

# SMOKE DETECTION IN HIGH CEILING SPACES

## Part 1: Introduction, literature review and modelling

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Specifying suitable smoke detection in high ceiling spaces such as atria, warehouses and entertainment venues is very complicated, and the criteria for assessing the performance of aspirating and optical smoke detectors are not fully understood. Research by BRE Trust and the Fire Industry Association (FIA), using computer modelling and full-scale tests, has provided valuable data that have enabled guidance to be revised. This Information Paper outlines the programme of research and summarises the conclusions.

The research was conducted in three phases: a literature review, computational fluid dynamic (CFD) modelling and fire tests conducted in a 43.5 m high hangar. Part 1 of this Information Paper covers the literature review and CFD modelling. Part 2 covers the fire tests and conclusions.

This Information Paper is aimed at manufacturers and installers of smoke detectors, building designers and regulators, who should find it valuable in gaining a full understanding of the main factors influencing smoke detection in such applications.

#### 1 INTRODUCTION

Smoke detectors are widely used in commercial premises to detect the smoke from a fire in its initial stages. By providing reliable early warning, they offer property protection as well as alerting building occupants and allowing them time to escape. In high ceiling spaces the smoke movement is influenced by many factors such as air movement, stratification and the smoke concentration, which depends on the fire size and the volume of the room. With so many variables, it is complicated to specify the type and location of the smoke detector and to be confident of its detection capabilities.



Figure 1: Smoke pellet burn test under way in 43.5 m high hangar

