

An in-house large eddy simulation (LES) based fire field model has been developed for large-scale compartment fire simulations. The model incorporates four major components, including subgrid-scale turbulence, combustion, soot and radiation models which are fully coupled. It is designed to simulate the temporal and fluid dynamical effects of turbulent reaction flow for non-premixed diffusion flame. Parametric studies were performed based on a large-scale fire experiment carried out in a 39-m long test hall facility. Several turbulent Prandtl and Schmidt numbers ranging from 0.2 to 0.5, and Smagorinsky constants ranging from 0.18 to 0.23 were investigated. It was found that the temperature and flow field predictions were most accurate with turbulent Prandtl and Schmidt numbers of 0.3, respectively, and a Smagorinsky constant of 0.2 applied. In addition, by utilising a set of numerically verified key modelling parameters, the smoke filling process was successfully captured by the present LES model.

