WAY-FINDING AND CROWD MANAGEMENT IN SHOPPING MALL EVACUATION

Evacuation time can be reduced by successful crowd management techniques and efficient evacuation strategies. It is possible to use evacuation models for analysing egress strategies and evacuation procedures in shopping malls.

Becoming more and more important with the passing of time, performance-based design approach is implemented in many complex buildings, e.g. shopping malls, high-rise buildings, industrial facilities, etc. Evacuation modelling, which is the key subject in this study, is one of the main tools used for performance-based design of shopping malls. Including egress simulations of the building occupants, evacuation modelling has different modelling assumptions and modelling input for different types of buildings. Key points employed in the models for shopping malls include the implementation of the data obtained by experiments or drills into the model. The case study for which a great number of simulation studies have been carried out refers to one of the biggest shopping malls in Scandinavia, located in the city of Malmö (Sweden), namely 'Emporia'. Evacuation model results provide useful and important information in order to make a reasonable analysis of evacuation process, e.g. evacuation times, flow constraints, congestion levels, etc, as carried out in the thesis. In this way, some precautions can be taken to reduce the traffic level or shorten the evacuation time. The current model in this case study exemplifies hypothetical evacuation scenarios in an existing shopping mall. A group of hypothetical evacuation scenarios including locally quickest and shortest algorithm in the current locations of occupants as well as worst-case scenario and optimal scenario have been simulated. Considering the worst-case scenario and optimal scenario as a benchmark scenario, respectively, the results of egress simulations carried out for different scenarios were compared with the other scenarios. The results of the study have fulfilled its purpose and objectives which was to investigate the use of evacuation modelling for analysing egress strategies in shopping malls as well as specify and carry out simulations of the shopping mall 'Emporia' by means of evacuation modelling. Comparing the impact of wayfinding and exit choices in complex shopping malls in relation to different crowd management and evacuation strategies, the evacuation times for each scenario have been analysed. One of the main objectives of the study was to check if there was a way to shorten evacuation time by means of efficient crowd management techniques and evacuation strategies. In this case study, the shortest evacuation time has been obtained by using a detailed evacuation strategy which has been identified. It should be noted that this strategy would require a high level of training by the staff that will conduct it. The greatest difference between the scenarios has been observed in the comparison of worst case scenario and optimal scenario. The total evacuation time for the worst-case scenario is 40.5% greater than the one for the optimal scenario. This study showed that lower evacuation time can also be achieved by using either locally quickest routes to evacuate or shortest routes in the current locations of occupants by means of directing occupant to the nearest emergency exits. Additionally, a set of recommendations for the design of shopping mall evacuation strategies and improvements of the evacuation conditions were provided. It should be noted that this is a theoretical study aimed at studying shopping malls in general, which can be provide useful information for shopping mall evacuation studies, not only Emporia Mall.

Ogun Fuat OZALP
Fire Safety Engineering
Lund University, 2016
Lund, Sweden