Designers' guide to firefighting operations

Construction, refurbishment and demolition sites

F5-12 GD

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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

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1. Context

Scope

When we're firefighting at construction sites (rather than finished structures), the refurbishment/remodelling and demolition/deconstruction works present significant hazards to us and can make our operations much harder. This chapter explains how to minimise hazards and impediments at these sites. It covers:

- all buildings, new or existing, undergoing construction works

  This includes new-build works and alterations of existing buildings whether works are to parts of the building floor or the entire building floor
- buildings under deconstruction or demolition for any reason, including remodelling or removal
- our position on appropriate life safety design considerations for owners, designers and other building practitioners involved in building construction.

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 emergency operations at work sites.

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.

This chapter is **not** intended as a reference on:

- general construction site safety, including work at heights
- fire prevention or risk management on construction/demolition sites, e.g. hot work permits
- first aid firefighting on construction/demolition sites
- evacuation of a construction/demolition site during a fire.

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 defines Building Code performance requirements of the Building Act 2004. C5 is the performance requirement on Access and safety for firefighting operations.

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 Acceptable solutions C/AS2.

Address point	This point is part of the dataset administered by Land Information New Zealand (LINZ). It is the address (point) where the building is commonly known to be located. It can be either a single point or a range of individual points as described on the LINZ data set.
Aerial vehicle	A specialised emergency vehicle that has an aerial device that hydraulically rises to suppress fire and/or effect rescue as well as support other operations.
Appliance	An emergency vehicle that provides capability to Fire and Emergency's mandated functions.
Attendance point	The place where the first attending Fire and Emergency pumping vehicle will stop and set up. **There is only one attendance point**, usually at the building's primary entry point. Firefighters may be deployed to other firefighter access points from here. A full description of the attendance point can be found within F5-02 GD FFO Emergency vehicle access.
Breathing apparatus (BA)	A device worn by firefighters 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 (BHS)	Fixed water main pipe system 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.
Collapse zone	The collapse zone is an area around the building measured as 1.5 times the height of the structure. This is the area which would be considered dangerous in the event of an outward failure of a facade element. For the purposes of this document, the term 'collapse zone' only applies to pre-cast concrete panel (tilt-slab) and unreinforced masonry type construction. Use a pragmatic approach where practicable when designing, and when in doubt, consult Fire and Emergency.
Fire resistance rating (FRR)	Building Code clause C regarding protection from fire defines FRR as: > The 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. (Refer to the NZBC C Protection from fire for the full definition) https://www.building.govt.nz/building-code-compliance/c-protection-from-fire/c-clauses-c1-c6/.
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 of the building 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 demarcation of the zones becomes dynamic.
Hard-standing area (for Fire and Emergency vehicles)	A hard (roading) surface capable of withstanding the fully laden weight of a fire appliance from which fire operations for a structure are conducted. A hard-standing must be big enough for the fire appliance to enter, exit and manoeuvre, and for firefighters to move around it to connect hose and safely access equipment. In most cases the hard-standing will be the main road if the structure is close to it A full description of the hard-standing area can be found within F5-02 GD FFO Emergency vehicle access.
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.
Wayfinding	Encompasses all the ways in which people orientate themselves in physical space and navigate from place to place.

3. Our operations

Firefighting on building sites	On construction or demolition sites, unlike in fully operational buildings, we're stepping into an unfamiliar environment where just moving around the site can be challenging and hazardous. We also don't know when we arrive whether any of the fire systems that we usually rely on for information or water will be in place and operational.

4. Challenges

4.1. Site access

Finding the site

Many developments don't have address points yet. This makes it difficult for us to find the site and the best roadway for access. We need accurate information about where you need us to go.

Site access point (SAP) signage can help direct us.

Figure 1 – Site access signage

Vehicular access

Ground conditions on the site and its surrounding area will determine how close Fire and Emergency vehicles can get to the building. Unsealed surfaces and steep grades or ramps can cause problems.

For more information, see F5-02 GD FFO Emergency vehicles access.

Availability of firefighting water

While existing buildings will typically have a pre-agreed firefighting water supply, this may not be the case for new buildings or buildings undergoing a significant expansion or change of use.

You should consider how to provide firefighting water for new construction sites early in the design phase.

We prefer access to reliable reticulated water supplies that meet the requirements of the SNZ PAS 4509:2008 Firefighting water supplies code of practice.

However, if the building is in a non-reticulated area, or if reticulated water won't be available early during construction, you need to store water on site.

Our equipment limits the distance we can be from our water supply. You need to put firefighting water sources within 135 m of the Fire and Emergency vehicle attendance point.

Site security

Access to construction sites is more difficult than fully functioning buildings. Most work sites have protective barriers for security and to exclude the public.

We have tools to open or remove site barriers and security features to gain access to sites, and legislative powers (under section 42 of the Fire and Emergency New Zealand Act 2017) to do this at a fire call. However, time we spend gaining access to a site will delay firefighting operations.

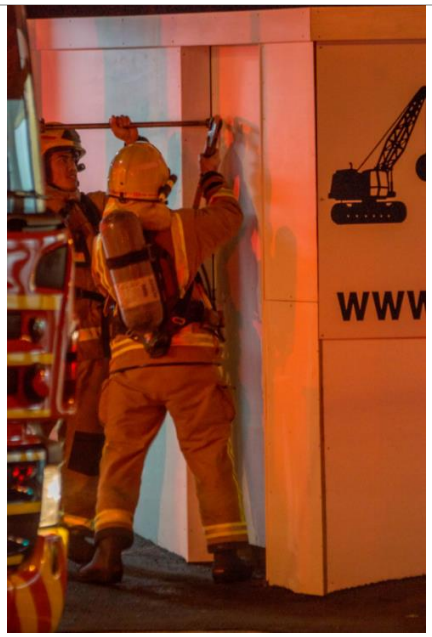

Figure 2 – Firefighters forcing entry to a secure work site

4.2. Site information and hazards

Site information

All construction and demolition sites are different – we can't easily predict all the hazards we may face on a site.

Once we've gained access to the site, we will start identifying hazards. We will try to find someone who can give us more information on the site hazards, such as a site manager or building fire warden. If we can't find anyone, we may use the site hazard board.

Hazards

Hazards include:

- Slip, trip and fall hazards – diggings, incomplete floor plates, unmapped egress paths, working at heights
- Crush hazards – scaffolding may fail, overhead storage of construction materials may fail, unprotected steel can also fail, causing partial or complete collapse of a structure
- Electrocution – finished or incomplete electrical wiring may be exposed during a fire. Firefighting water may also affect this
- Explosive hazards – construction equipment such as gas cylinders for hot work
- Exposure to hazardous building materials such as asbestos, silicon and dusts
- Exhaustion/fatigue because we have to access all upper floors on foot – use of aerial vehicles is limited, and we don't use site personnel/goods lifts
- Reduced visibility – due to smoke, water and lights not working.

It's essential to our operations that we can find the following:

- a site map showing the current site layout – this should be beside the hazard board
- service shut-offs (electricity, gas and water)
- hazardous materials (including Safety Data Sheets) and their location on site.

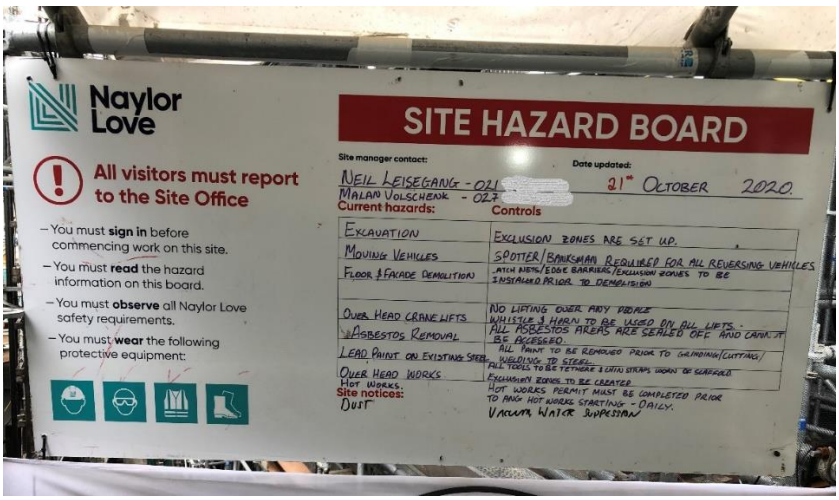

Figure 3 – Example of a site hazard board

4.3. Finding and reaching the fire

Fire observation

Firefighters usually rely on a fire alarm panel (refer to F5-04 GD FFO Fire alarm panels) to find the fire, but construction/demolition sites don't always have one, or it might not be working yet. This means that firefighters have to find the fire by observing and investigating.

However, on construction/demolition sites fires can spread more easily between floors:

- internally between floors because there's no fire separation or it's incomplete
- via external vertical fire spread.

This means that the smoke travel makes it difficult to locate the actual area(s) involved in the fire.

Large openings in the sides of the buildings can also create wind effects which can make a fire even more difficult to locate, and present additional wind-driven fire hazards to firefighters.

Site navigation

Site navigation can be challenging on construction sites: building layouts are always changing, and often there's no one on site to tell us the current layout. This is why it's so important to give us site and hazard plans when we arrive so we can quickly find our way around and locate the fire.

We need to identify floor levels and stairways, where there are more than one, so these should be clearly identifiable (see F5-07 GD FFO Stairs in buildings).

Make available any plans which may help us develop our firefighting tactics, including:

- blueprints and floor plans at various stages of construction/demolition
- electrical wiring plans/diagrams
- heating, air conditioning and ventilation (HVAC) system plans.

Lighting

Sites may not have lighting. We have torches and portable lighting, but these have limitations. If there's no other lighting within the building, we need to move extra carefully around the site, which can slow down our operations.

Firefighting water can also compromise any existing lighting; this increases the risk to firefighters and delays our operations.

Key areas where lighting is beneficial include the site entry point, the main access routes to each level of the building, stairways, and near hazards.

Communication

Firefighters can have difficulties communicating once they are inside the building. Radio communication doesn't always work as radios can function intermittently, particularly in high-rise or large footprint buildings.

Sometimes reliable communication is only possible through a hard-wired warden interface phone (WIP) system or similar, but these are often unavailable in buildings undergoing construction.

For further information, see F5-03 GD FFO Radio communications.

4.4. Fire safety systems for buildings under construction

Fire alarm systems

On all sites, before the fire alarm system is fully commissioned, you need a means of raising the alarm so you can start evacuating the site.

Sprinkler systems

Commission sprinkler systems as early as possible as they can provide fire protection even during construction. However, this must be offset against the risk of accidental activation from construction activities, to prevent water damage.

Building hydrant (riser) system

Issues we have encountered on construction sites include:

- firefighters unable to locate and/or access building hydrant inlets, and/or outlets, due to construction activity and storage of materials

Figure 4 – Building refurbishment that hasn't considered panel/inlet access

- incomplete piping systems with missing sections of the piping design, resulting in an unusable system
- landing valves (outlets) left open on other levels, allowing water to flow freely from the system on more than one level – this prevents the system from becoming fully pressurised and can also cause flooding
- no intermediary pump to bring water to levels above 40 m high, where gravity and friction losses can significantly impact pressure and flow rates available for firefighting
- no end cap on the top end of the pipework, which prevents the system from being pressurised and results in water flowing freely from the top level of the piping
- when the end cap isn't in place, foreign bodies entering the system and interfering with its operation.

You can provide a charged building hydrant system to deliver water to all parts of a building – see F5-05 GD FFO Building hydrant systems.

If you are installing a charged building hydrant system in a new building and the final location of the inlet is not accessible during construction, you should provide a temporary hydrant inlet. This should be accessible from the street frontage and clearly signposted (NZS 4510:2008, paragraph 8.3).

In a new building, you should install the building hydrant system in parallel with the main construction work and bring it into commission progressively as building work proceeds. The system shall be functional, with an outlet on each floor up to a level not lower than 9 m below the highest floor slab (NZS 4510:2008, paragraph 8.1.1.2).

4.5. Fire safety systems for buildings under refurbishment/demolition

Fire alarm systems

When you're refurbishing or demolishing a building, your detection systems should extend as far as practicable. However, if you need to isolate part of the system or temporarily shut down the entire system, follow NZS 4512:2021, Section 7.

If you need to do this, you must fix a notice to the alarm panel in a place where firefighters can easily see it, telling us which part(s) of the system aren't working (NZS 4512:2010, paragraph 7.3.4). Once the system's working again, remove the notice; out-of-date impairment notices create confusion.

Sprinkler systems

If you need to shut down sprinkler systems, partly or fully, for maintenance, repairs or alterations, it is important that you:

1. notify us in writing at least 24 hours prior (NZS 4541:2020, paragraph 11.3).
2. tie a tag to the main sprinkler stop valve showing which sections of the system are left isolated. Place this impairment notice somewhere firefighters can see it easily (NZS 4541:2020, paragraph 11.4).

It's very important that you tell us about any shutdown because this affects what resources we send if there's a fire on your building/site. We send fewer resources to fully sprinklered buildings because we assume that a fire in a sprinklered building with fully operational systems will be controlled and we'll need fewer resources than for an uncontrolled fire in a non-sprinklered building. If you tell us that you've shut down your system, we'll know to send appropriate resources.

Figure 5 – Clear signage and access to fire systems on a refurbishment site

Building hydrant (riser) system

The riser system should keep working during any construction or demolition works. This is a requirement of NZS 4510:2008 paragraph 8.4.

For buildings that remain partly occupied during the construction works this will typically be a condition of any Certificate for Public Use.

During demolition, the hydrant system should remain operational up to the floor below the highest intact floor (NZS 4510:2008 paragraph 8.4).

Figure 5 – Clear signage and access to fire systems on a refurbishment site

5. Recommendations

5.1. Before a fire

Advice	• Engage with us early on if you are planning new construction, refurbishment or demolition works.
Fire safety systems	• Make adequate firefighting water supplies available to the site when construction/demolition begins. • Maintain fire safety systems in an operational state according to the requirements of the relevant standards. • Ensure temporary inlets are marked with clear signage 1 metre by 1 metre with the words in a contrasting colour 'BUILDING HYDRANT INLET – KEEP CLEAR' (NZS 4510:2008, paragraph 8.3.2). • Ensure building hydrant systems are operational with an outlet on each floor up to a level not lower than 9 m below the highest floor slab during construction. This shall be provided with a temporary tag with the wording 'HIGHEST FUNCTIONAL OUTLET' (NZS 4510:2008, paragraph 8.2.5). • Ensure building hydrant systems remain in operation up to the floor below the highest intact floor during deconstruction and demolition. • Follow the requirements to notify the relevant bodies when a fire system is to be impaired/isolated/shutdown. • Display all fire safety impairment notices in a clearly visible location at the fire alarm index panel. • Repair any damage to fire safety systems within a reasonable time frame. • Consider a temporary automatic fire detection system which can provide early warning of fire. Fires detected in the early stages are less likely to need significant intervention. • Ensure there is a means of raising the alarm for the evacuation of the site.
Site hazards	• Follow site safety requirements by including the display of a hazard board at the entrance(s) to the site. Consider delegating key contact(s) to act as a liaison with us in the event of an incident. Display their after-hours contact with the site information. • Conduct familiarisation visits for local Fire and Emergency stations so they have a good understanding of the site and building layout. You can arrange this by contacting designers.guide@fireandemergency.nz Ensure hazardous materials on site are stored appropriately and clearly labelled/signposted with their safety data sheets (SDSs) available to firefighters.
Site navigation	• Provide after-hours contact information for all key-holder contacts on site. • Ensure ground conditions and access, including ramps, etc., are suitable for our vehicles. • Consider numbering the floors from outside the building so that they are visible from the ground. Ensure floors are also clearly numbered internally in stairways. • Keep stairs kept clear of debris and any storage, particularly construction materials.

- Consider providing a site and building map which can be made available to firefighters on arrival to indicate the layout of the site and building, the location of firefighting facilities, and the services (electricity, gas, water) shut-offs.
- Signpost spaces which are dead ends (either by design or due to gaps in construction). Unexpected dead ends can trap firefighters.
- Consider providing lighting 24/7 to key areas, including the site entry point, the main access routes to each level of the building, stairways, and near hazards.

5.2. In the event of a fire

Site access

- Ensure specific address and location details are available and provided.
- Provide site signage to help direct us.
- Remember that circumventing security measures will slow down our operations.

Figure 6 – Key contact lists at entry to a construction site

Liaison

- Consider providing a single point of contact who can hand over site information to firefighters on arrival.
- Provide as much accurate detail as possible on the best-known location of the fire.
- Make available blueprints and floor plans of the site which may be useful to us.

5.3. Completing the Firefighting facilities checklist

Completing the checklist

When completing **F5 SC Part C** of the Firefighting facilities checklist (FFFC), you should provide as much information as possible. This will allow us to understand the proposed layout/changes and ensure that all provisions meet the needs for firefighting operations.

Remember that all facilities are put in place for our 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
- Building Regulations 1992 > NZ building code > Fire safety

6.3. Standards

- 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

6.4. References

- C/AS2 Acceptable Solutions

Document information

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