# Abstract

In the scenario of a compartment fire, smoke is typically exhausted via natural or mechanical smoke ventilation systems. Natural smoke ventilation systems may make use of high-level smoke vents to disperse hot smoke due to its buoyancy, while mechanical smoke ventilation systems use a mechanical exhaust fan and/or duct system to exhaust smoke to the external environment.

This thesis studies the performance of a mechanical smoke ventilation system based on smoke exhaust duct (SED) systems by analysing a few key parameters which may be critical to achieving the desired life safety criteria in a single compartment office fire via computational fluid dynamics (CFD) simulations.

The CFD studies are conducted using the Fire Dynamics Simulator (FDS) software to model a single compartment office with an area of 2,500m2 and simulate a generic office fire of which the smoke is extracted via the smoke exhaust duct (SED) system. Several key parameters of the SED system are varied and analyzed to have a broader understanding on how the factors affect the performance of the SED system and its consequential impact on the life safety criteria which is the main performance criteria when designing a smoke ventilation system for an office fire.

This thesis aims to present a general indicative guide based on CFD simulations, for the design of mechanical SED systems for a fire scenario in a single compartment which is of an office occupancy type. This design guide is produced by studying the difference between plume correlations compared to CFD simulations and how variations in key SED parameters studied may influence the simulation results. Further research is recommended to validate the results and to explore further variation of parameters in a SED system and in different fire scenarios.