DESIGNER'S GUIDE

Firefighting operations on radio communications

F5-03 GD

Introduction

When to use

The purpose of this chapter is to provide a consistent Fire and Emergency New Zealand position on radio communication. The primary objectives are to:

- outline Fire and Emergency's position on appropriate use of radio communication on the incident ground
- identify and overcome the limitations of radio communication in special risk areas such as tunnels and high-rise buildings.

Scope

The scope of this chapter relates to radio communications used by Fire and Emergency for response, at incidents and special risk sites.

NZ Building code performance requirements

Fire Safety C Protection from fire clauses C1 – C6 defines NZ 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/ASx Acceptable Solutions provides only limited information on requirements for firefighting operations therefore additional guidelines are required.

Communication is a critical part of firefighting operations. Firefighters' safety and performance are dependent on effective communication.

Definitions

The following definitions apply for the purpose of this chapter. Defined terms (in italics) used throughout this document, are consistent with the Building Act 2004, New Zealand Building Code (NZBC) and Acceptable Solutions C/ASx.

British Research Establishment (BRE)

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 Fire Design Acceptable Solution parts 1 – 7 (x represents numbers 1 – 7)

Fire Engineering Brief (FEB)

A formal process as outlined in the International Fire Engineering Guidelines for all stakeholders to define the scope of work for the fire engineering analysis and the basis for analysis as agreed by stakeholders.

Fire Resistance Rating (FRR)

This is a defined term in the NZBC C Fire Documents. '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).

Incident ground communication (ICG) radio

Handheld two-way radios to communicate with one another when working at an incident. Relevant personnel cannot communicate with Fire and Emergency Communication Centres and other handheld radios on different channels.

Land mobile radio (LMR)

A land mobile radio network that allows Fire and Emergency to communicate with the station turnout system and fire appliances.

Mobile status unit (MSU)

A unit with a display screen showing the status of the fire appliance using a number coded system.

Communication Centres

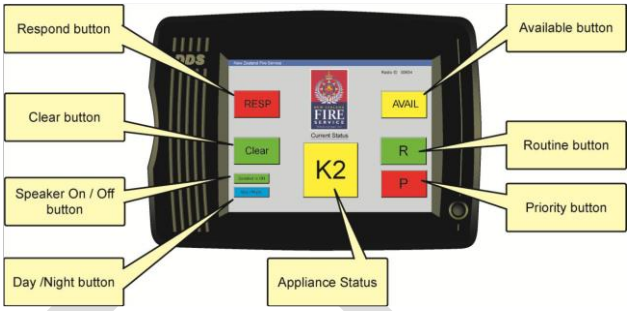
Response alert

Fire and Emergency New Zealand operates three communication centres nationally on a 24-hour basis. They are located in Auckland, Wellington and Christchurch, providing coverage throughout the entire country. Should one centre become demobilised, an operator in any centre can arrange an emergency response to an incident, providing a 24-hour national capability for emergency cover.

The communication centres activate station alarms (for response) and communicate (via radio) directly with any responding fire appliance. They also monitor non-incident radio communications from other fire service vehicles. Station alarm activation (response alert) operates on the Selcal unit. Once the appliances are mobile, response alert and radio communication operate on a land mobile radio (LMR) network.

Land mobile radio

Fixed radio communications equipment



Fire and Emergency appliances have fixed radio communications equipment installed that allows verbal messages to be sent and received to/from the Communication Centre (ComCen).

Each appliance also has an MSU that allows firefighters to send/receive call requests, along with status and arrival messages. This allows the user to select from a range of options by pressing one of the buttons displayed on screen. The MSU is connected to the radio network via the Tait TM8250 radio. The radio relays status messages over the air to and from ComCen.

The MSU screen automatically displays information on receipt of a 'Call' message from ComCen. It can also trigger a strobe light and audible alert, the audible alert lasts 15 seconds to alert fire crews if they are working away from the appliance.

LMR frequency range

Band	Frequency range (MHz)
VHF (ESA Band)	75 - 79 MHz
UHF (F Band)	470 – 494 MHz

Fire appliances have limited or no radio communication when entering a road tunnel. In most instances Fire and Emergency requires a leaky feeder cable (see Radio signal rebroadcast systems) installed in tunnels to provide radio coverage for fire appliances. Leaky feeder must be tuned using the above frequency for fire service use.

A separate system is required for incident ground radio (IGC) communications in tunnels. Contact the Regional Telecommunication Specialist or the National Telecommunication Manager for specific IGC tunnel radio requirements who can be reached at telecoms@fireandemergency.nz.

Incident ground radios

Handheld radios

Firefighters use two-way handheld radios to communicate with one another when they are working at an incident. This is called Incident Ground Communication (IGC).

Handheld radios:

- Use open channels, which means everyone tuned to one of those channels can hear what everyone else says
- Can only communicate with other handheld radios that are tuned to the same channel
- Have limited range in built up areas, which means firefighters often need line of sight with the person you are trying to talk to.

Handheld radios can NOT communicate with:

- appliances on the LMR network
- Fire and Emergency Communications Centre (ComCen)
- other handheld radios on different channels.

Fire and Emergency over time used different types of handheld radio for IGC. One example is the Motorola radio which has been adopted across the country.

IGC channels and frequency range

Band	Frequency range (MHz)
VHF (ESB Band)	138 - 144 MHz
VHF (ESC Band)	494 - 502 MHz

Incident Command Unit vehicles

Incident communication monitoring

Fire and Emergency operates a number of Incident Command Unit (ICU) vehicles nationally. They are strategically located within Regions and Areas to respond as a mobile command centre. These are also referred to as Hazmat Command Vehicles due to a dual purpose functionality. Their primary roles are to:

- become the mobile Command and Communication Centre at a specific incident or multiple incidents at a localised location.
- be the hazardous substance support for decontamination at a hazardous substance incident.

At an incident all incident communications, including IGC communications, are monitored by the ICU. Once established on site the ICU becomes the incident control point (ICP) for all command and control functions. The Incident Controller (IC) takes overall command and control of the incident from the ICU.

The ICU also monitors other incident radio frequencies and communicates with Fire and Emergency Communications Centres, other commanders on the incident ground and appliances responding to the incident.

Radio communications in high rise buildings

Challenges

IGC and other radio communications in high rise buildings have limited use for firefighters and commanders. There are a number of radio communication options available including some used by international fire services. However, Fire and Emergency experience and testing have shown that they all have proven unreliable. International fire services agree that incident ground radio communications are a challenge.

Fire and Emergency prefers to use hard wired telephone systems such as Emergency Warning and Intercommunication System (EWIS) in high rise buildings. EWIS systems must be installed in accordance with AS 1670.4:2015 and AS 4428.4:2004. These standards cover the installation, testing and control equipment for EWIS and emergency intercommunication systems.

In general Fire and Emergency recommends (as well the above standards):

- telephones in a fire rated stairwell or lobby
- use of fire rated cables
- the ability for WIP or EWIS to be used:
  - and controlled from the high rise building's Fire Control Centre
  - by multiple operators at once.

Radio signal rebroadcast systems

Signal transmission

Fire and Emergency portable radios are used frequently during an emergency incident. These can be unreliable inside buildings and other structures such as tunnels due to the construction materials used that greatly reduce the strength of radio signals. If a firefighter inside is unable to transmit or receive, he or she must then relocate closer to an exterior opening, move to a different floor, use an alternate means of communication, or resort to runners or direct voice communications.

Mobile phone signals are sometimes affected by the same factors as handheld radio signals. Landline phones will allow firefighters to communicate with Communication Centres, but not other fire appliances; they may also be affected by the incident occurring in the building.

All of these factors may delay operations and create greater challenges in maintaining crew integrity.

New technology can improve signal transmission within buildings and structures through fixed communication installations. Passive approaches that exist simply provide a conduit to assist in the transmission of signals. However, active methods involve powered devices to amplify and retransmit signals.

For example, the passive antenna system includes both an internal and an external antenna, connected with a short coaxial cable. A radiating cable also known as a leaky co-ax is a network of coaxial cables with slots in the outer conductor that create a continuous antenna effect.