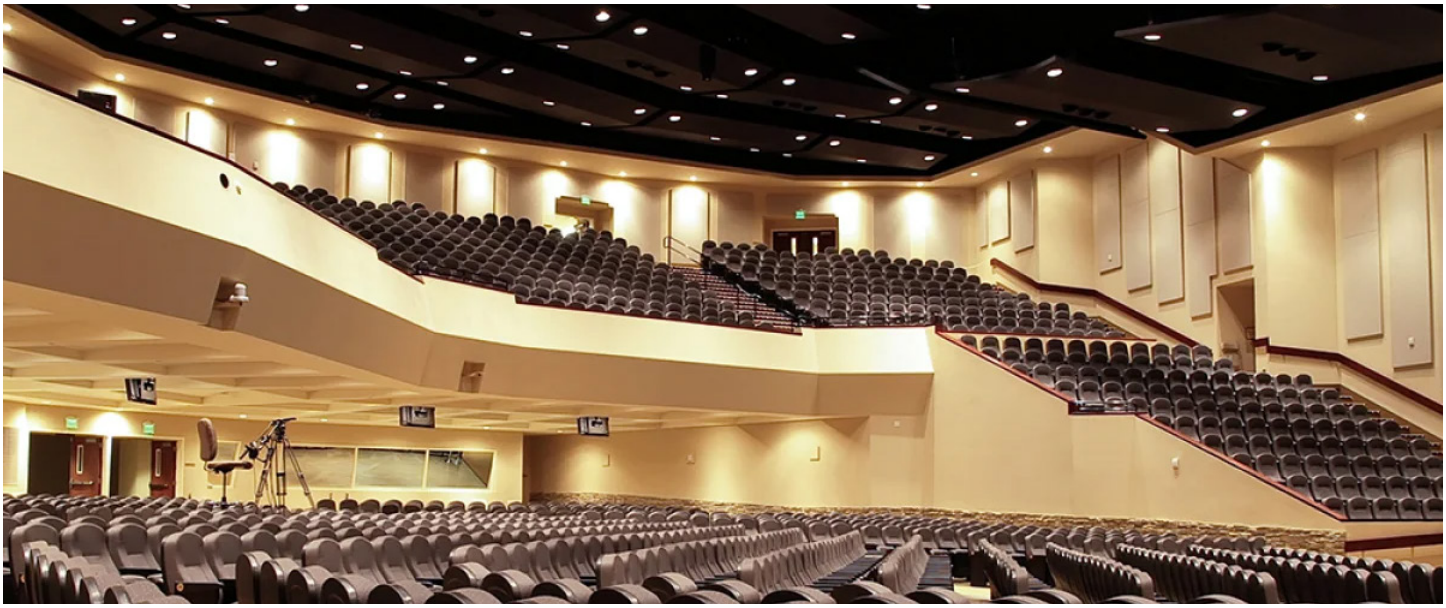
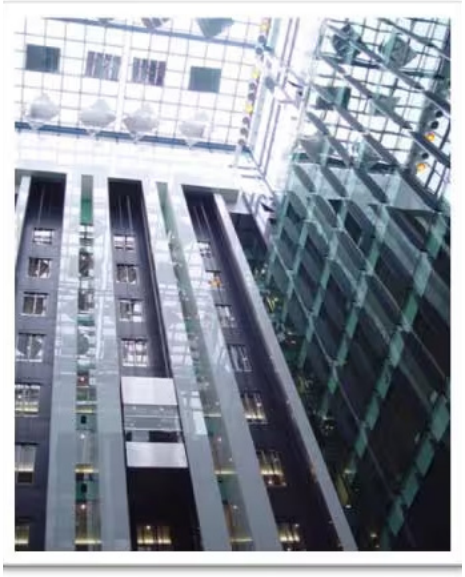


CHALLENGES FOR FIRE DETECTION IN LARGE OPEN SPACES PART 1

Large open space (LOS) areas are a key feature in commercial and public buildings that serve many diverse purposes:

- Enhance aesthetics; give a feel of space and light and provide a connection to the outside
- LOS1Create a communal space for the gathering of people (entertainment, exhibits, etc.)
- Serve as a hub connecting various parts of a building
- Facilitate natural ventilation as part of efforts to minimize energy consumption
- Act as a reservoir to collect and purge smoke from the building
- Provide for the efficient storage of goods and produce



Examples of building designs incorporating LOS include warehouses, theatres, arenas, stadiums, hangers, transport hubs (train stations, airport concourse), shopping malls, galleries, cathedrals, museums, industrial plants, etc.

The characteristics of LOS will vary depending on the intended purpose, however, common traits are large volumes, high ceilings, vertical thermal gradients and cross flows. Such building geometries and environmental conditions will complicate the development of smoke plumes and potentially affect the performance and reliability of fire safety systems.

FIRE DETECTION CHALLENGES IN LOS

The development of a smoke plume in a LOS can be complicated. The ascending smoke plume will entrain air, cool down and dilute, lack sufficient thermal lift to rise to the ceiling (stratify), or move sideways due to cross flows. As a result, smoke reaching the ceiling will be diluted, delayed, or unable to reach the ceiling, that will directly affect the performance reliability of ceiling detection technologies.

For LOS environments, the following detection strategies are commonly deployed:

- Aspirated detectors with very sensitive detection chambers and integrated smoke reading (i.e. cumulative sampling) are ideal for the detection of diluted smoke reaching ceiling level, however, to detect stratified smoke, the pipe network must be deployed on multiple levels adding to the installation cost. With the ability to support extended pipe lengths, aspirated detectors can be mounted at an easy to access location for service/maintenance.

- Optical smoke beam detectors provide integrated smoke reading along the beam paths allowing for the standard fire detection of diluted smoke. They are relatively easy to install and have a low cost of installation and maintenance. The latest optical smoke beam detectors using CMOS technology further simplify installation and are able to analyze and compensate for changing building and environmental conditions leading to increased reliability.

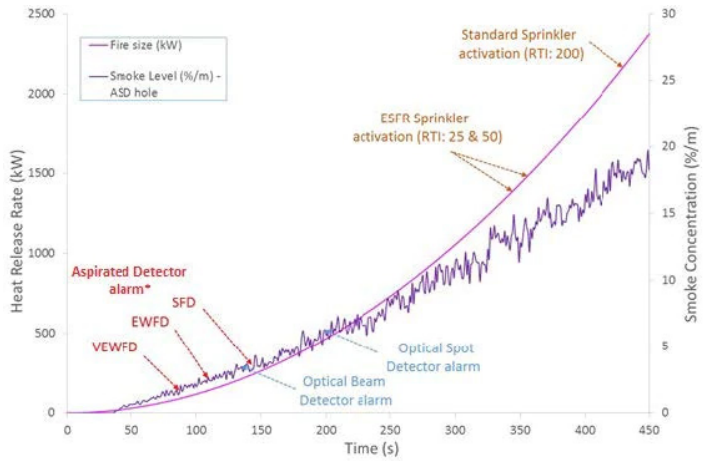
- Spot detectors provide addressability (desirable e.g. in high rack warehouses to identify the aisle of fire origin), however, are limited to localized (single point) detection making the technology unsuitable to detect diluted smoke – this is the reason why building codes limit spot detectors' deployment height. Accessing spot detectors for maintenance and service can be a difficult and expensive time-consuming exercise.

- Heat detection systems rely on the temperature of the ceiling jet / smoke layer to activate. Since smoke plume temperature decreases with height, detection systems relying on the fire heat signature will not detect fires in their early development stage in a high ceiling space, but only when they have grown to large heat release rates (HRR), at which point, occupant's safety might be at risk and potential damage has occurred to the property.

- Flame detectors detect the flame of a fire not smoke and though will provide relatively fast detection of an open flaming fire within its field of view, may fail to respond if the flames are contained or obstructed from view. Flame detectors may also be susceptible to nuisance alarm or faults from lightning, hot surfaces, radiation sources, etc.

- Emerging video smoke and flame technology provides fast detection as well as visual verification of a rising smoke plume, however, repeatability of the system is severely affected by colour of smoke / background, lighting conditions, airflow and obstructions in the field of view. For this reason, video / flame smoke detection has not gained wide acceptance as a reliable smoke detection technique.

The following chart helps to visualize the difference in detection performance between optical and heat detection systems in a LOS (8m (26ft) high ceiling) for a "Medium T-square" fire derived from Computational Fluid Dynamics (CFD) modelling



* VEWFD: Very Early Warning Fire Detection, EWFD: Early Warning Fire Detection, SFD: Standard Fire Detection

As seen from the chart, a sensitive smoke detection technology that integrates the smoke signal (i.e. ASD) can provide timely notification to a fire event for remedial actions to be taken while fire size is still manageable, as well as improve the fire services' response times.

To find out more about the Effective Fire Detection in LOS and the Project examples, please proceed to the next blog- Solutions for Effective Fire Detection in Large Open Spaces.

For more information
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