Introduction

Purpose

Architects and engineers create workplaces for everyday use. In the event of an emergency, these become workplaces for firefighters too. Tailoring a design for the operational requirements of Fire and Emergency New Zealand reduces the time it takes to mitigate an incident.

The purpose of the guide is to increase the safety of building occupants and emergency responders, by streamlining how Fire and Emergency interacts with buildings’ features and fire protection systems.

The information in this series of documents is aimed at designers of buildings and fire protection systems. Using the guide will help you better understand what Fire and Emergency needs when we are called on to operate in or near your built environment.

Overview

Using the guidance in this document offers both building occupants and Fire and Emergency personnel benefits to safe working conditions, as the Health and Safety at Work Act 2015 (HSWA) intends.

The faster a crew can mitigate an incident, the less time the hazardous situation has to grow. Fire and Emergency personnel who respond to incidents will see less harm. Employees who occupy the buildings will be less exposed and more protected from fire incidents.

Designers understand the NZ Building Code and Standards well, which govern building design and fire protection systems. However, typically only people who are involved in fire and emergency operations thoroughly understand the needs and requirements of Fire and Emergency personnel.

This guide discusses how Fire and Emergency interacts with different building features. To provide the most effective protection, designers should consider Fire and Emergency personnel to be users of their building’s features and fire protection systems.
systems. While mechanical events or other failures happen more often, fire can destroy more property, disrupt more operations, and cause injury and death.

**Scope**

Using this guide is voluntary. Consider it a companion to the:

- mandatory requirements of the NZ Building Code
- requirements of NZ standards associated with fire protection systems.

The documentation does not *replace* any part of the NZ Building Code or standards.

The material focuses on how designers of building and fire protection systems can help fire suppression operations work more efficiently. The guidance aims to help these designers build on existing requirements in ways that assist Fire and Emergency.

**Note:**

- This documentation only covers the parts of buildings and systems that Fire and Emergency interacts with. The suggested design details will help streamline and support Fire and Emergency operations.
- Many of the considerations will also help with responses to other types of emergency, such as release of hazardous substances, emergency medical care, non-fire rescues and terrorist events.

- F5 01 GD Introduction to Firefighting Operations (FFO) buildings
- F5-02 GD FFO Emergency vehicles access
- F5-03 GD FFO Radio communications
- F5-04 GD FFO Fire alarm systems
- F5-05 GD FFO Building hydrant systems
- F5-06 GD FFO Sprinkler systems
- F5-07 GD FFO Stairways in buildings
- F5-08 GD FFO Lifts
- F5-09 GD FFO Fire control centres
- F5-10 GD FFO Evacuation (high rise buildings)
- F5-11 GD FFO Water supply
- F5-12 GD FFO Construction sites
- F5-13 GD FFO Multi-tiered vehicle stacking buildings.
New Zealand building code

Impact of building code

The Building Regulations 1992 > NZ building code > C5 Access and safety for firefighting operations describes how every building and system must serve during firefighting operations.

In summary, Fire and Emergency personnel must be able to fight fires and make rescues with as little chance of delays or injuries as possible. Firefighting personnel and their appliances (vehicles) must be able to safely:

- get into the area
- use the systems to see what is happening and to carry out their operations
- get out.

The design also needs to consider what happens if any of the systems fail.

Fire and Emergency operations

What’s in this section

Read this section to understand the basics of how Fire and Emergency operates during an emergency, and the various capabilities and organisations involved in firefighting.

Types of personnel

Types of Fire and Emergency personnel

Fire and Emergency fire stations are staffed by career firefighters, volunteer firefighters, or a combination of both.

- Career firefighters are paid for their work. Career fire stations typically serve larger, urban or industrial settings. Many smaller cities or towns have a full or partial career staff too.
- Volunteers are unpaid. Volunteer brigades usually serve more suburban or rural settings, and some densely populated areas that have very high emergency response rates.

Another way to categorise fire stations is how the personnel are available for responses – a fire stations staffed at all times, or personnel on call.

- Most career organisations have personnel who remain in the station while on duty.
- Most volunteers respond from home or work when they are alerted to an emergency.

Other firefighting professionals

Other organisations in New Zealand can have their own industrial fire brigades. This is a group of specific employees trained to suppress fires, and perhaps respond to related emergencies, for their employer. The group’s members may be employed full time or part time for emergency response operations.

Industrial fire brigades are privately funded. Fire and Emergency does not control them, but works together with them when needed.
Typical response to an emergency

Discovering and reporting

A typical emergency begins with a person or system discovering an incident and reporting it to Fire and Emergency or to a monitoring service. The monitoring service investigates the report before notifying Fire and Emergency – this can mean a delay.

One of our Communication Centres receives the report. The three centres cover the entire country (ComCen consists of: NorthCom, CentralCom and SouthCom). All incidents, of every type and throughout New Zealand, have a predetermined attendance (PDA) loaded into the centres’ system. The PDA determines which appliance(s) from which station(s) attend the incident, based on:

- where it is
- whether it is a structure fire, car accident (motor vehicle accident or MVA), a hazardous substance spillage, a rescue, and so on.

A specific building with its own particular risks – for instance, high-rise or hospital – has its own PDA.

Preparing to respond

Once alerted:

- career firefighters make their way to the fire appliance
- volunteer firefighters travel to their fire station, then to the appliance.

Firefighters don their protective equipment, board the vehicle(s) and begin to respond.
Types of appliances (units or vehicles)

Fire and Emergency normally responds to a structure fire in several different units or vehicles – called ‘appliances’. Together with its personnel, this is called a ‘crew’.

They take a wide variety of forms, each for a specialised use. The basic types are a ‘pump’ and an ‘aerial’ appliance.

- A pump appliance normally carries hose, a pump, and a small water tank, an assortment of ground ladders, and many power and hand tools. Its main responsibility is to deliver water to the fire. Initially, the crew may operate using the water available in their tank. For many incidents bigger than a small exterior fire, the crew typically needs to establish a continuous water supply. Hose lines carry water from a source of supply (fire hydrant, lake, pond, temporary dam) to the on-board pump, which then boosts the pressure to hose lines (or other devices) attacking the fire.

- An aerial appliance is typically equipped with a long aerial ladder, or an elevating platform on top. It has a reach between 18 and 30 m. It also carries many power and hand tools.

Arriving at the incident

When they arrive at an incident, firefighters must handle many tasks. Using standard operating procedures, firefighters quickly assess the situation, and put the units that arrive first into operation.

The priority is to rescue all saveable occupants, then to confine and extinguish the fire. In some cases, firefighters must stop the fire first, before they can rescue occupants.
Commanding the incident

The first officer to arrive sets up the incident command. They begin by rapidly gathering information. This is called ‘size-up’ or Dynamic Risk Assessment (DRA). Incident command expands as additional units and station or executive officers arrive.

Incident commanders (ICs) must base their strategies on the information they have at any given time, about the fire, the building and the occupants. As they receive more information, they use the DRA approach to revise the strategies. They can call for more resources if needed.

Bringing the incident under control

As the operation brings the fire incident under control, crews start working on salvage, overhaul, and investigation. These activities are still dangerous and important, but are less time-sensitive.

Challenges for Fire and Emergency

Ability to act fast

Fire and Emergency operations happen in stressful, time sensitive environments. The speed of the operations is critical, especially during the initial phase when the first resources arrive and are committed. Delays make subsequent operations difficult and create risks for the final outcome. When delays happen, the fire could be growing exponentially.

These examples would cause delays that ripple out to other parts of an operation:

- poorly located fire hydrants
- confusing alarm information
- ineffective communication systems
- inaccessible valves.
### Why speed is so critical

Fire and Emergency personnel perform their functions at all times of day or night, in any weather conditions, and frequently in unfamiliar environments. Their work environment is dangerous, mentally stressful, and physically exhausting.

They must often make decisions with only a little information about the fire ground. They may not know what is on fire, how much is burning, whether the building contains any hazardous substances, where the fire is spreading to, and where the occupants are. These factors stack the deck against the safety of firefighters.

Even simplifying the firefighters’ job in small ways increases their safety, and so the building occupants’ safety.

### How good design can help firefighters act fast

Design features that save time or numbers of personnel can make a great difference. Any feature will help if it:
- provides information about the fire, the building, or the occupants
- speeds up the firefighters’ access to that information.

### Factors that influence when firefighting starts

Designers need to seek advice about what firefighting resources are most likely to arrive at the site or building for a suspected or actual fire. Designers can access this information through local area management. This can provide a possible timeframe for how fast they will arrive, and when they will start the firefighting operations. But designers must also consider that, when a call happens, these crews may already be attending a different incident.

Another method to consider is the FBIM software, which can be used in conjunction with C/VM2, which can generate a more realistic timeframe for fire service attendance.

A firefighting crew does not usually enter the building or area of a confirmed or suspected fire straight away. They usually only move in once a safety crew is there, to help if they cannot escape the danger area. This means that internal firefighting operations normally only start when a second (or further) pumping appliance arrives, with a big enough crew. The only exception is when a casualty is confirmed near an exit, where the crew can carry out a ‘snatch rescue’.

The location of the fire affects when a firefighting crew can start operations inside a building:
- The building’s size affects where a crew can wait, until more resources arrive.
- Generally, fire stations are closer together in urban areas than in rural areas. If appliances and personnel can arrive faster, operations can start sooner.
- Fire stations with permanent staff can usually turn out faster than those where the firefighters are on call from their homes or workplaces.
How pre-incident plans helps

Fire and Emergency prepares pre-incident plans, as a document that helps with emergency operations at a specific facility. The plan should contain the locations of the fire protection features that this guide discusses, and detailed information about them and any known hazards.

The station that will normally respond first to a particular facility is usually responsible for preparing its pre-incident plan and keeping it up to date.

The station prepares a thorough pre-incident plan, covering all the considerations in this guide, no matter how unlikely it seems that they will be needed.

Designers can help with pre-incident planning by providing copies of building and system plans (paper or electronic) to Fire and Emergency.

Pre-incident planning makes sense, but plans will always be limited.

Fire stations and firefighters will be more familiar with features of buildings in their response area, so are better prepared to deal with fires and other emergencies there. However, the responding crew may be a brigade working outside their usual area. They may not even have access to the pre-incident plan.

Even the best pre-incident planning cannot help if: the station that prepared it is:

- already committed on another response
- out of position
- out of service
- now staffed by different personnel.

So, the building design and systems must consider the needs of firefighters, even with the best pre-incident plan.

Getting Fire and Emergency involved

When and how

This document describes the general considerations. For each project they work on, the designer should seek and follow the advice of the Area Manager from Fire and Emergency.

For many projects, Fire and Emergency must be involved in the building’s design process:

- fire engineering brief (FEB) process
- design review
- inspecting the fire and emergency facilities
- approving some features of the building or site (including to get building consent granted).

In every case, it is wise to include Fire and Emergency early in the design process, when changes are easier and less costly.