

Disaster Risk News <Special Edition>

Importance of Fire Safety in a High-rise Apartment Building

Introduction

A massive fire broke out in a high-rise public apartment building in west London and it spread to the entire 24-story building before dawn on 14th of June, 2017.

In this report, we will look into the factors that contributed to the extensive damages and countermeasures, referring to the case of this fire and actual cases of fire in high-rise residential buildings in Japan.

* Please note that this report is created based on the information available as of 16th of June, 2017.

1. Fire in a high-rise public apartment building (west London)

The fire, which broke out before dawn on 14th of June, 2017 in a high-rise public apartment building (built in 1974, 24-story) in west London, spread to the entire building and caused many deaths and injuries. According to report, the blaze appeared to start from a residential area in a lower floor and rapidly spread upward to the whole building.

The cause of the fire has not been identified yet. However, according to media reports, followings are believed to be the contributors to extensive damages by fire (Table 1).

Table 1: Estimated contributors to extensive damages

Viewpoint	Contributors to extensive damages (Estimated)
(1) Initial fire fighting	<ul style="list-style-type: none"> ✓ Expired fire extinguishers suggested poor regular inspection of firefighting equipment (fire extinguishers). ✓ Lack of sprinkler system.
(2) Fire spreading	<ul style="list-style-type: none"> ✓ Lack of fire compartments (e.g. fire doors) in the building. ✓ Use of exterior cladding which contains a material that helps fire spreading in a renovation of the building
(3) Evacuation	<ul style="list-style-type: none"> ✓ Delay in fire detection due to time of fire break out (before dawn) and failure of activation of fire alarm system (automatic fire alarm system) ✓ Instructions by the building management to the residents to stay put in their units if fire is not close to their units/hallways.

(1) Initial firefighting

- Fire extinguishers in Utility Rooms (e.g. Power distribution room) had been expired. According to the sources, there were complaints from the residents to replace them. In addition, fire extinguishers in common areas (e.g. hallways) had been also expired. Thus, fire may have not been contained if they are used for firefighting.
- Some residents said that sprinkler system was not installed in the building. According to news releases, regulations in England require buildings constructed since 2007 and which are taller than 30m to have

sprinklers fitted. However, the requirement did not apply to this apartment building, which was built in 1974. Should sprinkler system be installed in the building, damages could have been mitigated.

(2) Fire spreading

- Lifts and staircases are located at the center of the building. This area was not fire compartmentalized. Thus, blaze and smoke of fire spread rapidly from one room to another causing more damages (refer to Figure 1 for the cross-section of the building and floor layout).
- It is said that an aluminum composite material (core material: resin) was used as external cladding of the building. Aluminum composite cladding was also used in the high-rise apartment building in Australia, where fire similarly spread to several floors of the building.

A fire broke out in a 23-story building in Melbourne on 25th of November, 2014. Aluminum cladding (core material: resin) is also used in the building. Fire started from the balcony on the 8th floor (cause of fire: cigarette) and spread to the 21st floor through the external wall. Meantime, there has been no casualty and injury by this fire

(3) Evacuation

- In addition to the time (before dawn) of fire breakout, failure of activation of fire alarm system (automatic fire alarm system) caused a delay in evacuation. As a result, blaze and smoke of fire spread to evacuation routes causing difficulty in evacuation before residents were notified of fire.
- According to news releases, the management of the building issued instructions to residents to stay put in their units if fire is not close to their units/hallways. Consequently, evacuation of some residents may have been delayed.

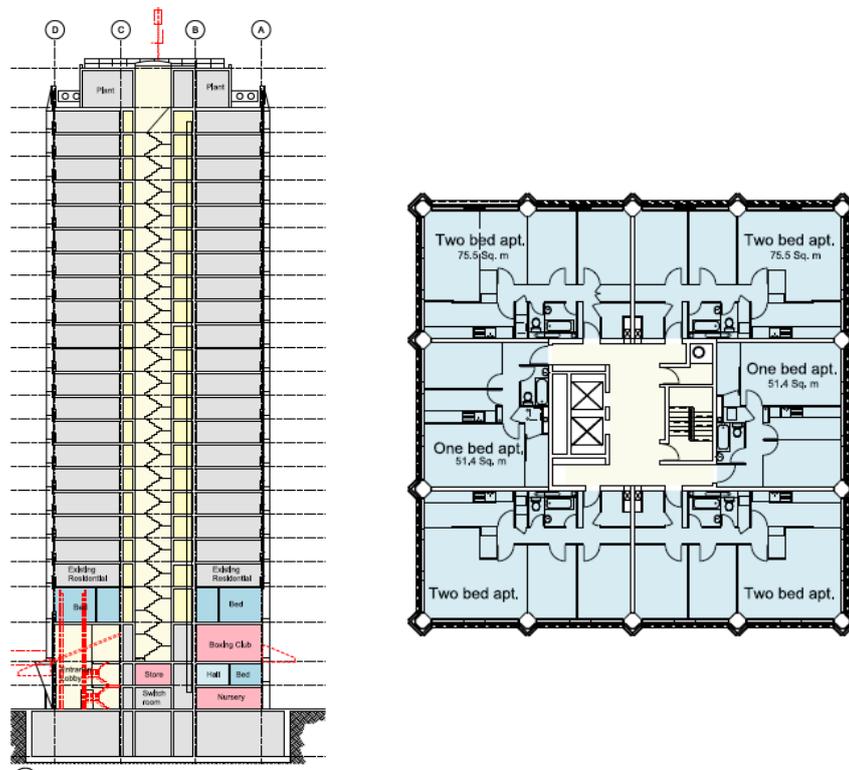


Fig 1. Cross-section of the building and floor layout

Sources: THE ROYAL BOROUGH OF KENSINGTON AND CHELSEA website

2. Fire in high-rise residential buildings in Japan

Similar fire incidents also occurred in high-rise residential buildings in Japan. However, most of them are limited within the unit where fire started. According to “Fire Safety in High-Rise Buildings – Report by Fire Safety Advisory Committee” by Tokyo Fire Department, the number of fire occurred in 15-story or higher apartment buildings within its jurisdiction was 319 for 10 years between 2003 and 2012. However, all of these cases caused partial damages of buildings or incipient fire, and none of the cases resulted in complete/half collapse of buildings. As such, fire spreading in an extensive area is quite rare.

Table 2 Fire incidents in Japan

Year	Description
① 1989	A fire broke out on the 24 th floor of a 28-story apartment building. The unit of fire origin was burned. Casualty: 0, Injured: 6
② 1996	A fire broke out on the 9 th floor of a 20-story apartment building. Many units right above the unit of fire origin (10-20 th floors) were burnt. Casualty: 0, Injured: 2
③ 2006	A fire broke out on the highest floor of a 32-story apartment building. Half of the unit of fire origin was burnt. Casualty: 0, Injured: 0
④ 2015	A fire broke out on the 20 th floor of a 25-story public apartment. The unit of fire origin was burnt. There was a difficulty in firefighting with aerial ladder fire trucks. Thus, fire fighters carried out firefighting from inside the room. Casualty: 0, Injured: 1
⑤ 2016	A fire broke out on the 12 th floor of a 14-story apartment building. The unit of fire origin was burnt. Casualty: 0, Injured: 5

As of 1989, “Case ①” in the above table was the fire in the highest floor in apartment buildings in the history of Japan. Followings are issues which revealed by the fire.

Case ①

- ✓ Although modern fire protection system was installed in the building, initial firefighting was failed due to personnel who could not use fire extinguishers and internal hydrants
- ✓ Emergency alarms and emergency broadcasting system were not used effectively to notify occupants of fire. As a result, emergency actions (e.g. evacuation) were not taken promptly.
- ✓ The building was taller than 40m, which made rescue operation with aerial ladder fire trucks impossible. Residents were rescued from balconies by using helicopter.
- ✓ Smoke of fire flowed into the staircases and emergency elevators, which caused difficulty in evacuation.

In “Case ②”, fire spread rapidly to the highest floor and caused unprecedented damages in the history in Japan. Followings are the factors which contributed to massive damages.

Case ②

- ✓ Fire broke out on the 9th floor and reached the highest floor in about 25 minutes. Blinds made of combustible acryl boards and combustible storages on balconies are the main contributors to the rapid fire spreading in an extensive area.

3. Fire safety management in high-rise apartment buildings

Here, we look at the factors which contributed to massive damages in London fire and fire in high-rise apartment buildings in Japan and important point of measures.

(1) Initial firefighting

At the time of completion, buildings were equipped with firefighting equipment (e.g. fire extinguishers, internal hydrants, sprinkler system) which met standards required by the law. However, if they are poorly maintained or personnel are not familiar with firefighting equipment, it is likely that effective initial firefighting cannot be conducted.

To ensure that effective initial firefighting is conducted in case of fire

- To conduct inspection of fire extinguishing/protection systems (e.g. function inspection and overall inspection) according to the law.
- To replace expired/deteriorated firefighting equipment and fire protection system immediately.
- To ensure fire extinguishers and internal hydrants (e.g. prohibition of storage materials) are accessible.

To educate all (many) residents on the use of firefighting equipment

- To provide residents with education on disaster prevention
- To conduct an emergency (evacuation) drill with participation of residents (with local fire brigade)
- To display instructions for the use of firefighting equipment

(2) Fire spreading

In order to prevent spreading of blaze and smoke from the unit of fire origin, fire compartments are constructed and high fireproofing external cladding is used in high-rise apartment buildings in Japan. However, there is a risk of fire spreading in an extensive area if integrity of fire compartments is compromised or combustibles are kept outside.

To prevent spreading of blaze and smoke horizontally (within the same floor) and vertically (to upstairs/downstairs through staircases and elevators etc.)

- To conduct regular inspection of fire protection system to ensure that fire doors and fire shutters operate properly in case of fire.
- To prohibit keeping of materials which cause obstruction to closing of fire doors and fire shutters.
- To educate residents to keep manual fire doors closed at all times.

To prohibit keeping of combustibles which encourage fire spreading

- To educate residents on prohibition of combustible storage on balconies (combustible storage may cause obstruction during evacuation).
- To check the flammability of materials (e.g. blind) which are additionally installed after completion of buildings.

(3) Evacuation

Factors such as a delay in fire detection and obstructions to evacuation routes may cause delay in evacuation.

- To ensure that fire can be detected at an early stage.
 - To conduct inspection of firefighting equipment and fire protection system (e.g. function inspection, overall inspection) according to the law.
 - To check the location of fire alarms and get familiarized with them (to educate relevant personnel)

- To ensure that residents evacuates safely.
 - To prohibit keeping of materials on evacuation routes.
 - To check evacuation routes for dangers which can cause injury to residents.

- To share a common awareness about evacuation among relevant people
 - To conduct an emergency (evacuation) drill with participation of residents (to promote participation of residents).

4. Conclusion

The massive fire in London has been reported widely due to huge damages it caused and it reminded us of the fear of “fire in a high-rise apartment building”. Countermeasures introduced in this report aim at ensuring appropriate maintenance of buildings and equipment, creating awareness and deepening knowledge about disaster prevention among residents. However, effectiveness of such countermeasures largely depends on the active involvement of the management and residents of the building in disaster preventive activities. We hope that readers of this report take the fire in London as an opportunity to review fire safety in their buildings and facilities.

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This report is written based on information open to public (news and other medias). The purpose of this report is to provide our customers with the useful information for their RM activities and has no intention to criticize any individuals and parties etc.

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