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Title: Influence of Double-Skin Facades on Fire Safety

Abstract

A combined experimental and numerical approach for fire modeling is developed and examined in this research. Salt water modeling experiments are successfully conducted in laboratory in a 1/20 scaled acrylic model to simulate the smoke transportation in the configuration of louver double-skin facade. Utilizing blue dye and PIV/PLIF measurements assisting with dimensionless analysis, dimensionless front arrival time, dimensionless velocity, and dimensionless density difference of the salt water flow could be obtained to evaluate CFD full-scale models in FDS in which velocity, temperature, mass fraction, mass flow and particles are tracked in the domain. The measurements from these two methods show a great agreement in predicting smoke spread rate in the cavity and smoke filling process in the adjacent floor. Totally four cases with four different louver angles are tested, from which the most critical case 135 degrees along with its mechanism is highlighted. Results and conclusions could be referenced by fire consultants and architects when making designs and even fire fighters when making tactics. The advantages and disadvantages of applying salt water modeling and CFD modeling in fire research are summarized for future reference.