



SMOKE MODELLING

The time taken between the ignition of a fire and the onset of life threatening conditions in a building is the maximum time that occupants have to move to a place of safety, referred to as the available safe egress time (ASET). It is smoke from a fire which usually hinders the occupant evacuation and therefore it is important to understand the principles of smoke movement in buildings. In simple cases, empirical models such as zone modelling techniques can be used to establish the smoke development and movement within a building.

Computational Fluid Dynamics (CFD) modelling is a specific area of fire engineering that is used when zone modelling capabilities exceed their limitations. This occurs in larger, more complex buildings when a design requires more sensitivity analysis or confidence for approval. It can provide clearer representation of the smoke temperature, visibility and toxicity.

With CFD modelling, the volume to be modelled is divided into a large number of smaller cells where calculations on the movement properties of fluids are determined between each cell. This means that more detailed information on the smoke can be generated in particular areas, taking into account the complex geometries and the ambient conditions in a space which may be sensitive to the overall fire engineering design.

The output produced by the CFD model are much more visual than zone models as it can clearly show the environment through which people escape in the building. Results include three dimensional information on visibility of escape routes, velocity and direction of smoke flows, or temperature distributions within the buildings. This can be advantageous in the approval process.

The application of CFD also allows a detailed analysis and optimisation of smoke control systems in complex buildings; this applies in particular to optimise the locations of extract and supply air and required air volumes.

Holmes Fire has used CFD models successfully on a number of projects including:

- North Sydney Station, Sydney, Australia
- Nationwide News Limited, Sydney, Australia
- El Corte Ingles Department Store, Barcelona, Spain

