Popular abstract

Increasing urbanization results in more high-rise buildings with more than 800 meters. And the ageing population phenomenon is a global trend. People over 60 years old are related to vulnerability and functional limitations. These two situations lead to the difficulty in escaping a building with stairs safely and rapidly. As a results, an alternative should be put forward to solve this problem. Elevators were proved to be a proper way to be used combined with stairs in the previous research.

To obtain a further understanding of using elevators for evacuation, this study focuses on the human factors associated with elevator use during evacuation in residential buildings, by using an online survey and a simulation.

An online survey is conducted to explore seven factors that may influence people's choice of elevators in China and The United Kingdom, including floor height, waiting time for elevators, crowd density in front of elevators, mobility limitations of people who occupants accompany with, instructions, fire location concerning people's current location, and information about reliability of elevators during evacuation.

Among the seven factors, the presence of people with mobility limitations is the primary factor that can influence people's choices. The usage of the elevators for evacuation in residential buildings increases along with the floor height people are in. Most people are not willing to wait for elevators for evacuation longer than five minutes. People who are on the fire floor or adjacent floor have less willingness to use elevators. The instructions from a management team unfamiliar to evacuees are not associated with a high willingness to use elevators for evacuation. Information within the evacuation plan about the reliability of elevators for evacuation can increase people's willingness of using them.

Comparing the results of this online survey with the previous studies, the online surveys can predict the usage of elevators in different ways, and the occupants in residential buildings use elevators less than those in high-rise buildings above 13^{th} floors.

Based on the results of online survey, a simulation with four scenarios in a fictitious 30-story residential building is performed to explore the evacuation process. The effects of three factors in online survey are proved by simulation: the distribution of occupants who choose to use elevators on each floor, waiting time, and instructions.

Considering total evacuation strategies based on the results of simulation, instructing people with mobility limitations to use elevators seems to be the priority as it can reduce the total evacuation time and the congestion in the staircase.

Although more scenarios should be performed in the simulation part to find more optimal evacuation strategies in residential buildings, this study still provide some recommendations for designing a total evacuation strategies for more types of high-rise residential buildings.