

SPECIAL APPLICATIONS

THE PROTECTION OF HIGH OR LARGE VOLUME BUILDINGS

Introduction One of the most widespread applications for Stratos detectors is the protection of high or large volume buildings and spaces such as warehouses, superstores, churches, cathedrals, cold stores, and aircraft hangers, atria and towers.

In these applications it is often difficult to achieve effective detection using. Whilst conventional point-type and infra-red beam detection systems can be very effective if correctly engineered, they do have fundamental disadvantages in this application.

- Point detectors should be installed in accordance with applicable Codes, Standards or Regulations. These instruct the installer on the minimum quantity of detectors and their positions within the building considered necessary to respond to a fire but it is very difficult in large or high spaces to provide an effective system.
- Once installed the performance of the system is fixed. Only on sophisticated closed protocol analogue addressable point detection systems can small adjustments be made. This sometimes will require the attendance of the original equipment manufacturer.
- The detectors are normally mounted at high level and any smoke may not reach them because of smoke stratification.
- Beam type smoke detectors are relatively insensitive and rely on stable mounting points. Modern steel frame buildings do flex in response to solar heating and wind pressure. This flexing can cause beams to go out of alignment.
- To heat the buildings it is common to use 'black heat' radiators at high level. These would cause unwanted alarms from beam detectors.
- Once installed, there is no statutory requirement to test the smoke detection system by replicating the smoke produced by a fire at or around the potential risks. The system may comply with a Standard or Code but does it actually work?
- Routine maintenance and testing of the detectors is often difficult and requires expensive access equipment. This is disruptive and in a building normally open to the general public, requires the work to be performed during premium-rate time. These costs are often overlooked when evaluating the different smoke detection systems that are available.

An intelligent Stratos aspirating smoke detection system will provide a cost-effective solution to the problem of providing an effective smoke detection system in a high or large volume building.

- The sampling pipe network can be installed so that as a minimum the spacing of sampling holes should meet the recommendations of any Code, Standard or Regulation
- If stratification is anticipated the sampling points can be extended away from the main sampling pipe runs (down, up or sideways) to place the sampling hole in the most effective position at very little cost.
- Once installed the cost of increasing the number of detectors is minimal – more calibrated holes are drilled.
- Stratos detectors have artificial intelligence that continually record the standing levels of air pollution, and providing consistent trends are evident will adjust themselves to give the highest possible sensitivity with the minimum risk of unwanted alarms. It is a simple operation to either increase or decrease the potential system sensitivity if the application requires it.
- Those parts of an aspirating smoke detection system requiring routine maintenance can be installed in an accessible position. This dramatically reduces the whole life costs of the system, as the sampling pipe network does not require regular maintenance.
- The detection systems would not be adversely affected by building movement or heating systems
- The accepted way of commissioning and testing aspirating smoke detection is based on a wide selection of smoke tests given in BS 6266 or the BFPSA code of practice. The user and his representatives can specify which of these tests is considered suitable prior to placing the works out to tender. Therefore the user can be assured the system will work under actual fire conditions. If internal alterations are likely to affect system performance a smoke test will verify whether alterations are also necessary for the aspirating smoke detection system

Smoke Stratification

A major consideration when designing a smoke detection system for a large, tall, space is smoke stratification. Smoke and aerosols generated by a fire at low level in the space may only have a certain amount of thermal energy to lift them up towards those positions where smoke or beam detectors can be installed. As the hot smoke rises it dissipates and cools as it mixes with the air in the space. There will be a point where the smoke has lost its thermal energy and can no longer rise. It will spread horizontally and eventually begin to fall as small particulate matter. This is known as the thermal inversion or stratification level.

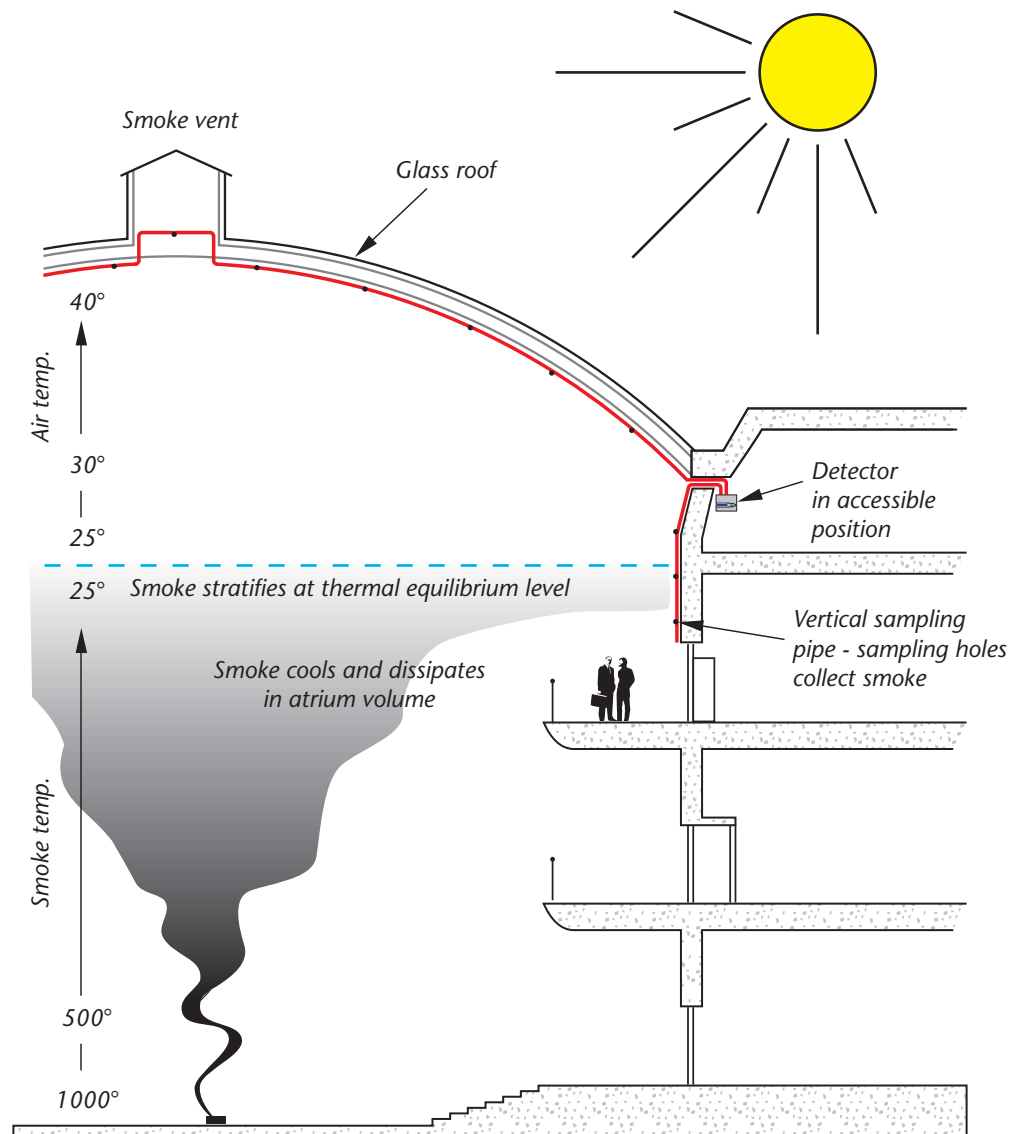
The exact height at which this occurs is dependent on many factors. For example on a hot summer day the temperature at high level in the space will be high and consequently the stratification level would be lower. At night, or during winter, the stratification level would be higher within the space or non-existent. Ventilation, either fixed or forced will also have an effect, so a smoke detection system that can account for these phenomena is required.

APPLICATIONS Atria.

Many modern buildings are being built around a centre atrium to provide a bright airy atmosphere to the occupied spaces. In multi-storey buildings such as shopping malls there is the potential for smoke and fumes to enter this common space from many directions.

The difficulty with detecting this smoke is that there are limited positions available to mount smoke detection systems (without spoiling aesthetics) that will be effective at all times. Traditionally infra-red beams have been installed but with the requirement to reduce the spread of smoke by compartmentalisation of the void and the fact regular access is required to the units has made them less popular. Fig.1). Shows how a Stratos system can be installed using both horizontal and vertical runs of sampling pipe to protect the space under virtually all circumstances.

Fig. 1 Using Stratos to protect an atrium



It can be seen in this example that the Stratos detector has the ability to detect smoke over approximately one third of the void height. By using an appropriate material or finish for the sampling pipe it can blend with the architectural features.

The detector has been mounted in a service area so that it is readily accessible for routine maintenance.

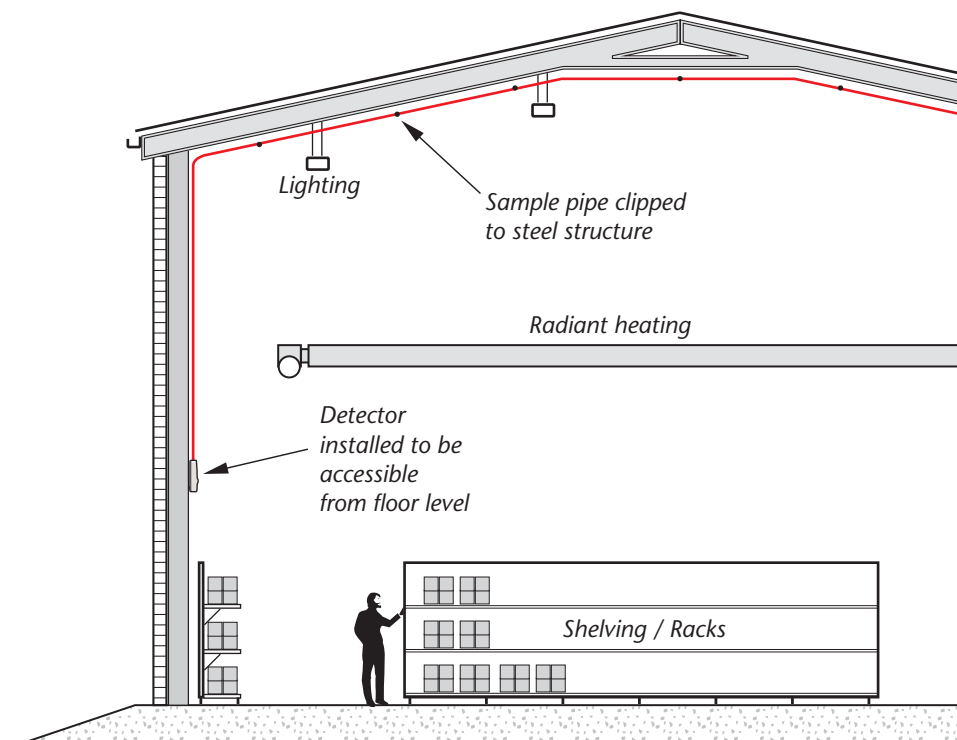
Superstores and Warehouses

Because of their greater height and volume general warehouses and superstores are often difficult to protect reliably with conventional point or infrared beam smoke detectors.

The great variety in the shape of stored goods in warehouses mean that infra red beams can become obscured, movement in the building can give rise to faults or the 'shimmer' from overhead space heaters can cause unwanted alarms.

Maintenance can be difficult for both types of system as goods or fittings may obstruct the floor beneath the detectors. If the building is open to the general public maintenance may have to be undertaken at premium rate times.

Fig. 2 *Stratos installed in a warehouse/superstore*



By using a Stratos aspirating smoke detection system the problems normally associated with conventional detection techniques will be overcome. The Stratos detector can be installed in an accessible position and heat or building movement would not affect the sampling pipe network.

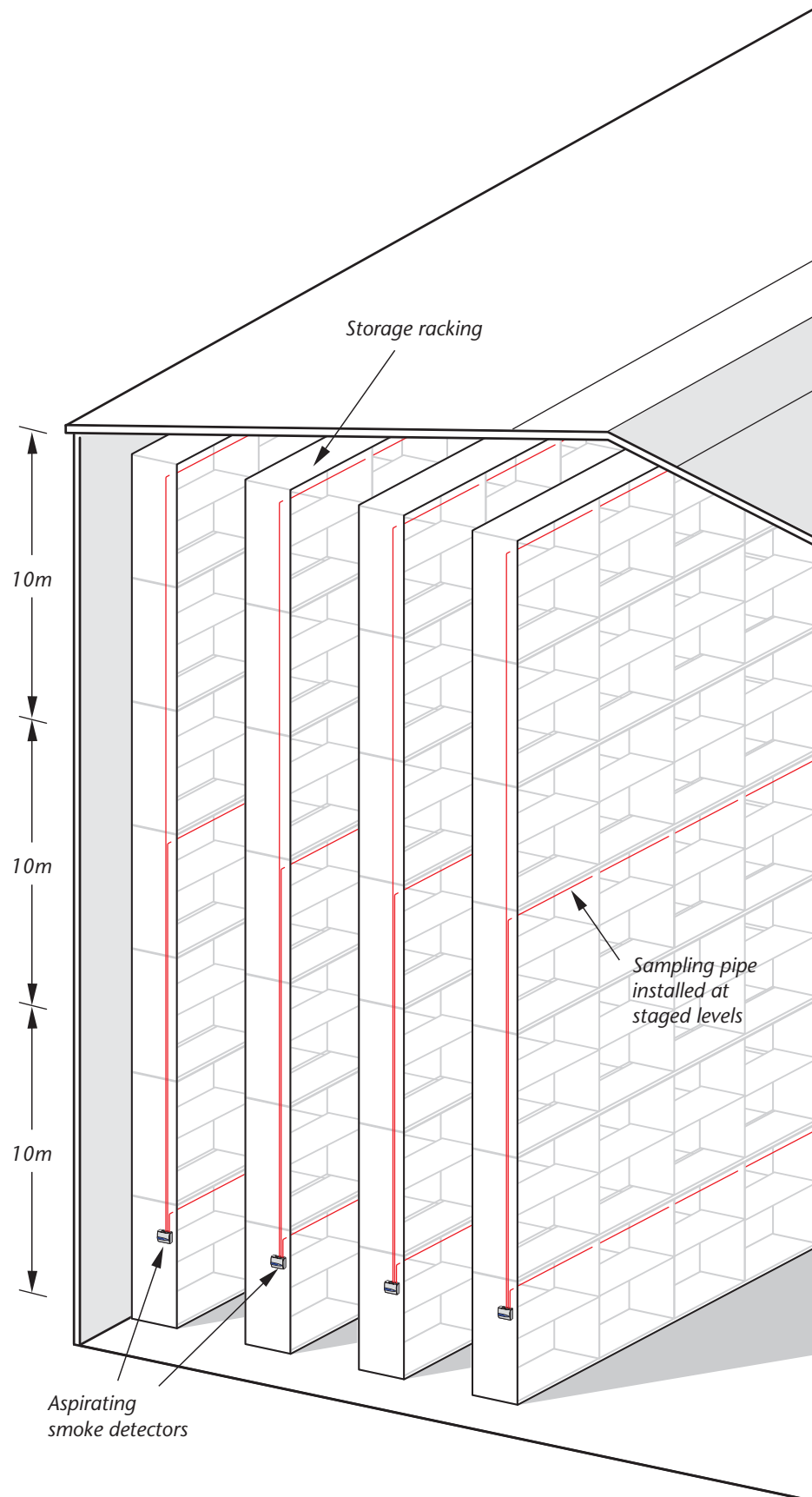
To facilitate routine performance testing the sampling pipes can be extended to accessible positions and fitted with test points as described in Guidelines for Standard Sampling Point Networks.

Automated High-Bay Warehouses

Stratos is ideal for the protection of modern automated high-bay warehouses. The problems associated with Superstores and Warehouses and conventional detection are similar but the designer may also have to consider the overall height of the area to be protected.

Any Codes, Standards and Regulations that may apply to the project often have maximum height limitations for a single horizontal layer of smoke detection. The designer must be aware of these requirements before choosing the position and number of sampling pipe branches and the total number of Stratos detectors. It must also be remembered that the general limits given in these documents are the absolute maximum heights and the system designer should take care to ensure the installed system would actually pass a specified or relevant performance test.

Fig. 3 *Installing Stratos to protect an automated high-bay warehouse*



Large Public Buildings

There are many public buildings that feature large void spaces. Many of these are of great historical significance and may contain irreplaceable art treasures.

Aesthetics are often important in these buildings but the rules and recommendations governing the position of detection remain unchanged. This means the system designer may often have to devise a system that fulfils the spirit of the rules and regulations yet remains unobtrusive. Stratos aspirating smoke detectors give the designer the ability to install systems that are both efficient and practical.

Figure 4 shows a number of options for the protection of a large church. These have all been applied successfully in the past and have responded well to appropriate smoke tests. The main sampling pipes are concealed and the sampling points (detectors) are virtually invisible. Because the Stratos detectors can be installed in accessible positions, the cost of routine maintenance is kept relatively low when compared to conventional point and infrared beam detectors.

Fig. 4 *Cross section through a church showing various options for the position of smoke sampling points*

