Designers' guide to firefighting operations

Lifts

F5-08 GD

FIRE EMERGENCY NEW ZEALAND

WHAKARATONGA IWI

Document Title: Lifts

Published: 13 December 2021

Document review date: 13 December 2023

Status of this document

This document is issued by Fire and Emergency New Zealand.

Recommendations for change

The document, its content and specific processes are not to be altered except through Fire and Emergency New Zealand document management processes.

Requests or recommendations for changes to this material should be sent to National Manager Response Capability.

Table of contents

1. Context

Scope

This chapter covers all lifts in buildings, whether or not they are specified firefighting lifts. It explains how they affect firefighting operations.

In this chapter, the term 'lift' refers to a standard building lift, and 'firefighting lift' refers to a firefighting specified lift as per BS EN 81-72:2020.

Who this chapter is for

This chapter is for building owners, designers and other building practitioners and contractors. It provides guidance from Fire and Emergency's perspective on the installation and use of lifts in buildings.

This should help identify and overcome any limitations of the Acceptable Solutions (C/AS2) and the Verification Method (VM) design methodologies when considering the use of lifts in the event of an emergency.

It also outlines specific issues affecting firefighting operations when using lifts.

What is not included in this chapter

This chapter gives building industry stakeholders an overview of aspects of our operations that relate to them. However, it is not an exhaustive guide to our operations, nor does it replace any statutory requirements. We recommend you read it alongside other chapters in the guide.

Legislative framework

We aim to reduce the risk to both firefighters and building occupants through encouraging appropriate building design which allows us to achieve our statutory objective (under the Fire and Emergency New Zealand Act 2017) to reduce the incidence of unwanted fire and the associated risk to life and property. Our functions include responding to and suppressing fires and attending to other types of emergencies that may occur in a building.

Read this guide alongside the:

- mandatory requirements of the New Zealand Building Code (Building Code);
- requirements of New Zealand Standards (Standards); and
- Building Act 2004.

This guide **does not** replace any part of the Building Code or Standards or other mandatory building requirements.

The Building Code Fire Safety – C Protection from fire, clauses C1 – C6 define Building Code performance requirements of the Building Act 2004. C5 is the performance requirement on Access and safety for firefighting operations.

Part 6 of C/AS2 Acceptable Solutions provides only limited information on requirements for firefighting operations and the consideration of using lifts in a fire emergency, so additional guidelines are required.

The specific standard for lifts in New Zealand is NZS 4332:1997, which addresses approximately 20 key country-specific requirements (e.g. seismic restraint spacings, etc.). These are in addition to BS EN 81-72:2020 (Safety rules for the construction and installation of lifts. Particular applications for passenger and goods passenger lifts - Firefighters lifts). The European standard applies because almost all lifts in New Zealand are imported.

2. Definitions

The following definitions apply for the purposes of this chapter. Defined terms used throughout this document are consistent with the Building Act 2004, Building Code and C/AS2 Acceptable solutions.

Breathing apparatus (BA)	A device firefighters wear to provide breathable air in an atmosphere that is immediately dangerous to life or health. Also known as self-contained breathing apparatus (SCBA) or compressed air breathing apparatus (CABA).
Building hydrant system	Fixed water main pipe system is normally already charged with water and supplemented by Fire and Emergency pumps. This should not be confused with an in-ground hydrant connected to the town mains.
Fire control centre (FCC)	The principal location where the status of a fire detection system, an alarm system, and a communications and control system are displayed, and from which all systems can be manually controlled. Standards and publications refer to the fire control centre as 'central control station', 'emergency command centre', 'fire service centre' or 'fire control room', (although different standards exist amongst these).
Fire engineering brief (FEB)	A formal process outlined in the International fire engineering guidelines for all stakeholders to define and agree on the basis and scope of work for the fire engineering analysis.
Fire floor	The floor of the building on which the fire is reported by automatic systems or observed/reported by occupants or other persons. The fire floor may change with new information and the initial reports by occupants may be inaccurate, if the observation is of the effects of fire (e.g. smoke spread), rather than the fire itself.
Fire resistance rating (FRR)	Building Code clause C regarding protection from fire defines FRR as: [t]he term used to describe the minimum fire resistance of primary and secondary elements as determined in the standard test for fire resistance, or in accordance with specific calculation method verified by experimental data from standard fire resistance tests. It comprises three numbers giving the time in minutes for which each of the criteria stability, integrity and insulation are satisfied and is presented always in this order.
Firefighting lift	A lift or elevator designed for use by firefighters during an emergency fitted with systems to provide additional resilience to support emergency operations.
Forward control point (FCP)	A safe position inside the building from which to carry out firefighting operations. This is usually one to two floors below the lowest floor that is affected by smoke and/or fire. The location becomes the last point to assemble personnel awaiting deployment. If the extent of the fire is unknown, or the fire develops and extends vertically, it creates a situation where the boundaries between zones become dynamic.
Lift	A moving compartment (also known as the lift car), housed in a shaft, for raising and lowering people or things to different levels in a building. For the purposes of this document, the terms 'lift' and 'elevator' are interchangeable.

3. Our operations

Overcoming firefighting challenges

Rapid access to the upper floors of buildings is critical for our operations. This chapter explains how we use lifts during a fire and what we need from lift design.

In small or low-rise buildings (under five floors) we don't normally need to use lifts. However, the taller the building, the longer it takes and the more energy we use to reach the emergency. This can become a challenge.

Lifts can solve this problem and make it safer for us, but only if they are designed for us to use.

4. Challenges

4.1. Lift overview

Lift response to an alarm activation

Standard building lifts are not usually used for evacuation. If a fire alarm activates, lift cars should automatically return to the main access lift lobby and remain there with the doors open.

For more information on lifts during evacuations, refer to F5-10 GD FFO Evacuation and rescues.

4.2. Lift design requirements for all lifts

We assume that any lift design follows NZS 4332:1997. However, we recommend you consider the following additional features to assist firefighting operations.

Design

- Consider a secondary or emergency power supply for all lifts.
- We recommend all lifts be returned to the designated floor (usually ground floor or main entrance lift lobby) when a fire alarm activates.
- Minimise water getting into the lift shaft, e.g. by putting landing drainage channels or a ramp in front of each landing entrance.
- Consider a sump drain and pump to remove any water in the sump of the lift shaft pit.

Labelling

- Lift signage should clearly indicate whether a lift is a 'standard' fire service-controlled lift or a specifically designed firefighting lift.
- Lifts that have firefighter control should be easily identifiable.

Figure 1 – Firefighter control recall switch

- If a lift isn't a designated firefighting lift, you must clearly label it 'Not to be used by occupants in an emergency'.
- Lift floor button numbering should be identical to the building floor numbering and this should be replicated at the fire alarm panel (see F5-04 GD FFO Fire alarm panels).

Figure 2 – Lift floor numbering which replicates the fire alarm panel floor numbering

Control

- The Tok 9 key is the standard key-switch used across Australia and New Zealand and is recommended for all emergency lift control.
- We need to be able to recall lifts in an emergency.
- The building's FCC may also have the ability to control and monitor both 'standard' and firefighting lifts.

4.3. Evacuation

Standard lifts not used

Due to the associated risks, standard lifts are not usually used for occupant evacuation, however, firefighting lifts where installed, may be used.

Responsibility for evacuation

The building owner or their representative is entirely responsible for evacuating the building.

Lifts as part of an evacuation strategy

If you are considering utilising a firefighting lift as part of your evacuation strategy, note the following:

- Any use of firefighting lifts for evacuation will be in addition to the normal means of escape provisions.
- Firefighters will probably need to start using the firefighting lift for our emergency operations while occupants are still evacuating.

Firefighting lift evacuation

If you plan for occupants to use firefighting lifts during emergency evacuation from a building, you should include them in an integrated evacuation strategy. The building design team should therefore include them in their planning from the concept stage, in close collaboration with us.

4.4. Firefighting operations

Use of lifts during fire incidents

For any lift, the Fire Incident Controller (IC) will assign a firefighter to be the lift operator at all times, to control the lift and manually open and close the doors.

Moving the lift car between floors is a longer process than normal lift operation as all door movements must be undertaken manually when it is in fire service mode.

Designated recall level	The designated recall level is usually the ground, or main entry level, lift lobby. This facilitates rapid firefighter access. For buildings with entrances on multiple levels, designers should consult us about the entrance firefighters plan to use initially.
Emergency power	Standard lifts may have an emergency power supply, which would assist our operations. You should provide all firefighting lifts with a redundant power supply, fed by an uninterruptible power supply or generator. This will provide two more hours' use if power fails, which is common during large fires.
Fire detection	We recommend installing adequate detection in the lift shaft or lift machine rooms. These should trigger separate and distinct visible notifications, 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	Firefighters with specialist equipment and other resources move to the floor at least two levels below the fire floor. This is called the forward control point (FCP). The initial firefighting crews will set up from the pressurised stairwell and wear breathing apparatus before beginning firefighting and rescue operations on the floor(s) above. As the incident develops, they may set up a forward staging area (FSA) on the floor below the FCP. Firefighters and additional equipment need to move to and from this floor as quickly as possible to control the incident. In taller buildings, firefighters need dedicated firefighting lifts designed to keep them safe while they do this work.

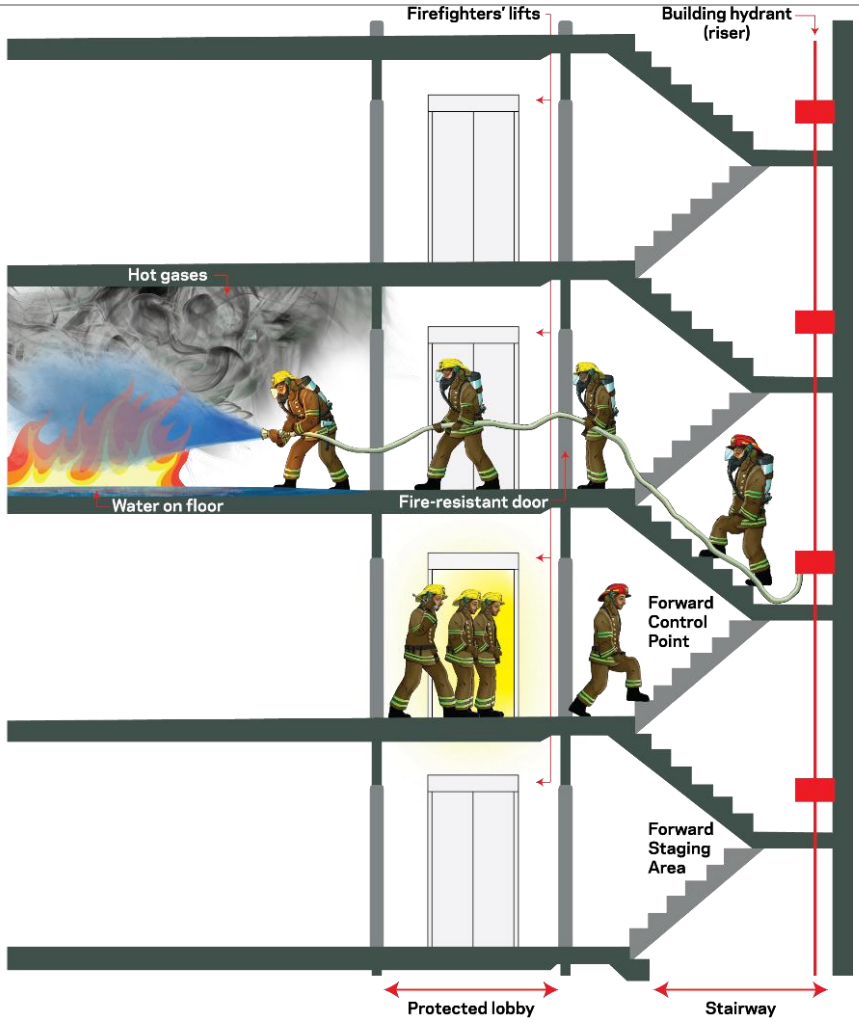

Figure 3 – Diagram highlighting the forward control point (FCP)

4.5. Keys

Keys we carry

We carry keys for standard lift control, firefighting lift control, as well as emergency lift door keys. However, not all Fire and Emergency vehicles carry these keys.

Standard and firefighting lift control

For lift control, the Tok 9 is the most common lift key-switch. These are standard throughout the lift industry and are the only lift keys recommended for use.

The Tok 5 key-switch is less common but also occasionally used.

Lift emergency door keys

Lift emergency door keys allow us to open the outer lift doors on building floors so we can access the lift car behind.

We do this to rescue people when the lift car gets stuck between floors, or is out of alignment, or loses power, making it inoperable. We have very strict procedures to keep firefighters and the public safe during lift rescues.

We may have to do this if people get stuck while evacuating in a firefighting lift, or if firefighters get stuck during firefighting operations because the lift car stops working.

Figure 4 – Lift emergency door keys

4.6. Smoke movement

	A firefighting lift car moving in a lift shaft will drive airflows throughout a building. This can have three effects:
Piston effect	The 'piston effect' occurs when air being pushed out of the lift shaft creates pressure differences, forcing air from the shaft and out of the building, through lobbies and main floor areas. Analysis shows this is the most common phenomena of the three.
Pump effect	The 'pump effect' occurs when the car moving up and down the shaft alternately: 1. draws smoke into the shaft, where it is under negative pressure relative to the floor areas and/or protected lobbies, and then 2. expels the smoky air from the shaft, where the pressure within the shaft is positive relative to the floor areas and/or protected lobbies.
Smoke transport	This occurs when smoke enters the lift car itself and then moves from floor to floor.

4.7. Standard lifts

How we use standard lifts	As standard building lifts don't have the extra fire safety features that firefighting lifts have, we don't normally use them during firefighting operations. For certain situations, procedures give guidance to the Fire Incident Controller (IC) on when to use standard lifts to support firefighting operations. This is normally only to transport equipment.
Limitations of standard lifts with fire service control	• These are not generally protected from fire with fire-resisting enclosures for the lift shaft and adjoining lobbies, etc. • The fire service control functionality can be unreliable, i.e. the lifts do not always respond as we would expect.

- They tend to move between floors slowly compared with dedicated firefighting lifts.

Fire service lift control specification

NZS 4332:1997 Non-domestic passenger and goods lifts provides specifications for fire service lift control, where a lift or lifts can be used exclusively for firefighting operations.

Our use of these will be dictated by the limitations outlined above.

Note: Fire service lift control is not the same as a firefighting lift.

4.8. Firefighting lifts

Fire and Emergency use of 'firefighting' lifts

If a fire is high up, we have to fight it from inside the building. This is because our aerial vehicles may not reach high enough.

Other factors make it difficult to access upper levels in buildings – refer to F5-07 GD FFO Stairs in buildings and F5-14 GD FFO Firefighting shafts in taller buildings for further information.

Therefore, in taller multi-storey buildings (> 25m), or where a need might otherwise be identified, we recommend installing firefighting lifts designed to higher specifications as part of the design.

Firefighting lifts have additional features that support our emergency operations and keep us safe. This allows us to bring any incident to a conclusion much faster than if we had to rely on stairs alone.

Advantages of firefighting lifts

- Allow a fast response to a fire.
- Minimise firefighter fatigue, which reduces our resourcing needs.
- Firefighters can easily transport the large amounts of equipment required.
- May be used for rescues.

4.9. Recommendations for firefighting lifts

We recommend that firefighting lifts have the features and capabilities outlined below.

The layout of the building around the lift location should align with BS 9999:2017 and the specifications for the lift itself should follow BS EN 81-72:2020, except for keys, which should be as per NZS 4332:1997. We consider that these standards, when used together, provide a basis for design and discussion on specified features for a firefighting lift.

Note: Other international standards may offer suitable alternatives, but it is important to remember that the lift features are typically intended to be complemented by other aspects of the building design. If you are considering using a different standard for the lift specifications, we will need to understand how the building design supports that standard, in the same way that the requirements of BS 9999:2017 support the lift specifications in BS EN 81-72:2020.

Number of firefighting lifts

For a multi-storey building, a firefighting lift is essential.

Note: A multi-storey building is a building:

- of six floors or more, taken from the lowest point of Fire and Emergency access, or

	• in which a riser system has been fitted. See S1 POP Multi-storey buildings policy More lifts will be required for buildings with higher occupancies, larger floor areas, or more complex designs.
Control keys	The Tok-9 key is recommended for all lift control. This supersedes the requirement laid out in BS EN 81-72:2020, which requires a triangular key. This standardises the keys we are required to carry and simplifies and speeds up our operations, in turn simplifying our training for these. 
Floors served	The firefighting lift needs to serve all floors within a building from the lowest level. These should be continuous from a single shaft, without the need to change lift cars. This ensures we can access any level we may need to, not just for firefighting, but also for rescues and personnel/equipment staging.
Lift speed	The firefighters' lift must reach the furthest floor from the fire service access level within 60 seconds of the lift doors closing. This ensures rapid access to the fire and minimises time lost transporting personnel and equipment.
Lift car door opening	'Glimpse' control of doors is required. This means that doors should only open when there is continuous pressure on the 'Door Open' button when the lift is stopped at a floor, and this should override any door sensors. If the button is released while the doors are being opened, the doors must close immediately. This is to prevent the doors from opening fully if presented with untenable conditions on our arrival at any particular floor.
Immobilised lift cars	The lift car roof should have a trap door so firefighters can escape should the lift car be immobilised for any reason.
Dimensions	The minimum rated load is 630 kg. The minimum interior dimensions are 1100 mm wide by 1400 mm deep. Minimum clear entrance width to the lift car needs to be 800 mm. This allows us to fit in the lift with all of our equipment.
Evacuation dimensions	If the intended use includes evacuating occupants on stretchers or beds, then the minimum rated load needs to be 1000 kg and the dimensions of the car 1100 mm wide by 2100 mm deep. These are internationally accepted figures based on standard bed sizes and evacuation loads.
Fire resistance	Fire resistance of doors, walls, etc., is usually determined in accordance with the Building Code. However, where a burn-out rating of less than two hours is determined, a minimum of two hours' FRR is required. This protects the lift and other critical adjoining areas from fire while we undertake firefighting operations.

Separation	The firefighting lift should be located in a protected shaft, including a fire-protected lobby enclosure in front of every landing door. Where other lifts are in the same lift shaft, the common shaft should fulfil the fire resistance requirements of a firefighting lift shaft. This level of fire resistance also applies to the fire-protected lobby doors and lift machine room (if present) and its associated equipment. See F5-07 GD FFO Stairs in buildings and F5-14 GD FFO Firefighting shafts in taller buildings for further detail. Compartmentation protects us while we're operating from protected areas.
Ventilation	Firefighting lift shafts need protection from smoke. This is normally achieved through pressurisation. This prevents the lift shaft, lift cars and lobbies becoming compromised by smoke ingress, or if they do, minimises the impact from any smoke so we can continue our firefighting operations.
Back-up power supply	Firefighting lifts need reliable power supplies and circuitry so we can continue using them throughout an emergency. This means they must have a secondary power supply in a fire-protected area, with a reliable source, which can run for at least two hours after power fails.
System interfaces	Firefighting lifts usually have multiple interfaces between different building services systems. This is likely to further increase the complexity and importance of the cause and effects matrices for the fire detection and alarm system, ventilation system and lift systems. It is critical that these interfaces are correctly engineered, well documented and available at an FCC so that we know what to expect the systems to do. Regular testing must be carried out to ensure that interfaces are working as expected. The Fire Protection Association is developing guidance on integrated testing, and this is expected to be available in the near future.

5. Recommendations

Fire and Emergency recommended approach	• To ensure the building complies with the Building Code, designers should consider firefighting operations. • We strongly recommend that designers meet with us as early as possible during the fire engineering brief (FEB) process in the concept phase to discuss requirements. • BS9999: 2017 and BS EN 81-72:2020 provide specific requirements for firefighting lifts. We recommend using these standards as the basis for designing firefighting lifts. The exception to the standards referenced above is the key override which should be in line with NZS 4332:1997.
Design considerations for all lifts	We recommend you provide these features for all lifts: • Signage prohibiting occupants from using lifts during an evacuation, except firefighting lifts as part of a Fire and Emergency approved evacuation scheme • Clear signage to indicate the type of lift and which lift cars we can control

	• Lift buttons that match the building floor numbering. Keep this simple where possible – no missing numbers or complicated sub-floors • Firefighters should be able to recall lifts • Lifts automatically return to the main access lift lobby, with the doors open, when a fire alarm activates • Measures to keep water out of the shaft • Lift pit sump drains and/or pumps • Back-up power supply • Monitoring and/or control of lifts from FCC.
Evacuation	If firefighting lifts are part of the evacuation strategy: • You need to collaborate closely with us at the concept stage of your design on how we will use the firefighting lifts and where they fit in the evacuation strategy. • There should be no reduction in the redundancy for firefighting lifts, i.e. there should not be a reduction in stair width provision.
Firefighting operations	• Lifts should return to a designated level when alarms activate. • Designers should consult us about the entrance intended for firefighters to use initially. • Install detection in the lift shaft and/or lift machine rooms to provide clear information for us at the fire alarm panel.
Lift keys	• Lift control keys for all lift types should be the industry standard Tok-9 key.
Smoke movement	• We recommend providing a means to help overcome smoke ingress and movement to protect the lift from the smoke.

Firefighting lifts	• Firefighting lifts are recommended for all buildings planned over 25 m.
	• Fire-resisting enclosures for:
	  ○ shafts
	  ○ doors
	  ○ lift lobbies
	  ○ machine rooms
	  ○ secondary power supplies.
	• Should serve all floors.
	• Must reach the furthest floor from the fire service access level within 60 seconds.
	• Needs a back-up power supply with a minimum supply time of two hours.
	• Minimum load ratings and dimensions should meet or exceed the requirements of BS EN 81-72:2020.
	• Lift cars should have a means for firefighters to escape.
	• Require 'glimpse' control of doors which overrides any sensors.

5.1. Additional features

Building layout	Co-locating a fire-protected stair with firefighting lifts has several benefits: • It is easy for us to switch between stairs and lifts

	• Firefighters waiting for lifts have an alternative available from the same protected lobby. • Firefighters can assess the relative efficiency of each method of travel. For more information, refer to F5-07 GD FFO Stairs in buildings.
Protected lobby	Lift lobbies can play an important role in protecting us while we wait for a firefighting lift. When designing these, refer to the chapter F5-14 GD FFO Firefighting shafts in taller buildings.
Closed circuit television (CCTV)	A visual means of monitoring lift function and shaft conditions from the FCC benefits our operations. For more information on equipment in an FCC, see F5-09 GD FFO Fire control centres.

5.2. Completing the Firefighting facilities checklist

Completing the checklist	When completing F5 SC Part C: 3 of the Firefighting facilities checklist (FFFC), you should provide as much information as possible regarding the lifts and access. Remember that all facilities are put in place for us to use in emergency situations and should be located in consultation with us. Email designers.guide@fireandemergency.nz

6. Related information

6.1. Designers' guide to firefighting operations

- F5 01 GD FFO Introduction
- F5-02 GD FFO Emergency vehicles access
- F5-03 GD FFO Radio communications
- F5-04 GD FFO Fire alarm panels
- F5-05 GD FFO Building hydrant systems
- F5-06 GD FFO Automatic sprinkler systems
- F5-07 GD FFO Stairs in buildings
- F5-08 GD FFO Lifts
- F5-09 GD FFO Fire Control Centres
- F5-10 GD FFO Evacuation and rescues
- F5-11 GD FFO Water supplies
- F5-12 GD FFO Construction, refurbishment and demolition sites
- F5-13 GD FFO Multi-tiered vehicle stacking buildings
- F5-14 GD FFO Firefighting shafts in taller buildings

6.2. Legislation

- Fire and Emergency New Zealand Act 2017
- Building Act 2004
- New Zealand Building Code (Building Regulations 1992 > New Zealand Building Code > C Protection from fire)

6.3. Standards

- NZS 4332:1997 Non-domestic passenger and goods lifts
- BS EN 81-72:2020 Safety rules for the construction and installation of lifts. Particular applications for passenger and goods passenger lifts. Firefighters lifts
- SNZ PAS 4509:2008 New Zealand Fire Service firefighting water supplies code of practice
- NZS 4510:2008 Fire hydrant systems for buildings
- NZS 4512:2021 Fire detection and alarm systems in buildings
- NZS 4541:2020 Automatic fire sprinkler systems
- AS/NZS 1668.1: 2015 The use of ventilation and air conditioning in buildings – Part 1: Fire and smoke control in buildings
- BS 9999:2017 Fire safety in the design, management and use of buildings. Code of Practice

6.4. References

Australian Building Codes Board, International fire engineering guidelines, Edition 2005, Canberra, Australia.

Document information

Owner	National Manager Response Capability
Last reviewed	13/12/2021
Review period	Every second year

Record of amendments

Date	Brief description of amendment
December 2021	Format update and SME content review
March 2018	Initial version