

Introduction

When to use

The purpose of this chapter is to provide a consistent Fire and Emergency New Zealand position on the risks linked with firefighting operations on construction sites. The primary objectives are to:

- highlight the risks associated with firefighting operations on construction sites.
- describe appropriate approaches that can be adopted to manage the risks associated with firefighting operations on construction sites.
- outline the Fire and Emergency position on appropriate life safety design considerations for owners, designers and other building practitioners involved in building construction.

Scope

This chapter is about all buildings, new or existing, undergoing construction works. This includes base build works and alterations of existing buildings involving parts of or full building floors.

This document has been written from a Fire and Emergency point of view. It is based on practical experiences, supported with requirements from relevant New Zealand Standards and prepared with a view to inform others of the issues that may impact the outcome of a fire on a construction site.

This chapter is not intended as a reference on the following matters:

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

Fire and Emergency notes that these issues fall within the scope of guidelines issued by WorkSafe New Zealand.

Background

Construction site challenges

Firefighting operations on construction sites require special considerations as, unlike fully operational buildings, the fire crew is stepping into an unfamiliar environment where moving around the site can be challenging and hazardous. It is also unclear on arrival whether any of the systems that we usually rely on for information or water will be in place and operational.

Difficulties with firefighting operations on construction sites include:

- site access
- site information and hazards
- locating the fire
- site navigation, wayfinding and communication
- protection of the means of escape for fire crews
- availability of water to all parts of a building.

Each difficulty may be caused by a lack of information on the site. There are challenges in terms of risk management during firefighting operations which can cause delays to firefighting operations if not properly managed.

Risks and controls

The [Background](#) section above has identified several issues which can arise during firefighting operations on a construction site. The following sections discuss each in detail. This information is relevant to both new and existing buildings.

Site access

Site access is the first obstacle faced by fire crews when they arrive on site. During working hours, site access can be easy usually, however, outside normal working hours this can be more difficult. Fire and Emergency fire crews carry tools to open or remove gates/fences to gain access to sites and have regulatory powers (under Section 42 of the Fire and Emergency Act 2017) to do so at a fire call. However, time spent gaining access to site will delay firefighting operations.

Inside the site the terrain will determine how close fire appliances can get to the building. Note that terrain suitable for machinery and delivery of construction materials may not be suitable for fire appliances. In particular, steep grades can be a problem for fire appliances. For more information, see guidelines: F5-02 GD FFO Emergency Vehicle Access.

As a general rule, the closer Fire and Emergency can park the fire appliance to the building, the smoother operational firefighting will be. See [Availability to firefighting water](#) in this chapter for further discussion on requirements for access to firefighting facilities.

Site information and hazards

Fire and Emergency notes that Health and Safety at Work Act 2015 (HSWA) requires that employers manage the risk of employees becoming injured while in their place of work. Fire and Emergency believes that this also extends to managing the risks posed to any fire crew that may come to the site to fight a fire.

Given that every construction site is different and that construction risks are in a constant state of change; fire crews cannot easily predict all the hazards they may face on site. Fire crews, therefore, rely heavily on the site hazard information (which should be available to site workers) being easily available to inform their on-site risk assessment.

Once access to the site has been established the crew will look around the site to find any hazards and, if possible, find a person who can provide information on the hazards on site (typically a site manager).

Hazards for fire crews include the following:

- Slip trip and fall hazards – diggings, incomplete floor plates, unmapped egress paths, working at heights on unfinished and unfamiliar construction sites can create slip, trip and fall hazards.
 - Crush hazards – scaffolding may fail, above head storage of construction materials may fail, unprotected steel exposed to fire conditions can also behave unpredictably and fail suddenly causing part or complete collapse to a structure.
 - Electrocution – electrical wiring may become exposed during a fire and could cause an electrical shock.
 - Exposure/explosion hazards – construction materials, such as gas canisters for hot works are an explosion hazard (this risk should, generally, be managed by a hot works permit). Exposure to hazardous building materials, such as asbestos can be a concern for existing buildings.
 - Exhaustion/fatigue – this issue relates specifically to fires located on upper floors. Gaining access to upper floors in tall buildings can be difficult during construction works. The highest reach of Fire and Emergency appliances is, approximately, six floors. All floors above this will be more difficult to reach. Because the risk of fall, site personnel/goods lifts will not be used to access upper floors of a building.
 - The work required to reach a fire without a lift for firefighting. This carries an increased risk of crew exhaustion/fatigue. The lack of complete fire separations may also put increased demand on air supplies and reduce time available for firefighting because air resources are used up reaching the fire floor.
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Ideally, this type of information should be available in a location readily seen (or at least accessible) to fire crews both inside and outside normal working hours. Other useful information includes the location of services shut-off (electricity, gas and water) and where and what any hazardous materials are (to include Materials Safety Data Sheets). For wayfinding it would also be good for a site map showing the current site layout to be beside the hazard board.

Locating the fire

Locating a fire in a building being constructed can be challenging. Typically, fire crews rely on a fire alarm panel (located as per the requirements of NZS 4512:2010) to find possible fire locations. A new totally unused building may have a fire alarm system installed. In an existing building with construction work, the fire detection system may not be working. In these areas the building may have no automatic detection. This is done to reduce the risk of construction work triggering false alarms. Existing detection systems should remain fully operational as far as possible during construction works. However, when it becomes necessary to isolate part of the system or temporarily shut down the entire system this should be done according to relevant standards.

Summary requirements are shown below:

- Manual/heat and smoke detection – alarm systems may be rendered inoperative for maintenance repairs or alterations (NZS 4512:2010, paragraph 701). A notice identifying the presence and extent of the system impairment shall be fixed to the alarm panel (NZS 4512:2010, paragraph 702.4). This impairment notice should be easily seen by attending fire crews.
- Sprinkler systems – sprinkler systems may be rendered inoperative for maintenance repairs or alterations. Before being turned off, partly or in full, Fire and Emergency must be notified in writing (NZS 4541:2010, paragraph 1102.1). There should be a tag tied to the main sprinkler stop valve to identify the sections of the system left isolated. This impairment notice should also be easily seen by attending fire crews.

For sprinkler systems, it is very important that the impairment notice is passed to Fire and Emergency. Fewer resources are dispatched to sprinklered buildings in comparison with unsprinklered buildings. It is assumed that a fire in a sprinklered building will be controlled and will require less resources to fight than an uncontrolled fire in an unsprinklered building with fully operational systems. By telling Fire and Emergency of the system impairment the resource given to this building will be corrected so that the right resources are sent immediately.

Noting that there may be limited fire detection within the building, location of the fire is therefore often by visual inspection and, if there are workers on site, by word of mouth. Location of the fire by visual inspection can be challenging as the lack of complete fire separation between floors, and/or the increased risk of fire spread between floors via external vertical fire spread, can allow fires to spread easily around and between floors. Large openings in the sides of the buildings can also create wind effects which can make finding a fire even more difficult.

Site navigation, wayfinding and communication

Site navigation can be challenging on construction sites. The layout of the buildings is always changing. Situations can arise where fire crews are asked to respond to fire at a construction site where there is nobody on site to explain the latest layout of the building. This highlights the importance of making a site and building plan available to fire crews on arrival.

Specific issues faced with respect to wayfinding include the identifying of floor levels, and stair cores (where there is more than one). Where there is more than one floor and/or more than one stair shaft in the building, the floors and stair shafts of the building should be clearly identifiable. This makes it easier to way-find and makes operational instructions clearer.

Sites may also be without lighting, fire crews have portable light sources, however, if there's no supporting lighting within the building, this can delay the start of firefighting. Key areas where lighting is beneficial include the main access routes to each level of the building.

Communication between crews can also be challenging once crews are inside the building. Radio communication is not always a viable option as the functionality of Fire and Emergency radios can be intermittent, particularly when operating in high rise situations. This is not an issue unique to Fire and Emergency. Reliable communication can sometimes only be possible through warden intercom phone (WIP) system or similar, which are often unavailable in buildings undergoing construction.

Availability of firefighting water

All water for firefighting must be either brought to the site from a reticulated source or, in a non-reticulated area water, made available from an alternative source, e.g. tank source. While existing buildings will typically have a pre-agreed firefighting water source, this may not be the case for new buildings or buildings undergoing a significant expansion or change of use.

Providing firefighting water for new construction sites should be considered early in works. Consideration should also be given to water storage on site where reticulated water will not be available during early construction works. Firefighting water sources must be within 135 m of the fire appliance attendance point. Specific guidance on the volumes of water required for firefighting can be found in SNZ PAS 4509:2008 Firefighting water supplies code of practice.

In order to reach all parts of the building fire, the most remote part of the building must be within a 75 m hose run of the appliance. If this distance is not possible owing to the size and/or height of the building or the landscaping around the building, then additional sources of firefighting water will be required.

A charged fire hydrant system (designed to NZS 4510:2008) can be provided to deliver water to all parts of a building. These systems are to be charged by fire crews from a clearly signposted inlet located according to an agreement with Fire and Emergency. Where the system is to be provided for a new building, a temporary hydrant inlet should be provided during construction. This should be accessible from the street frontage and signposted (NZS 4510:2008, paragraph 8.3).

Hydrant outlets for new systems should be discussed with Fire and Emergency before construction starts. The outlets should be located to allow ready and effective use by fire crews (NZS 4510:2008). Common issues linked with the use of hydrant outlets on construction sites include:

- incomplete piping systems missing sections of the piping design result in an unusable system
- valves left open on several levels allow water to flow freely from the system on more than one level this carries a risk of flooding and prevents the system from becoming fully pressurised
- no intermediary pump to bring water to levels above 40 m, where gravity and friction losses can significantly impact flow rates available on fire floor
- no end cap (if applicable) on the uppermost end of the pipework which prevents the system from being pressurised and results in charged water freely flowing from the uppermost level of the piping
- possible introduction of foreign bodies which can interfere with the operation of the system when the end cap has not been put in place.

These issues are to be managed by complying with the requirements of NZS 4510:2008. In the case of a new building, the building hydrant system should be installed in parallel with the main construction work and brought into commission progressively as building work proceeds (NZS 4510:2008, paragraph 8.1.1.1). In new multi storied buildings 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 8.1.1.1).

For existing buildings, any existing system should remain operable during construction works. For buildings that remain partly occupied during the construction works this will typically be a condition of any Certificate for Public use in addition to being a requirement of NZS 4510:2008. Where an existing building is being demolished the hydrant system should remain operational up to the floor below the highest intact floor (NZS 4510:2008 paragraph 8.4).

For tall buildings, because Fire and Emergency has limited ability to pump over 40 m, an intermediary pump is needed to provide adequate flow rates and pressure on the upper levels (NZS 4510:2008, paragraph 8.2.2).

Firefighting considerations

The [Risks and controls](#) section above has highlighted the difficulties associated with firefighting on construction sites. This section focuses on means of reducing risk to operational crews and avoiding delays to firefighting.

Before a fire – fire safety systems

- Ensure that enough firefighting water is available to the site when construction begins.
- Maintain fire safety systems operational according to the requirements of the relevant standards.
- Follow the requirements to notify the relevant bodies when a fire system is to be impaired.
- Display all fire safety impairment notices where they would be expected to be found.
- Repair any damages to fire safety systems within a reasonable timeframe.
- Consider a temporary automatic fire detection system which can provide an early warning of fire. Fires detected in the early stages are less likely to need fire service intervention.

Before a fire – site hazards

- Follow site safety requirements by including the display of an up to date hazards board at the entrance(s) to the site.
- Consider delegating key contact(s) to act as liaison with Fire and Emergency in the event of a fire incident.
- Consider a familiarisation visit by local Fire and Emergency crews so they have a good understanding of the site and building layout. This can be arranged by contacting the local Fire and Emergency representative via the fire engineer.
- Ensure hazardous materials on site are stored appropriately and clearly labelled/signposted.

Before a fire – site navigation

- Consider numbering the floors from outside the building so that they are visible from the ground.
- Stairs should be kept clear of debris and preferably be free of fire load.
- Consider providing a site and building map which can be made available to fire crews on arrival to indicate the layout of the site and building, the location of firefighting facilities and the services (electricity, gas, water) shutoffs.
- Signpost spaces which are dead ends (either by design or due to gaps in construction). Unexpected dead ends can, potentially, trap fire crews.
- Consider providing lighting 24/7 to the main access routes to include the stairs (if any).

In the event of a fire

Consider providing a single point of contact that can hand over site information to fire crews on arrival.