

Digest

Fire risk in high-rise and super high-rise buildings

Prevention and mitigation

David Charters, Roisin Cullinan and Emma Warren

This Digest provides practical information and guidance on the nature of fire risk in high-rise and super high-rise buildings and how it can be adequately assessed and mitigated against. The Digest reviews several major fire incidents in high-rise buildings and fire statistics before presenting theoretical and quantitative analysis of fire risks in high-rise buildings. This guidance is intended mainly for designers (architects and engineers), approval authorities such as building approvers and fire officers, as well as those responsible for owning, operating and insuring high-rise buildings.

Introduction

The nature of high-rise buildings

High-rise and super high-rise buildings provide many benefits including efficiency, the effective use of restricted sites and iconic statements, not to mention great views. However, to ensure they are safe from fire, there are a number of challenges. For example, there is no universally agreed definition for a high-rise building, as this would depend on the surroundings and context. Guidance in Approved Document B of the Building Regulations 2010 (England and Wales) contains no clear definition. It is intimated in Section 17 that a high-rise building is any building above 18 m in height (approximately six storeys), as buildings of this height require firefighting shafts that would not be necessary in low-rise buildings^[1]. However, automatic sprinkler systems are only required in buildings over 30 m (10 storeys)^[1], which could be argued as the delineation of high-rise structures. Guidance to fire services from the Department for Communities and Local Government (DCLG) gives the definition of a high-rise building as 'one containing floors at such a height or position or design that external firefighting and rescue operations may not be feasible or practicable^[2].

By the traditional definition, high-rise buildings are those for which a fire cannot be fought using standard firefighting methods. There are therefore significant differences to fire safety measures in a high-rise building.



Figure 1: Canary Wharf, London

There are additional considerations, such as the increased number of occupants and their height above ground, which mean that evacuation strategies differ for high-rise buildings. The simultaneous total evacuation strategy adopted for most low-rise buildings is replaced by a phased evacuation strategy. Phased evacuation initially involves the occupants of a small number (two or three) of floors evacuating. Those occupants perceived to be in most danger evacuate first, while occupants on other floors remain in place. Phased evacuation can be escalated to full evacuation if necessary. However, the limited available stair capacity means that the length of time needed to evacuate high-rise structures often makes a full evacuation impractical during a fire. In some residential high-rise buildings, this approach is taken further and results in a 'defend in place' firefighting strategy, which is based on a fire being contained in a small area such as the flat in which the fire originated. The building occupants not within the flat of fire origin remain in place and/or obey instructions from the Fire and Rescue Service. For some high-rise buildings, people may still be evacuating down stairwells as firefighters gain access and set up bridgeheads via the stairs.