Analysis of Evacuation Safety in Kiosk Fire on Typical Platform of Station
Hiroyuki Hayashi(K112615)

Keywords: Subway, Evacuation safety, Fire Escape Simulator, Event tree

The subway system which utilizes underground space effectively takes root in East Asian countries as a means of urban. Although the convenience and amenity of underground space such as subway and underground mall are improve. It would be comparatively difficult to evacuate underground space at the time of fire. Fortunately, we have never suffered extensive damage from subway fire in Japan. However, the Daegu subway fire was mass murder on February 18, 2003 which killed at least 198 people and injured at least 147. So I think that we have to evaluate the present condition of the fire safety performance of subway system in Japan again.

In this study, the evacuation safety in kiosk fire at the subway platform is evaluated by simulating evacuation and smoke movement in the real platform under the several conditions which are the type of platform, presence or absence of train at the platform, the number of people on the platform and in the train and use of escalators or not.

First, the safety measures of kiosk against fire currently installed on the all subway station platform of Tokyo Metro are investigated. The sprinkler system is not installed in the subway platform even if kiosk is installed there because kiosk is treated as the movable shop. However, the automatic water spray extinguishing system is install on the top portion of some kiosks. The installation rate of its system at kiosk is approximately 40%. So, the subway stations for evaluation of evacuation safety in fire were selected from the remaining 60% stations.

The simulation system of evacuation and smoke movement “EVATUS” is used for evaluation of evacuation safety. The several conditions such as occupant density of platform and train, presence or absence of train at the platform and availability of escalators as the escape route were varied in each case of simulation, and the evacuation time and the number of people who can’t evacuate from platform safely were measured in each case of simulation. On the other hand, event tree was created on the combinations of condition, and the occurrence probability of each combination was calculated by assuming the arrival time interval of train and time zone (rush hour or not). Then, the expectation of the number of people who can’t evacuate safely (hereinafter referred to as “the expectation of casualties”) was computed by multiplying the occurrence probability by it.

The simulation results showed that many people would be not able to evacuate from the platform in kiosk fire in the case of presence of train in rush hour. In the other cases, most people would be able to evacuate from the platform in kiosk fire. The probability of presence of train at the platform in rush hour is just 10 % of the total operational time. However, the possibility can’t be disregarded that many people would be not able to evacuate safely. And also, the expectation of casualties at the case of fire in subway platform computed in this study was almost equal to that at the case of fire in the hospitals computed by others in the previous study. Therefore, it is thought that the automatic water spray extinguishing system should be installed at least in the kiosk on the all subway platform.