

Introduction

Purpose

The purpose of this guide is to provide a Fire and Emergency New Zealand position on the use of stairways within buildings in the event of fire. The primary objectives are to:

1. Outline the Fire and Emergency position on appropriate life safety design considerations for owners, designers and other building practitioners concerning use of stairways if they are to be utilised in a fire emergency.
2. Identify and address any limitations of the Acceptable Solutions (C/AS2-7) and the Verification Method (C/VM2) design methodologies when considering the use of stairways in the event of a fire emergency.
3. Describe specific issues affecting firefighting operations when using stairways.

Scope

This guide relates to any stairway serving a building that is intended to be used in a fire emergency.

In this document, two types of stairway are referred to:

- **Open or Accommodation stairways**
These are not provided with any complete fire separation from the surrounding spaces. Open stairways may include stairways between intermediate or mezzanine floors and those that are not fire-separated from all the floors that they serve. Escalators can be open stairways whether or not they have been stopped by operating the emergency stop mechanism.
- **Protected stairways**
Protected stairways are those that are fully fire-separated from all those levels that they serve. Another applicable term, used in the Acceptable Solutions, is 'vertical safe path'.

NZ building code

Performance requirements

Fire Safety C clauses C1 – C6 of the NZ Building Code define the performance requirements of the Building Act. Clause C4 details the functional requirements for occupants' movement to a place of safety while C5 details requirements relating to access and safety for firefighting operations. Parts 3 and 4 of the Acceptable Solutions provide information criteria relating to both open and protected stairways. Given the Life Rating in the Acceptable Solutions is no less than 30 minutes, no additional criteria are imposed in Part 6 ('Firefighting') of the document.

Fire Service Intervention – Notwithstanding the prescribed figures, Fire and Emergency observes that firefighting activities may be delayed (e.g. by commitment at other incidents or by the time taken to amass sufficient resources to commence firefighting operations within the building). If this is the case, the prescribed periods of fire resistance in the Acceptable Solutions may not be adequate to ensure safe conditions when sufficient firefighting resources arrive to commence internal operations.

Clause C5.6 of the Building Code requires that the building is 'to be designed and constructed in a manner that will allow firefighters, taking into account the firefighters' personal protective equipment and standard training' to reach and search the area of fire origin and to withdraw safely. Compliance with this Clause may require additional consideration of the time taken to reach the area where the fire may be located and/or persons may be trapped.

Standards – The following is a list of some Standards specific to building fire safety systems that are mandated for a variety of buildings. This is not an exhaustive list.

- NZS PAS 4509:2008 NZFS Firefighting Water Supplies Code of Practice
- NZS 4510:2008 Fire Hydrant Systems for Buildings

- NZS 4512:2010 Fire Detection and Alarm Systems in Buildings
- NZS 4541:2013 Automatic Fire Sprinkler Systems

Because stairways are integral to structures, a standard relating solely to stairways in isolation does not exist. However, all standards and reports related to structures and their fire-ratings and test methods are deemed to include stairways within their scopes.

Definitions

The following definitions apply for this guide.

BRE (British Research Establishment)

A research unit established by the UK government to consult, conduct research and testing for construction and the built environment.

C/ASx

New Zealand Building Code (NZBC) Fire Design Acceptable Solution parts 1 – 7 (xx represents numbers 1 – 7)

FEB (Fire Engineering Brief)

A formal process as outlined in the International Fire Engineer Guidelines for all stakeholders to define the scope of work for the fire engineering analysis and the basis for analysis as agreed by stakeholders.

FRR (Fire Resistance Rating)

This is a defined term in the NZBC Clause A1 – Classified uses. 'The term used to describe the minimum fire resistance required of primary and secondary elements as determined in the standard test for fire resistance' (refer to NZBC for full description).

Firefighting considerations

Minimum recommended Fire and Emergency requirements for multi-level buildings

Successful firefighting operations in multi-level buildings largely depend on what fire safety features have been installed.

Designers are required to consider firefighting operations to ensure compliance with the NZ Building Code, however additional considerations for high-rise buildings should be explored to enable lifts to be reliably able to be used for firefighting operations. Fire and Emergency recommends that designers meet with Fire and Emergency personnel as early as possible during the Fire Engineering Brief (FEB) process to discuss the firefighting requirements.

The following is the minimum recommended Fire and Emergency requirements for multi-level buildings above 25 m tall:

- A reliable automatic fire suppression system covering the entire building complex, for control or complete extinguishment. A fully compliant system in accordance with NZS 4541:2013 provides early fire suppression and control reducing the likelihood of fire spread.
- A building hydrant system in accordance with NZS 4510:2008, with the outlets inside a safe path stairwell.
- A fully compliant fire detection system in accordance with NZS 4512:2010 to provide early warning for building occupants. A detection system monitored by Fire and Emergency will raise an early response from the nearest fire crews. Fire and Emergency is committed to reducing false alarms, therefore it is important to select the most suitable detection system that is fit for purpose.
- Acceptable firefighter access onto the fire floor. This is normally from a safe place via a (pressurized) safe path stairwell.
 - Multi-level buildings <500 m² and <10 metres below ground require 1 x pressurised safe path stair.
 - Multi-level buildings >500 m² and >10 metres below ground require 2 x pressurised safe path stairs.
- Stairs pressurisation in accordance with AS/NZS 1668.1:2015. Firefighters must be able to enter and operate from a safe path stairwell to the lowest part of the building or basement. Vision (viewing) panels are required in the safe path stairwell to allow firefighters to gain first-hand knowledge on the possible

location of the fire and its development. An Entry Control Officer (ECO) sets up and operates from the safe path stairs in a multi-level building.

- An automatic smoke ventilation or smoke exhaust/extract system in a multi-level building to assist with firefighting operations. This is especially important for basement fires as visibility is lost very early, often before the first crew arrives so their origin is difficult to locate. Additionally, heat and smoke have very little opportunity to escape so can congest the vertical means of escape. Firefighters must have full access and ability to control the ventilation/extraction system if required.
- Where firefighting lifts (FFLs) are provided, compliance with this recommendation, BS9999:2008 and EN81-72:2015 or NZS4332:1997 will enable the safety of firefighters in their use.

Background

Supporting firefighting and rescue activities in multi-storey buildings

Stairways are, and are likely to remain, critical to supporting firefighting and rescue activities in buildings. In low-rise buildings, particularly where suitable lifts are not provided, stairways are likely to form the only means of access to and egress from levels that are not directly accessed from a ground-level entrance. In taller buildings, even if lifts are provided for use by the fire service, stairways will form the only means of access to the fire zone (the floors where the fire is thought to be located and those to which the fire is likely to spread early in its progress).

With respect to protected stairways, the degree of fire separation to be provided between them and adjacent is likely to be a prescribed period (as in the Acceptable Solutions) or a period based on the calculated time that the stairway's enclosure is likely to be exposed to in a fire (burn-out time) and/or the period until conditions within the stairway become untenable (as defined in Clauses C4 and C5 of the New Zealand Building Code).

Whichever criteria are used, the intention is to ensure that the stairway remains usable by both occupants for the building (for egress) and by firefighters (for emergency access and firefighting/search operations) without persons in the protected stairway being exposed to the effects of fire for a defined period.

Protected stairways may be provided with additional systems to ensure that conditions within the stairway's enclosure remain tenable. These include positive pressure systems and ventilation/smoke extraction system. If these systems are provided, they should remain effective for at least the period required.

The use of stairways in firefighting operations

As previously indicated, stairways are critical to firefighting operations on levels above or below ground. How critical the stairway is, is in direct relation to the time it takes to get from the ground level access to highest level where the fire occurs.

Stairways may have lobbies preceding them to prevent smoke from the space of fire origin immediately entering the stairway in large quantities when the stairway door is open. The lobbies may be specifically designed when the stairway is accessed by an open path escape route. Alternatively, an access corridor could serve the same function. If to be used purely for egress, smoke separations are usually sufficient to protect the stairway. However, when considering firefighting operations may occur a considerable time after the Required Safe Egress Time (RSET) from the floor in question, fire-rated structure will probably be required. This need is particularly so in high-rise buildings and in multi-storey buildings with a single stairway.

Figure 1 shows firefighters using a stairway to advance to the fire floor. In low-rise buildings, access from ground level is likely to be by stairway. In taller buildings, use of lifts to the floors below the fire floor may be an option (as shown).

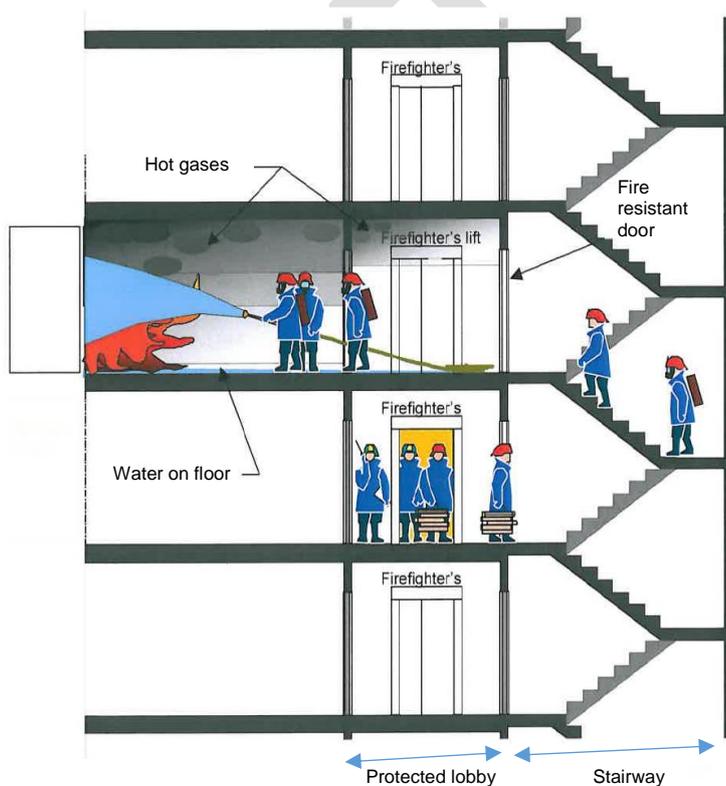


Figure 1: An example of fighting a fire in a high-rise building

Firefighting lobby

The following drawing shows a firefighting lobby on each floor. The purpose of the lobby is to allow firefighters to access firefighting facilities (e.g. building hydrant outlets) while not in the stairway shaft. Note that the figure shows some smoke in the lobby but none in the stairway. If the fire spreads into the protected lobby the firefighting lift can no longer be guaranteed for firefighting or rescue, this is shown in figure 2 below.

Firefighters entering the lobby may allow some smoke into the stairway but the amount is not likely to create untenable conditions during operations.

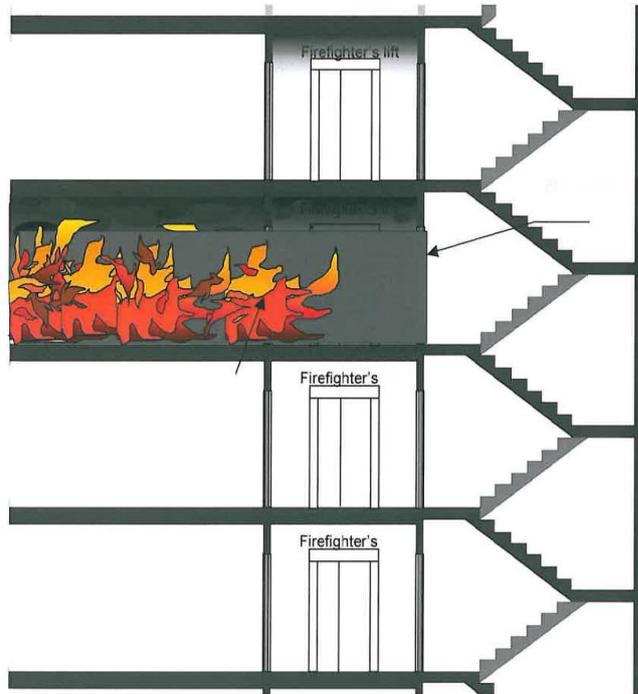


Figure 2: Fire breaching the protected lobby (source EN81-72:2015)