NEW ZEALAND FIRE SERVICE
Whakaratonga Iwi

Emergency vehicle access guidelines

May 2015

Scope

This guidance document can be used to ensure that New Zealand Fire Service (NZFS) fire *appliances* can adequately access sites, buildings and structures in the event of an emergency.

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

The users of this guideline should be aware that this document is an informative guideline, and does not replace any statutory requirements.

Contents

Context

During an emergency, the NZFS is most efficient and effective when there is suitable provision for rapid and unhindered response by its fire *appliances*. Poor or inadequate access can result in a delayed NZFS response, with the obvious delay to intervention having a direct impact on the life safety of occupants and the protection of property. Due to the nature of the functions required to be performed, NZFS fire *appliances* are generally larger and heavier than those used by other emergency services.

The guidance provided is based around compliance with New Zealand Building Code Clause C5, which addresses access and safety for firefighting operations. More specifically, Clauses C5.3 and C5.4 of the Building Code describe the performance requirements relating to fire appliance access:

"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 m² 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." [1, p. 33A]

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

The NZFS also recommends the use of the Fire Fighting Facilities Checklist (FFFC) to document NZFS agreement on specific sites access requirements. The FFFC document can be found on the NZFS website (http://www.fire.org.nz/business-fire-safety/building-design/Documents/Fire-Fighting-Facilities-Checklist.pdf).

During the design of NZFS vehicle access, where appropriate the New Zealand Transport Agency (NZTA) guidelines should also be followed.

Definitions

The following definitions apply in this document:

- **Aerial appliance:** A specialised emergency vehicle that has an aerial apparatus which elevates to height for suppression 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 Materials (HazMat) 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 NZFS fire *appliance* and its crew, which can withstand the laden weight and associated loads of the vehicle in use.

NZFS appliances

Types of NZFS fire appliances

The NZFS fleet consists of different types of vehicles, which are designed to perform specific functions at an emergency incident. Such vehicles are collectively known within fire service agencies as *appliances.*

The vast majority of NZFS fire *appliances* comprise of a specially built body fitted on a multi axle heavy vehicle chassis. Depending on the function of each vehicle, various levels of firefighting, rescue or hazardous material capabilities are provided by way of equipment carried.

Some *appliances* perform specialised functions in the event of 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 elevates to height for fire suppression of large premises, or to rescue trapped occupants 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 is able to get relatively close to the building or structure that it needs to attend.*

The NZFS categorises its *appliances* into six Types, where Types 1 to 3 represent the general *appliances* and Types 4 to 6 represent the *aerial appliances*.

While specifications vary between different *appliances*, the maximum parameters (i.e. worst case scenario) for NZFS appliances are shown in *Table 1*:

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

Table 1: Maximum parameters for NZFS appliances

Appliance type coverage

All sites, buildings and structures across New Zealand (NZ) should ensure all NZFS *appliances* are given adequate access in the event of an emergency.

When applicable, developers and planners must also ensure that adequate access is provided for *aerial appliances*. The location of the site must be within the coverage area of an *aerial appliance* and the buildings or structures likely to require an *aerial appliance* during an emergency.

To determine whether *aerial appliance* access is necessary for a given site, contact NZFS Operations through the local Fire Area office.

Access requirements

Carriageway widths

Carriageways should be wide enough to allow *appliances* to easily negotiate them, and provide sufficient room to allow vehicle crews to work with firefighting equipment around the vehicle. During an emergency, *appliances* will park along the *carriageway* in the most tactically advantageous position.

Along straight *carriageway* sections, a minimum width of 4 m should be provided for general appliance access, and a minimum width of 6 m for *aerial appliance* access (see *Figure 1*).

Note: *Aerial appliances require additional width to fully extend their stabilisers. Where continuous 6 m clearance cannot be provided, NZFS may consider designated hardstand areas for aerial appliance operation.*

A clear passageway of no less than 3.5 m wide should be provided at site entrances, internal entrances and between buildings.

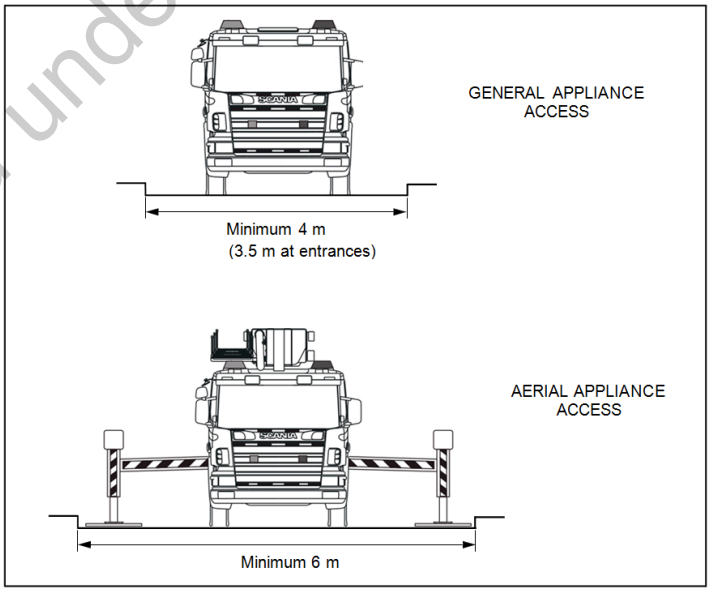

Figure 1: Minimum *carriageway* widths along straight sections

Along curved *carriageway* sections, a minimum inner radius of 6.3 m and 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*).

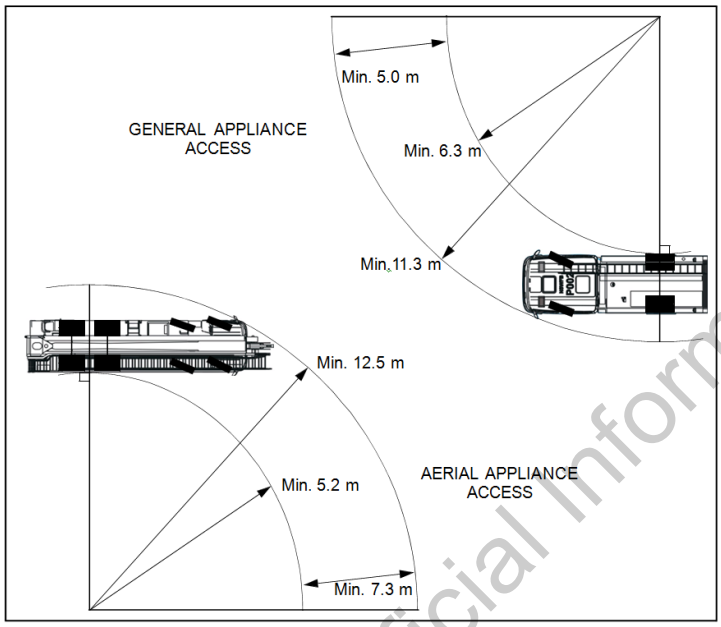

Figure 2: Minimum *carriageway* widths — curved sections

Note: *The radius dimensions specified 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.

NZFS 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 Road Tracking Curves [2] as indicated in *Table 2* should be considered.

NZFS fire appliance type	NZTA road tracking curve
Type 1, 2, 3	8 m Medium Rigid Truck
Type 4, 5, 6	Large Rigid Truck

Table 2: NZFS fire appliance types in relation with the NZTA road tracking curves

Ensuring clear access

Site managers must ensure *carriageways* are not fully or partially obstructed in a manner that prevents unhindered access by *appliances*, at any time. Moreover, it must be ensured that access routes are trafficable during all weather conditions.

Note: *Carriageways can be obstructed 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 unnecessarily impede *appliances* from gaining 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 constructed 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.

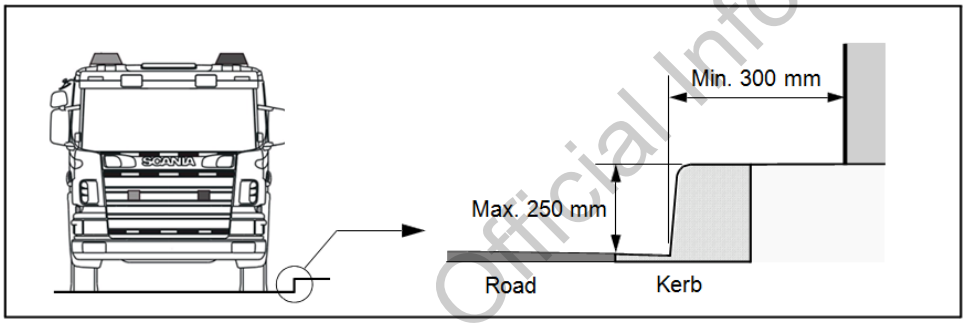

Figure 3: *Carriageway* kerb clearance dimensions

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.).

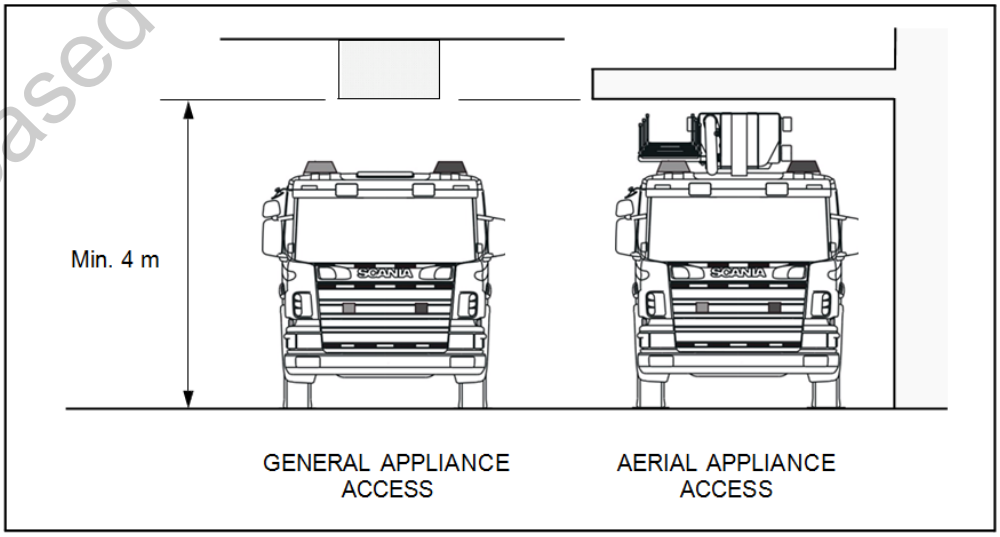

Figure 4: Building and structure clearance heights

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 (e.g. access ramps)

NZFS 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 negotiating the ramp, thus a lower gradient is necessary.*

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

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*).

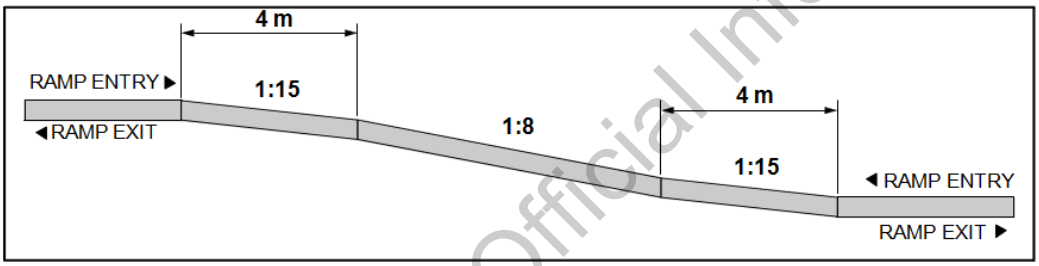

Figure 5: Maximum access ramp gradients

When a change of gradient includes a recessed threshold, such as a gutter (e.g. for storm water drainage), consideration must be given to reduced approach and departure clearance (see *Figure 6*).

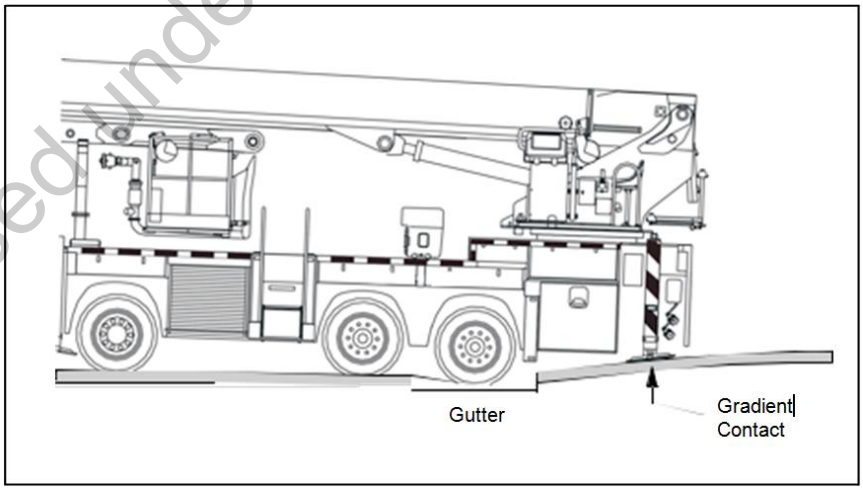

Figure 6: Reduced gradient clearance due to gutter

Note: *As wheels recede 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 exacerbated when the gutter depth is greater and/or when the overhang length is greater.*

Besides the general access gradients as indicated above, *hardstand* gradients are limited due to deployment of the stabilisers of *aerial appliances*. *Aerial appliances* can only deploy 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.*

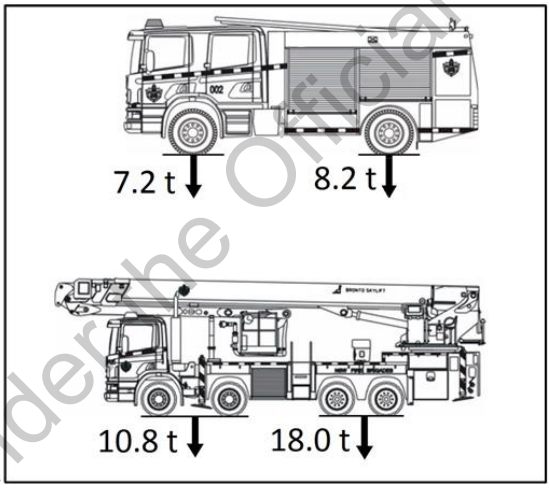

Figure 7: Axle loads of *appliances*

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: *The NZFS 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*).

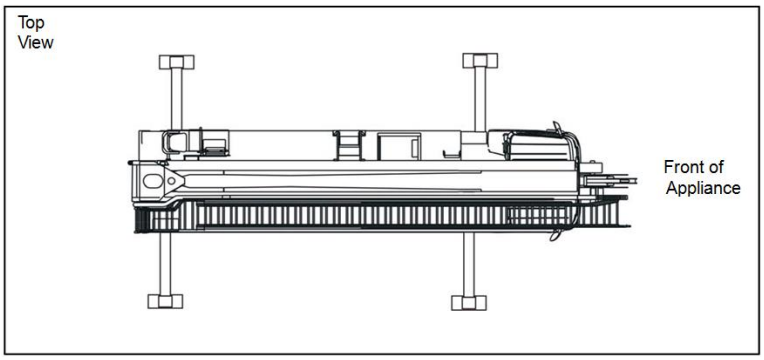

Figure 8: General stabiliser arrangement on aerials

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)

The maximum exerted pressure above should be considered when calculating the minimum *Allowable Bearing Pressure* (ABP) for the *carriageway* or hardstand area.

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.

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 NZFS 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:

a) firefighter access into the building and;

b) 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 respective 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*.

Designers should also refer to Paragraph 6 of the Applicable Acceptable Solution C/AS1-7 for the appropriate hardstand requirements. Be aware that special care should be taken in case of Acceptable Solution Risk Groups SH (C/AS1) and SI (C/AS3). A description of the different possible Risk Groups can be found in Table 1.1 of each of the Acceptable Solutions C/AS1-7. For example, in the case of a sleeping risk group as per C/AS1, the *hardstand* shall also be within 75 m of any point in any unit contained in the building, unless there is a sprinkler system installed that is compliant with NZS 4515.

Specific guidance on the firefighting water supply near a hardstand can be found in the NZFS Firefighting Water Supplies Code of Practice SNZ PAS 4509:2008 [3]. Depending on the water supply circumstances, specific solutions and requirements can be found in this Code of Practice. For example, if reticulated water supplies are unavailable or insufficient, alternative firefighting water sources might be required near the *hardstand* (see Figure 9). In order to determine the exact water supply requirements (e.g. type water supply, type connection, etc.), contact NZFS Operations through the local Fire Area office.

Note: *Fire districts may have a range of water supply systems such as a fully reticulated water supply system (in an urban water supply area), a rural water supply system that feeds a supply tank (in a rural water supply area), or a stand-alone tank supply using rain water or a local well or bore for maintaining its contents.*

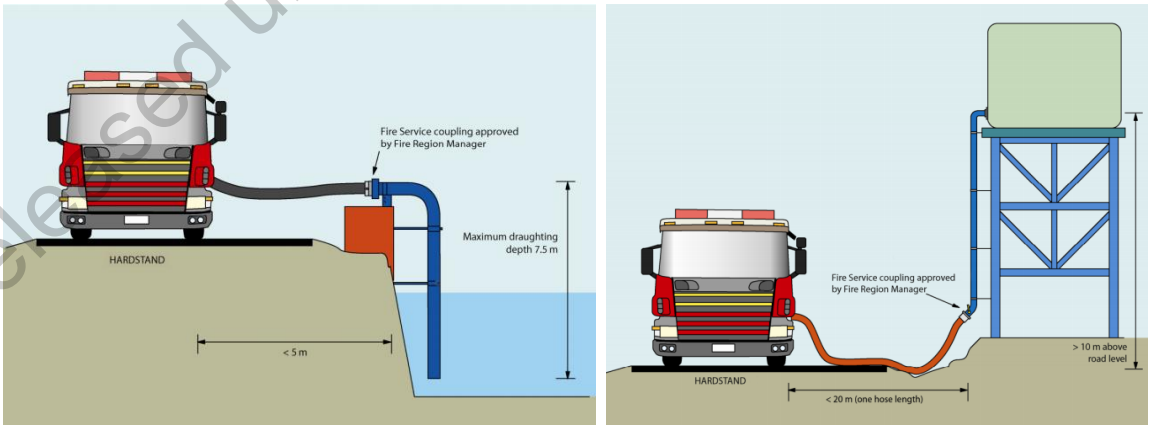

Figure 9: Examples of Suction (left) and Flooded (right) water supply sources near the hardstand

References

[1] Ministry of Business Innovation and Employment, *New Zealand Building Code Handbook,* 2013.

[2] Land Transport New Zealand, *New Zealand on-road tracking curves for heavy vehicles,* 2007.

[3] *New Zealand Fire Service Firefighting Water Supplies Code of Practice SNZ PAS 4509,* Standards New Zealand, 2008.