incite fire

Car Park Jet Fan Application Note

Car parks, many of which are underground or partially enclosed, have poor air quality due to restricted air flow. Cars release carbon monoxide (CO), nitrogen oxides (NOx) and volatile organic compounds (VOCs) which are especially harmful in confined spaces where they can't disperse. Without dedicated ventilation systems, air can stagnate and create "hot spots" where CO and NO_2 levels can exceed safe exposure limits.

When designing car parks, it's important to understand the key differences between traditional ducted ventilation systems and modern impulse fan systems, especially in the event of a fire, as they impact safety, efficiency, and overall performance.

TRADITIONAL DUCTED SYSTEMS

- Fixed ductwork throughout the ceiling
- Fans usually operate at a constant speed
- Air changes per hour are designed to meet code and ventilation requirements
- Basic smoke detectors monitor car park

IN SHORT: *Figure 1* systems are duct-heavy, always on, expensive to install, less effective maintaining air quality and standards only require traditional smoke detection for entire car park.

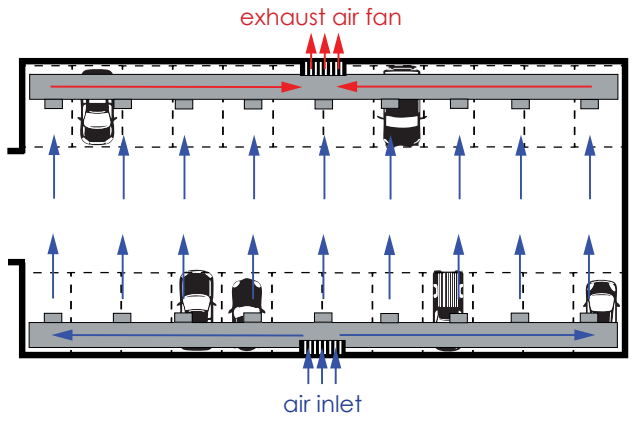

Figure 1: Traditional ducted system

IMPULSE / JET FAN SYSTEMS

- Fans can be controlled by sensors and only run when needed
- Directional airflow allows direct control of pollution
- Compact ceiling-mounted units free up headroom
- Class A smoke detection monitoring fans and basic smoke detectors for car park.

IN SHORT: *Figure 2* systems are duct-free, sensor controlled, energy efficient in maintaining air quality and standards require that all jet fans must have
Class A smoke detection in the area of air jet influence. Traditional smoke detection can be used for the rest of the car park.

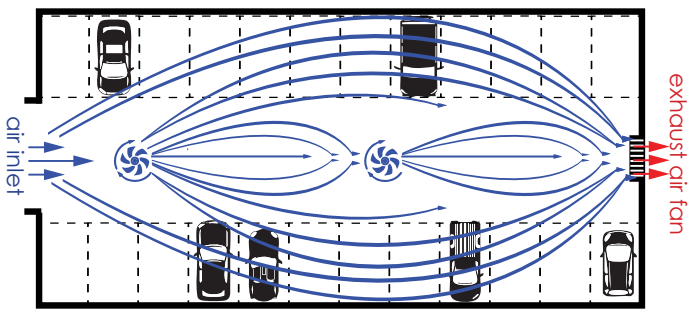

Figure 2: Impulse / Jet fan system

In the event of a fire, the system's job is to prevent the spread of fire, keep escape routes clear so people can evacuate and firefighters can get in. The best way for the system to operate;

EARLY DETECTION → FAN CONTROL → AIRFLOW CONTROL → SMOKE DISPERSAL

HOW DOES THE SYSTEM WORK?

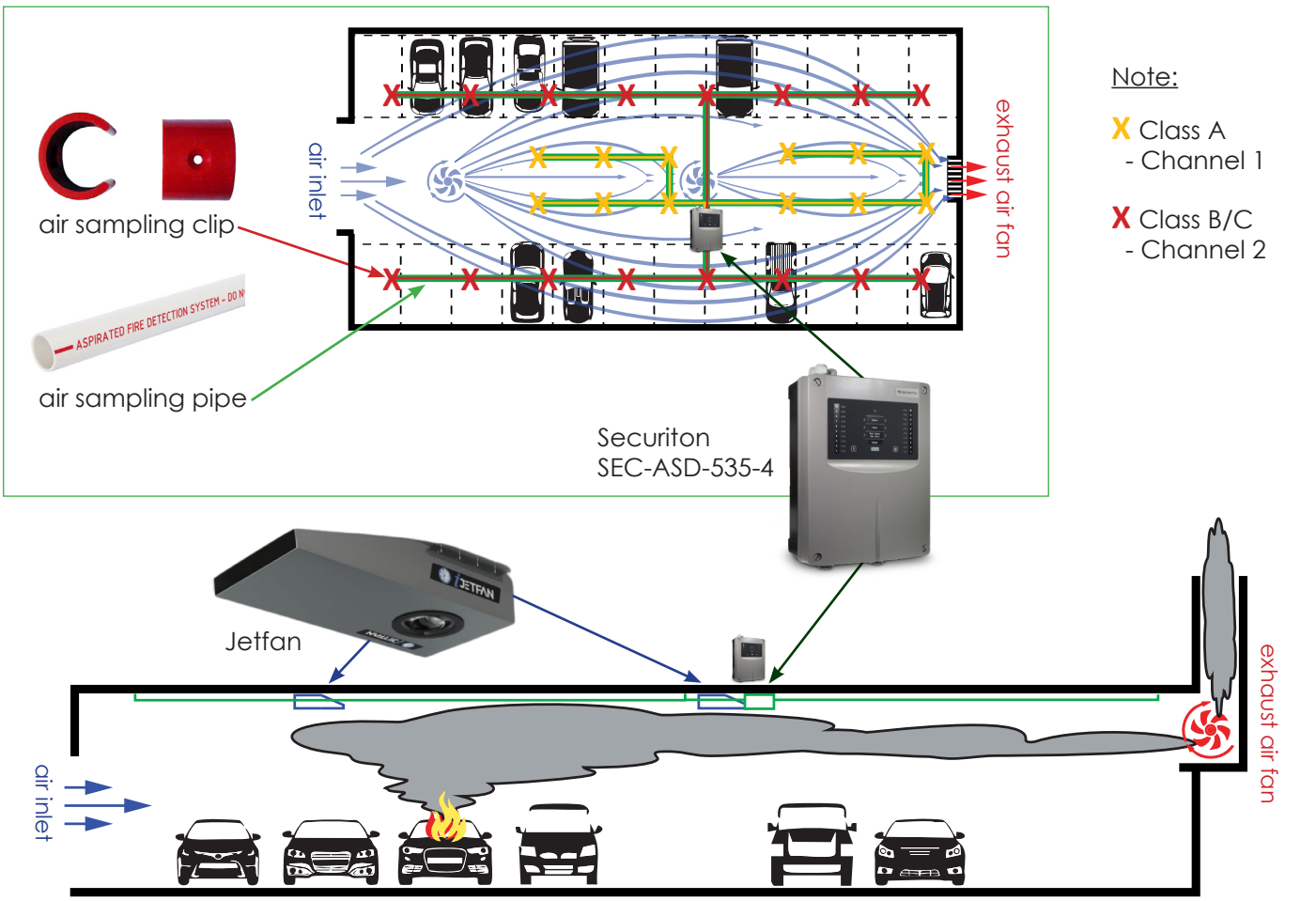

Figure 3: Securiton ASD protection for Jet fans within car parks

EARLY DETECTION

A Securiton Aspirating Smoke Detector (ASD) see Figure 3, consists of 2 independent sampling tubes, continuously evaluating the air both at the Impulse ventilation fan (IVF), Yellow coloured pipe Network, and in the Car park area, Red coloured pipe network.
When an increase in smoke concentration to Class A concentration is detected (Yellow pipe network) the ASD unit will signal the Fire Alarm Panel to shut down ALL IVF within the Car Park zone.

FAN CONTROL

Upon receiving Class B/C Smoke concentration in the Car Park area (Red Pipe network), the Securiton ASD will signal the Fire Panel and place the Fire System in Full Fire mode. The panel will control the Fans within the site according to engineering specifications.

AIRFLOW CONTROL

Jet fans create very high airflow, therefore fire and smoke can spread rapidly making visibility difficult. Once the Fire panel triggers to shut down the Jet fans, the exhaust fans can change to full power, to commence extracting smoke. The extraction system remains on continuous full power smoke extraction until it is manually overridden at the Fire Panel.

SMOKE DISPERSAL

Whilst Jet fans must shutdown when the ASD detects smoke, they can be used to RUN or STOP, when the Fire Panel is in Fire Mode. Once the area has been deemed safe the Jet fans can be used to clear the smoke in conjunction with the exhaust fans.

DESIGN CONSIDERATIONS

1. Impulse ventilation fan (IVF) systems MUST NOT impede the correct operation of the fire suppression system.
2. Jet fans or IVF systems require X Class A Aspirating Smoke Detection, connected to the fire panel.
3. Fans within the space must have activated shut down connectivity to prevent the spread smoke.
4. Fan positioning crucial to ensure smoke and pollutants are directed to an exhaust point.
5. X Class A Aspirating Smoke Detection must be within the area of air jet influence.
6. X Class B/C Aspirating Smoke Detection can be used for the remaining car park areas.

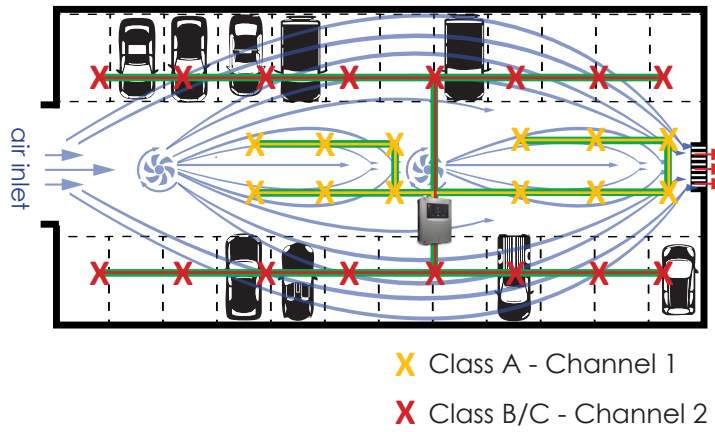

Figure 4: Securiton ASD pipe network

It is not recommended to sample air within the jet fan enclosure as there is a potential for missing or not detecting a fire downstream, when there is no jet fan present or sampling points afterwards.
Therefore the position of the monitoring pipe network is crucial.

- For X Class A monitoring the sampling hole positions need to be 8m downstream from the jet fan, with a 4m spacing between holes and 3m gap between pipe lines as per *Figure 4* above.
- Using ASD PipeFlow calculation software, a Securiton SEC-ASD-535 can protect the entire *Figure 4* car park under the following conditions:

	Securiton Product SEC-ASD-535	
	X CLASS A - Channel 1 (jet fan air influence)	X CLASS B/C - Channel 2 (other car park areas)
Monitoring Area per channel	2,000m²	
Max. length of the furthest sampling hole	110m	
Max. overall length of the sampling pipe network (branched) per channel	300m	
Max. number of sampling holes per channel	18	56 / 120
Max. smoke transport time	< 60 secs	< 90 secs / <120s
Smoke detection alarm	will shutdown ALL Jet fans within zone	activates fire mode for entire car park
Fire panel alarm (FDCIE activation)	NO manual override - will clear and return to normal state once alarm event is over	Enters Fire Mode - REQUIRES manual override to clear and return to normal state

DESIGN ASSISTANCE

For complex installations where there are multiple levels and different shaped car parks, the ASD PipeFlow calculation software looks for the ideal layout of the pipe network within the car park space.
Different models are available within the Securiton range to meet the specifics required.
Contact the team at Incite Fire to assist with designing your project.

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