EXPERIMENTAL AND NUMERICAL INVESTIGATIONS OF SMOKE EXTRACTION SYSTEMS IN MOVIE THEATERS

By

Amro Hossam-Eldeen Al-Tohamy Saleh

A Thesis Submitted to the
Faculty of Engineering at Cairo University
in Partial Fulfillment of the
Requirements for the Degree of
DOCTOR OF PHILOSOPHY
in
Mechanical Power Engineering

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
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Title of Thesis:

EXPERIMENTAL AND NUMERICAL INVESTIGATIONS OF SMOKE EXTRACTION SYSTEMS IN MOVIE THEATERS

Key Words:
Fire Dynamics Simulator (FDS); movie theaters fires; nondedicated systems; smoke-control mode; smoke extraction systems.

Summary:
The ability of the Fire Dynamics Simulator (FDS) to simulate smoke extraction systems and its ability to correctly deduce temperatures at several different locations during the fire is verified through the current experimental work. Also, through the present study the FDS is used to simulate fire development, and to analyze the characteristics of smoke movement in a movie theater hall. Four cases are performed in this study to investigate the behavior of the HVAC systems when make-up air is supplied and smoke is extracted through linear and square vents. Depending on airflow patterns, temperature contours, and concentration of CO and CO_2, the performance of nondedicated systems is evaluated and compared. The behavior of the HVAC systems has been the main focus in the comparison at normal operation and when it changes to smoke control mode.

DISCLAIMER

I hereby declare that this thesis is my own original work and that no part of it has been submitted for a degree qualification at any other university or institute.

I further declare that I have appropriately acknowledged all sources used and have cited them in the references section.

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