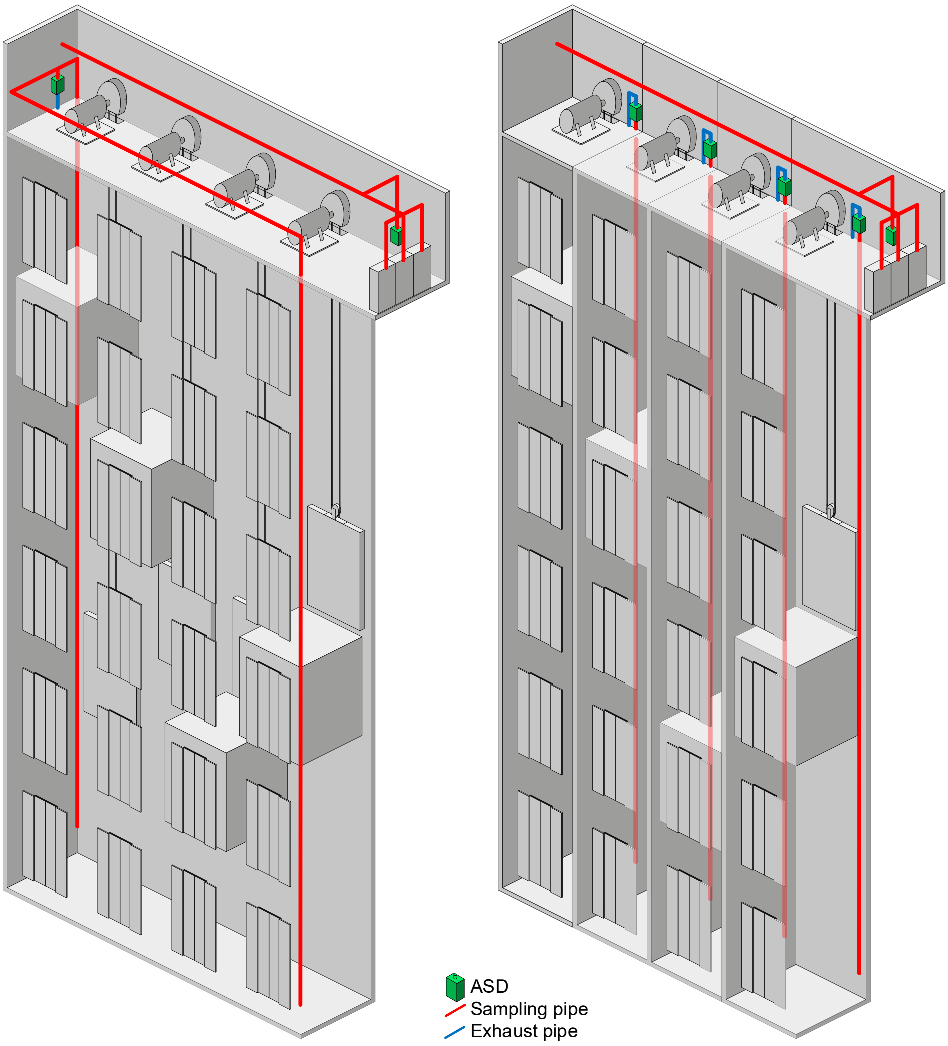


Figure 3: Fire detection placement (elevators with one large or individual shafts)

Elevator shaft detection

SecuriSmoke ASD units can be conveniently located in the elevator machine room without the need to access the shaft for ITM tasks. Figure 3 illustrates:

- Left: One SecuriSmoke ASD detector with to pipes for large shafts and one for machine room an in-cabinet protection
- Right: One SecuriSmoke ASD detector per individual shaft and one for machine room and in-cabinet protection

Sampling holes

Variable	Design recommendation (SecuriSmoke)
Spacing	Up to 4.0 m (13.0 ft)
Placement	(i) 1 or 2 vertical pipes (depending on the size of the cross section area of elevator shaft/hoistway, see also Hole Coverage in Table 3) from top down, position pipes diagonally opposite to each other; (ii) Exhaust pipes (in blue see Figure 3) to be installed inside the shaft to compensate pressure fluctuation when the elevator is in operation. The exhaust pipe is best designed in using the SecuriSmoke ASD PipeFlow tool. This way its length is factored into the total system design and therefore not critical.
Orientation	Perpendicular sideways to the run of sampling pipes

Accessory	Description
DFU 911	Dust filter unit increases the service life of the smoke sensors used in the ASD and greatly reduces the likelihood of false alarms
ADB 500	automatic blow-out device 1 sampling pipe is automatically blown out and cleaned, to prevent fault messages caused by clogged aspiration points and to avoid false alarms
ASD Housing Ex	IP54 Steel used to protect the ASD from unauthorised manipulation in case it is installed in locations accessibly to the general public

Refer to selected Securiton Aspirating Smoke Detector Technical Description manual for accessory selection and application design details [25].

Use of SecuriSmoke Accessories

Prevent False Alarms

Prevent false alarms

Up to 62% of calls to emergency services from transit systems in London were false alarms [26]. Any operation interruption to the metro and transit system due to a real fire event or false or nuisance alarms could present risks to life safety, but also lead to an unacceptable extended service downtime to passengers and direct and consequential losses in revenue and productivity as a whole.

False alarms, when not verified, will not only interrupt transit system operation, inconvenience the public and slow down productivity, but also potentially lead to unwarranted emergency evacuation, particularly troublesome during the peak hours of operation. Key attributes of preventing false alarms when using Securiton SecuriSmoke ASD products are:

- 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)
- Suitable accessories to keep the sampling pipe network clean to prevent fault messages and ensure the overall performance of the SecuriSmoke ASD for example the dust filter unit DFU 911 or the automatic blow-out device ADB 500 (see above)

Securiton 360° Fire Protection Solution

SecuriFire Fire Alarm Systems (FAS)

Securiton 360° Fire Protection Solution is built on its advanced Securiton Fire Alarm Systems (FAS). SecuriFire is not just reliable in operation with its modular, decentralised system architecture, it is also versatile and expandable to cater for current and future needs to connect all approved fire safety devices such as signalling, alarming, display and control units.

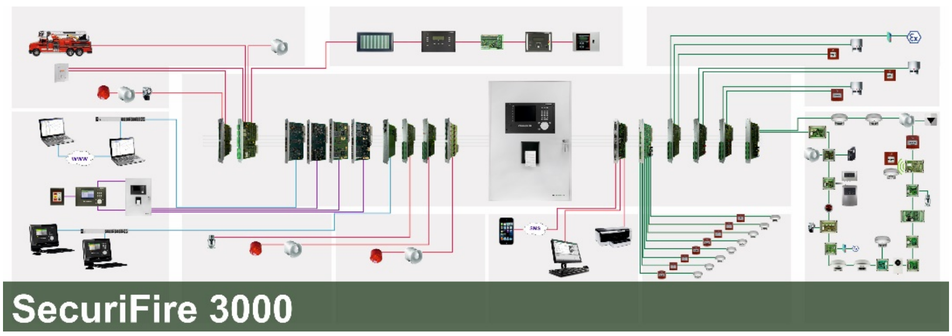


Figure 4 Securiton 360° Fire Protection Solution (FACP and Connections)

Remote or local monitoring

SecuriSmoke ASD detectors are networked through RS485 or Ethernet (TCP/IP). The networked detectors from one or multiple sites can be centrally monitored and managed from a remote location, such as an on-site control room or any authorised off-site location or certified remote monitoring centre.

Manage with Securiton UMS or via a BMS

In general, two methods to monitor and manage ASD detectors apply:

1. Use Securiton UMS[7] software to manage SecuriSmoke ASD detectors independently networked and connected to the UMS or connected via SecuriLine to a FAS of the SecuriFire family which in turn is connected to the UMS.
2. Manage SecuriSmoke ASD detectors through an enterprise BMS software.

Integrated Verify, Control and Respond

SecuriSmoke ASD integrated verify, control and respond

One of the advantages of using SecuriSmoke ASD detectors is the five levels of alerts ('Pre-signal1', 'Pre-signal2', 'Pre-signal3') and alarm signals ('Alarm', 'Alarm2'). These alarm signals can be used for power-down and building system control, detection and suppression actuation.

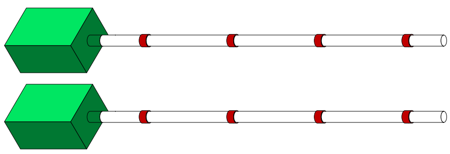
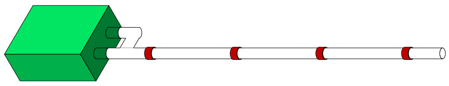
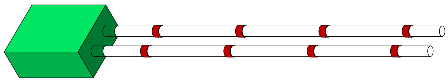
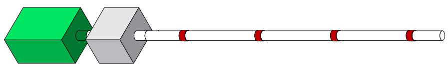
Table 4 Typical use of SecuriSmoke ASD multilevel alarms

Level	Signal	Typical use
1	Pre-signal1	Verify and control (manual extinguishing as needed)
2	Pre-signal2	Manual shutdown of HVAC operation to affected areas if required; call emergency team
3	Pre-signal3	Auto shutdown of HVAC and related BMS; Initiate smoke and fire management and other related processes (e.g. voice alarms and escalators/travelators movement) evacuate the site
4	Alarm	Actuate clean agent suppression; initiate fire alarm; call fire brigade
5	Alarm2	Actuate pre-action sprinkler

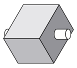
SecuriSmoke ASD integrated suppression

Regardless where and what type of suppression systems are installed, a suitable smoke detection system such as SecuriSmoke ASD is required to either actuate the related suppression zones or allow for a timely intervention to prevent the need for suppression. When configured for automatic actuation and release schemes, SecuriSmoke ASD 'Alarm' or 'Alarm2' alarm signals alone or together with alarms from other fire detectors can be applied.

Table 5 SecuriSmoke ASD and REK for control and suppression actuation

Scheme	Illustration	Remark
A		2 x SecuriSmoke ASD 531, 532, 533 for full redundancy or cross zone coincidence design
B		Single SecuriSmoke ASD 535-2/4 with one set of pipe network
C		Single SecuriSmoke ASD 535-2/4 with two independent pipe network
D		Use REK in place of 2nd ASD in Scheme A, or localised suppression

[7] UMS: Universal Management System

Scheme	Illustration	Remark
E	Scheme A, B or C + 	Any of SecuriSmoke ASD with REK
F	 + 	Combination of Optical Smoke Switches ORS, localised suppression
G	Scheme A to F + SecuriHeat d-LIST	Combine with SecuriHeat Line Type Heat Detection

Non-intrusive System Access for ITM

Non-intrusive system access

Another advantage of using SecuriSmoke ASD detectors is the non-intrusive access to the system while the protected areas, which can be public areas with high people traffic, restricted areas due to electrical or chemical hazards or high security areas, remain in full operation. When fire detection systems are used to protect escalators, travelators or elevators which commonly require to meet uninterrupted high traffic movement with long operation periods in places like busy shopping malls, packed metro stations and 24/7 operation airport terminals, non-intrusive access to the fire detection system for ITM tasks is an important design consideration.

SecuriSmoke ASD units can be conveniently located inside a MEP[8] service column near protected escalators or travelators, or in elevator machine rooms without the need to access the shaft (see Figure 2 and Figure 3).

Low-cost & efficient ongoing Inspection, Testing and Maintenance

Codes and standards for fire detection and alarm systems Inspection, Testing and Maintenance, such as ISO 7240-14 [27], BS 5839-1 [20], AS1851 [28] and NFPA 72 [29], also refer to the manufacturer's design, installation and operation manuals. Testing methods refer to FIA CoP, NFPA 76 or local applicable requirements.

Table 6 Typical Inspection, Testing and Maintenance (ITM) Schedule

Service Item	Fault/ Alarm	Trimestrial	Yearly
Cleaning the detector housing exterior (air outlet)	(✓)	?	✓
Cleaning of sampling pipe tube network, accessory parts, airflow sensors	(✓)	?	✓
Replacement of dust filters	(✓)	✓#1	✓
Cleaning of air flow sensor	(✓)	✓#1	✓
Check correct seating (no leakage)	(✓)	?	✓
Check of fault and alarm release	✓	?	✓
Update maintenance protocol	✓	?	✓
Analyse event memory	✓	?	✓
Analyse airflow issues (caused by operational changes)	✓	?	✓

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

#1: As per manufacturer recommendation for maintenance areas where high level of dust presents, areas such as underneath the escalators/travelators or semi-enclosed areas subject to dusty air particulates [30].

[8] MEP: Mechanical, Electrical and Plumbing

Expect the best from SecuriSmoke ASD

Securiton 50+ years of ASD development with unparalleled global QA/QC systems

Since the first ASD product launch in 1970, decades of research and development knowledge and the experience gained from thousands of installed systems led to this impressive success story. Aspirating smoke detectors from Securiton are among the most precise and reliable early warning systems against fires.

Developed in Switzerland and manufactured in Germany, 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.

Benefits of SecuriSmoke ASD

Benefits of Early Warning Fire Detection

Benefits of SecuriSmoke ASD for escalators, travelators and elevators protection:

Features	Benefits
Early and reliable smoke detection	Ensure safe egress for life safety
ASD unit away from sampling pipes	Easy access for services while ensure 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, high or low temperature or humidity
Seamless integration 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

Support with Peace of Mind

Software tools

Software tools to support the design and maintain SecuriSmoke ASD include:

- SecuriSmoke ASD PipeFlow for design of air sampling pipe network
- SecuriSmoke ASD Config for on-site configuration, commissioning and ongoing ITM

Application support

Application 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 in Mexico, Brazil, Russia, India, Malaysia and China

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