NUMERICAL INVESTIGATION FOR CONTROL OF SMOKE IN DOMED MOSQUES

by

Eng. Osama Mansour Selim El-Sayed

A Thesis Submitted to the

Faculty of Engineering at Cairo University

in Partial Fulfillment of the

Requirements for the Degree of

MASTER OF SCIENCE

in

MECHANICAL POWER ENGINEERING

FACULTY OF ENGINEERING, CAIRO UNIVERSITY

GIZA, EGYPT

2015

NUMERICAL INVESTIGATION FOR CONTROL OF SMOKE IN DOMED MOSQUES

by

Eng. Osama Mansour Selim El-Sayed

A Thesis Submitted to the

Faculty of Engineering at Cairo University

in Partial Fulfillment of the

Requirements for the Degree of

MASTER OF SCIENCE

in

MECHANICAL POWER ENGINEERING

Under the Supervision of

Prof. Dr. Essam E. Khalil Hassan Khalil

Mechanical Power Engineering Department

Faculty of Engineering

Cairo University

Dr. Esmail Mohamed Ali El-Bialy

Mechanical Power Engineering Department

Faculty of Engineering

Cairo University

Dr. Waleed A. Abdelmaksoud

Mechanical Power Engineering Department

Faculty of Engineering

Cairo University

FACULTY OF ENGINEERING, CAIRO UNIVERSITY

GIZA, EGYPT

2015

NUMERICAL INVESTIGATION FOR CONTROL OF SMOKE IN DOMED MOSQUES

by

Eng. Osama Mansour Selim El-Sayed

A Thesis Submitted to the

Faculty of Engineering at Cairo University

in Partial Fulfillment of the

Requirements for the Degree of

MASTER OF SCIENCE

in

MECHANICAL POWER ENGINEERING

Approved by the

Examining Committee

Prof. Dr. Essam E. Khalil Hassan	**Thesis Advisor and Member**
Prof. Dr. Mahmoud Ahmed Fouad	**Member (Internal examiner)**
Prof. Dr. Osama Ezzat Abdel-Latif (Professor at Faculty of Engineering Banha University)	**Member (External examiner)**

FACULTY OF ENGINEERING, CAIRO UNIVERSITY

GIZA, EGYPT

2015

Engineer: Osama Mansour Selim El-Sayed

Date of Birth: 25 / 03 / 1990

Nationality: **Egyptian**

E-mail: **Osama.Selim@live.com**

Phone. : 01285262268

Address: 55, Abnaa Kaaemat Street, Embaba, Giza

Registration Date: 01 / 10 / 2013

Awarding Date: / /

Degree: Master of Science

Department: Mechanical Power Engineering

Supervisors: Prof. Dr. Essam E. Khalil Hassan
Dr. Esmail Mohamed Ali El-Bialy
Dr. Waleed A. Abdelmaksoud

Examiners: Prof. Dr. Essam E. Khalil Hassan
Prof. Dr. Mahmoud Ahmed Fouad
Prof. Dr. Osama Ezzat Abdel-Latif (Professor at Banha University)

Title of Thesis: NUMERICAL INVESTIGATION FOR CONTROL OF SMOKE IN DOMED MOSQUES

Key Words: Large buildings, smoke control, Mosques, Domed, Fire Dynamics Simulator

Summary:

The study shows the effect of Heat Release Rate (HRR), fire location and natural vents location on visibility, carbon monoxide concentration, smoke layer temperature and evacuation time. The results show that increasing the HRR, reduces visibility, increase carbon monoxide concentration and increase smoke layer temperature at human level as a result it increase the evacuation time. Also, when fire takes place at the center of the mosque, the smoke speared is faster than that one in corner fire. Finally the results show that the best position of natural vents is to be at the ceiling which give a better conditions for the occupants according to NFPA 130.

ACKNOWLEDGMENT

Firstly, I would like to thank Almighty ALLAH, whom I owe everything, for his generousness and support through all my life.

I would like to thank Prof. Essam E.Khalil, Dr. Esmail Mohamed Ali El-Bialy and Dr. Waleed A. Abdelmaksoud for their guidance and unremitting encouragement. I am grateful to them, and to all my respectful professors, for mentoring me throughout my undergraduate and graduate study.

I extend my gratitude to Eng. Mahmoud Amer for his valuable suggestions and noteworthy discussions. Thanks are also to my colleagues for their encouragement and support.

I would like also to thank Dr. Heba El-Sayed Teba for her great effort to help me in getting some information about the large mosque.

Finally, I owe a lifelong debt to my parents, my sister and my brother for their motivation through finishing this thesis and their patience and care and for maintaining a perfect environment for study and research.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES