NATIONAL TRANSPORTATION SAFETY BOARD
Investigative Hearing
Washington Metropolitan Area Transit Authority Metrorail train 302 that encountered heavy smoke in the tunnel between the L'Enfant Plaza Station and the Potomac River Bridge on January 12, 2015

GROUP	H
EXHIBIT	
34	

Agency / Organization

Washington Metropolitan Area Transit Authority

Title

Smoke Detection Feasibility Report
August 31, 2015

Technical Report

Installation of Smoke Detection in WMATA Underground

August 31, 2015

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Installation of Smoke Detection in WMATA Underground

Abstract

WMATA recently experienced a severe smoke incident inside one of our tunnels along the underground. CENI-COM has been tasked to research smoke detection technology and recommend a smoke detection system for installation in the underground.

Introduction

This report shall identify the different technologies available for smoke detection. Each technology shall be evaluated for installation in the WMATA underground. The advantages and disadvantages for each technology are briefly discussed. Suppliers of each different type of technology are identified. Finally, budgetary pricing and a draft installation schedule are provided for acceptable smoke detection technologies.

Smoke Detection Technologies

Evaluation Criteria

As a minimum, the smoke detection system must be able to reliably detect smoke and report the presence of smoke within a very short time period. The smoke detection technology must not generate false alarms due to contaminants (such as brake dust) or due to train motion. Installation of the system must require minimal track access time and support a very short deployment schedule. The system must function reliably with preventative maintenance intervals of less than twice per year. The system must physically connect to the WMATA communication infrastructure. The system must software integrate with an existing WMATA reporting system such as the Edwards EST3 fire alarm system, the CNL PSIM in the SOCC, or the AIM SCADA system in ROCC.

System Maintenance Requirements

Any smoke detection technology deployed in the WMATA underground will be considered a Life Safety system. As such it will be required to comply with the maintenance documentation requirements of NFPA 72. Therefore, maintenance resources (including personnel, spares, and training) must be allocated for scheduled periodic maintenance and unscheduled maintenance activities prior to system installation.

Industry Outreach

CENI-COM contacted representatives from transit agencies in New York, Chicago, San Francisco, and Pittsburgh, as well as several non-affiliated tunnel ventilation design engineers at AECOM. In discussions with these agencies, WMATA asked whether or not smoke detection in tunnels was part of their tunnel ventilation system design. The non-affiliated designers were asked whether or not any system they have been involved in, or aware of, utilized smoke detection as an intelligent part of the tunnel ventilation system. In all cases, smoke detection was not installed in the tunnels. All parties questioned cited a lack of research into the subject, but noted that the dirt and dust in their tunnels and difficulty of maintenance and installation would be a concern. The subway system in Pittsburgh does integrate smoke detectors in their stations into their emergency ventilation system. No agencies indicated they actually investigated their options when their systems were installed, let alone researched modern components and systems available today. Contact and discussion with additional transit agencies is ongoing. Due to lack of research and of comparable installations WMATA would be taking pioneering steps in the industry by installing intelligent tunnel ventilation utilizing smoke detection in the tunnels.

Available Technologies

There are several different technologies available for smoke detection. However, not all smoke detection technologies are a good fit for installation in the WMATA underground. Smoke detection technologies which were investigated by CENI-COM include:

- Standard Point Smoke Detectors – Ionization and Photoelectric
- Optical Beam Smoke Detectors
- Aspirating Smoke Detectors
- Video Analytic Smoke Detectors
- Hybrid Approach of Different Technologies

Standard Point Smoke Detectors – Ionization and Photoelectric

The two most common forms of point smoke detectors are the ionization smoke detectors and the photoelectric smoke detectors. Both the standard ionization and the photoelectric point smoke detectors generate an alarm when smoke disrupts a steady state condition inside the smoke detector. Past experience has shown that brake dust (which is found in the WMATA underground) would cause this type of smoke detection technology to generate a large amount of false alarm and suffer a high failure rate. To minimize the false alarm rates, a significant amount of maintenance would be required. It is estimated that these sensors would need to be cleaned every three months. Additionally, since this type of smoke detection has a very small coverage area a very large amount of smoke detectors would need to be installed.

It was determined that this type of smoke detection technology would NOT WORK in the WMATA underground because this technology would have unacceptably high false alarm rates. Additionally, time intervals between maintenance actions would be very short, and maintenance on the sensors would be very labor intensive thus placing a very high demand on maintenance resources. Lastly, there is no visual confirmation of the smoke alarm.

No estimate or schedule was developed for this smoke detection technology.

Optical Beam Smoke Detectors

Optical beam smoke detectors generate an alarm when a beam of light (UV and/or IR) which is projected across a large area is blocked be the presence of smoke. Optical beam detectors generate false alarms when there is a buildup of dirt or debris on the receiver or when the alignment is disrupted. The piston action and vibrations generated by train movement in the WMATA underground would negatively impact the stability of the receiver and the brake dust would quickly foul the sensor if constant maintenance was not performed. This in turn would have an adverse impact on the reliable operation of the Optical Beam Smoke Detector.

It was determined that this type of smoke detection technology would NOT WORK in the WMATA underground because this technology would have unacceptably high false alarm rates, the maintenance on the sensors would be very intensive and place a very high demand on maintenance resources, and there is no visual confirmation of the smoke alarm.

No estimate or schedule was developed for this smoke detection technology.

Aspirating Smoke Detectors

Aspirating Smoke Detectors (ASD) generate an alarm by drawing air through a network of pipes into a sampling chamber where a nephelometer detects the presence of smoke particles. The nephelometer has the ability to differentiate smoke from dust. On many of these units, the air inlet is protected by a filter that removes any contaminants or dust. In addition to the filter, many of these units provide some type of self-cleaning operations and fault monitoring. However, these units will still require maintenance on a semi-annual basis.

A typical design for ASDs installed in WMATA underground is shown in Figure No.1. Each ASD Control unit would be provided with four sampling tubes and the control unit would be mounted inside most vent and fan shafts. Locating the control unit inside the shafts will allow most scheduled and unscheduled maintenance to be performed at any time during the day and not require track access. Additionally, locating the control unit in the shafts would help contain the installation costs.

In each tunnel bore, two sample tubes would be installed along about 50 feet of track. One sample tube would sample the air upstream of the shaft and the other would sample the air downstream of the shaft. This configuration would allow the line operators (or the control system in the future) to know if the smoke is generated upstream or downstream of the shaft on Track I or Track 2.

In the short term, the status of these alarms would be reported to ROCC via the existing Edwards EST3 fire alarm system installed in all stations and shafts. If desired, this information could be integrated with the AIM ROCC software and/or the SOCC PSIM software.

In the long term, it is planned to extend connectivity to the entire collection of fan and vent shafts. Once this connectivity is available in the shafts, the ASD Control units would be attached to this network switch and additional data from the ASD Control Unit could be collected. This additional data would take the form of additional diagnostic/status information or could (with the purchase of the optional software upgrade) augment the PROTECT Chemical warning system.

The advantages of using ASD technology is that these sensors can reject brake dust, can alarm on smoke very fast (even before it is visible), and can augment the PROTECT sensors by detecting hazardous chemicals. The disadvantage of using ASD technology is that the sampling tubes would need to be installed along the ROW thus increasing installation cost since track access must be requested. Since these sensors use filters, periodic maintenance (estimated at twice per year) would be required on each ASD control unit. Lastly, no visual confirmation of the smoke alarm would be possible using ASD alone.

There are XX fan shafts and YY vent shafts in the WMATA underground.

A cost estimate and preliminary schedule to install ASDs in the WMATA underground is included Appendix B. The additional manpower that would be required to maintain this system is also included with the estimate.

Suppliers of ASDs system include VESDA by Xtralis and FAAST XT by Sensor System. Data sheets are provided in Appendix B.

Video Analytic Smoke Detectors

Video Analytic Smoke Detectors generate an alarm by running software algorithms against pixel images captured by video cameras. Video analytics can be either server based or camera based. Some video analytics can use the existing security cameras and some require the installation of cameras specifically installed for smoke detection.

In the short term, a typical design for Video Analytic Smoke Detector would be to use existing security cameras which are already installed in each underground station. The theory is that the piston action of

the train would push (or suck) smoke from the tunnels into the station platforms. The cameras installed in the underground station focused on the end of platform would see the smoke when the train's piston action forced the smoke into the station. Additionally, there are some cameras already installed in vent/fan shafts. These cameras would also provide video feeds to the video analytic server.

The Video Analytic server(s) would be installed in each station COM room and collect the camera images from the VMS server. The Video Analytic server would also be connected to our Physical Security Interface Manager (PSIM) software which would annunciate the alarm in the SOCC and ROCC(s). One of the main advantages to this approach is that it could be implemented in a very short time. This work could be completed within six months of identifying a funding source.

In the long term, a typical design would extend network connectivity to the fan and vent shafts and then additional cameras would be installed near the fan and vent shafts. See Figure No.2. As a minimum, two cameras would be installed on each track. One camera would be looking at the upstream side of the shaft and the other would be looking at the downstream side of the shaft. Once again, these cameras would be attached to the video analytic server which in turn would be connected to the PSIM software. This would allow the line operators to know if the smoke is generated on Track I or Track 2 and if the smoke is upstream or downstream of the shaft.

One of the main advantages of using Video Analytics is that his approach will allow WMATA to leverage the security camera coverage already installed in the stations and improve smoke detection time almost immediately. If smoke is generated inside the tunnels, the smoke will migrate to the stations via the piston action of the trains. Once the piston action of the train pushes the smoke into the station, the cameras which monitor the end of platforms (adjacent to the underground tunnels) can be tied into the video analytic server and an alarm generated. Maintenance for this type of system is very minor. Basically, the domes of the cameras will have to be cleaned with a soft cloth on a periodic basic (~ once per year)

Conversely, cameras install for smoke monitoring purposes would also vastly improve the security and operation of the underground rail system. If desired, the PSIM smoke alarms could be exported to the AIM ROCC software.

One minor disadvantage of using this approach is the station and/or tunnel lighting conditions. Video analytics work best with higher and more uniform levels of light. WMATA tunnels and station are very poorly illuminated. Spot lighting may be required to improve the efficiency of the video analytic system. Perhaps, the cost of improved lighting could be offset or underwritten by the energy reduction initiatives underway at WMATA.

A cost estimate to install Video Analytics in the WMATA underground is included Appendix A. The additional manpower that would be required to maintain this system is also included with the estimate.

Suppliers of smoke video analytics include FireVu from Dedicated Micros, SignFire by Fife, and Araani. Data sheets are provided in Appendix B.

NOTE: Some video analytics are currently being installed in underground stations. Testing will be performed to determine if the current brand of video analytics will work at detecting smoke.

Hybrid Approach of Different Technologies

A hybrid approach to smoke detection would combine different smoke detection technologies into a single smoke detection system. The advantages of a hybrid approach are that individual weaknesses of one technology could be overcome by strengths in another technology. Different mixes of technology can also have an impact on price. ASD technology offers a very fast and reliable smoke detection but is expensive to implement and maintain. Combining ASD technology with Video Analytic technology provides a smoke detection system with very acceptable performance and reliability results.

CENI-COM Recommendation

CENI-COM recommends a hybrid solution which installs some short term solutions with some long term solutions. In the short term, it is recommended that a video analytic server be installed in each below ground station COM room. This server would be connected to the station CCTV camera feeds and report alarms via the SOCC PSIM. Some supplemental lighting may be required. Then over the course of the next five years, network switches can be installed in the vent and/or fan shafts. These network switches will support the smoke detection effort as well as support planned MEP SCADA requirements. Once the network switches are installed, then ASDs and additional cameras would be installed track side at each and every vent or fan shaft. Additional video analytic servers would be installed to support the additional cameras.

A cost estimate and preliminary schedule for the recommended hybrid solution is attached in Appendix A. Significant cost savings could be realized if this work was to be incorporated with the underground radio work.

Appendix A

Cost Estimates & Preliminary Schedules

Estimate - Video Analytics Short Term

Material	QTY	Unit	Unit Cost	Ext Cost	Sub Totals	Comments
Servers	60	ea	$ 20,000	$ 1,200,000		16 Camera / server
Spares	6	ea	$ 4,000	$ 24,000		
Misc Small Parts	50	ea	$ 1,000	$ 50,000		
Sub-Total Material					$ 1,274,000.00	

Labor - Contractor *	People	Days	Unit Cost	Ext Cost	Sub Totals	Comments
Install Server per Station	2	1	$ 75	$ 1,200		
QTY of Stations	**60**				$ 72,000.00	
Software Integration	2	180	$ 125	$ 360,000		
PM Support	1	180	$ 100	$ 144,000		
Sub-Total Contractor					$ 576,000.00	

Labor - WMATA *	QTY	Days	Unit Cost	Ext Cost	Sub Totals	Comments
Escorts - COM	1	60	$ 100	$ 48,000		
Escorts - PWR	0.5	60	$ 100	$ 24,000		
Inspectors	0.25	60	$ 100	$ 12,000		
PM Support	1	180	$ 100	$ 144,000		
Software Support	1	180	$ 100	$ 144,000		
Engineering Support	0.5	180	$ 100	$ 72,000		
Sub-Total WMATA					$ 444,000.00	

Total - Video Analytics Short Term $ 2,294,000.00

* Assume 8 hours labor / day

** Assume labor hours / PCN / Year

Estimate - Aspiration System

Material	QTY	Unit	Unit Cost	Ext Cost	Sub Totals	Comments
Sensor Unit Kit	195	ea	$ 4,000	$ 780,000		
Sample Tubing	195	ea	$ 250	$ 48,750		
Misc Small Parts	195	Lot	$ 500	$ 97,500		
Conduit/Wiring	195	ea	$ 1,000	$ 195,000		
Sub-Total Material					$ 1,121,250.00	

Labor - Contractor *	People	Days	Unit Cost	Ext Cost	Sub Totals	Comments
Install Sensor per Shaft	5	10	$ 75	$ 30,000		
QTY of Shafts	**195**				$ 5,850,000.00	
Software Integration	2	90	$ 125	$ 180,000		
PM Support	1	1950	$ 100	$ 1,560,000		
Sub-Total Contractor					$ 7,590,000.00	

Labor - WMATA *	QTY	Days	Unit Cost	Ext Cost	Sub Totals	Comments
Escorts - COM	2	1950	$ 100	$ 3,120,000		
Escorts - PWR	0.5	100	$ 100	$ 40,000		
Escorts - ROW	5	200	$ 100	$ 800,000		
Inspectors	1	1950	$ 100	$ 1,560,000		
PM Support	0.5	1950	$ 100	$ 780,000		
Software Support	1	1950	$ 100	$ 1,560,000		
Engineering Support	0.25	1950	$ 100	$ 390,000		
Sub-Total WMATA					$ 8,250,000.00	

Total - Asperation System	$ 16,961,250.00

* Assume 8 hours labor / day

** Assume labor hours / PCN / Year

Estimate - Video Analytic - Long Term

Material	QTY	Unit	Unit Cost	Ext Cost	Sub Totals	Comments
Cameras	400	ea	$ 1,500	$ 600,000		Min 4 Camera / shaft
Servers	60	ea	$ 20,000	$ 1,200,000		1 Server / station
Conduit/Wiring	100	Lot	$ 1,500	$ 150,000		
Spares	40	ea	$ 1,500	$ 60,000		
Misc Small Parts	150	ea	$ 1,000	$ 150,000		
Network Switch	100	ea	$ 3,000	$ 300,000		
Sub-Total Material					$ 2,460,000.00	

Labor - Contractor *	People	Days	Unit Cost	Ext Cost	Sub Totals	Comments
Install Camera per Shaft	5	5	$ 75	$ 15,000		
QTY of Shafts	**195**				$ 2,925,000.00	
Install Server per COM Room	2	1	$ 75	$ 1,200		
QTY of Stations	**60**				$ 72,000.00	
Software Integration	2	180	$ 125	$ 360,000	$ 360,000.00	
PM Support	1	500	$ 100	$ 400,000	$ 400,000.00	
Sub-Total Contractor					$ 3,757,000.00	

Labor - WMATA *	QTY	Days	Unit Cost	Ext Cost	Sub Totals	Comments
Escorts - COM	1	975	$ 100	$ 780,000		
Escorts - PWR	0.5	195	$ 100	$ 78,000		
Escorts - ROW	5	487.5	$ 100	$ 1,950,000		
Inspectors	0.25	975	$ 100	$ 195,000		
PM Support	0.5	500	$ 100	$ 200,000		
Software Support	1	360	$ 100	$ 288,000		
Engineering Support	0.25	360	$ 100	$ 72,000		
Sub-Total WMATA					$ 3,563,000.00	

Total - Video Analytic - Long Term $ 9,780,000.00

Smoke Detection - Hybrid Solution

Video Anaytics - Short Term Install	$ 2,294,000.00
ASDS -	$ 16,961,250.00
Video Analytics - Long Term Install	$ 9,780,000.00
Total	$ 29,035,250.00

Smoke Detection Project Schedule

Description	Month 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47
Video ST - ENG	X																																														
Video Analytic - RFP		X	X																																											
Video Analytic - NTP				X																																										
Video Analytic - Install *					X	X	X	X																																						
Video Analytic - Config						X	X	X	X																																					
Video Analytic - SCI										X																																				
ASDs - ENG	X	X	X																																											
ASDs - RFP				X	X																																									
ASDs - NTP						X																																								
ASDs - Install **							X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
ASDs - CONFIG									X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
ASDs - SCI																																														
Video - ST - ENG	X	X	X																																											
Video - ST - RFP				X	X																																									
Video - ST - NTP						X																																								
Video - ST - Install **							X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Video - ST - CONFIG									X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Video - ST - SCI																																														

* Assume 16 Server / Month

** Assume 2.5 Shafts/month

48

X
X

X
X

Impact to Maintenance Forces

Video Analytics - Short Term

Labor - WMATA *	QTY / PMI	Days / PMI	Total Manhours	Ext Cost	Freq of PMI / year	Comments
PMI - Clean Lens	60	2	960		1	1 people for 2 days each PM
PMI - Server	60	1	480		1	1 people for 1 days each PM

Total - NEW PCN **	0.90	1600

Aspirating Smoke Detection

Labor - WMATA *	QTY / PMI	Days / PMI	Total Manhours	Ext Cost	Freq of PMI / year	Comments
PMI - Clean Filter	100	4	3200		1	2 people for 2 days each PM
PMI - Clean Tubes	100	2	400		0.25	2 people for 1 days each PM

Total - NEW PCN **	2.25	1600

Video Analytics - Long Term

Labor - WMATA *	QTY / PMI	Days / PMI	Total Manhours	Ext Cost	Freq of PMI / year	Comments
PMI - Clean Lens	60	1	480		1	1 people for 1 days each PM
PMI - Server	60	1	480		1	1 people for 1 days each PM

Total - NEW PCN **	0.60	1600

Appendix B

Manufacture Data Sheets

Kidde wireless system

SIGNALING UL LISTED

Provide Advanced Fire Protection with the Kidde Wireless System

Why Wireless?

- When one alarm sounds they all do.
- Ability to interconnect without wires.
- Install in minutes, anywhere in the home! Less cost, and less hassle than re-wiring.

AC Powered Smoke Alarm

Makes it easy to expand the coverage of a current interconnected system.

Wireless AC Powered Smoke Alarm

The Kidde Wireless AC Powered Smoke Alarm makes it easy to expand the coverage of a current interconnected system. Simply replace one interconnected smoke alarm with the Kidde Wireless AC powered alarm. Kidde Wireless Battery Powered Smoke Alarms can be installed in additional rooms that need extra protection. This AC powered alarm bridges a home's current interconnected system to the newly installed alarms, so that when one alarm is triggered, all alarms will sound.

Battery Powered Smoke Alarm

Enables quick and easy installation of an interconnected smoke alarm system without messy wiring or labor.

Wireless Battery Powered Smoke Alarm

The Kidde Wireless Battery Powered Smoke Alarm allows for quick and easy installation an interconnected smoke alarm system without messy wiring or labor. The battery-powered units are linked so that when one alarm is triggered, all alarms will sound. In addition to providing protection to any room of the home, this battery powered alarm also can be placed in a detached workshop or shed and linked into the home's interconnected system.

Kidde wireless alarms use ionization sensing technology. Ionization sensing alarms may detect invisible fire particles (associated with flaming fires) sooner than photoelectric alarms. Photoelectric sensing alarms may detect visible particles (associated with smoldering fires) sooner than ionization alarms.

Item	Part Number	Pack Qty	UPC	I 2 of 5	Dimensions w x d x h
Battery Wireless Smoke Alarm RF-SM-DC	0919-9999	3 piece PDQ	0 47871 05557 9	100 47871 05557 6	8.5" x 6.75" x 9.75"
Hardwired AC Wireless Smoke Alarm RF-SM-AC	1279-9999	3 piece PDQ	0 47871 05560 9	100 47871 05560 6	8.5" x 6.75" x 9.75"

Kidde Wireless System: Architectural, Engineering, and Technical Specifications

Architectural and Engineering Specifications for Wireless Model RF-SM-AC

The smoke alarm shall be Kidde Model RF-SM-AC or approved equal. It shall be powered by a 120VAC, 60Hz source along with a 9V battery backup. The unit shall incorporate an ionization sensor with nominal sensitivity of 0.60±0.1 percent/Ft. The temperature operation rage shall be between 40F (4C) to 100F (38C) and the humidity operating range shall be up to 85% relative humidity.

The smoke alarm can be installed on any standard single gang electrical box, up to a 4" octagon junction box. The electrical connection (to the alarm) shall be made with a plug-in connector.

The smoke alarm shall work interconnected immediately out of the box without any user programming. A maximum of 24 Kidde devices can be interconnected in a multiple station arrangement. The interconnect system must not exceed the NFPA (National Fire Protection Association) limit of 18 initiation devices, of which 12 can be smoke alarms. With 18 initiating devices (smoke, heat, CO, etc.), interconnected, it is still possible to interconnect 6 strobe lights and or relay modules.

The smoke alarm shall give fire alarm signals priority over all other signals. The smoke alarm shall incorporate a maximum allowable response delay from activation of an initiating device to receipt and alarm/display by the receiver/control unit of 30 seconds. The smoke alarm shall automatically repeat alarm transmission at intervals not exceeding 60 seconds until the initiating device is returned to its non-alarm condition (per NFPA 72, Chapter 6, Section 6.16.3.2).

The smoke alarm shall have remote hush and low battery hush capabilities. The unit shall have alarm memory to indicate which alarm in a system was the initiating alarm (per NFPA 72, Chapter 6, Section 6.16.3.5). The unit shall provide optional tamper resistance that deters removal of the unit from the wall or ceiling.

The alarm shall include a test button that will electronically simulate the presence of smoke and cause the unit to go into alarm. This sequence tests the unit's electronics, battery and horn to ensure proper operation.

The unit shall include a piezoelectric horn that is rated at 85 decibels at 10 feet. The smoke alarm shall produce an audible signal in the form of the "three pulse" temporal pattern. Each ON phase shall last 0.5-second +/-10 percent. After the third of these ON phases, there shall be an OFF phase that lasts 1.5 seconds +/-10 percent. This pattern should repeat continuously without interruption. The unit shall also include a low battery warning utilizing a brief alarm chirp every 30-40 seconds for a minimum of seven (7) days.

The unit shall incorporate one red LED to the alarm's current status and mode of operation. The red LED will flash in conjunction with the alarm beep, and flash during a smoke alarm, a low battery mode and a unit error. The unit shall incorporate one green LED to indicate the alarm's current status and mode of operation. The green LED will indicate one of five (5) conditions:

Standby Condition (powered by AC and battery backup)– The LED will be constant on

Standby Condition (powered by only battery backup) – The LED will flash approximately every 10 seconds.

Initiating Alarm Indicator – The LED will flash every second while sounding an alarm to signify that the alarm sensed a smoke hazard.

Alarm Memory Condition – The LED will flash every second signifying that the alarm sensed a smoke hazard. It will continue to flash every second until the test/reset button is pressed, thus resetting the alarm.

Hush® Mode Condition – The LED will flash every 2 seconds while the alarm is in Hush® Mode

The unit shall at a minimum meet the requirements of UL217, NFPA72. The State of California Fire Marshall, NFPA 101 (one and two family dwellings) Federal Housing Authority (FHA), Housing and Urban Development (HUD). It shall also include a 10-year manufacturer's limited warranty.

Technical Specifications:

Power Source: 120VAC; 9V battery backup
Audio Alarm: 85dB at 10ft
Temperature Range: 40F (4.4C) to 100F (37.8C)
Humidity Range: up to 85% relative humidity (RH)
Sensor: Ionization
Wiring: Quick connect plug with 8" pigtails
Size: 5.75" in diameter x 1.25" depth
Weight: .5lb
Interconnects: Up to 24 devices (of which 18 can be initiating)

Architectural and Engineering Specifications for Wireless Model RF-SM-DC

The smoke alarm shall be Kidde Model RF-SM-DC or approved equal. It shall be powered by three (3) AA batteries. The unit shall incorporate an ionization sensor with nominal sensitivity of 0.69±0.19%/ft. The temperature operation range shall be between 40F (4C) to 100F (38C) and the humidity operating range shall be up to 85% relative humidity.

The smoke alarm shall work interconnected immediately out of the box without any user programming. A maximum of 24 Kidde devices can be interconnected in a multiple station arrangement. The interconnect system must not exceed the NFPA (National Fire Protection Association) limit of 18 initiation devices, of which 12 can be smoke alarms. With 18 initiating devices (smoke, heat, CO, etc.), interconnected, it is still possible to interconnect 6 strobe lights and or relay modules. The smoke alarm shall give fire alarm signals priority over all other signals. The smoke alarm shall incorporate a maximum allowable response delay from activation of an initiating device to receipt and alarm/display by the receiver/control unit of 30 seconds. The smoke alarm shall automatically repeat alarm transmission at intervals not exceeding 60 seconds until the initiating device is returned to its non-alarm condition (per NFPA 72, Chapter 6, Section 6.16.3.2).

The smoke alarm shall have remote hush and low battery hush capabilities. The unit shall have alarm memory to indicate which alarm in a system was the initiating alarm (per NFPA 72, Chapter 6, Section 6.16.3.5). The unit shall provide optional tamper resistance that deters removal of the unit from the wall or ceiling.

The alarm shall include a test button that will electronically simulate the presence of smoke and cause the unit to go into alarm. This sequence tests the unit's electronics, battery and horn to ensure proper operation.

The unit shall include a piezoelectric horn that is rated at 85 decibels at 10 feet. The smoke alarm shall produce an audible signal in the form of the "three pulse" temporal pattern. Each ON phase shall last 0.5-second +/-10 percent. After the third of these ON phases, there shall be an OFF phase that lasts 1.5 seconds +/-10 percent. This pattern should repeat continuously without interruption. The unit shall also include a low battery warning utilizing a brief alarm chirp every 30-40 seconds for a minimum of seven (7) days.

The unit shall incorporate one red LED to indicate the alarm's current status and mode of operation. The red LED will flash in conjunction with the alarm beep, and flash during a smoke alarm, a low battery mode and a unit error.

The unit shall incorporate one green LED to indicate the alarm's current status and mode of operation. The green LED will indicate one of four (4) conditions:

Standby Condition – The LED will flash approximately every 10 seconds.

Initiating Alarm Indicator – The LED will flash every second while sounding an alarm to signify that the alarm sensed a smoke hazard.

Alarm Memory Condition – The LED will flash every second signifying that the alarm sensed a smoke hazard. It will continue to flash every second until the test/reset button is pressed, thus resetting the alarm.

Hush® Mode Condition – The LED will flash every 2 seconds while the alarm is in Hush® Mode

The unit shall at a minimum meet the requirements of UL217, NFPA72 (chapter 11 2002 edition), The State of California Fire Marshall, NFPA 101 (one and two family dwellings) Federal Housing Authority (FHA), Housing and Urban Development (HUD). It shall also include a 10-year manufacturer's limited warranty.

Technical Specifications:

Power Source: 3 AA batteries
Audio Alarm: 85dB at 10ft
Temperature Range: 40F (4.4C) to 100F (37.8C)
Humidity Range: up to 85% relative humidity (RH)
Sensor: Ionization
Wiring: None
Size: 5.75" in diameter x 1.25" depth
Weight: .5lb
Interconnects: Up to 24 devices (of which 18 can be initiating)

KL-1279-9999DS

Kidde
1016 Corporate Park Drive
Mebane, NC 27302

SIEMENS

FDL241-9

Sinteso™
Cerberus™ PRO

ASA Linear smoke detector

CE

addressable or collective, conventional, **ASA***technology*™

- **Reliable smoke detection in large-volume rooms (inside application)**
- **Detection distance from 5 – 100 Meter**
- **Signal processing with ASA***technology*
- **Works according to the principle of light attenuation by smoke**
- **Selectable response behavior, up to 3 sensitivity levels can be selected**
- **Event-controlled detection behavior**
- **Transmission of 4 different danger levels to control unit**
- **Microprocessor-controlled signal evaluation**
- **Automatic self-test**
- **Automatic compensation for soiling**
- **High immunity against extraneous light and electromagnetic influences**
- **Transmitter and receiver in one housing**
- **Distance measuring between transmitter and receiver**
- **Communication via FDnet/C-NET (individual addressing), or collective, conventional signal evaluation (change-over)**

Building Technologies

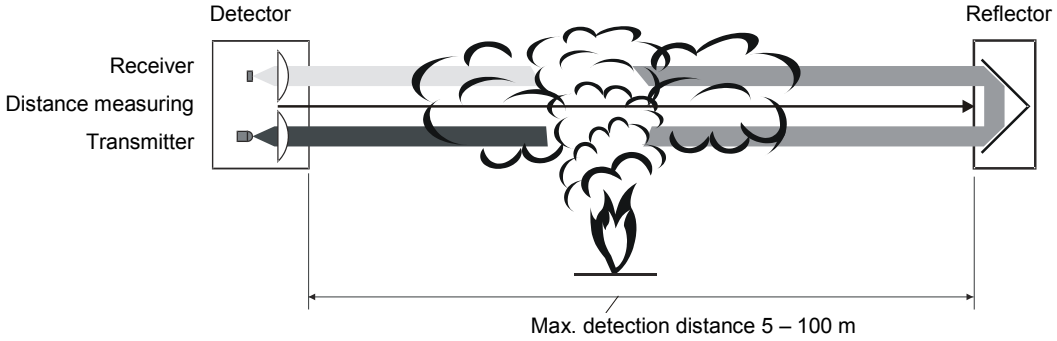
CPS Fire Safety

Characteristics

- **Environmental**
  - ecologically processing
  - recyclable materials
  - electronic und synthetic material simple separable
- **Characteristics**
  - the detector and base housing is made of a robust, glass fiber reinforced synthetic material
  - protected electronic
  - built-in alarm indicator
  - self-test function
  - integrated line separator
  - detector heating in case of danger of moisture condensation
  - 3 sensitivity levels and event-controlled detection behavior
  - addressable signal processing
    - 4 danger levels facilitate the initiation of dedicated actions as well as early warning in case of erroneous application
    - 4 function states; in addition to the normal status, the detector signals Information, Interference or Fault, depending on the urgency of the cause
  - collective, conventional signal processing
    - the detector signals alarm and fault states to the control unit

FDL241-9 ASA Linear smoke detector

- **Function**
  - The detector consists of a light emitter and a light receiver. The light emitter emits a bundled infrared ray, which is scattered back by the prism-shaped reflector to the light emitter. The receiver converts the received infrared signal in an electric signal, which is evaluated by the microprocessor-controlled electronics.
  - Smoke penetrating the measuring section attenuates the infrared signal. When the signal reaches predefined measuring values, the detector transmits the corresponding danger level to the control unit.
  - distance measurement for the recognition of foreign matters
  - The built-in alarm indicator signals the alarm status locally.



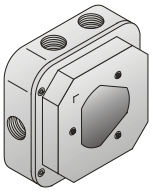
- **Environmental influences**
  - digital signal follower circuit
    - Gradual changes in the infrared signal received owing to dust on the lens or the detector automatically compensates other environmental influences.
  - multiple coincidence circuit
    - Suppresses electrical and optical interference signals. The DLF1191-AC filter is provided in the event of particularly strong incidence of extraneous light.
  - prism-shaped reflectors
    - light rays arriving are reflected parallel
    - vibrations of the installation surface have no effect on the detector

- **Application**

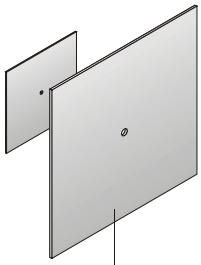
– large store-rooms and production workshops
– areas with complex roof structures or historically valuable ceilings
– covered courtyards
– atrium-type buildings
– reception halls

Accessories

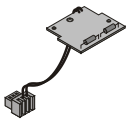
Reflector for long distance (Prism) DLR1191

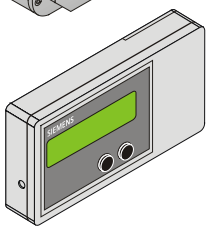


Reflector for short distance DLR1193



Detector heating element DLH1191A





Adjustment set FDLU291 (incl. Front sight, Visor, Alarm test filter, Magnet, FCC spiral cable, MC-Link cable)

Reflector for middle distance DLR1192

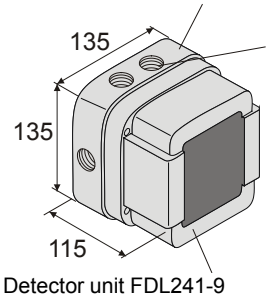
Special filters DLF1191-AA/-AB/-AC

Installation

– Easy mounting of the housing on stable surfaces; wood and steel constructions are rather unsuitable as temperature and humidity fluctuations, wind or snow pressure may exert an influence.
– 6 openings with M20 thread for cable glands
– ext. alarm indicator connectable
– Between the detector and the reflector there must be permanent, unhindered visual contact. Obscuration by operational dust, vapor or smoke generation may impair the system. Any objects in motion, e.g. overhead traveling cranes, ladders, portable items, cobwebs etc, must not interrupt the monitoring ray.
– The optics can be rationally adjusted to the reflector by single-handed alignment by means of the adjustment device FDLU291.
– For various distances, different reflectors are available.

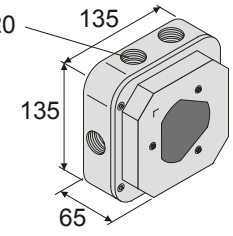
Dimensions

Base FDLB291

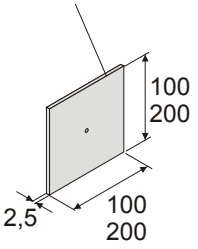


Detector unit FDL241-9

Reflector DLR1191



Reflector DLR1192/93



Technical data

Detector	Operating voltage addressable / collective	DC12…33 V / DC 14…28 V
	Operating current (quiescent) addressable / collective	0.8 mA / 0.7 mA
	Alarm indicator (AI) ext. connectable and programmable	2
	Detection distance	5…100 m
	Operating temperature	-25…+60 °C
	Storage temperature	-30…+75 °C
	Humidity	≤95 % rel.
	Communication protocol	FDnet/C-NET or collective (with and without current limitation)
	Connection terminals	0.2…1.5 mm^2
	Color	white, ~RAL 9010
	Protection category EN 60529 / IEC 60529	IP65
	Standards	EN 54-12, EN 54-17, EN 62471
	Approvals	
	– VdS	G204063
	– LPCB	126bd/02
	QS standards	Siemens Standard SN 36350
	System compatibility	
	– FDnet	FS20, AlgoRex, SIGMASYS
	– C-NET	FS720
	System compatibility collective, conventional	CZ10, BC10, FC10, XC10, CS11, FC700A, FC330A, SIGMASYS, BMS, SM80/88/D100
Detector heating	Operating voltage	DC 20…30 V
	Operating current	30… 50 mA
	Resistor	600 Ω

07 CE 0786	**FDL241-9**	Siemens Switzerland Ltd, Gubelstrasse 22 CH-6301 Zug, Switzerland Technical data: see doc. **007016**
FDL241-9 - Linear optical smoke detector incl. short-circuit isolator for use in fire detection and fire alarm systems installed in buildings		
305/2011/EU (CPR): EN 54-12 / EN 54-17 ; 2004/108/EC (EMC): EN 50130-4 / EN 61000-6-3 ;		
Declared performance and conformity can be seen in the Declaration of Performance and the EC Declaration of Conformity, which is obtainable via the Customer Support center: Tel. +49 89 9221-8000 or http://siemens.com/bt/download		
DoP No.: 0786-CPR-20014; DoC No.: CED-FDL241-9		

Details for ordering

	Type	Part no	Designation	Weight
	FDL241-9	A5Q00002298	Linear smoke detector	0.440 kg
	FDLB291	A5Q00003941	Base	0.305 kg
	–	A5Q00004478	Metal screwed cable gland M20 x 1.5	0.039 kg
	DLF1191-AA	BPZ:4933030001	Filters for distances of 7…10 m	0.005 kg
	DLF1191-AB	BPZ:4933160001	Filters for distances of 5…8 m	0.005 kg
	DLF1191-AC	BPZ:5221480001	Filter against incidence of extraneous light	0.005 kg
	DLH1191A	BPZ:4787970001	Detector heating element	0.010 kg
	DLR1191	BPZ:4787710001	Reflector for long distance (Prism, 20-100 m)	0.510 kg
	DLR1192	BPZ:4788490001	Reflector for middle dist. (400 cm^2, 30-65 m)	0.075 kg
	DLR1193	BPZ:4787840001	Reflector for short dist. (100 cm^2, 10-30 m)	0.025 kg
	FDLU291	A5Q00004905	Adjustment set incl. accessories (case)	0.840 kg
	RE10	BPZ:3685190001	Detector tester for linear smoke detectors	0.345 kg
Alarm test filter for RE10 (is also included in Adjustment set FDLU291)	TF04	BPZ:4931090001	Alarm test filter (Absorption 77 %)	0.005 kg

Details about system compatibility see List of compatibility 008331

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AIR Intelligence™

ASPIRATED SMOKE DETECTION

THE INTELLIGENT SOLUTION FOR ASPIRATED AIR SAMPLING

AIR Intelligence

ASPIRATED AIR SAMPLING TECHNOLOGY

Aspirated Air Sampling is a method of Smoke Detection where the air from the protected area is actively drawn through a network of sampling pipes, passed through a central detection unit and sampled for presence of smoke. Based on a patented 'forward scatter' system, the unit directs a powerful semiconductor laser through an aperture in a specially designed reflector. Any combustion products present in the moving air sample scatter light on the reflector from where it is focused on a single photo-receiver.

While perfectly clean air produces a very small amount of scatter, as the volume of particles below a specific size increases, the amount of light scatter increases. Measuring the amount of scatter gives a measure of the volume of impurity in the air – which in itself is directly related to the size of the fire.

Relative to other methods, forward scatter laser technology has the advantage of significantly earlier detection. Other advantages include inherent immunity to dust / dirt build-up, high signal to noise level and resistance to problems caused by vibration and high humidity. The signal from the detection transducer is processed by a unique ClassiFire-3D® Perceptive Artificial Intelligence system which continually adjusts the detector sensitivity to maintain a consistent level of performance. The detector's patented 'waste-gate' system samples a fraction of the air while bypassing the rest thereby maximizing service life and permitting operation in diverse environments.

Since AIR-Intelligence detectors can have as many as 100 sampling ports on a single pipe network, installation and life cycle costs are often considerably lower than other detection technologies.

AIR-Intelligence ASD-640
Aspirated Smoke Detector

AIR Intelligence™

Products

AIR-Intelligence ASD-160H

- Single pipe inlet
- Up to 2500 sq. ft
- Up to 164 ft. pipe length
- Up to 10 sample ports
- Four alarm thresholds
- SenseNET Network ready
- Direct PC connect

The AIR-Intelligence ASD-160H provides high sensitivity smoke detection in a smaller package for localized applications. ClassiFire™ Perceptive Artificial Intelligence ensures that the detector operates at optimum sensitivity for the protected environment without the need for complex setup.

The ASD-160H ships with 'Fault' and 'Fire' relays and an optional Input Relay Card provides four levels of alarm, fault and three programmable remote inputs. Networkable through SenseNET™ or the Command Module. The detector is housed in a rugged metal enclosure.

AIR-Intelligence ASD-320

- Two pipe inlets
- Up to 10,000 sq. ft
- Up to 328 ft. pipe length
- Up to 50 sample ports
- Four alarm thresholds
- SenseNET Network ready
- Direct PC connect

The AIR-Intelligence ASD-320 provides high sensitivity smoke detection in a medium size package for small to medium applications. ClassiFire Perceptive Artificial Intelligence ensures that the detector operates at optimum sensitivity for the protected environment without the need for complex setup.

The ASD-320 ships with 'Fault' and 'Fire' relays and an optional Input Relay Card provides four levels of alarm, fault and three programmable remote inputs. Networkable through SenseNET or the Command Module. The detector is housed in a rugged metal enclosure.

AIR-Intelligence ASD-640

- Four pipe inlets
- Up to 20,000 sq. ft
- Up to 820 ft. pipe length
- Up to 100 sample ports
- Four alarm thresholds
- SenseNET Network ready
- Direct PC connect

The AIR-Intelligence ASD-640 provides high sensitivity smoke detection for medium to large applications. ClassiFire Perceptive Artificial Intelligence ensures that the detector operates at optimum sensitivity for the protected environment without the need for complex setup.

The ASD-640 ships with 'Fault' and 'Fire' relays plus three programmable remote inputs. Networkable through SenseNET or the Command Module. The detector is housed in a rugged metal enclosure. An optional plastic enclosure is also available.

AIR-Intelligence ASD-Ex

- Explosion proof
- Up to 2500 sq. ft.
- Up to 164 ft. pipe length
- Up to 10 sample ports
- Four alarm thresholds
- SenseNET Network ready
- ATEX rated
- Lightweight design
- Direct PC connect

The AIR-Intelligence ASD-Ex is designed to provide reliable very early warning smoke detection in potentially explosive atmospheres. The detector is supplied in a cast aluminum enclosure. All sampling pipes and cables can be connected to the enclosure as a first fix operation, leaving the internals to be fitted during final commissioning. An external filter with housing is provided to simplify maintenance without de-classifying the protected area.

Equipped with 'Fault' and 'Fire' relays. Relay outputs provide a convenient method for remote monitoring by local fire alarm panels or building management systems. Open Protocol available for 3rd party integration.

Products

AIR-Intelligence COMMAND MODULE

- Network management of up to 127 detectors
- Global network display
- Global network programmer
- Multiple configurations
- SenseNET RS-485 communications
- RS-232 for PC interface
- Integral Modbus and BACnet protocol for BMS integration

The AIR-Intelligence Command Module provides a single location display, control and interface option for systems of up to 127 detectors. Provides global programming of all detector functions simultaneously. Multiple configurations are available including an integral detector option, rugged metal enclosure and a 19" rack mount version.

The integral bar graph automatically displays the status of the detector on the network with the highest alarm level to identify potential problem areas. Integral 'Fault' and four 'Alarm' relays provide global detector output for integration to other systems. Contact monitors enable detectors from alternative manufacturers' to be monitored where necessary.

AIR-Intelligence REMOTE DISPLAY UNIT

- Affordably priced
- 26 bar graph segments
- Four alarm indicators
- SenseNET RS-485 networkable
- Remote relay option
- Wall mount enclosure option
- 19" rack mountable option
- Stratos series compatible

Remote Display Units mimic the display of an AIR-Intelligence detector and provide a means of adding or positioning a graphical display where needed. An unlimited number of RDU's can be associated with a single detector. Interface is via the RS-485 SenseNET bus.

The unit consists of a 3U high metal front panel plate with a graphics overlay and a main PCB which contains terminals for power and RS-485 communications. An optional relay board can be added providing 'Fault' and four 'Alarm' relays at the display unit. Can be rack mounted or housed in a metal wall mount enclosure as shown.

SENSENET™ PC GRAPHICAL SYSTEM MANAGEMENT

- Manages all devices centrally
- Manages 16 x loops of 127 detectors via Command Modules
- Real-time indication of alarms identifiable sound files
- User definable sound files for alarm and fault conditions
- Displays graphical maps with specific instructions
- SiteAudit™ logs all events in real time
- SiteScan™ detects all attached devices for rapid configuration
- SiteMail™ and SitePage™ for automatic email/text alarm alerts
- 4 levels of password protected access
- Full system diagnostics
- Connects to other manufacturers' systems
- Global configuration changes
- Display full system status or historical information at any time

AIR-Intelligence used the latest object-oriented programming technologies to create the SenseNET system monitoring and management tool. The result is a fast, reliable and easy to use program that contains many innovative technologies and features.

SenseNET is a Windows based program that provides central management and monitoring of up to 127 detectors on a fault tolerant communications loop with extensive error checking and correction for the utmost in reliability. For large campus type facilities, up to 16 loops of 127 detectors per loop, can be efficiently monitored.

The ability of SenseNET to produce site maps, warning sounds and provide spoken instruction messages, which may be unique to each detector, is highly beneficial. Detectors may also be grouped together in zones with an associated zone map, allowing alarms and faults to be quickly and easily located.

Applications

WHERE TO USE AIR-Intelligence

There are many instances where a more 'Active' effective and reliable form of detection is required or where 'Passive' point detection is just not suitable. Aspirated Smoke Detection (ASD) offers the best solution to challenging applications, which are often High Risk, High Value, or Mission Critical in nature.

- *Where very early warning detection is required*
- *Where high air flow is present*
- *Where the environment is hostile (very cold, very hot, wet or dusty, strong RF fields)*
- *Where detection is to be concealed for aesthetic or covert considerations*
- *Where there are areas subject to smoke stratification*
- *Where access for maintenance is impractical or impossible*
- *Where reliable detection is required for suppression release*

VERY EARLY WARNING

- *Computer cabinet protection*
- *Computer room protection*
- *Communication facilities*
- *Cleanrooms*
- *Datacenters*
- *Museums*

High sensitivity provided by laser based forward light scatter mass detection and particle evaluation for reliable very early warning detection. AIR-Intelligence particle sensitivity range is 0.003µ to 10µ and boasts the industries widest sensitivity range of 0.00046 to 7.62% obs/ft.

AIR-Intelligence detectors are arguably the most sensitive of its type and can be thousands of times more sensitive than traditional spot-type detection systems.

When such a system is coupled with ClassiFire Perceptive Artificial Intelligence system, an exclusive feature of AIR-Intelligence, it enables the system to provide and maintain the optimum sensitivity without external input, maximizing sensitivity and minimizing nuisance alarms.

HIGH AIRFLOW ENVIRONMENTS

- *Datacenters*
- *Communication facilities*
- *Cleanrooms*
- *Duct detection*
- *Return air monitoring*

With the cooling requirements of modern computing environments, cooling systems producing relatively high velocity air currents challenge traditional detection methods. High air velocity cools smoke from an incipient fire, which has insufficient thermal buoyancy to rise to the ceiling where conventional spot-type detectors reside. AIR-Intelligence actively samples the environment and with its high sensitivity capabilities, can overcome the dilution effect providing reliable very early warning in aggressively high airflow environments.

In these applications, AIR-Intelligence sampling pipe network is often strategically positioned in front of return air grilles with sample ports positioned towards the airflow to capture particulate from an incipient fire as it's transported by the airflow.

HOSTILE ENVIRONMENTS

- *Textile areas*
- *Paper mills*
- *Flour mills*
- *Cold and refrigerated storage facilities*
- *Recycling plants*
- *Contaminated areas*
- *Areas subject to high smoke or dust particulate*
- *Record storage warehouses*

By nature of the system, an aspirated smoke detection system, such as AIR-Intelligence, has no need to be located within the area it's protecting as the environment from the protected area is transported to the detector via a sampling pipe network. This means AIR-Intelligence detectors can be used in areas of extreme temperatures or high humidity.

ClassiFire Perceptive Artificial Intelligence system ensures optimum sensitivity and performance in practically any environment without the need for external adjustment. AIR-Intelligence detectors also incorporate Dust Compensation and Laser Dust Discrimination (LDD^{3}™), providing highly effective smoke detection in dusty, hostile environments with minimum risk of nuisance alarms.

AIR Intelligence™

Applications

CONCEALED DETECTION

- *Heritage buildings*
- *High-end residential*
- *Prison cells*
- *Architectural and design considerations*

Where detection is required for reasons of aesthetic consideration or potential vandalism, it must not be visible or accessible. A continuous air sample can be discreetly drawn via flexible capillary tubes, which are either flush terminated or otherwise concealed in ceiling features.

Capillary sampling provides an effective and affordable means to strategically locate the actual sample port away from the main pipe trunk. Many configurations are possible. AIR-Intelligence offers a wide variety of 'Off the Shelf' remote sample port configurations.

HIGH CEILINGS

- *Atriums*
- *Warehouse and distribution centers*
- *Elevator shafts*
- *Aircraft hangars*
- *Auditoriums*
- *Airport terminals*

Due to the effects of stratification in buildings with high ceilings, it is unlikely that smoke will rise high enough or quickly enough for traditional detection systems to respond. Maintenance access to traditional detection once installed, also pose a problem.

AIR-Intelligence aspirated smoke detection systems utilize a sampling pipe network to actively draw the environment back to a centrally located location. With proper design and strategically located sample ports, the effects of stratification can be overcome and maintenance access simplified. Due to its high sensitivity potential, AIR-Intelligence can also overcome the effects of dilution in large open spaces.

MAINTENANCE ACCESS ISSUES

- *Atriums*
- *Warehouse and distribution centers*
- *Cleanrooms*
- *Ceiling voids and below raised floors*
- *Record storage facilities*
- *Hospitals*
- *Classified areas*

Smoke detectors generally require testing on an annual basis or more frequently depending on jurisdictional requirements. Access for testing and maintenance must be achievable.

This is often impractical for traditional detection technologies in a large number of applications, as access equipment may be necessary or access to the protected area restricted.

Sampling pipe network of an aspirating smoke detection system, such as AIR-Intelligence, transport the protected environment back to a strategically located detector facilitating ease of maintenance, test and inspection.

COMPLEMENTS SUPPRESSION

- *Electrical control rooms*
- *Substations*
- *Datacenters*
- *Server rooms*
- *Equipment cabinets*

AIR-Intelligence provides the earliest warning of a developing condition allowing personnel time to respond, time to avoid the risk of a costly suppression release. As conditions develop, relying on AIR-Intelligence as part of the suppression release sequence provides a reliable means to initiate a release. The detector's auxiliary alarm threshold is often times used for this purpose.

ClassiFire Perceptive Artificial Intelligence system continually ensures optimum reliable sensitivity without the need for external or repeated adjustments.

Technology

AIR-Intelligence is a highly sophisticated 'next generation' of High Sensitivity Aspirated Smoke Detection product that has been designed to ensure that installation and commissioning is as simple as possible, while optimizing performance. AIR-Intelligence series detectors incorporates a patented 'artificial intelligence' known as ClassiFire, which allows the detector to continually optimize its sensitivity ensuring a consistent level of protection in virtually any environment with minimal chance of nuisance alarms.

ClassiFire intelligence also monitors the detector chamber and filter cartridge for contamination, continually adjusting the appropriate operating parameters to counteract the negative effects of such contamination. With its unique award-winning technology, AIR-Intelligence series aspirated detection systems are able to provide superior very early warning smoke detection that can adapt to virtually any environment and to any normal fluctuations within those environments. AIR-Intelligence has proven its worth many times by detecting 'difficult-to-detect' slow growth electrical overload incipient fires in 'difficult' environments.

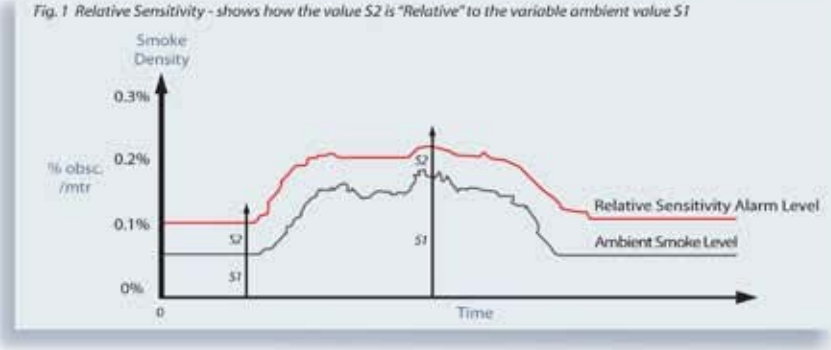
AIR-Intelligence Next Generation Aspirated Smoke Detectors provide unparalleled robust features

- *High sensitivity provided by laser based forward light scatter mass detection and particle evaluation for reliable early warning detection.*
- *Particle sensitivity range: 0.003 to 10 micron.*
- *Industries widest sensitivity range: 0.00046 to 7.62% obs/ft.*
- *Four programmable alarm thresholds (Aux, Pre-Alarm, Fire 1 and Fire 2).*
- *ClassiFire Perceptive Artificial Intelligence system.*
- *Dual Technology LDD 3D3 Laser Dust Discrimination and elimination system.*
- *RS-485 built-in as standard for networking and remote communications. Up to 127 detectors per loop, 4000 ft. between devices.*
- *RS-232 built in for direct PC interface without the expense of high level interface equipment.*
- *Powered by 24-Volt DC regulated supply, low current draw.*
- *Supervised flow sensors, each inlet with adjustable fault tolerance window per inlet (AIR-Intelligence ADS-640).*
- *Supervised, low cost disposable filter cartridge. Average replacement period of three years in an office type environment.*
- *Filter loading compensation - maintains a consistent level of sensitivity ensuring optimum system performance.*

ClassiFire™
Perceptive Artificial Intelligence

AIR-Intelligence Series detectors continuously adapt their sensitivity to the environment in which they are installed, providing alarm thresholds which are 'relative' to the background smoke levels in the protected area, instead of placing the alarm threshold at a fixed level relative to ambient conditions. At any time, the detector's performance remains constant, regardless of fluctuations in the normal background smoke level, as can be seen in the Figure below. AIR-Intelligence bargraph displays only show smoke levels significantly above the expected background level, such as from a genuine fire situation.

Fig. 1 Relative Sensitivity - shows how the value S2 is "Relative" to the variable ambient value S1



The philosophy of Relative Sensitivity is to continuously calibrate the detector relative to the fluctuating background smoke level, so that the thresholds only take into account the increase in smoke caused by a fire. This means that as the background level changes, the threshold must change too.

THE INTELLIGENT SOLUTION FOR ASPIRATED AIR SAMPLING

AIR Intelligence™

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Technical Support: 866.287.2531
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AI-001 September 2009

Protecting rail passengers and infrastructure from fire

Ensure safe evacuations by increasing the available time

Avoid major asset loss

Reduce false alarms

Lower maintenance costs

Yield improved service continuity and efficiency

VESDA® by xtralis™

In 2006 a subway fire started in stored wood ties (wooden sleepers for rail tracks) in Brooklyn, NY, requiring 4000 passengers to be evacuated, injuring at least 25 people, and causing delays to thousands of peak hour commuters.

The consequences of smoke or fire in a crowded rail facility are dangerous and possibly fatal. The feeling of panic spreads quickly and hampers any chance of a safe and orderly evacuation.

Exit from a railway station is often along the same path as smoke will travel. Escalators and stairways act like chimneys for smoke – and smoke kills!

Trying to evacuate a train is difficult and dangerous. Even evacuation does not guarantee escape from the smoke trapped in a tunnel or an underground station.

Service interruption can impact thousands of commuters, and service level obligations and profitability will be threatened.

What are the risks?

Fires in rail facilities result from:

- High current electrical faults.
- Friction caused by mechanical faults, fueled by a build-up of oil, dirt and lint.
- Arson, which commonly occurs in unsupervised areas, and may be started using discarded litter.
- Unauthorized cigarette smoking.

What makes a fire spread?

In rail facilities, the growth and spread of fire is fueled by:

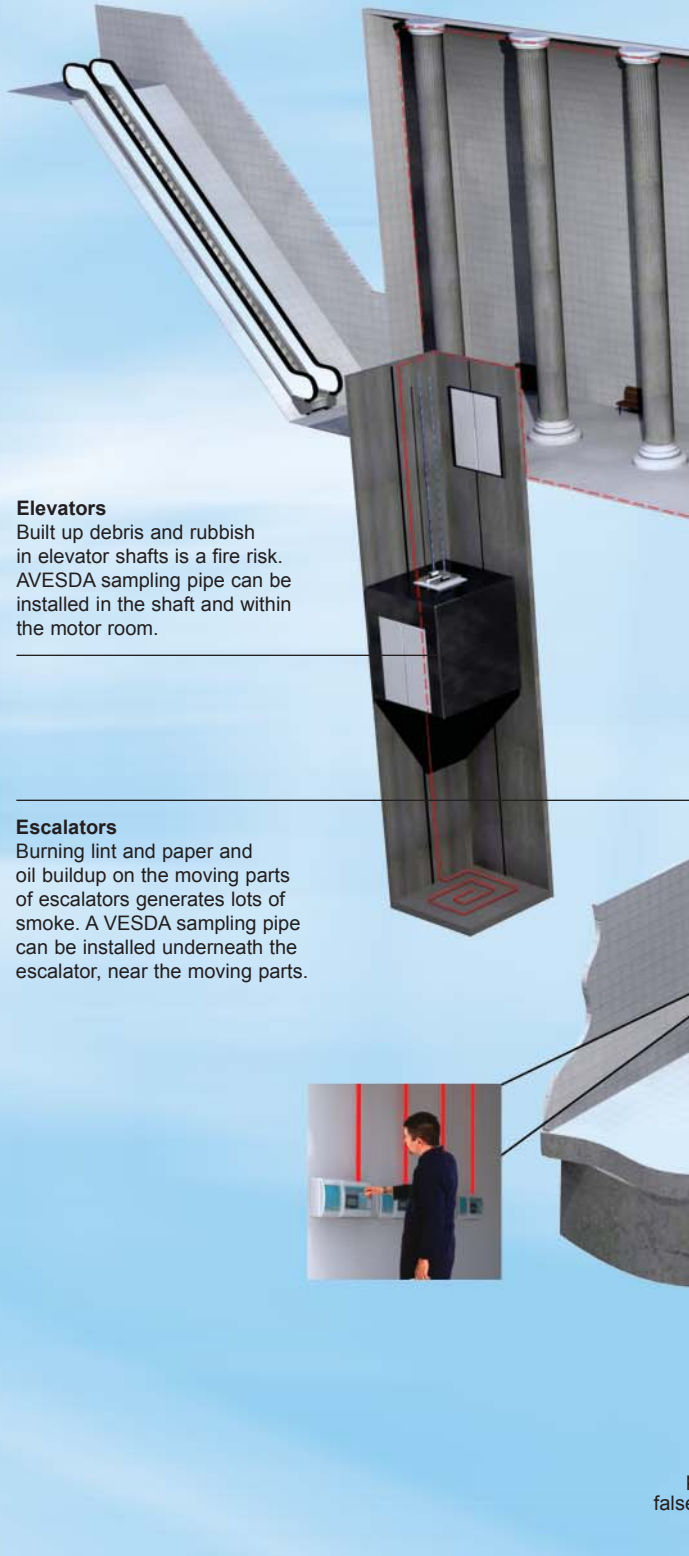
- Dirt and lint, which builds up on the moving parts of mechanical equipment and acts like a wick.
- High airflow, resulting from Heating Ventilation and Air Conditioning (HVAC) systems and the motion of trains.
- Litter, in the form of newspapers and other rubbish.

Detection challenges:

- Air movement from drafts, air-conditioning and train motion interferes with the normal dispersion of smoke; often drawing it away from conventional detectors.
- Smoke from small or smouldering fires lacks sufficient thermal energy to rise to conventional detectors located on the high ceilings of atriums and concourses.
- Within escalators and other concealed mechanical equipment, fires tend to smoulder for a long time. This delays detection by conventional detectors.

How can you protect lives and rail services?

A specialized design approach and the early detection of smoke will save lives, maintain business continuity and protect assets.



Elevators
Built up debris and rubbish in elevator shafts is a fire risk. AVESDA sampling pipe can be installed in the shaft and within the motor room.

Escalators
Burning lint and paper and oil buildup on the moving parts of escalators generates lots of smoke. A VESDA sampling pipe can be installed underneath the escalator, near the moving parts.

false

In 2003, over 100 people were killed by a fire that started in an underground station in South Korea.

Atriums and concourses
Smoke dilutes and stratifies below high ceilings, never reaching the conventional detectors above. VESDA sampling pipes can be located where smoke is likely to spread, ensuring early detection.

Data Centers
Positioning a VESDA sampling pipe across the return air vent of an air conditioning unit detects smoke as it is carried with the airflow. Sampling on the ceiling can be used for actuation of suppression systems.

Emergency Control Rooms
By installing VESDA sampling pipes inside equipment cabinets and in the sub-floor space, any smoke is quickly drawn to a detector.

Substations
High voltage cables, switch gear and uninterrupted power supply batteries are a fire risk.
A VESDA solution provides targeted equipment protection, allowing early warning of a fire, and time to plan.

Air handling and exhaust systems
Air handling systems can purge smoke and buy time for evacuation. A VESDA sampling pipe can be positioned across the exhaust fan vent. VESDA detectors can also be used for air quality management and energy consumption reduction.

Service cupboards
High current electrical equipment and densely packed cables are a fire hazard. VESDA sampling pipes can be installed in cable trays and within equipment cabinets.

Trains
High voltage electrical systems and the fuel loads brought aboard (e.g. newspapers) increase the risk of fire. High airflow within and around the train makes the detection of smoke difficult. VESDA can detect invisible, incipient smoke.

Service Ducts and Tunnels
Dusty service ducts and tunnels can be protected with VESDA detectors – without e alarms or excessive maintenance costs.

31 people died in the tragic 1987 escalator fire in Kings Cross, London, when the presence of smoke caused panic.

The VESDA Solution

A VESDA air-sampling smoke detector works by continually drawing air into a series of pipes attached to a detector unit. Air is moved through a laser detection chamber where it is analyzed for smoke. The detector can be positioned in an area that allows easy access for maintenance.

VESDA detectors can be connected to a standard fire alarm control panel, a building management system or a software-based monitoring system. They are ideally suited to the diverse environments found in a rail facility. The key advantage they offer is detecting smoke at the earliest stages of a fire.

This allows:

- Investigation of what caused the alarm.
- Preventative action to stop the spread of fire or toxic smoke.
- Safe and orderly evacuation.
- Prevention of damage to expensive and vital equipment.
- The avoidance of service disruption and breaches of service level obligations.

Rail facilities and fleets that have a VESDA system installed

London Underground
Moscow Metro
Hong Kong KCRC
Shanghai South Station
Madrid Metro
Queensland Tilt Train
Perth Urban Rail
XPT High Speed Express
China Star Express
RailCorp Hunter DMU
City Rail Explorer

Global Approvals

CCCF

Need more information?

Call the Xtralis office closest to you, as listed below.

www.xtralis.com

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Document: 13184_08

VESDA® by xtralis™

ARAANI
VISION ON SAFETY

Reliable EARLY WARNING system for SMOKE DETECTION

We bring the detector to the smoke

With this technical solution, there is no physical contact required of the smoke gasses with the detector.
Instead of having to wait for the products of combustion to reach the detector at the ceiling, we can SEE the smoke at a distance.
This approach offers some MAJOR ADVANTAGES for specific types of risks where conventional smoke and fire detection is less reliable and prone to false alarms.

FAST RESPONSE TIME

We don't have to wait for the smoke gases to reach the detector, thus faster detection. This offers a more efficient fire safety solution to all stratification related problems

ROBUST TO FALSE ALARMS

Not triggered by chemicals, ionised particles or contaminents. Can make the difference between smoke and dust upto a certain level.

VISUAL VERIFICATION

Includes all the advantages of a camera surveillance system :
- Remote visual verification
- Post-incident analysis on alarm-recording
- Real-time monitoring

FLEXIBILITY

Wide range of host cameras
Best suited camera selection
Unlimited distance :
- -Close-ups
- -Long range
- -Corridor format

BUILT-IN IR-ILLUMINATION possible for night view

SCALABILITY

FIRE SAFETY & camera surveilance
SMALL & LARGE SCALE systems
Scalable EVENT COMMUNICATION
- -via digital output
- -via e-mail
- -via mesage to VMS/BMS

Compatible to major VMS/BMS systems

EASY SET-UP

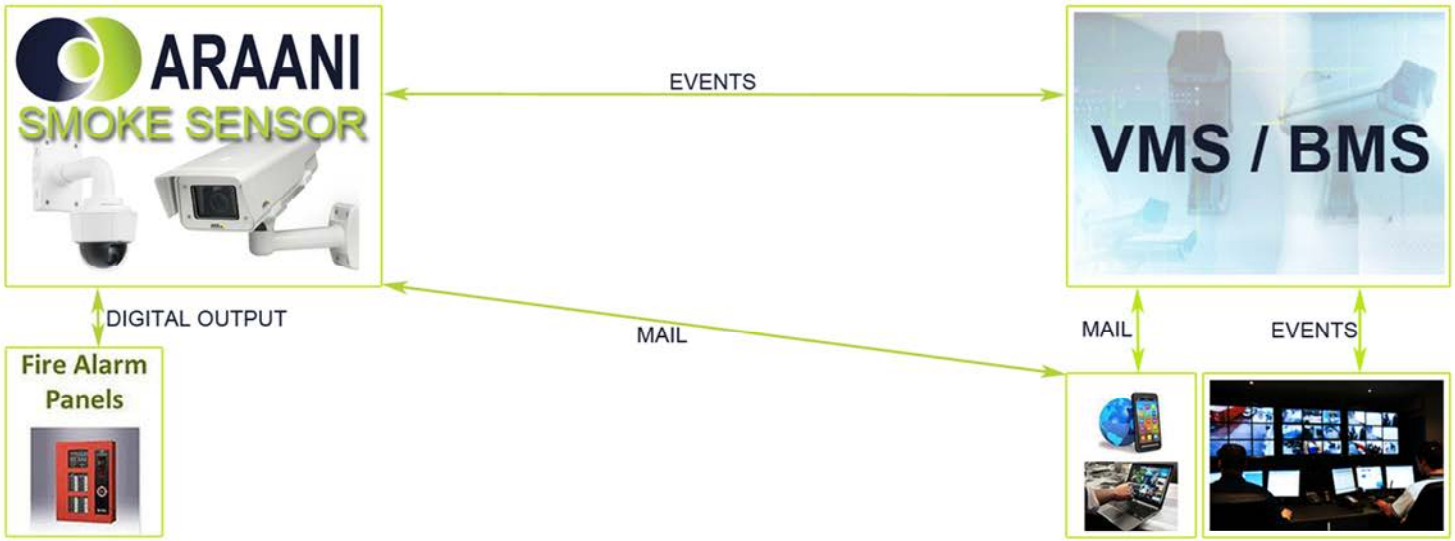
LIMITED number of PARAMETERS to optimise for a WIDE VARIETY of RISKS
- -FLEXIBLE set-up
- -FLEXIBLE concept

WIDE RANGE of compatible camera types

LOW TCO

PoE
Built-in SELF TEST
- -Check on image quality
- -Out of focus monitor
- -Check on lens contamination
- -Check on blocking field of view

t'Hoge 49 - 8500 Kortrijk - Belgium



STANDARD VERSION

- Normal environments.
- Stabile background.
- Controlled light level.

Features :

Easy set-up with basic set of parameters
- Adjustable Sensitivity Level
- Adjustable Response time

Events :
- PreSmoke & Smoke alarm
- Fault Signal

HEAVY DUTY

- Can handle a controlable amount of **dust or damp.**
- **Motion** : large parts of the image being temporary disturbed by large moving objects.
- **Variable light conditions.**

Features:

Easy set-up with basic set of parameters :
- Adjustable Sensitivity Level
- Adjustable Response time

Events :
- PreSmoke & Smoke alarm
- Fault Signal

EXTREME / CUSTOMIZED

The premium version is designed to deal with various numbers of **extreme conditions :**
- Shaking cameras
- Unstable background or multiple back ground
- High risk environments
- ...

Features :

Completely customised set of parameters :
- Adjustable Advanced Sensitivity Level
- Adjustable Response time
- Motion compensation
- Light Change compensation

+ Extra customised parameters

Events :
- PreSmoke & Smoke alarm
- Fault Signal

This version also includes :
- Extended field assistance
- Single Point of Contact
- R&D-as required (upto 6 months full-time)

ARAANI
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FireVu

Video based detection and visual verification of smoke and flame.

Protecting assets and industrial processes: Waste recycling - Food - Petrochemical - Chemical - Paper - Metal - Critical Infrastructure - Heritage - Military

The Challenge

The Challenge

Fire detection systems are often based upon well established technology, however, most if not all conventional means of detection require some form of direct interface or 'contact' with the smoke or flame generated by the fire. Whether detection follows the passing through and partial obscuration of a beam or the need to physically detect smoke particles within a sample of air, the need for the fire to reach the detector effects both the number of detectors required and the size to which a fire must get before detection can take place, subject to it starting in the immediate vicinity of the detector itself.

This problem is further compounded when dealing with large structures where voluminous atriums, high ceilinged areas and open roofless facilities can be affected by high airflow and smoke stratification, often preventing smoke from reaching spot-type smoke detectors significantly reducing their performance if not rendering them completely ineffective. The presence of airborne particles/contamination in certain applications often result in false activation of beam technology based systems.

Risk to commercial building owners

Even where conventional fire detectors are able to respond in an effective and desirable way, they alone offer no means of quantifying or qualifying the fire, or even of verifying that a fire is in fact present. This often leaves fire fighters unaware as to what they may face upon entering a building and if human life is not at risk may even result in non-entry and greater loss to property, as a fire which may have been easily tackled is left to spread.

False alarms have often resulted in the unnecessary deployment and use of costly resource, both in the financial impact of said deployment as well as the potential opportunity cost of delayed, diminished or non-existent presence at real incidents whilst dealing with non-events. It is said that over 95% of automatic alarms generated from non-sleeping commercial premises are false.

Contents

Even where conventional fire detectors are able to respond in an effective and desirable way they alone offer no means of quantifying or qualifying the fire or even of verifying that a fire is in fact present

Video Smoke Detection & Visual Verification of Fire

FireVu offers an early warning reaction to a fire incident at its inception stage not needing to wait for the smoke to reach the 'detectors' vicinity. Thus offering the best opportunity to protect commercial property in the shortest possible time.

The Intelligent Solution

FireVu from AD Network Video offers a video flame and smoke detection solution. Internal software comprising sophisticated analytic algorithms within the product itself analyse video images then detect the presence of smoke and flame at source unaffected by airflow or the effects of stratification. Even in areas where conventional fire detection could work, FireVu is able to cover larger areas with a single camera or 'detector' through its active analysis of the entire field of view.

EARLY DETECTION

FireVu offers an early warning reaction to a fire incident at its inception stage not needing to wait for the smoke to reach the 'detectors' vicinity, thus offering the best opportunity to protect commercial property in the shortest possible time.

FULL INTEGRATION

Relay outputs and alarm inputs enable full integration with existing building management and fire panel systems enabling the activation of these systems as well as controlled use or activation of on-site suppression systems such as sprinklers.

VISUAL VERIFICATION

Early detection combined with detailed knowledge of the threat in hand means controlled, measured and appropriate action can be taken as safely as possible, not to mention the benefit of being able to stand down any false alarms before resources are unnecessarily committed.

LOCAL OR REMOTE

The ability to view images from, and configure a FireVu product over IP mean that not only is there a means of early fire detection but, equally as important, a means of both verifying and assessing a fire either from a terminal on a local network or remotely at either a guard house or monitoring station (RVRC).

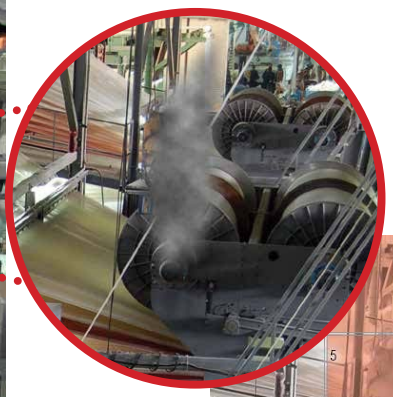



At the heart of FireVu

At the heart of the FireVu family lies AD Group's proprietary FireVu analytic software that is able to 'see' the movement of smoke across a CCTV image or the presence of flame within that image through the identification of characteristics unique to either smoke or flame. These include, but are not restricted to, assessing changes in brightness, contrast, shape, edge content, loss of detail, motion and colour matching.

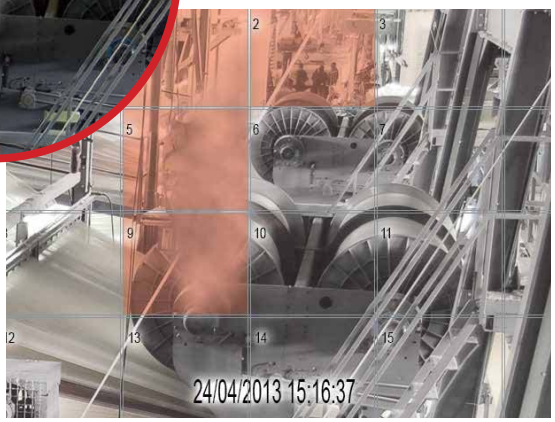
FireVu analytics will operate when a minimum of 20 Lux of lighting is present, as well as operating under IR conditions when required for unlit areas.

Early 'cause' focused detection



BEFORE

Not only does FireVu offer the ability to monitor an area for fire anywhere within the field of view of the detecting cameras, but due to the unique visual benefit of this form of detection technology, you can focus on specific identified risk items. This may include deposits of flammable material or machinery where friction creates heat, for example bearings.

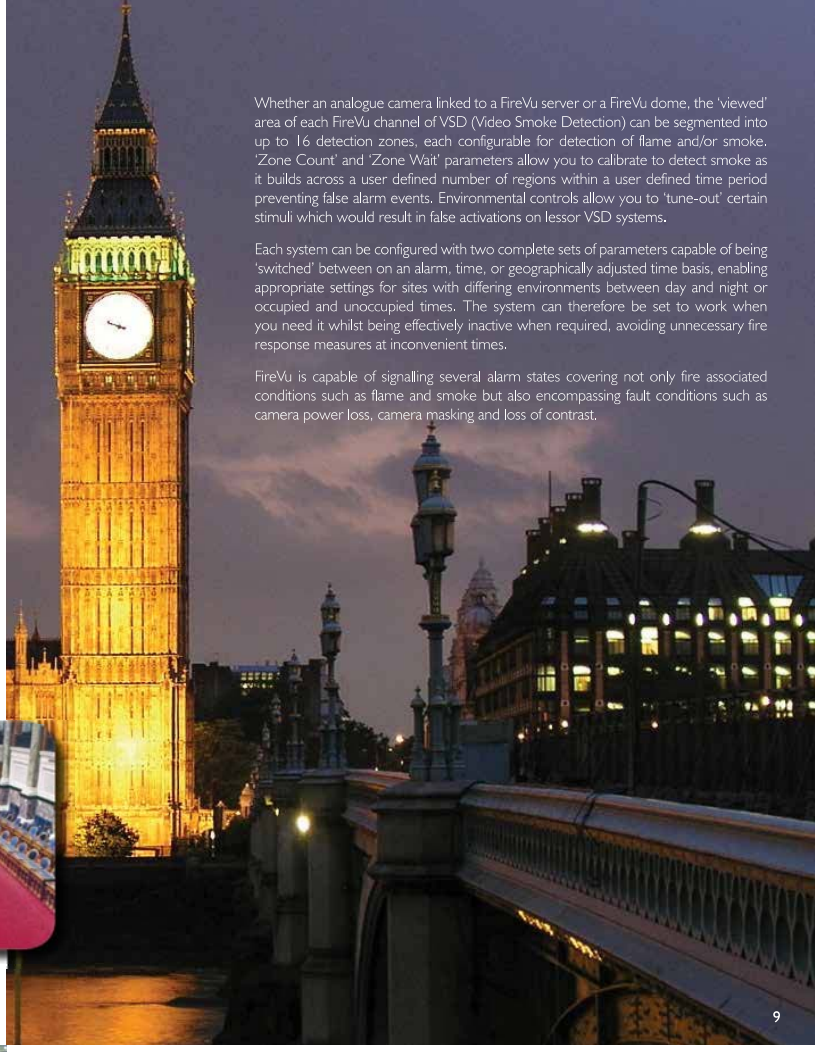


DURING FIRE/SMOKE

FireVu provides early warning, being able to trigger at the first signs of smoke or flame within the view and provides a clear image of where in that field of view the detection has occurred, identifying immediately the location and (if visible) the cause of the fire.

FireVu Benefits

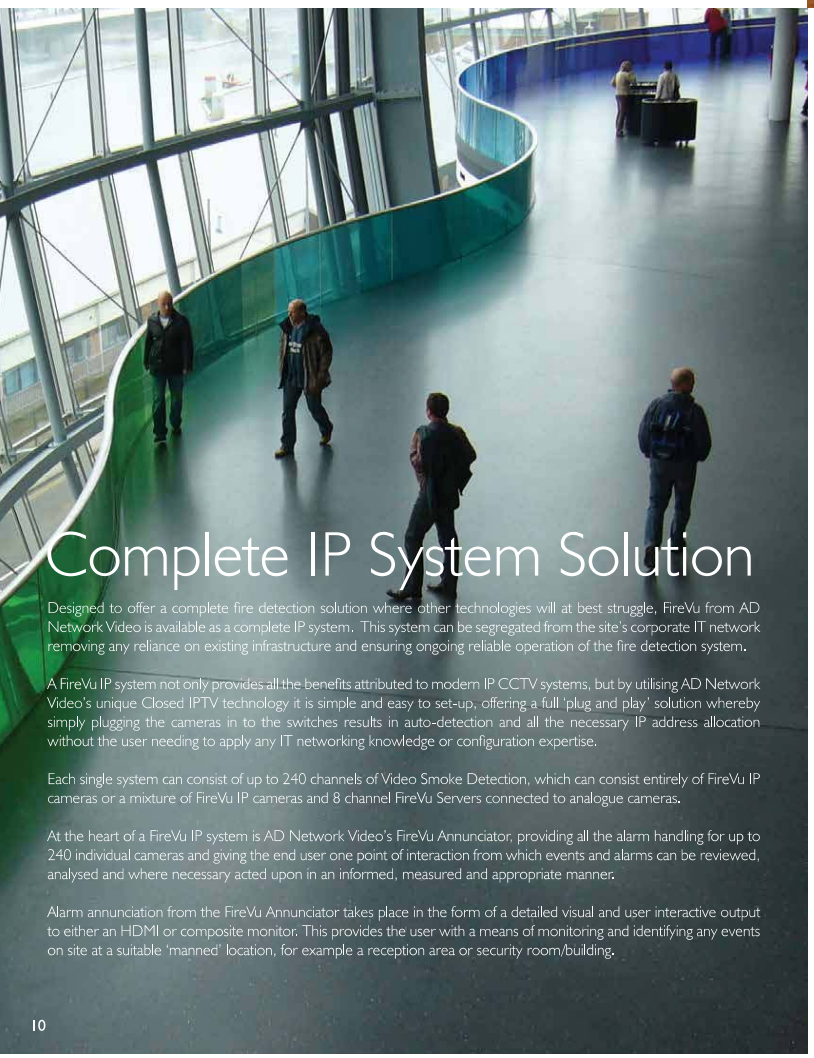
- Capable of 'seeing' flame within seconds.
- Capable of 'detecting' reflected flame.
- Detection of pluming smoke based on the unique way in which it moves.
- IP connectivity offers access to footage across networks and to remote locations, enabling visual verification of incidents, fully configurable for dial out to an RVRC (Remote Video Response Centre).
- Bandwidth limitation avoids network congestion.
- Compatible with bespoke NetVu Observer FREE viewing software, enabling monitoring of live and recorded video from various devices, from anywhere in the world.
- Events are logged and associated footage is marked.
- Generic web-browser based interface for configuration.
- Configure two separate sets of parameters. Often necessary where two separate environments may exist, for example if the equipment is required to run 24 hours a day then separate criteria is relevant in hours of darkness than during daylight. Other differences may occur in occupied and unoccupied hours as more sensitive criteria can run in unoccupied hours where there will be fewer or no false alarm stimuli.
- View footage live from a camera as well as being able to replay recorded footage or view downloaded files/ footage. Incidents or false alarms can be reviewed and the analytics parameters behaviour clearly seen and assessed.
- Fully tailorable masking enables an area within the cameras field of view of any size or shape to be ignored, hence problematic areas can be excluded. This means that camera views with sections where smoke or smoke like phenomena are present normally and acceptably can still be analysed by ignoring those parts of the view.



Whether an analogue camera linked to a FireVu server or a FireVu dome, the 'viewed' area of each FireVu channel of VSD (Video Smoke Detection) can be segmented into up to 16 detection zones, each configurable for detection of flame and/or smoke. 'Zone Count' and 'Zone Wait' parameters allow you to calibrate to detect smoke as it builds across a user defined number of regions within a user defined time period preventing false alarm events. Environmental controls allow you to 'tune-out' certain stimuli which would result in false activations on lessor VSD systems.

Each system can be configured with two complete sets of parameters capable of being 'switched' between on an alarm, time, or geographically adjusted time basis, enabling appropriate settings for sites with differing environments between day and night or occupied and unoccupied times. The system can therefore be set to work when you need it whilst being effectively inactive when required, avoiding unnecessary fire response measures at inconvenient times.

FireVu is capable of signalling several alarm states covering not only fire associated conditions such as flame and smoke but also encompassing fault conditions such as camera power loss, camera masking and loss of contrast.



Complete IP System Solution

Designed to offer a complete fire detection solution where other technologies will at best struggle, FireVu from AD Network Video is available as a complete IP system. This system can be segregated from the site's corporate IT network removing any reliance on existing infrastructure and ensuring ongoing reliable operation of the fire detection system.

A FireVu IP system not only provides all the benefits attributed to modern IP CCTV systems, but by utilising AD Network Video's unique Closed IPTV technology it is simple and easy to set-up, offering a full 'plug and play' solution whereby simply plugging the cameras in to the switches results in auto-detection and all the necessary IP address allocation without the user needing to apply any IT networking knowledge or configuration expertise.

Each single system can consist of up to 240 channels of Video Smoke Detection, which can consist entirely of FireVu IP cameras or a mixture of FireVu IP cameras and 8 channel FireVu Servers connected to analogue cameras.

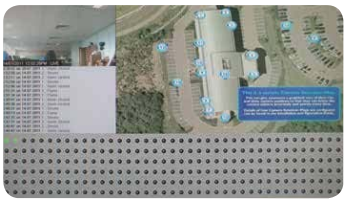
At the heart of a FireVu IP system is AD Network Video's FireVu Annunciator, providing all the alarm handling for up to 240 individual cameras and giving the end user one point of interaction from which events and alarms can be reviewed, analysed and where necessary acted upon in an informed, measured and appropriate manner.

Alarm annunciation from the FireVu Annunciator takes place in the form of a detailed visual and user interactive output to either an HDMI or composite monitor. This provides the user with a means of monitoring and identifying any events on site at a suitable 'manned' location, for example a reception area or security room/building.

Situational Awareness

All the information required to analyse and act upon a FireVu raised alarm is achieved through a detailed yet user-friendly visual interface. This consists of the following methods of supplying complete situational awareness: -

- Site map detailing camera locations.
- Event list showing alarms recorded.
- Video window playing live video from the last camera in alarm.
- Bank of virtual LED's one for each camera connected showing:
  Camera operation 'Normal' - Green
  'Smoke Alarm' - Red
  'Flame Alarm' - Magenta
  Camera 'Fault' - Yellow



Alarm verification, acceptance and clearance is provided through either a mouse connected to the FireVu Annunciator or the use of touch screen technology. The user is also able to view live video from any camera on the site map by simply selecting that camera's LED or location label from the site map.

In systems of up to 32 FireVu cameras, the FireVu Annunciator can be connected to an external storage device to which it will record all the footage from the connected cameras. This can be utilised in addition to the integrated on-board recording available on all FireVu IP camera products, and will provide the user with a centralised repository of recorded footage from all connected cameras which can be reviewed either locally or remotely without the need to identify and interrogate individual cameras.

This central point of video collection means that the record profiles used can be configured in the most appropriate way to accommodate the end users needs, for example if being reviewed remotely, lower resolution images or record rates can be employed to make best use of connections of lower bandwidth(s).

With provision of a suitable link, (for example an ADSL line) the FireVu Annunciator will report alarms directly to a Remote Video Response Centre (RVRC), as well as providing the local annunciation as described above. This 'architecture' means that any RVRC has one point of access for up to 240 devices, (and access to recorded images in one location for up to 32 devices).

The central control point provided by the FireVu Annunciator also enables other benefits such as being able to use the Annunciator as an NTP clock server across all connected cameras/servers. Beyond notification, (either to an RVRC or on-site) the FireVu Annunciator can be used to generate local responses or activate local notification devices/systems via its in-built relay output.

The FireVu Annunciator supports alarm messaging transmitted over 'Mod-bus' protocol, allowing a FireVu system to communicate with building management systems, offering the facility to integrate the FireVu solution with a premises' overall facilities management system.

Closed IPTV

Secure Network

Each FireVu IP system is built up using AD Network Video's Layer 3 Enhanced CCTV Switch. The Closed IPTV switch is available as a 16 port PoE or non PoE variant or an 8 port variant with 2 SFP fibre ports, again PoE or non-PoE.

The use of AD Network Video's Layer 3 Enhanced CCTV Switch in either 8 or 16 port guise brings with it the unique Closed IPTV architecture. This provides a means of segregating the FireVu IP system from the corporate network whilst still enabling access and the ability to configure the system over that network.

With trusted and recognised end points, AD Network Video's Closed IPTV architecture also provides total security and resilience to physical tampering or damage to infrastructure within the system.

NetVu ObserVer

NetVu ObserVer Video Management Software allows users to seamlessly view distributed images from any NetVu Connected product, such as FireVu. Whether working on routine tasks or responding to a critical situation, you can now have up-to-the-minute access control and video information.

NetVu ObserVer is now also available as an App. Available on the App Store or Android App on Google Play.

ANDROID APP ON Google play

Available on the App Store

Remote Access

External IP access to a FireVu product, either a single standalone dome or a complete IP system means that monitoring personnel, either on site or at an RVRC (Remote Video Response Centre) can be provided with immediate situational awareness.

This can mean that knowledgeable and better planned suppression measures can be followed, and in the case of linkage to a RVRC (Remote Video Response Centre) these actions can be in accordance with well thought out procedures following actions defined by the client.

A further benefit of this interaction is that it provides the ability to react to events as they happen rather than simply providing a means of post event analysis.

All of this not only enables fire & rescue authorities to tackle incidents from a position of knowledge but even prior to this stage allows for the complete eradication of false alarms that result in costly and unwanted resource use, avoided by allowing a human operator to properly and accurately verify the existence of an incident.

Notes

Notes

network video
Seamless Intelligence

www.ad-networkvideo.com
www.firevu.co.uk

AD Network Video is part of the AD Group of Companies, whose experience in providing high quality video solutions doesn't stop at securing commercial buildings, other areas of expertise include: the FireVu Video Smoke Detection solution which provides early warning of smoke and flame to commercial and industrial businesses; and the TransVu video surveillance solution designed for the transport sector which both secures and increases the operational efficiency of the fleets of major transport operators around the world.

Head Office: 1200 Daresbury Park, Daresbury, Warrington, Cheshire, UK, WA4 4HS
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INTELLIGENT FIRE ALARM DETECTION SYSTEMS

SigniFire™

FLAME, SMOKE AND
INTRUSION VIDEO
DETECTION TECHNOLOGY

STATE-OF-THE-ART

FIRE DETECTION AND

VIDEO SURVEILLANCE

Fike®

SigniFire

STATE-OF-THE-ART FIRE DETECTION AND VIDEO SURVEILLANCE

Due to the inherent nature of their design, many of today's modern, large structures are not adequately protected against smoke and fire. Features like large atriums, vast open areas and high ceilings, can make the use of traditional smoke and fire detection methods impractical, ineffective and difficult to maintain and operate. High airflow and smoke stratification can prevent smoke from reaching spot-type smoke detectors, adding to the ineffectiveness of traditional fire detection in open area facilities.

THE SOLUTION: SigniFire

VIDEO FIRE DETECTION TECHNOLOGY

Signi*Fire* by Fike, is a turnkey video, flame, smoke and intrusion detection solution. The state-of-the-art, camera-based **Signi*Fire*** detection system, visually detects the presence of fire or smoke at its source, independent of airflow in the area. **Signi*Fire*** represents a critical advantage for early warning fire detection, identifying and reacting to fire situations in their earliest stages, and protecting lives and property.

- Detects flame in seconds
- Supplies vital, situational awareness through live video to remote locations
- Triggers fire alarm systems
- Provides pre-recorded video forensic evidence for future fire investigations
- Provides video surveillance capabilities

Challenging environments and open area venues no longer have to settle for inadequate fire protection. Protection and security … that's **Signi*Fire*** video fire detection.

Each **Signi*Fire*** IP camera can be configured with multiple detection and/or exclusion zones within the field of view. These zones are set to either detect specific events (fire, smoke and motion) within the zone, or detect events outside the zone. The activation of each zone can also be linked to time schedules – so the system is always working when you need it, but won't interfere with special events or circumstances.

Signi*Fire* *… SCALABLE TECHNOLOGY THAT CAN BE APPLIED AS A STAND-ALONE SYSTEM FOR NEW INSTALLATIONS, OR INTEGRATED INTO YOUR CURRENT VIDEO MANAGEMENT SYSTEM.*

Signi*Fire* Approvals

UL · FM APPROVED · CE

DEPENDABLE, INNOVATIVE AND INTELLIGENT

Fike®

THE COMPLETE SIGNI*FIRE* LINE OF PRODUCTS:

Signi*Fire* ... state-of-the-art fire detection and advanced video surveillance capabilities in a single product family.

IP Network Camera

The **Signi*Fire*** IP camera combines the enhanced resolution and picture clarity of a standard network camera with built-in flame, smoke and motion detector capabilities. The **Signi*Fire*** technology detects:

- Presence of flames within the field of view of the camera
- Reflected fire light when flames are obstructed
- Presence of pluming smoke clouds and ambient smoke
- Unauthorized intrusion

FSM-IP

A scalable, Network Video Recorder (NVR) with video management software, each FSM-IP NVR is designed to support up to 32 **Signi*Fire*** network cameras:

- Constantly records video streams on to internal hard disk
- Includes up to 6 terabytes of storage space with on-demand playback
- Provides a platform for monitoring of live videos
- Maintains an event log for all alarm conditions
- Dispatches alarms and videos to remote locations
- Provides a network management interface for configuration and maintenance

Spyder*Guard*

Spyder*Guard* is a state-of-the-art monitoring, investigative and administrative tool designed to seamlessly access multiple FSM-IP servers over an enterprise-wide network or the internet. SpyderGuard combines physical security with early warning flame and smoke detection:

- Access multiple **FSM-IP** NVRs at a time
- Integrates building, site and floor plans
- Remote monitoring over the internet
- Remote playback of archived events
- Emails alarms and video snapshots
- Generates commissioning and maintenance reports

Spyder*Panel*

Spyder*Panel* is a touch-screen panel designed to provide security personnel with a simplified user interface for quick response to an emergency situation. The intuitive SpyderPanel does not require any training to review alarms, video feeds, building plans or vital site information.

In its simplest form, a* Signi*Fire* *installation will consist of multiple* Signi*Fire* *IP cameras connected to the FSM-IP NVR platform over a local area network. Guards and administrators can then monitor and configure the system over this network, or remotely using the Internet. Additional FSM-IP NVRs are added as necessary, each capable of handling as many as 32 cameras and providing continuous recording and on-demand video playback.

SIGNI*FIRE* FLEXIBILITY – NVR-BASED EARLY WARNING DETECTION

Signi*Fire* is a total video, flame, smoke and intrusion detection solution – scalable and ideal for new facilities, stand-alone systems and some retro-fit projects. However, existing facilities may already have a video security system in place.

CAN EXISTING SECURITY CAMERAS BE USED TO PROTECT THE FACILITY FROM FIRE? ***Yes!***

The **Signi*Fire*** Server is a Wintel based solution for flame, smoke and intrusion detection, designed for use in places where analog/network cameras are already in place. While the result may not be an NFPA approved solution, the **Signi*Fire*** Server uses the same algorithms as the **Signi*Fire*** IP camera and is capable of detecting and alarming on a variety of events. The **Signi*Fire*** Server can process the video signals from up to 16 ONVIF video streams and can be used in conjunction with **Spyder*Guard***.

- 16 ONVIF video streams (IP Camera or Encoders)*
- Multiple unit scalability over IP network
- Remote monitoring over the Internet
- Remote playback of archived events
- Addresses security needs of organization

** Please contact factory for compatibilty of existing cameras*

Signi*Fire *Server can be a cost-effective alternative in many retro-fit and existing security applications.

Protection WHEN You Need It.

The complex detection algorithms of **Signi*Fire*** *provide endless configuration options for optimal system performance and flexibility.*

SigniFire

FIRE CONTROL PANEL INTERFACE

The **Signi*Fire*** IP camera can easily connect directly to a Fire Alarm Control Panel as a regular smoke and flame detector via three built-in dry-contact relays mounted on the back plane of each camera. These relays are configurable to signal alarms such as flame, smoke, motion and fault conditions which include no picture, camera out of focus and low-light situations. The dry contacts can also be programmed by the end-user to include a delay of the relay closure on specific events to allow video verification before the alarm panel is notified. This delay helps to reduce or eliminate nuisance alarms.

EXCEEDING YOUR EXPECTATIONS –

DEPENDABLE, INNOVATIVE AND INTELLIGENT

CyberCat® – the digital, peer-to-peer bi-directional, communication system that delivers it all.

When smoke and fire threaten lives and property, reaction time is critical. That's why we've designed our **CyberCat** fire alarm and control panels to respond faster than the industry requires, by eliminating polling, delays and interference. Information is delivered simultaneously from the intelligent sensors to the alarm panel and other devices within the system.

This direct communication, or peer-to-peer technology, not only reduces response time, but each **CyberCat** device is capable of generating accurate and highly detailed information. Conventional systems give you a general idea of a fire's location – for example, the second floor of your building. **CyberCat's** intelligent sensors tell you precisely which device is in alarm. And the intelligent **CyberCat** can be programmed to relay information and perform process management tasks.

UNPRECEDENTED PERFORMANCE

THE TOTAL SOLUTION

Fike has long been known for being a leader in service, support and delivery in the fire protection industry. No matter what the concern, no matter what the time, we make it easy to reach a trained, knowledgeable Fike representative who will assist you quickly. Combine that with the most advanced technology available in fire alarm systems, competitively priced to meet all your application needs, and you have a total solution for all your fire alarm and fire protection needs.

FIKE GLOBAL MANUFACTURING, SALES AND SERVICE

AMERICAS

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Email: signifire@fike.com

FIKE CORPORATION
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Tel: +1-816-229-3405
Email: facilitiesprotection@fike.com

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Selangor Darul Ehsan, Malaysia
Tel: +60-3-7859-1462
Email: fikeap@fike.com

MIDDLE EAST

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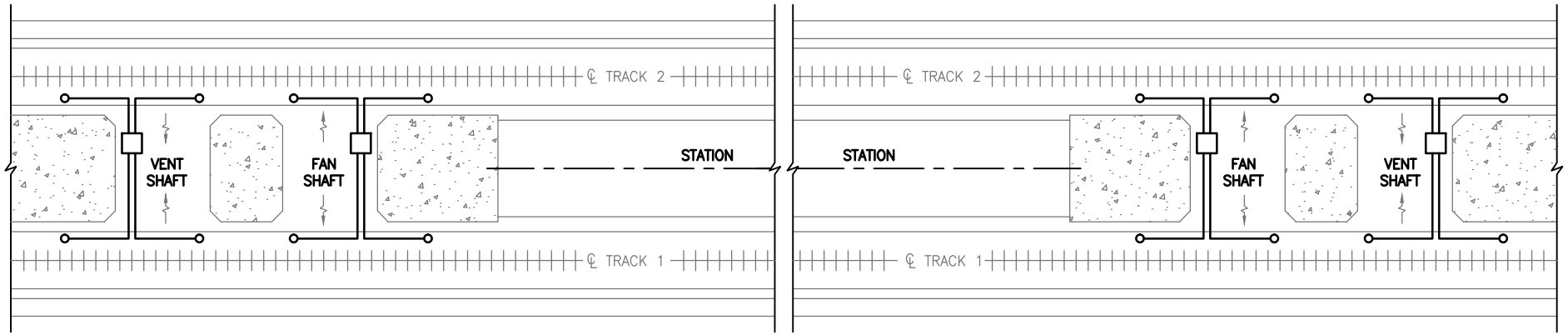
Appendix C

System Diagrams

LEGEND

ASD CONTROL UNIT

ASD SAMPLE TUBE

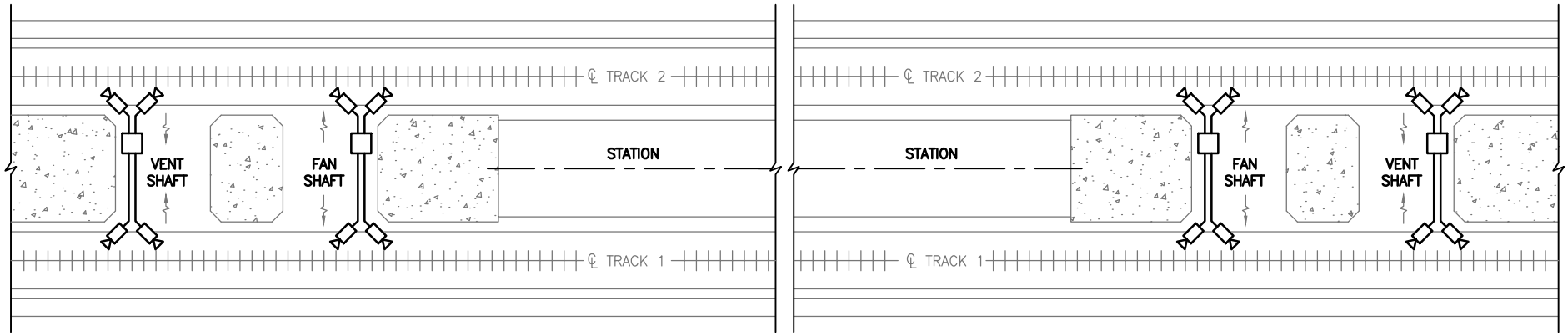


ASPIRATING SMOKE DETECTION
(TYPICAL INSTALLATION)
FIGURE NO. 1

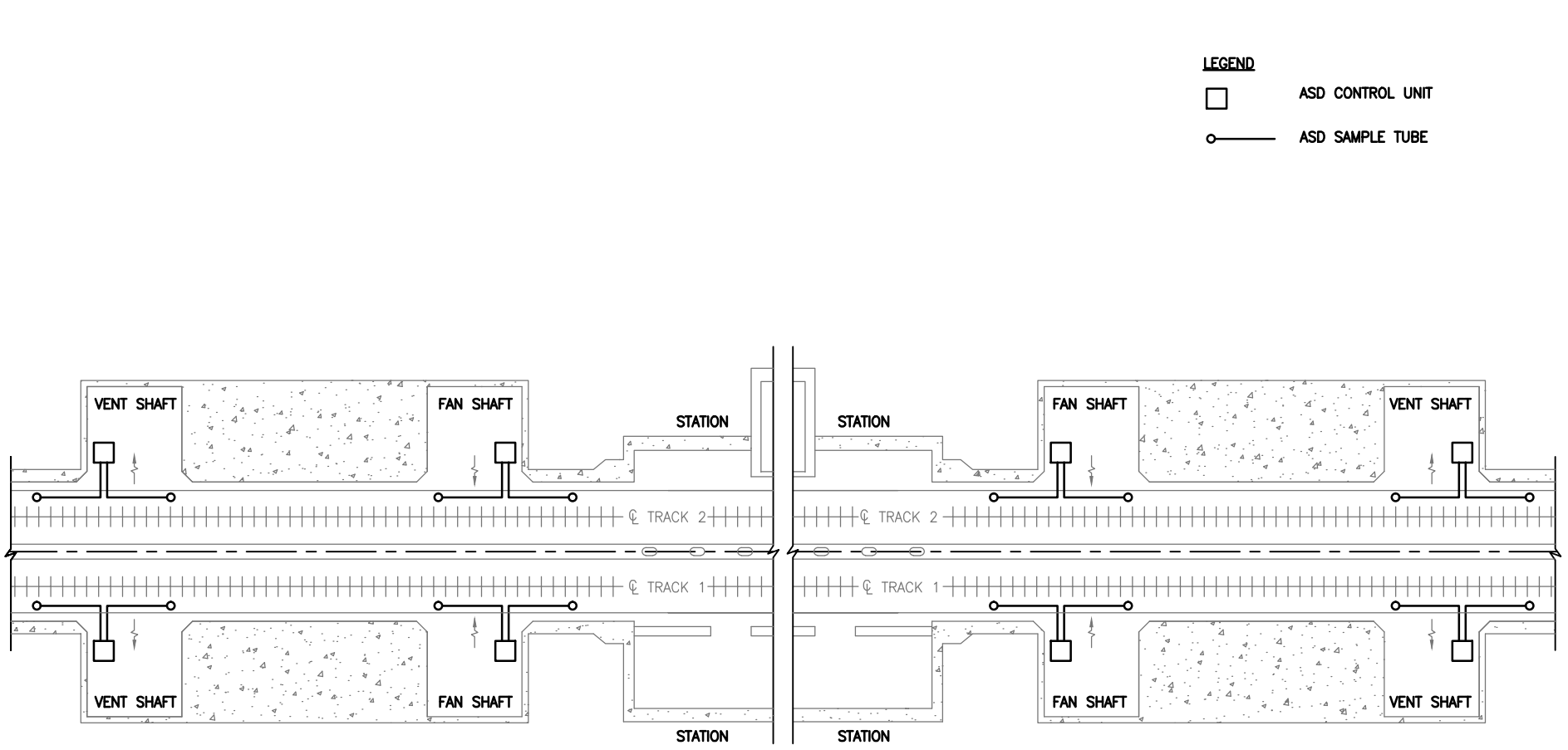
LEGEND

NETWORK SWITCH

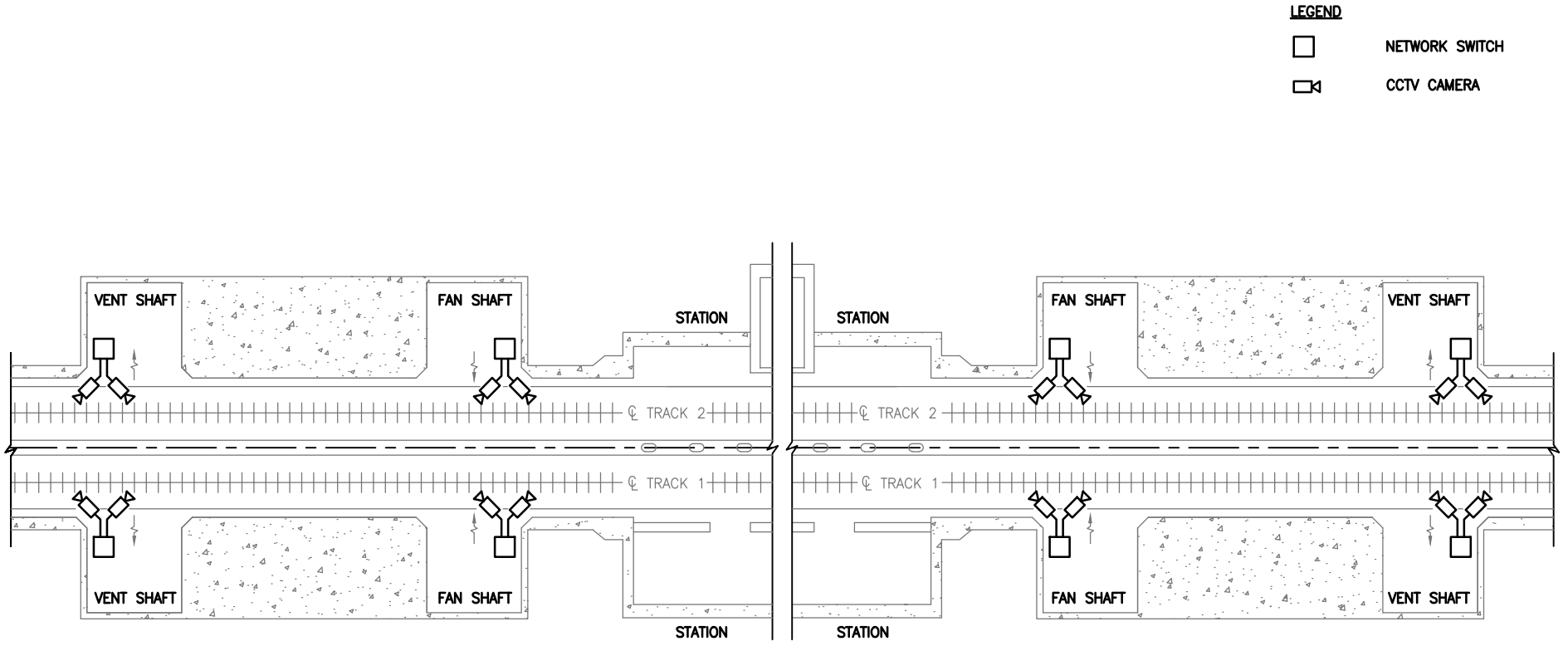
CCTV CAMERA



VIDEO ANALYTICS
(TYPICAL INSTALLATION)
FIGURE NO. 2



ASPIRATING SMOKE DETECTION
(TYPICAL INSTALLATION)
FIGURE NO. 3



VIDEO ANALYTICS
(TYPICAL INSTALLATION)
FIGURE NO. 4