

## A Study on an Evacuation Test to Measure Delay Time in Using an Evacuation Elevator

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**Abstract :** Elevators are examined as one of evacuation methods in super-tall buildings. However, data on the use of elevators for evacuation at a fire are extremely scarce. Therefore, a test to measure delay time in using an evacuation elevator was conducted. In the test, time taken to get on and get off an elevator was measured and the case in which people gave up boarding when the capacity of the elevator was exceeded was also taken into consideration. 170 men and women participated in the test, 130 of whom were young people (20 ~ 50 years old) and 40 were senior citizens (over 60 years old). The capacity of the elevator was 25 people and it travelled between the 2nd and 4th floors. A video recording device was used to analyze the test. An elevator at an ordinary building, not a super-tall building, was used in the test to measure delay time in getting on and getting off an elevator. In order to minimize interference from other elements, elevator platforms on the 2nd and 4th floors were partitioned off. The elevator travelled between the 2nd and 4th floors where people got on and off. If less than 20 people got on the elevator which was empty, the data were excluded. If the elevator carrying 10 passengers stopped and less than 10 new passengers got on the elevator, the data were excluded. Getting-on an empty elevator was observed 49 times. The average number of passengers was 23.7, it took 14.98 seconds for the passengers to get on the empty elevator and the load factor was 1.67 N/s. It took the passengers, whose average number was 23.7, 10.84 seconds to get off the elevator and the unload factor was 2.33 N/s. When an elevator's capacity is exceeded, the excessive number of people should get off. Time taken for it and the probability of the case were measure in the test. 37% of the times of boarding experienced excessive number of people. As the number of people who gave up boarding increased, the load factor of the ride decreased. When 1 person gave up boarding, the load factor was 1.55 N/s. The case was observed 10 times, which was 12.7% of the total. When 2 people gave up boarding, the load factor was 1.15 N/s. The case was observed 7 times, which was 8.9% of the total. When 3 people gave up boarding, the load factor was 1.26 N/s. The case was observed 4 times, which was 5.1% of the total. When 4 people gave up boarding, the load factor was 1.03 N/s. The case was observed 5 times, which was 6.3% of the total. Getting-on and getting-off time data for people who can walk freely were obtained from the test. In addition, quantitative results were obtained from the relation between the number of people giving up boarding and time taken for getting on. This work was supported by the National Research Council of Science & Technology (NST) grant by the Korea government (MSIP) (No. CRC-16-02-KICT).

**Keywords :** evacuation elevator, super tall buildings, evacuees, delay time

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