Rising to a global challenge

Stuart Kerr, Managing Director of Bodycote Warringtonfire Consulting (Middle East), discusses the challenges in evacuating and managing super high rise and complex buildings

Super high rise buildings present many unique fire safety challenges. The predominant challenge is how to facilitate the safe and timely evacuation of occupants in the case of an emergency. At any one time it is estimated that 15% of people would have some difficulty or discomfort walking down a number of flights of stairs.

This estimate would be increased in significantly tall buildings – some occupants may have disabilities or debilitating health problems such as asthma or arthritis. The use of lifts for evacuation is seen as the only option as they would not have the capacity to egress the building in a timely manner.

Even for people in full health the task of descending a building of 100 storeys would prove very arduous. Many countries have published guidelines on the use of lifts for fire fighting and for the evacuation of people with disabilities. For example *BS 5588: Part 8, Code of Practice for Means of Escape for Disabled People 1999*, allows the use of fire fighting lifts to evacuate disabled persons.

Interestingly, research in the UK found that the evacuation time from very tall buildings could be reduced by up to 50% when a combined strategy of lifts and stair evacuation was adopted. Not all people are comfortable using lifts. It is therefore important to give occupants a choice between lifts or stairs rather than to mandate the use of lifts. It is also very important to educate and train people, (by providing regular fire drills), in the use of lifts within specific buildings, as we are historically taught not to use lifts in a fire. Lifts are marked, 'do not use in an emergency'. We are therefore looking at a cultural change.

The benefit of utilising carefully protected and specified evacuation lifts to contribute to the evacuation of buildings is widely accepted nowadays. The preferred strategy in an emergency is to automatically take control of the lift cars and direct them towards pre-determined strategic evacuation floors.

There could be up to five or six evacuation areas/floors in a super high rise building. The building's occupants are required to utilise stairs to descend to the evacuation floors, before taking the express evacuation lifts to complete the journey to the ground floor and ultimately, to safety outside the building.

This article is not intended to be a technical summary of a lift evacuation strategy in a super high rise building, but the aim is to primarily highlight some of the areas of the design where differing approaches are being adopted.

These approaches seem to vary according to geographical location, and are reliant upon a high standard of facilities management in super high, complex and innovative buildings.

Currently, there isn't a definitive international code available which specifically addresses the provisions necessary for adopting such an approach, although the Hong Kong Code provides guidance to be adopted within its jurisdiction. Having such an international code, and having all necessary countries sign up to it, is probably an unrealistic aspiration by some.

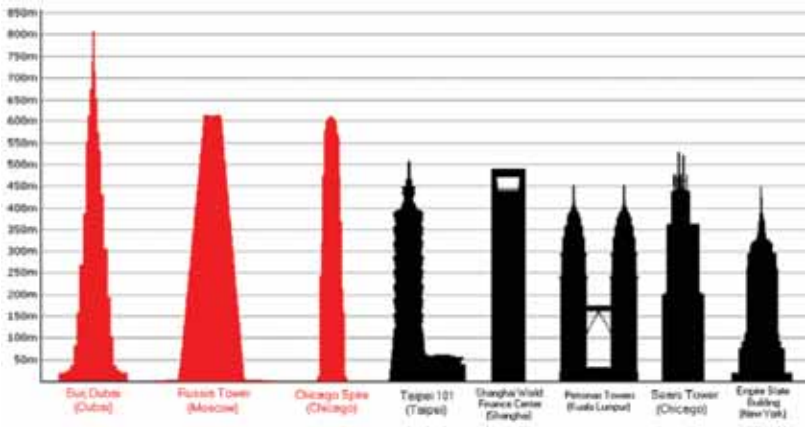
"THE PREFERRED STRATEGY IN AN EMERGENCY IS TO AUTOMATICALLY TAKE CONTROL OF THE LIFT CARS AND DIRECT THEM TOWARDS PRE-DETERMINED STRATEGIC EVACUATION FLOORS"

The lack of recognised codes and standards regarding lift evacuation in high rise buildings leaves the provisions to a competent Fire Safety Engineer and the local authority having jurisdiction to determine, and is therefore largely driven by the regulators' interpretation and the Fire Safety Engineer's experiences on similar structures.

These differing approaches being adopted internationally are bound to create uncertainty and confusion both in the design process and to facilities management companies.

Some examples of the differing approaches are highlighted below:

- The frequency of the evacuation floor. The solutions to this range from 20-30 storeys between evacuation floors containing refuge areas. It is often seen as efficient design to coincide the mechanical floors with the evacuation floors to minimise any loss in leasable floor area.
- The evacuation floors, which are served by the shuttle lifts, need to be equipped with a 'sufficiently sized' refuge area. The solutions to this range from sizing the refuge area based upon applying floor space factors of 0.28m^2/person (elevator lobbies, NFPA



How the current competition compares

101 Life Safety Code), to a refuge floor taking the whole evacuation floor as a safe refuge free from other uses and combustibles.

- The evacuating occupants should be able to continue down the escape staircase in the usual manner if they prefer. In some solutions, persons using the staircases are encouraged to leave the staircase at the evacuation floors and pass through the refuge area. They are then offered alternatives, ie. to take the evacuation lifts, or alternatively re-enter the staircase by an opposing entry point and continue down the staircases.
- The refuge floor/area should be provided with some means of preventing smoke ingress. The solutions adopted to this range from natural ventilation to the façade of the refuge floor providing cross ventilation, to pressurisation of the refuge area, to smoke extract within the refuge area.
- The lifts serving as evacuation lifts are required to be sufficiently protected from the effects of the fire, to ensure as far as reasonably practicable that the lift is available during a fire event. There are concerns surrounding this topic relating to smoke ingress, water ingress, and the effect of high temperatures on lift landing call switches. The adopted solutions to this range from blind lifts, serving only the evacuation floors in an attempt to limit water and smoke ingress, water resisting electrical installations, landings sloped away from lift shafts, pressurised lift shafts etc. (Some fire authorities have expressed concerns regarding the use of blind lifts as this may complicate any escape operations in the event a lift car malfunctions in between evacuation floors).
- Number of lifts/ evacuation or waiting times in the refuge, i.e. what is a reasonable time to empty the refuge floor. This is important if the intention is to progressively evacuate the upper floors by lifts.
- The use of dedicated evacuation lifts or alternatively designating passenger lifts as evacuation lifts. This has implications in the event of power loss to the building and generator sizing.

CONCLUSION

Whilst the above list is not exhaustive, it emphasises a need to engage a suitably competent Fire Safety Engineer who is experienced and familiar with the approach to the principles of lift evacuation in super high rise buildings, as this is a topic which is currently not addressed in international codes and standards.

"IT IS FUNDAMENTALLY IMPORTANT FOR FACILITIES MANAGEMENT TO FULLY APPRECIATE THE DESIGN INTENT"

Of equal importance, is the understanding by all of the intent of the fire strategy, and particularly in super high rise, complex and innovative buildings.

It is fundamentally important for Facilities Management to fully appreciate the design intent, and consequently be aware of how the building should be managed; any operational restrictions or limitations in the use of the building; the correct maintenance requirements for life safety systems; fire drill requirements; and how the evacuation should be managed.

This should be addressed in an Evacuation Plan and Fire Safety Manual produced by a competent Fire Safety Engineer prior to occupation. The Evacuation Plan and Fire Safety Manual stay with the building for the life of the building, and are updated as necessary, incorporating changes in the use or layout of the building.

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