NUMERICAL INVESTIGATION OF SMOKE MANAGEMENT IN AIRPORT INTERNATIONAL ARRIVALS HALL

By

Eng. Mohamed Karam Ali Hassan Fayed

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

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Title of Thesis: **Numerical Investigation of Smoke Management in Airport International Arrivals Hall**

Key Words: Smoke, HRR Effect, Fire Location Effect

Summary:

The smoke resulted from fire has a fatal effect on the occupants. The toxic products resulted from fires consist of narcotic components (carbon monoxide, hydrogen cyanide) and irritant (organic smoke products and acid gases HCL) which can cause incapacitation, death or disorientation. The effect of toxicity depends on length of exposure and the concentration. Numerical investigation of smoke propagation in Hurghada airport international arrivals hall. The investigation of HRR effect, fire location effect and smoke extraction vent location effect on the height of smoke layer, evacuation time, CO concentration, visibility and temperature. Besides the investigation of passenger's number effect on evacuation time. Fire Dynamic Simulator V 6.1.2 is a powerful tool used to simulate 8 case studies in Hurghada airport international arrivals hall with main dimensions of (200 X 5 X 3) m. The fire is caused by an accidental fire in hand bags. FDS is validated with experiment conducted by Huo. It shows an acceptable agreement with available experimental data. Case 7 is the best case because it has the best tenability conditions (evacuation time, visibility, smoke layer height, carbon monoxide concentration and smoke layer temperature) and ensures safe evacuation for passengers and case 5 is the worst case because it has the worst tenability conditions (evacuation time, visibility, smoke layer height, carbon monoxide concentration and smoke layer temperature) and does not ensure safe evacuation for passengers (3 dead passengers) when the passenger's number is 1350. Case 8 is the best case because it ensures safe evacuation for passengers when the passenger's number is 500.

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