DESIGNERS' GUIDE

Firefighting operations emergency vehicle access guide

F5-02 GD

Introduction

Scope

Use this guidance document to ensure that Fire and Emergency New Zealand fire appliances can access sites, buildings and structures in an emergency.

The document details the requirements for fire appliance access, including general access to sites or premises, and access around buildings or structures within a site (allotment).

You should be aware that this document is a guide and doesn't replace any statutory requirements.

Context

During an emergency, Fire and Emergency is most efficient and effective when fire appliances have fast and clear access provided. Poor or inadequate access can delay a Fire and Emergency response. Delays getting to and dealing with a fire may risk the safety of people and their property. Because of the functions performed by Fire and Emergency appliances, they are larger and heavier than those used by other emergency services.

This guide is based around compliance with New Zealand Building Code Clause C5, which deals with access and safety for firefighting operations. Clauses C5.3 and C5.4 of the Building Code describe how an access is built and works:

> *"C5.3) Buildings must be provided with access for fire service vehicles to a hard-standing from which there is an unobstructed path to the building within 20 m of:*
>
> *(a) the firefighter access into the building, and*
> *(b) the inlets to automatic fire sprinkler systems or fire hydrant systems, where these are installed.*
>
> *C5.4) Access for fire service vehicles in accordance with clause C5.3 must be provided to more than 1 side of firecells greater than 5,000 m^2 in floor area that are not protected by an automatic fire sprinkler system.*
>
> *Performance requirements in clauses C5.3 to C5.8 do not apply to backcountry huts, detached dwellings, within household units in multi-unit dwellings, or to outbuildings, and ancillary buildings."*
>
> *[Schedule 1, p. 33A]*

A second key source of information for this guidance is based on the Acceptable Solutions C/AS1-7, Paragraph 6.

Fire and Emergency also recommends the use of the Firefighting Facilities Checklist (FFFC) to document the Fire and Emergency agreement on specific sites access requirements).

The New Zealand Transport Agency (NZTA) guidelines should also be followed during the design of Fire and Emergency vehicle access, where appropriate:

- RTS 18 New Zealand on road tracking curves for heavy vehicles 2007
- Bridging the gap: NZTA urban design guidelines 2013.

Definitions

Aerial appliance	A specialised emergency vehicle that has an aerial apparatus that rises to suppress and/or rescue.
Allowable bearing pressure	The calculated pressure required to counter compression forces exerted by dead loads (i.e. the minimum strength required to maintain stability under a weight load).
Appliance	An emergency vehicle that provides firefighting, rescue or Hazardous Substances (HazSub) capability.
Carriageway	Any construction specifically designed to be traversed by vehicular traffic (may or may not include a sealed top surface layer).
Stabilisers	Fitted to aerial appliances to provide stability when the vehicle's centre of gravity shifts during the operation of the aerial apparatus.
Hardstand area	An area designated and designed for use by a Fire and Emergency fire appliance and its crew, which can withstand the laden weight and associated loads of the vehicle in use.
Attendance point	The attendance point is generally located at the building's main entrance. This location should include alarm panels, sprinkler and hydrant inlets etc. This is the location where the first attending appliance will attend and set up. Attendance point – A single point of emergency response attendance per building, as referenced in clause 6.2.1 of the C/ASx documents, and to comply with Clause C5.3 of the New Zealand Building Code, NZBC. This will give access to: • indications of fire location, • controls for fire safety systems and • inlets for fire sprinkler or hydrant systems. **Note:** An attendance point where facilities are provided to meet the provisions of NZBC C5-7 giving firefighters clear information, will be the initial tasking and safety briefing point for crews before deploying to any other access point.
Address point	This point is part of the data set administered by Land Information New Zealand, (LINZ). It is the address, (point)where the Building is commonly known to be located. The address point can be either singular, or a range of individual points as described on the LINZ data set.
Fire service vehicular access	C/AS Part 6: Firefighting Clause 6.1.1 describes this. Additionally, for the health and safety of our personnel, this access: • must not involve a canopy, or other part of a structure to drive or park under • must be located outside a horizontal collapse zone requirement of 1.5 times height of the tilt slab • must be within 135 m of a firefighting water supply. If the access meets these requirements then it is deemed usable, and the 75 m hose run may be measured from this hard-standing.
Firefighter access point	NZ Building Code clause C6.3 applies. Additionally, for access points which are not linked to the requirements for an Attendance point described above, it will be advantageous to the building owner for the Provisions requirements of NZBC Clause C5.7 to apply. See the note in the Attendance point definition. Failure to provide these may mean that briefings for safety and tasking may delay arrival at the additional access points.

Fire and Emergency appliances

Fire and Emergency appliance types

The Fire and Emergency fleet has different types of vehicles, which are designed to perform specific functions at an emergency incident. Fire service agencies call these types of vehicles appliances.

Most Fire and Emergency appliances have a specially built body fitted on a multi-axle heavy vehicle chassis. The equipment each vehicle carries depends on its different levels of firefighting, rescue or hazardous material capabilities.

Some appliances perform specialised functions in an emergency. Besides the general appliances, the second main category of appliance is aerial appliances. An aerial appliance has a specially built telescopic and/or articulated apparatus that can rise up to supress a fire at large premises, or rescue people trapped in multi-storey buildings. Aerial appliances are larger and heavier than general appliances, and may be on either a two, three or even four axle heavy vehicle chassis.

Note: The functions of an aerial appliance require that it can get close to the building or structure that it needs to attend.

Fire and Emergency groups its appliances into six types. Types 1 to 3 are the general appliances and Types 4 to 6 are aerial appliances.

Specifications for appliances are different. The maximum parameters (i.e. worst case scenario) for Fire and Emergency appliances are shown below.

Maximum parameters	
Gross vehicle mass	25 t
Maximum overall length	12.6 m
Maximum overall width	2.5 m (6 m when stabilisers are deployed)
Required free height	4 m

Appliance type coverage

New Zealand sites, buildings and structures should provide all Fire and Emergency appliances adequate access in an emergency.

When applicable, developers and planners must also ensure adequate access for aerial appliances. An aerial appliance must be able to reach an emergency in a building or structure, wherever it is.

Contact Fire and Emergency Operations through your local Fire Area office for advice on whether an aerial appliance access is necessary for a site.

Access requirements

Carriageway widths

Carriageways should be wide enough to allow appliances to easily get through them. Vehicles should also have enough room around them for vehicle crews working with firefighting equipment. During an emergency, appliances will park in the carriageway in a spot that provides the best access and most options for fighting a fire or emergency.

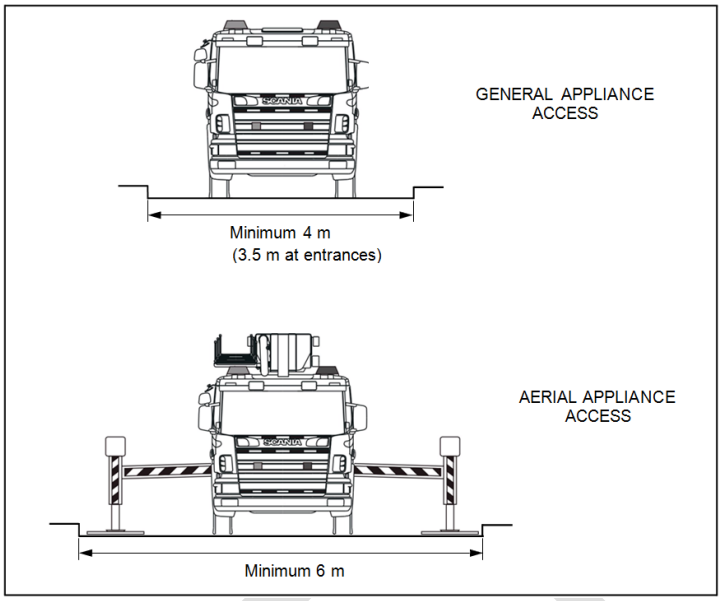

Figure 1: Minimum carriageway widths along straight sections

Along curved carriageway sections, a minimum inner radius of 6.3 m and an outer radius of 11.3 m should be provided for general appliance access, and a minimum inner radius of 5.2 m and outer radius of 12.5 m for aerial appliance access (see Figure 2).

The distance between inner and outer turning arcs must allow for expected vehicle body swing. The minimum distance between the inner and outer arcs should not be less than 5.0 m for general appliances and 7.3 m for aerial appliances (see Figure 2).

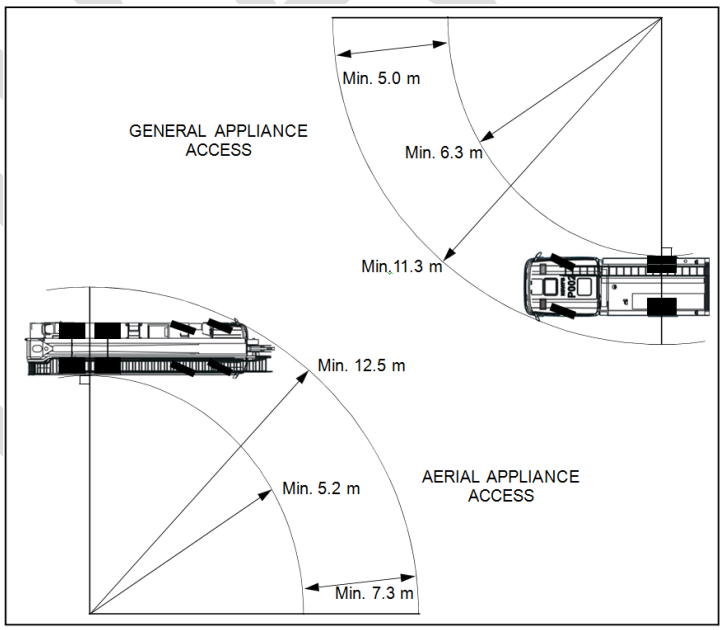

Figure 2: Minimum carriageway widths – curved sections

Note: The radius dimensions above are for wall to wall clearance from body overhang, and do not represent the vehicle's wheel tracks.

Turning areas

Any carriageway not leading directly to an exit (i.e. dead end) should be provided with a turnaround area that prevents the need to perform multi-point turns.

Fire and Emergency vehicles are required, and are designed, to perform a full 360° turn within a 25 m circle (wall to wall clearance) to meet NZTA requirements.

The minimum turning radius of turnaround areas should be no less than 11.3 m for general appliances, and 12.5 m for aerial appliances (see Figure 2).

As per the NZTA guidelines, the On-Road Tracking Curves [2] as indicated in Table 2 should be considered.

Fire and Emergency fire appliance type	NZTA on-road tracking curve
Type 1, 2, 3	8 m Medium Rigid Truck
Type 4, 5, 6	Large Rigid Truck

Table 2: Fire and Emergency fire appliance types in relation to the NZTA on-road tracking curves

Ensuring clear access

At all times, site managers must ensure nothing blocks or partly blocks carriageways for appliances. It must be ensured that access routes can be driven through during all weather conditions.

Note: Carriageways can be blocked by parked vehicles, shipping containers, pallets, stored goods, industrial bins etc.

Perimeter security points (e.g. sliding/swinging gates, boom gates, bollards, vehicle security barriers) must not make it difficult for appliances to gain access. A minimum width of 3.5 m and height of 4 m should be provided at site entrances, internal entrances and between buildings.

Kerb dimensions

All kerbs built along the edges of a carriageway should be no higher than 250 mm and should be free of vertical obstructions at least 300 mm back from the kerb face to allow clearance for front and rear body overhang.

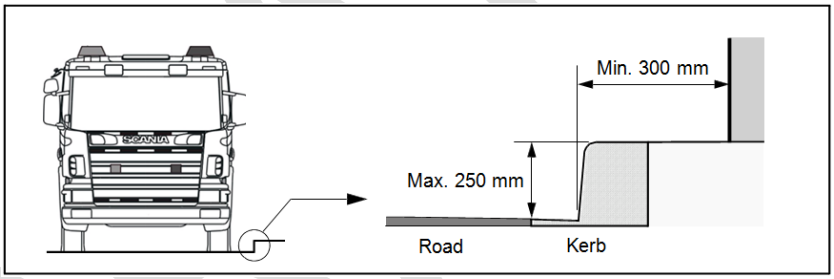

Figure 3: Carriageway kerb clearance dimensions

Building and structure clearance height

An unobstructed clearance height of 4 m should be maintained above all access ways, including clearance from building construction, archways, gateways/doorways and overhanging structures (e.g. ducts, pipes, sprinklers, walkways, signs, beams, trees, hanging cables, etc.).

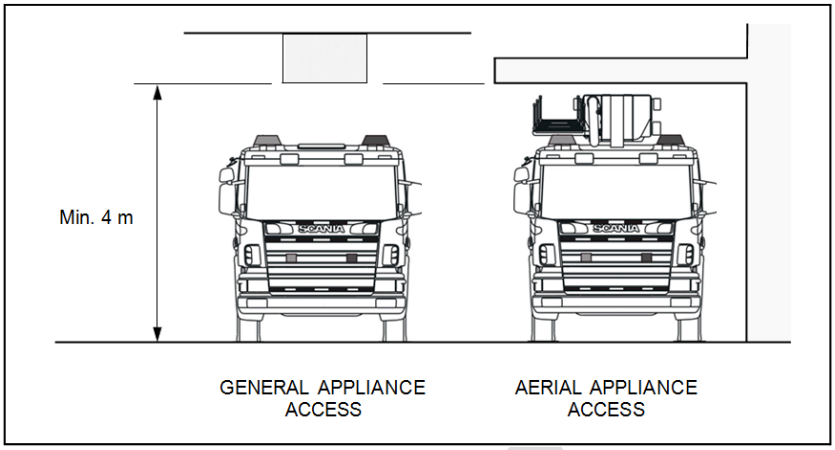

Figure 4: Building and structure clearance heights

Note: Special consideration must be made where there are height restrictions in combination with gradient changes. In some cases, more than 4 m of clearance will need to be provided so the appliance can take the gradient change.

Gradients for access ramps

Fire and Emergency prefers a ramp gradient of 1:8 or less. The maximum negotiable ramp gradient is 1:5.

Access ramps that follow a curved or circular profile in plan view should have a maximum gradient no greater than 1:10 (measured along the centre line).

Note: The chassis of an appliance will twist and flex when driving up a ramp, so a lower gradient is needed.

Ramps should not delay vehicle response and should provide entry/exit clearances for appliances.

Maximum access ramp gradients

Access ramps should have a smooth transition between the main ramp gradient and entry/exit gradients. A minimum 4.0 m long 1:15 transition grade is preferred for both ramp approach and departure (see Figure 5).

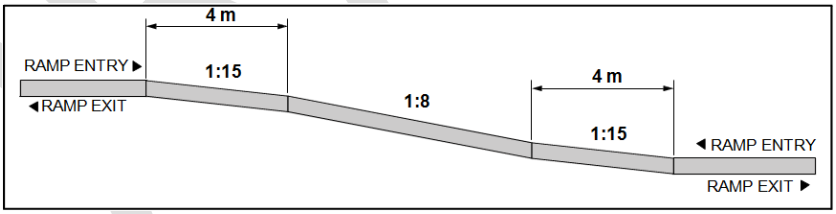

Figure 5: Maximum access ramp gradients

Reduced gradient clearance

When a change of gradient includes a recessed threshold, such as a gutter (e.g. for storm water drainage), plan and design for the reduced approach and departure clearance (see Figure 6).

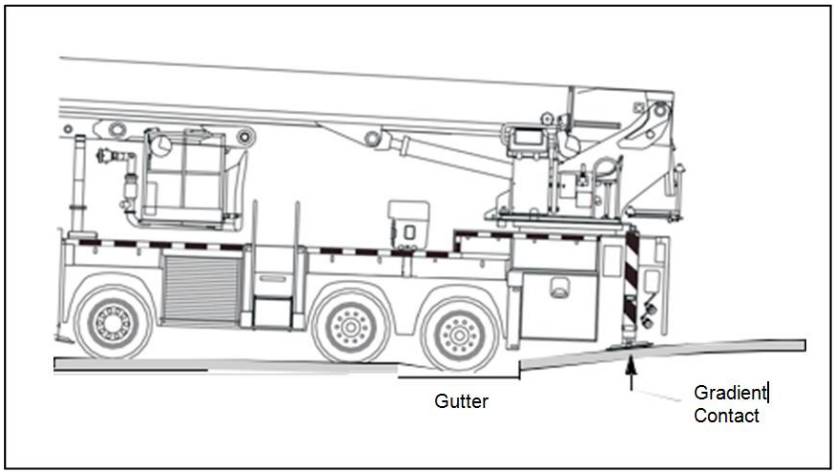

Figure 6: Reduced gradient clearance due to gutter

Note: When wheels go into a gutter, the effective under-body clearance height at both front and rear overhanging sections are reduced due to the body slanting downwards. This problem is made worse when the gutter depth is greater and/or when the overhang length is greater.

Besides the general access gradients as shown above, hardstand gradients are limited because the stabilisers are used on aerial appliances. Aerial appliances can only use their stabilisers and operate if the ground slope is within +/- 6°.

Appliance weights (loads)

Static loads of appliances

Carriageways must maintain structural adequacy and integrity when under load from a fire appliance, with particular attention given to those supported, elevated or reinforced by structural members (e.g. suspended floors, ramps, wharfs, aprons etc.).

The loads of appliances (exerted through wheels) used to determine forces acting through load-bearing structural members are provided in Figure 7. Wheelbase distances between the front and back axles range from 3.7 to 5.5 m for general appliances, and 4.4 to 5.6 m for aerial appliances. Distances between wheels – both longitudinal and lateral – may need consideration when calculating point loads for wheels.

Note: Designers should be aware that the axle loads, as indicated in Figure 7, cannot be assumed to be evenly distributed over all wheels.

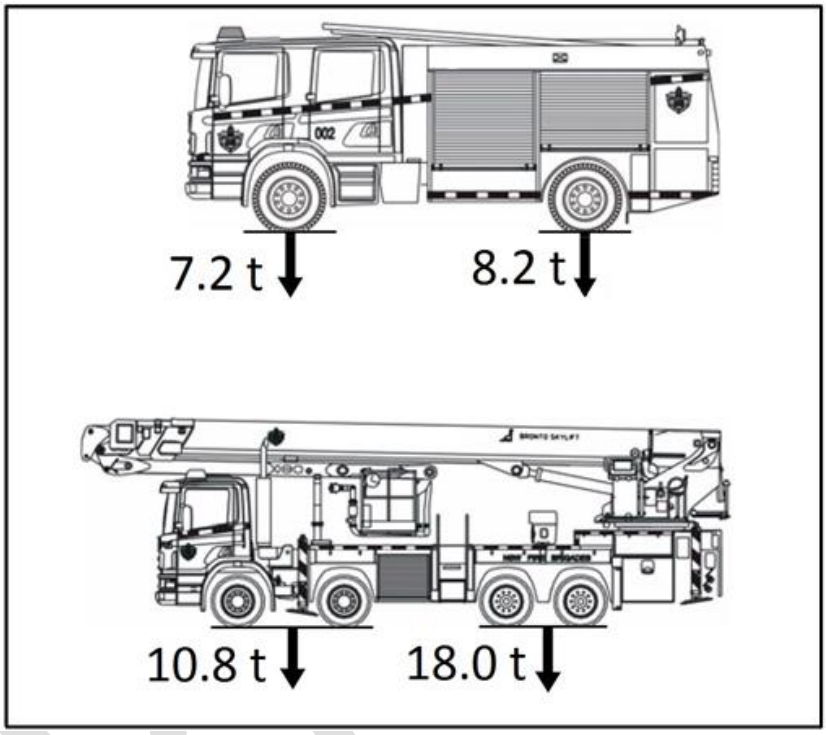

Figure 7: Axle loads of appliances

In general, access routes should be able to withstand a laden weight of up to 25 tonnes with an axle load of 8 tonnes or have a load-bearing capacity of no less than the public roadway serving the property, whichever is the lower.

Roadway pavements designed for aerial appliances shall withstand a vehicle of multiple axles spaced at no less than 2.5 m centres and each carrying 8.2 tonnes.

The hardness of the carriageway surface must withstand the static pressure exerted by tyres of an appliance that is not greater than 850 kPa.

Note: Fire and Emergency recommends that pavements for fire appliance access are designed according to NZTA HN-HO-72 traffic loading specifications, in order to meet the load-bearing requirements.

Dynamic loads (on aerial appliances)

Aerial appliances are fitted with stabilisers that prevent the vehicle from overbalancing when the aerial apparatus is operating. Aerial appliances will either have two stabilisers at the rear only, or two front and two rear stabilisers (see Figure 8).

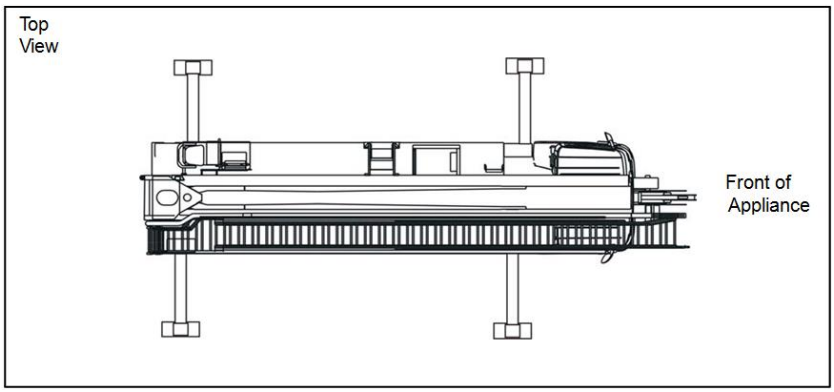

Figure 8: General stabiliser arrangement on aerials

Dynamic forces exerted through the stabilisers are caused by changing weight distribution and other forces, such as torsion moment forces, which are created by the extension and rotation of the aerial apparatus.

Note: The ever-changing distribution of weight can cause up to 70% of the total vehicle weight to bear on a single stabiliser.

The maximum dynamic loads and pressures exerted though a single stabiliser of the Bronto Skylift F44 RLX, having a fully loaded cage (500 kg) at maximum extension/outreach and under worst case rotation angle are:

- Maximum stabiliser force: 200 kN
- Maximum footplate pressure: 11 kg/cm^2 (1079 kPa)
- Maximum bearing plate (block) pressure: 2.8 kg/cm^2 (274 kPa).

Consider the maximum exerted pressure above when calculating the minimum Allowable Bearing Pressure (ABP) for the carriageway or hardstand area.

Vehicle hardstand requirements

For a fire appliance to be effective it needs to be able to park in an area as close as possible to both the available water supply and the structure to be protected. This area is termed the hardstand. The exact location and extent of hardstands shall be determined in consultation with Fire and Emergency Operations.

As indicated in the Building Code Clause C5.3, buildings must be provided with access for fire service appliances to a hardstand area from which there is an unobstructed path to the building within 20 m of:

- firefighter access into the building
- the inlets to automatic fire sprinkler systems or fire hydrant systems, where these are installed.

If the floor area of a firecell is greater than 5000 m^2, a hardstand area must be provided to more than one side of the firecell.

Note: The above hardstand requirements do not apply to the following classified uses (as defined in Clause A1 of the Building Code): Backcountry huts, detached dwellings, within household units in multi-unit dwellings, outbuildings, ancillary buildings.

Attendance point

During an incident Fire and Emergency will respond to the attendance point on the system for the building. Fire and Emergency policy is to use a single attendance point to respond from. The attendance point, also known as an address point, is generally at the building's main entrance. This location should include alarm panels, inlets etc.

If there is a remote point which cannot be reached within 75 m then a building hydrant should be provided (Acceptable Solution requirement 2.2.1). This attendance point should not be confused with a firefighter access point or vehicular access point which may be remote from the attendance point and provided with a building hydrant outlet. It may also provide a mimic panel or other fire safety features.

Notes:

- Operational procedures will not permit the driving of appliances to access locations down narrow lanes, under canopies or through flood water.
- It is also policy that the appliance not be parked under a canopy and not within a factor of 1.5 times the height of a tilt slab panel where possible. Where there are safety concerns, appliances may be strategically placed at building corners.