

Introduction

Purpose

The purpose of this guide is to provide a Fire and Emergency New Zealand position on the use of lifts 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 on the use of lifts if they are to be utilised in a fire emergency.
2. Identify and overcome any limitations of the Acceptable Solutions (C/AS7) and the Verification Method (VM) design methodologies when considering the use of lifts in the event of a fire emergency.
3. Describe specific issues affecting firefighting operations when using lifts.

Scope

The scope of this guide relates to any lift within a building that is intended to be utilised in a fire emergency. In small buildings or low-rise buildings, the use of a lift in a fire emergency may not be required, however as the height above ground and distance firefighters must travel to reach the uppermost floor increases the need to expedite timely response increases and necessitates use of the building's lift(s).

NZ building code

Performance requirements

Fire Safety C clauses C1 – C6 defines NZ Building Code performance requirements of the Building Act. C5 is the performance requirement on 'Access and Safety for Firefighting Operations'. Part 6 of C/ASx Acceptable Solutions provides only limited information on requirements for firefighting operations therefore additional guidelines are required.

C/ASx is the Acceptable Solution design for buildings, but does not specifically address fire operational requirements when considering use of lifts in a fire emergency. Below is the list of 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 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

The standard specific for lifts in New Zealand is NZS 4332:1997, which addresses approximately 20 key country specific requirements (e.g. seismic restraint spacings, etc.) that are in addition to EN 81-72:2015 (European Standard for Elevators and Escalators) – as almost all lifts are imported into NZ.

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 depend on fire safety features installed in the buildings.

Designers are required to consider firefighting operations to ensure compliance with the NZ Building Code. Fire and Emergency recommends that designers meet with the Fire and Emergency personnel as early as possible during the Fire Engineering Brief (FEB) process to discuss firefighting requirements.

The following is the minimum 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 outlet inside a safe path stairwell.
- A fully compliant fire detection system in accordance with NZS 4512:2010 provides 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.
- Firefighters require good access onto the fire floor. This is normally from a safe place via a (pressurised) safe path stairwell.
 - Multi-level buildings <500 m² and <10 metres below ground require 1 x safe path 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 allowing firefighters to gain first-hand knowledge on possible location of the fire and fire development. Entry Control Officer (ECO) sets up and operates from the safe path stairs in a multi-level building.
- Basement fires are difficult to locate as visibility is lost very early, often before the first crew arrives. Heat and smoke have very little opportunities to escape particularly from the basement area. An automatic smoke ventilation or smoke exhaust/extract system in a multi-level building will assist with firefighting operations. Firefighters must have full access and ability to control the ventilation/extraction system if required.

Background

Normal lift control

Where the escape height in buildings exceeds 15 m, fire service lift control is required, allowing firefighter use of a normal lift in an emergency. For tall high-rise buildings, a higher specified firefighting lift is required (Acceptable Solutions C/AS2-6 part 6.4.3).

Note: A firefighting lift is not the same as fire service lift control.

Normal lifts are designed with a 'home' function that activates on operation of the fire alarm so the lift car travels to the ground floor so is ready to be used for firefighting operations without delay. These lifts are not used for evacuation, often the lift recall buttons on each floor are disabled when the fire alarm activates.

Fire service lift control

Fire service lift control provides exclusive use of a normal lift or lifts for firefighting operations. These lifts are for everyday building use by building occupants, often without extra fire safety features such as found in a fire-protected lift shaft. In general, Fire and Emergency do not use normal lifts during an incident however certain situations and certain procedures give guidance to the incident controller (officer) on when to use normal lifts for firefighting operations. For firefighter lift control specification see New Zealand Standard: NZS 4332:1997 Non-domestic passenger and goods lifts.

Fire rated lift enclosures

Firefighting operations in tall high-rise buildings require fire rated lift enclosures to ensure that firefighters can transport themselves and equipment in a tall high rise building quickly and safely. Fire and Emergency will use firefighting lifts for evacuation if required.

Types of multi-storey buildings and lifts

Use of lifts during fire incidents

There are various construction methods and building features used in multi-storey buildings that may have an impact on smoke and fire spread, occupant evacuation and firefighting operations. Although common outside New Zealand, the use of lifts during fire incidents in New Zealand is controversial and are not usually used for occupant evacuation. One exception is trained operators evacuating occupants with special needs. The lifts should, however, be designed for emergency services use.



Figure 1: Fire safety signage for lifts



Figure 2: Manual lift control

Everyday lifts will be used by fire crews if the Officer in Charge (OIC Fire) deems it is safe to do so, while following Fire and Emergency standard operational procedures. An 'Emergency Lift Recall' switch will automatically send a lift to a 'designated' primary level, typically the main lift lobby (NZS 4332:1997 paragraph 25.6.2). The OIC will assign a firefighter to be the lift operator who will control the lift and the manual opening/closing of doors.

Designated recall level

The designated recall level usually is the ground or entry level. This will facilitate rapid fire service access. For buildings with entrances on multiple levels, designers should consult Fire and Emergency about the entrance firefighters plan to use initially.



Figure 3: Designated recall level showing the lift key location

Fire safety features

Normal everyday lifts may have emergency power supply however most are not equipped with additional fire safety features. Fire and Emergency recommend that if smoke detectors are installed in the lift shaft or lift machine rooms that they trigger separate and distinct visible annunciation at both the fire alarm control unit and the fire alarm index panel. This alarm notifies firefighters that the lifts are no longer safe to use.

Forward control point

For tall high-rise buildings (>60 m or 20 floors) Fire and Emergency requires dedicated firefighting lifts. Firefighting operations at height is limited to hand held firefighting/ internal attack and beyond the capability of aerial firefighting. Initial firefighting crews with specialist equipment and other resources are transported to the floor below the fire floor. This is called the forward control point (FCP). The initial firefighting crews will often set up from the pressurised stairwell, don breathing apparatus before beginning firefighting and rescue operations.

As the incident develops, a forward staging area will be set up two floors below the fire floor. All extra equipment and firefighters require fast transportation to and from this floor. Dedicated firefighting lifts must be designed for the safety of firefighters in tall buildings.

Design issues and considerations

Challenges for building fire safety

The use of lifts within buildings in a fire emergency present both unique opportunities and challenges for building fire safety and firefighting operations.

The opportunities are:

- that they can allow fastest response to a fire, enabling firefighters to both transport required firefighting equipment to establish a firm base to effectively combat a fire
- potentially use them for building evacuation (especially for disabled occupants).

The challenges are that lifts not properly designed for these circumstances can place users in danger.

Fire service lift control specification

NZS 4332:1997 provides specification for fire service lift control where a lift or many lifts can be used exclusively for firefighting operations. The lifts are grounded during an alarm activation with the floor recall button disabled. These lifts are often the everyday lifts for normal building use. They are not firefighting lifts.

Firefighting lift design requirements

BS 9999 and EN 81-72 provide specific requirement for a firefighting lift. Fire and Emergency NZ recommends the use of these standards as the basis for design of firefighting lifts for tall buildings (including THRBs) in New Zealand. Designers can use this chapter for further discussion with Fire and Emergency regarding design requirements for firefighting lifts.

Designers must consider the following factors when designing lifts that require fire service control in buildings.

General**Fire service control lift design requirements**

The following applies to lifts design for fire service control lifts and dedicated firefighting lifts. These are general requirements to assist firefighting operation.

- Lift signage must clearly indicate whether a lift is fire service lift controlled or a dedicated firefighting lift.
- All lifts must be returned to the designated floor (usual ground floor) upon the fire alarm activation.
- The fire service must have the ability to recall lifts in an emergency.
- Lifts must be clearly labelled not to be used by occupants in an emergency.
- Measures are taken to minimise the ingress of water into the lift well, e.g. landing drainage channels or ramp in front of each landing entrance
- Consider sump drains and pump to remove excess water in the sump pit.
- Consider a secondary or emergency power supply for lifts or lift particularly non-firefighter lifts.
- Fire and Emergency carry a range of keys, mainly the Tok 9 lift keys for lift control. Only a limited number of fire appliances carry emergency lift keys.
- The building's Fire Control Centre (FCC) must have the ability to control all lifts, be it normal everyday lift or a firefighting lift.

Fire and Emergency NZ recommends the use of NZS 4332:1997 in conjunction with BS9999, EN 81-72:2015 and ISO 4190-1. This will ensure that the appropriate safety provisions have been incorporated in the design.

Fire service lift control**Lift controls**

Fire service lift control does not give the same level of safety facilities as a firefighting lift. The NZBC allows lifts to be fitted with firefighter lift controls for buildings above 15 m high. These are normal lifts for everyday use by occupants, they will not have all the extra fire safety features that are required in a firefighting lift. On alarm activation all lifts must be returned to a designated floor, generally the ground floor. Once on the ground floor all lift doors must remain open and inoperable until the emergency is over and the building handed back to the occupiers or owner.

Lifts that have firefighter control must be easily identifiable by the firefighters who will use specified lift keys to take over the operation of the lift during the emergency or incident. Fire and Emergency procedure allows the use of normal lifts for firefighting operations should the Fire and Emergency Incident Controller deem it safe to do so. He must conduct a dynamic risk assessment before deciding, while considering that normal lifts may not necessarily have the same level of safety features/protection that a firefighting lift will offer. Fire and Emergency carry and use the following lift keys: TOK 5 and TOK 9. See section [Lift keys](#) in this chapter.

Firefighting lifts**Specialised features for firefighting lifts**

Firefighting lifts require specifically for firefighting operations in tall high-rise buildings. It allows Fire and Emergency to use lifts confidently during firefighting operations as part of the operational procedures. These lifts are not the same as normal everyday lifts and are different from lifts with fire service lift control.

Firefighting lifts are generally larger, designed to carry a higher load and travel faster than a normal everyday lift. The firefighting lift can operate as the building's goods/services lift in normal mode until emergency services arrive. This provides a level of surety that the lift will function in an emergency.

Firefighting lifts can be used by firefighters to assist with evacuation particularly for occupants with a disability. They must be clearly sign posted and easy to identify in an emergency. Fire and Emergency accepts the use of the goods/service lift as the firefighting lift. The service lift must be designed to meet all the specifications for a firefighting lift.

The following are fire service requirements for a Firefighting Lift. BS 9999 and EN 81-72 provides a basis for design and discussion on designed features for a firefighting lift. Some diagrams provided in this document are referenced directly from BS 9999, they help illustrate Fire and Emergency operations around lifts and demonstrate the minimum standard required for firefighting operations using lifts.

Firefighting lift design requirements

Based on BS 9999 and EN 81-72:2015, Fire and Emergency requirements for firefighting lift design are:

- The fire design strategy will determine the requirements for firefighting lifts. For a tall high-rise building (>60 m) with a large footprint and high occupancy, a minimum of two firefighting lifts is required.
- Fire resistance of doors, walls, etc. are in accordance with the fire regulations and fire strategy. Minimum of two-hour FRR where building FRR is less than two hours.
- The firefighting lift shall serve all floors within a building.
- A suitable fire-resistant structure of the building is provided, for example, fire-protected lobbies, fire detection and extinguisher system.
- Any compartment containing the lift machine and its associated equipment are provided with at least the same degree of fire protection as given to the lift well.
- The firefighting lift is located in a protected shaft including a fire-protected lobby in front of every landing door.
- Where other lifts are in the same lift shaft, then the common shaft fulfils the fire resistance requirements of a firefighting lift shaft. This level of fire resistance also applies to the fire-protected lobby doors and machine room (if present).
- A secondary power supply is provided and located in a fire-protected area. Reliability of power supplies and circuitry is essential to the operation of the firefighting lift.
- The Fire Control Centre must have the ability to control movement of the firefighting lift.
- The minimum rated load is 630 kg. The minimum interior dimensions are 1100 mm wide by 1400 mm deep as outlined in ISO 4190-1:2010.
- Minimum clear entrance width to the car shall be 800 mm.
- Where the intended use is to include evacuation, accommodate such items as a stretcher or bed or designed as a dual entry firefighters lift, then the minimum rated load shall be 1000 kg and the dimensions of the car 1100 mm wide by 2100 mm deep as defined by ISO 4190-1:2010.
- The firefighters lift shall reach the furthest floor from the fire service access level within 60 seconds from closing of the lift doors.
- A trap door is provided in the lift car roof for purposes of escape from the lift car by firefighters.
- All lift shafts require ventilation.
- Where firefighter lift control is required, 'peep' control of doors to control opening width is required. The doors shall only be opened by continuous pressure on a specific Door Open button when the lift is stopped at a floor. If the button is released while the doors are being opened, the doors shall shut immediately. This is provided to prevent the doors from opening fully if presented with untenable conditions (NZS4332:1997 Clause 25.6)

Lift keys

Fire and Emergency carry many keys for firefighting lift control and emergency lift keys. The latter are called emergency lift door keys. The image below shows a few emergency lift door keys carried on Pump Rescue Tenders (PRTs). These are not carried on all fire appliances.

For fire service lift control, Fire and Emergency fire appliances carry a range of keys mainly the 'Tok 9' lift keys. These are standard throughout the lift industry and are the only lift keys recommended for use. Fire service lift control requires a firefighter to 'ride' the lift at all times as operator. Moving the lifts between floors is a long process and one that removes a valuable resource from firefighting operations.

Fire and Emergency recommends firefighting lifts in all high-rise and complex buildings with full control at the FCC or from the lobby where an FCC is not available.



Figure 4: Fire service lift control keys