Project:

PARAMETRIC STUDY ON THE EFFECT OF INSULATED BOUNDARIES ON THE BEHAVIOUR OF COMPARTMENT FIRES

Keywords: insulation materials, compartment fires, fire growth, thermal barrier, thermal inertia

Background and motivation

Insulation materials are increasingly used in the built environment in order to meet stringent energy efficiency requirements. The increase use of insulation is however deemed to represent a fire hazard due to the reduction in heat losses from the compartment to the exterior. Despite the fact that this is widely recognised in the Fire Safety community, there are few quantitative assessments in the literature to determine the relationship between fire growth and the thermal properties of compartment boundaries. Furthermore, these correlations are limited to very specific conditions.

Research objectives

The main objective from this study is to identify different regimes and conditions under which the insulation makes significant or little difference to the effective thermal exposure from the compartment fire, and therefore fire growth.

Methodology

The nature of this project is mainly analytical, with possibility of performing validation experimental work. This project will primarily focus on:

(1) a review and compilation of experimental data regarding the effect of insulated boundaries on the fire growth (e.g. McCaffrey et al. (1981), Poulsen et al. (2012, 2013), Edinburgh Tall Building Fire Tests (ETFT) (2012), Malveira Test (2013), etc.);

(2) numerical analyses to study for specific scenarios the relationship between compartment dimensions, boundary thermal properties, and layers distribution, and thermal exposure; and

(3) potentially further experimental work to serve as validation of the numerical studies and correlations found.

Recommended literature

