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Direction of FIRE Response in Super Tall Buildings

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Abstract

Not long ago, a fire in high-rise buildings in London, England, killed 58 people and caused enormous damage, which is the worst fire incident in the UK since World War II. In Korea, high-rise buildings and super tall buildings have a tendency to continue to increase, but they are more vulnerable to fire response. Therefore, it is necessary to discuss prevention and countermeasures against super tall buildings in the future.

As such, super tall buildings have been increasing more and more, but super tall buildings have not been able to cope with the fire countermeasures. Thus, this article examines the fire vulnerability of super tall buildings and the difficulty of fire suppression of super tall buildings, and suggests ways to prevent and quickly cope with fire in super tall buildings in the future. Super tall buildings are more vulnerable to fire. Of course, super tall buildings are strictly regulated with firefighting facilities such as sprinklers, evacuation facilities, and fir ewalls rather than general buildings. However, if fire breaks out due to the failure of fire suppression in the early stage of the fire, the firefighting authority is more vulnerable to fire because the firefighting must be accompanied by considerable difficulty. In particular, firefighting and rescue operations using helicopters are also difficult to access due to the rapidly changing currents around high-rise buildings. And as a result, firefighters must enter the super tall buildings themselves to quell the fire, which is not easy. Therefore super tall buildings fires are more vulnerable. Therefore, in case of fire in super tall buildings, fire suppression is very difficult, so more attention should be paid to fire prevention. Super tall buildings in many countries overseas, the emphasis is on expanding fire protection and fire evacuation facilities by applying very strict regulations. In Korea, it is also necessary to strengthen regulations for fire-fighting facilities such as fire detectors and sprinklers for each building, and to strengthen the inspection in advance. The introduction of mid-sized to large-sized helicopters that can extinguish the fire of super tall buildings seems to be urgent. In addition, it is necessary to strengthen the initial fire detection system. In addition, it would be a good way to reduce the damage by conducting evacuation drills in advance for residents.

[Keywords] ***Fire Response, Super Tall Buildings. Fire Suppression, Fire Vulnerability, Republic of Korea***

1. Introduction

Not long ago, a fire broke out in high-rise buildings in London, killing 58 people and causing enormous damage. This is the worst fire incident ever occurred in the United Kingdom after World War II[1].

In Korea, high-rise buildings and super tall buildings tend to continue to increase, but are more vulnerable to fire response. Therefore, it is fundamentally necessary to discuss the prevention and countermeasures for super tall buildings in the future.

Especially, super tall buildings in Busan are the most popular in Korea. Over 50 floors are called super tall, and 30 to 49 floors are called semi-super tall buildings. Busan has the largest number of super tall buildings in more than 50 floors, there are 344 super tall buildings over 30 floors and 49 floors, which is 14% of the nation[2].

In the mean time, the fire in the Busan Haeundae Marine City apartment complex in October 2010 was shocking enough to remind us of the disaster film "Tower". A fire broke out on the 4th floor of the 38-storey apartment building, where the golden-colored aluminum facade rushed to the roof, and Marine City, which was aiming for a futuristic residential complex, fell into great chaos. Nevertheless, since each floor firewall works relatively normally, the internal inflow of toxic gas has been blocked as much as possible, so it has not spread to large-scale disasters. As a result of this fire incident, fire safety standards for high-rise buildings have been significantly strengthened. However, there are still large and small fire accidents. In Seoul, 863 fires occurred in high-rise buildings during the past three years from 2013 to 2015, and 6 people were injured by the fire and damaged 450 million won in assets[3].

As such, super tall buildings have been increasing more and more, but the issues of super tall buildings that have not been able to cope with the fire countermeasures emerge. This article examines the fire vulnerability of super tall buildings and the difficulty of fire suppression of super tall buildings, and suggests ways to prevent and quickly cope with fire in super tall buildings in the future.

2. Fire Vulnerability of Super Tall Buildings

Super tall buildings are more vulnerable to fire. In fact, super tall buildings strictly regulate disaster prevention systems such as sprinklers, firewalls, and evacuation facilities rather than general buildings, but if the initial self-extinguishment of a fire fails, it will be more vulnerable since the fire authorities will have to face considerable difficulties. In particular, extinguishment and rescue operations using helicopters are also difficult to access due to the rapidly changing currents around high-rise buildings. As a result, firefighters must directly enter the super tall buildings to extinguish the fire, which is not easy. So the fire of super tall buildings is more vulnerable[4].

Actually, to look at firefighting drills conducted by firefighters of Busan Fire Department a few years ago (2013), it took 22 minutes for a firefighter to carry a 20kg equipment (air box, etc.) and walk to the stairs to reach the 67th floor fire site. And, as he climbed fast, the oxygen that could hold for 50 minutes showed up in 10 minutes. As a result, even if the firefighter succeeded in entering such a situation, the oxygen in the reservoir was insufficient, and it became a situation where it was possible to work on the fire extinguishment only about 10 minutes. As such, fire suppression of super tall buildings should be considered very difficult for firefighting.

3. Difficulty of Fire Suppression in Super Tall Buildings

Fire extinguishing of super tall buildings uses high ladder vehicles to extinguish fire. There are 435 ladder vehicles owned by national fire departments. Of these, only two refractor ladder vehicles (70m) are capable of extinguishing more than the 25th floor (72m) apartments, and one vehicle in Seoul and Busan respectively. Of all the ladder vehicles, 160 ladder vehicles are for 55m, which is the largest number and accessible only to the 20th floor of the apartment building[5]. As such, equipment that can directly extinguish more than 25 floors is insufficient as two in the whole country. Especially, in case of Busan, the number of super tall buildings with more than 50 floors is the largest in the nation with 28 buildings, and the number of super tall buildings with 30 floors to 49 floors is 344 buildings, which in conclusion demonstrates that high ladder vehicles have limitations in fire suppression.

Also, firefighting helicopters must be used to extinguish the fire, but it is also inconceivable. In Busan, there are two small helicopters, which are also old helicopters, which have limited water capacity. And in high-rise buildings, helicopters are vulnerable to rising winds in the sky, such as the wind, so it is a situation that rescue works cannot be properly conducted. That is to say, in Busan, there are two BK-117 models, small helicopters for rescue, but the first unit introduced

in 1992 was one of the 26 firefighting helicopters nationwide, the oldest, and the second unit was introduced in 1997, which was also an old helicopter. First of all, small helicopters are lacking in freshwater capacity to hold water, and because they are small, they are more susceptible to winds, making it difficult to approach or land on super tall buildings.

In the case of fire in super tall buildings, there is a limit to fire suppression with high ladder vehicles or firefighting helicopters.

4. Fire Response Direction of Super Tall Buildings

In the case of a fire in a super tall building, because there are many difficulties in suppressing the fire, more attention should be paid to fire prevention. Super tall buildings in many other countries abroad, the focus is on expanding fire protection and evacuation facilities by applying very stringent disaster safety regulations. For example, Dubai's Burj Khalifa (height 828m, 160 floors), the tallest building in the world, has an evacuation safe zone on all four floors including 42nd floor, 75th floor, 111th floor and 138th floor. The evacuation area, which can accommodate approximately 3,500 people, is finished with special fireproof materials and designed to accept only outside air, so that even if there was a fire inside the building, it is possible to shut the door and escape in it for two hours. Likewise, in Japan, super tall buildings are supposed to be equipped with super-fast sprinklers. So the water comes out quickly so that the initial automatic extinguishment of the fire is possible. Thus, in Korea, it is necessary to strengthen regulations on firefighting facilities such as fire detectors and sprinklers for each building, and to strengthen inspection in advance[6].

The introduction of mid- to large-sized new helicopters capable of extinguishing the fire of super tall buildings seems to be needed as soon as possible and it is necessary to strengthen the initial fire detection system. Also, it would be a good way to reduce the damage by conducting evacuation drills in advance for residents.

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