



Fire Safety Guideline
Dry Fire Hydrant Systems

MFS Fire Safety Guideline for Dry Fire Hydrant Systems

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GLOSSARY

ABCB	Australian Building Codes Board
AS	Australian Standard
BCA	Building Code of Australia
DtS	Deemed-to-Satisfy (refer Definitions)
ESP	essential safety provision
MFS	South Australian Metropolitan Fire Service
NCC	National Construction Code

REFERENCED DOCUMENTS

The following documents are referred to in this Guideline:

- AS 2419.1 Australian Standard 2419 – *Fire hydrant installations, Part 1: System design, installation and commissioning*
- AS 2118.1 Australian Standard 2118 – *Automatic fire sprinkler systems, Part 1: General systems*
- AS 2118.4 Australian Standard 2118 – *Automatic fire sprinkler systems, Part 4: Sprinkler protection for accommodation buildings not exceeding four storeys in height*

Australian Building Codes Board, *National Construction Code, Volume One, Building Code of Australia*, (Edition applicable at the time of Development Approval), Australian Building Codes Board, Canberra.

Minister for Planning and Local Government, *Ministerial Building Standard MBS 002, Maintaining the performance of essential safety provisions*, Government of South Australia.

Planning, Development and Infrastructure (General) Regulations 2017 (SA)

DEFINITIONS

Deemed-to-Satisfy (DtS) Provisions has the meaning as defined in the National Construction Code.

1 INTRODUCTION

The National Construction Code (NCC) Building Code of Australia Volume 1 (BCA) 2019 introduced new Deemed-to-Satisfy (DTS) Provisions that require the installation of an automatic fire sprinkler system in mid-rise buildings containing an accommodation component (i.e. buildings containing Class 2 or 3 sole-occupancy units that are 4 or more storeys but under 25m in effective height).

With the introduction of sprinkler systems in mid-rise building came a number of concessions to other NCC DtS Provisions. One such concession is the provision of dry fire hydrant systems in lieu of the traditional wet fire hydrant system complying with Australian Standard AS 2419.1¹.

2 PURPOSE

The South Australian Metropolitan Fire Service (MFS) commends the Australian Building Codes Board (ABCB) for introducing DTS Provisions requiring the installation of automatic fire sprinkler systems in mid-rise accommodation buildings, and actively endorses the installation of these systems generally. The MFS does have some concerns, however, regarding the concession for dry fire hydrant systems and the absence of further design guidance for such systems.

The purpose of this document is to detail the preferred position of the MFS in relation to fire hydrant systems in these buildings, discuss concerns relating to dry fire hydrant systems and provide guidance on the design and installation of fire hydrant systems subject to the concessions allowed by the NCC 2019 DtS Provisions.

It is the preference of the MFS that wet fire hydrant systems complying with AS 2419.1 are installed in all buildings.

It is recognised, however, that dry fire hydrant systems can and will be provided in mid-rise accommodation buildings in accordance with the NCC 2019 DtS Provisions. As such, and in an effort to address the concerns discussed herein, this document also provides some guidance and recommendations in relation to the design, installation, commissioning and maintenance requirements of dry fire hydrant systems.

This guideline and the position statement above do not preclude the consideration of Performance Solutions in accordance with the NCC and relating to AS 2419.1. Performance Solutions relating to fire hydrant systems will be supported by the MFS where the Performance Solution is considered to adequately meet the fire brigade intervention and operational requirements of the MFS.

Reference to an “AS 2419.1 compliant fire hydrant system” in this document primarily infers the connection of the fire hydrant system to a water supply in accordance with Section 4 of AS 2419.1.

¹ A dry fire hydrant system can only be considered if an external street or feed hydrant capable of providing the required flow is located within 60m of the fire hydrant booster connection.

3 CONCERNS WITH DRY FIRE HYDRANT SYSTEMS

The main concerns relating to dry fire hydrant systems discussed in this document are:

1. Delays to fire brigade intervention—
 - a. Absence of the requirement to identify a system as being a dry fire hydrant system;
 - b. Locating an offsite water supply;
 - c. Checking the position of all fire hydrant valves, which must be closed prior to filling; and
 - d. Filling the dry (empty) system.
2. Security of fire hydrant valves—
 - a. Valves being left open; and
 - b. Debris and biological hazards being placed in the system.
3. Absence of air release valves and issues associated with filling the system with water.
4. Potential corrosion and reduced system service life.
5. Clarity of commissioning requirements.
6. Clarity of maintenance requirements—
 - a. Fire hydrant system (within the building); and
 - b. Water supply (separate to the building).

3.1 Delays to Fire Brigade Intervention

Dry fire hydrant systems present a number of operational delays to firefighting response. These delays include time taken to identify, locate and connect to a suitable water source (e.g. street plug/hydrant), ensuring all fire hydrant valves on a dry system are in the closed position prior to connecting the water supply, and time taken for the system to fill with water to supply connected fire hoses.

3.1.1 Identification of a Dry Fire Hydrant System

There are no specific requirements to identify a dry fire hydrant system. Compliance with AS 2419.1 means that the words “FIRE HYDRANT BOOSTER” would be provided on the cabinet, but the encircled “FH” symbol would not be present. The absence of this symbol in itself does not identify that the system is dry, only that there is no feed hydrant present within the cabinet.

A lack of immediate and clear identification to responding fire crews of a dry fire hydrant system will add to the compounded delays associated with boosting this type of system. These delays are described in further detail at the end of this section.

3.1.2 Locating and Connection of a Suitable Water Supply

The lack of an on-site water source introduces operational response time delays associated with locating and connecting to a suitable water source. Typically in the form of a street plug/hydrant, this could be located some distance from the premises, require additional equipment to be carried to this location, additional hose lays and set up time.

3.1.3 Fire Hydrant Valve Checks

Fire hydrant valves on dry systems may be opened and left open when the system is empty of water. This presents a couple of issues; the first being that if fire hydrant valves are left open when fire crews attend and fill the system with water, then water will flow from these open valves once the water level in the system reaches them. This means sufficient water flows may not be supplied to fire hoses connected to another valve on the system to fight a fire, as well as causing **substantial water damage** from the open valves into the stairs and the building. This would also prevent the effective boosting of the system.

In order to avoid the above and ensure effective firefighting water streams, responding crews will need to check every fire hydrant valve on a dry fire hydrant system to ensure they are fully closed before water can be introduced to the system.

The greater the number of fire hydrant valves – such as for taller buildings, or large buildings with multiple dry fire hydrant risers – **the longer this activity will delay active firefighting operations.**

Other issues relating to open fire hydrant valves are discussed under the section on Valve Security.

3.1.4 Filling the Dry System

Another significant delay in setting up a firefighting hose line off a dry fire hydrant system is the time taken to physically fill the empty system with water.

The greater the amount of dry pipework in the system – such as for taller buildings, or large buildings with multiple dry fire hydrant risers – **the longer this activity will delay active firefighting operations.**

3.1.5 Fire Brigade Procedures to Supply and Boost a Dry Fire Hydrant System

A general description of the procedures and activities required to boost a dry fire hydrant system are provided below to elaborate on the expected delays:

1. Open booster cabinet and determine the presence of a dry fire hydrant system and that an on-site water supply is not available.
2. Physically locate water source – this delay may be reduced if clear details of the water source type and location are provided at the booster.
3. Obtain equipment off fire appliance required to access water supply – in the case of a street plug, this includes plate cover key, standpipe, turncock key, hoses (enough to connect standpipe to appliance: expected 2x 30m fire hoses at approximately 20kg each).
4. Roll out feed hoses and connect to fire appliance.
5. Travel to water source location from fire appliance, carrying all equipment and laying out required number of hoses to connect fire appliance to water source. This may be up to 60m away, as per NCC Specification E1.5a.
6. Remove plate cover.
7. Clear valve chamber of any rubbish or debris.
8. Connect standpipe to street plug valve.
9. Connect turncock key to valve spindle.
10. Open standpipe and “flush” (flow water) until all debris and dirt has cleared.
11. Close standpipe.

12. Connect feed hose from fire appliance to standpipe.
13. Turn on water supply.
14. Return to fire appliance (up to 60m).
15. Connect hose lines from fire appliance to booster inlets on building.
16. Operate fire appliance pump and turn on water supply lines to the booster.
17. Fill dry system with water – duration will depend on amount of empty pipe to fill, the supply rate from the water source, and the presence/type of air bleed valves provided on the system.
18. (Fire hydrant valve checks are expected to occur simultaneously to the above activities but could cause further delays).

All of the above activities need to occur prior to a firefighting hose line being available to internal firefighting crews to advance into the building to provide personal protection to the crew and to fight a fire.

Comparatively, the procedures and activities required to boost an AS 2419.1 compliant, wet fire hydrant system and getting to work with attack lines would be as follows:

1. Open booster cabinet.
2. Connect hose lines from the booster feed hydrants to the fire appliance.
3. Connect hose lines from the fire appliance to the booster inlets.
4. Turn on water supply lines, operate appliance pump and commence boosting.

The NCC requires that the *required* system flow for the fire hydrant system must be achieved from a single, external street or feed hydrant.

In addition to the above procedures for a dry fire hydrant system, these same activities will also need to be carried out in order to boost the building sprinkler system (where installed in accordance with AS 2118.1 or AS 2118.4) where the water source for the fire hydrant system is unable to provide the combined required system flow rates.

Ideally, the nominated water source for the fire hydrant system should be capable of providing the combined flow rates required for the fire hydrant and sprinkler systems in order to reduce delays to active firefighting.

3.2 Security of Fire Hydrant Valves

Due to the empty nature of a dry fire hydrant system, there is a risk that fire hydrant valves may be opened when the system is empty of water and left open. If the position of each valve is not checked to ensure it is closed, then significant water damage, reduction to firefighting water flows and restrictions on boosting capabilities could occur when the system is filled with water. The need for fire crews to perform these checks prior to filling the system will add further and potentially significant delays to active firefighting operations.

Another risk associated with a dry fire hydrant system is the ability for foreign objects to be placed within the pipework when empty. Such introduced objects could cause blockages within the system, damage both system pipework and connected firefighting equipment, or cause injury. There is also a risk that biological hazards and needles could be placed within the system, presenting significant health risks to firefighters and occupants.

3.3 Absence of Air Release Valves

To fill a dry fire hydrant system with water, the air needs to be released from the system, preferably in a controlled manner so as to prevent damaging pressure surges in the system. To facilitate this and minimise operational response delays, the provision of a non-slam air release valve is recommended (such as the Ventomat RBX valve or similar, for non-slam air release and a vacuum breaker for drain down). There is no requirement in the NCC to provide such facilities, however.

Without an automatic air bleed valve, the air will need to be manually bled from the system as it is being filled with water. This would typically need to occur from the topmost point(s) of the system.

The manual bleeding of air from the system would require firefighters to travel to the topmost fire hydrant valve(s) to open it whilst the system is being filled with water, and then close it once water has reached that level. This must be done prior to firefighting attack lines being used – a partially filled fire hydrant system cannot physically be boosted to provide the flow rates and pressures required to provide an effective hose stream.

Where a building is served by a dry fire hydrant system comprising multiple risers, air will need to be bled from the top of each riser simultaneously as it is being filled with water. If automatic air release valves are not provided to a dry fire hydrant system, the manual bleeding of air from the system will require significantly greater personnel resourcing and response, resulting in greater operational delays.

Standard operating procedures of fire brigades commonly require firefighters to enter a structure in teams of no less than two firefighters for safety reasons. MFS appliances typically respond with four-person crews. Of the first arrival crew, the Officer of the appliance takes the role of Incident Controller, whilst the driver assumes the role of pump operator and is required to locate and connect the water supply. This leaves a single two-person crew for internal firefighting activities. In a building with a dry fire hydrant system with just two fire hydrant risers, a single firefighting crew would be unable to manually bleed air from and fill the dry system. The first arrival crew would therefore need to wait for the arrival of a second appliance in order for there to be enough personnel to form at least two entry crews (of two persons each) in order to manually bleed air from each riser on a two-riser dry fire hydrant system simultaneously. Additional risers on a dry fire hydrant system increases the personnel resourcing required and hence delays to active firefighting even further. This response and resourcing issue would also be exacerbated even further in regional areas.

For the reasons discussed above, the MFS does not support dry fire hydrant systems comprising multiple risers without the provision of appropriate automatic air release valves.

Filling a system too quickly without appropriate controls in place can cause a hydraulic surge event that may result in damaging surge pressures. This may result in damaged or burst fittings within the building, or on the fire appliance. When direct boosting from the street main, it may be possible to convey the hydraulic event back into the reticulation network.

It is strongly recommended that non-slam automatic air release valves be provided at the topmost point of each riser within a dry fire hydrant system to assist in reducing delays to effective firefighting operations. **The presence of air release valves should be clearly and readily identified at the system booster.**

In addition to facilitating filling of a dry fire hydrant system, an automatic non-slam air release valve with vacuum breaker can also prevent vacuum conditions occurring within the pipe should the system need to be drained. Other considerations associated with the installation of air release valves include but are not limited to – maintenance and servicing requirements, consideration of system charging rates and automatic air valves in the design pressure limits of the system.

3.4 Corrosion and Reduced System Service Life

The presence of both air and water within galvanised steel pipework will provide conditions where accelerated corrosion is possible. Factors increasing the corrosion potential of galvanised steel include oxygen rich environments (e.g. where not fully submerged in water), and potential additional salt deposits on the galvanising from wet/dry cycling, leading to an increase in deterioration of the coating.

Increasing the probability of corrosive conditions within the system will likely result in a reduced service life or unexpected failures. Areas of pipe weakened by corrosion are also at risk of failure when the system is subjected to high pressures when boosting.

3.5 Commissioning and Maintenance Requirements

As a dry fire hydrant system is not directly connected to a water source, there may be some confusion as to the commissioning and maintenance requirements. For example, whether commissioning and maintenance testing is only required for the water supply point itself (e.g. street plug/hydrant), or the dry fire hydrant system as well. There may also be some confusion as to the responsibility for maintenance of the water supply point where it is publicly owned infrastructure and/or managed by the local water authority.

Commissioning and maintenance requirements for fire hydrant systems is discussed in Section 6 of this document.

4 MFS POSITION AND PREFERRED FIRE HYDRANT SYSTEM DESIGN

It is the preference of the MFS that wet fire hydrant systems complying with AS 2419.1 are installed in all buildings.

The provision of an AS 2419.1 compliant fire hydrant system, connected to a suitable water supply, ensures responding fire crews can get to work and perform effective firefighting operations without delay. These systems do not present any of the operational delays or concerns discussed within this document associated with a dry fire hydrant system.

The MFS still considers and supports the use of Performance Solutions relating to fire hydrant systems where the Performance Solution is considered to adequately meet the operational requirements of the MFS.

5 “DRY” FIRE HYDRANT SYSTEM DESIGN OPTIONS AND RECOMMENDATIONS

5.1 General

The MFS does not support the installation of dry fire hydrant systems comprising multiple risers.

This is due to the significant personnel resourcing requirements and operational delays associated with this type of system, as discussed in Section 3.3.

The MFS also does not support the installation of dry fire hydrant systems in buildings of timber construction.

As timber is combustible, there is a high risk of increased fire severity when timber members/elements are exposed in a fire, which adds to the total fuel load of the building (during or post construction). There is also risk of fire spread through cavities which sprinklers may or may not be able to control. In these instances, firefighting provisions need to

be readily available to the internal firefighting crews to advance into the building to provide personal protection to the crew and to fight a fire.

For these reasons, the MFS strongly recommends the installation of a compliant AS 2419.1 fire hydrant system in these buildings.

5.2 Charged Fire Hydrant System Design Solution

The MFS does not support the installation of “charged fire hydrant systems” in fire-protected timber buildings. The MFS strongly recommends the installation of a compliant AS 2419.1 fire hydrant system in these buildings.

Where a wet fire hydrant system in accordance with AS 2419.1 is not to be provided, the MFS strongly recommends the connection of the domestic water supply into the fire hydrant system to maintain a fully charged (flooded) system.

The domestic supply should be via a minimum 25mm diameter connection with a suitable non-return or backflow prevention device (the appropriate arrangement should be confirmed with the water authority; SA Water). This supply valve should be located within the booster cabinet and locked open.

Benefits include:

1. No delays to fire brigade intervention in respect of filling the system pipework;
2. No delays in having to check and close all fire hydrant valves prior to filling;
3. Valves unlikely to be left open (as this would cause flooding within the building);
4. Debris and biological hazards cannot be placed into the system due to the presence of mains pressurised water;
5. Rationalised (smaller) air bleed valve(s) may be appropriate (recommended for system maintenance purposes);
6. No issues with accelerated corrosion of the pipework and therefore longer/normal service life.

Block plans within the booster cabinet should clearly identify the location of the “required” street plug for water supply, as well as the location of an alternate street plug / water source.

5.3 Dry Fire Hydrant System Design and Installation Recommendations

Where either an AS 2419.1 wet fire hydrant system or the above “Charged Fire Hydrant System Design Solution” is not to be provided, the MFS makes the following recommendations in relation to the design and installation of a dry fire hydrant system generally.

Additional system components required include:

Component	Purpose
Signage on the booster cabinet: “FIRE HYDRANT BOOSTER DRY SYSTEM”	Rapid identification of the presence of a dry system to attending fire crews to minimise response delays for firefighting and setting up protection lines.

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Component	Purpose
Block plans within the booster cabinet to clearly identify location of “required” street hydrant supply point. Block plans should also identify the location of an alternate street hydrant or water source.	To aid crews in locating and connecting to a water source and minimise response delays for firefighting and protection lines.
Automatic air release valve(s) located at high points in the system. ¹	To allow air in the system to escape when filling with water (and enter the system to prevent vacuum conditions when/if drained).
All fire hydrant valve handwheels to be secured in the closed position. Recommended securing methods are: a) Use of oval-shaped spindles ² ; b) Use of a chain and Lockwood 003 keyed padlock; or c) Fitting of plastic clamps, locked closed with a Lockwood 003 key compatible lock.	To prevent vandalism of system through opening of valves or the introduction of foreign objects, including biological hazards.

Notes:

- Automatic air release valves should facilitate timely filling of the system pipework whilst minimising the likelihood of a pressure surge event. One such suitable valve type may be a non-slam automatic air release valve. A double-acting air valve, which provides both air release and acts as a vacuum breaker, would also facilitate drain down of the system for maintenance purposes.
- Refer AS 2419.2 Clause 3.9.2 for design details.

6 COMMISSIONING AND MAINTENANCE REQUIREMENTS

6.1 Commissioning

Section 10 of AS 2419.1 requires fire hydrant systems, once installed, be commissioned to verify the performance of the system in accordance with the design approval. This commissioning testing is conducted by the installing contractor upon completion of system installation and includes both hydrostatic and full flow testing to confirm the minimum performance requirements of the Standard/design approval are met. The hydrostatic testing must also be coordinated with and witnessed by the Office of the Technical Regulator in South Australia.

A fire hydrant system is classified as an essential safety provision (ESP) as defined in the *Planning, Development and Infrastructure (General) Regulations 2017*.

A *Form 2 – ESP Compliance Certificate* for the system, signed by the installing contractor, must be provided to the certifier or council, as appropriate, on completion of all works certifying that the ESP has been installed in compliance with the relevant approval and installation standards.

Regulation 103 of the *Planning, Development and Infrastructure (General) Regulations 2017* also requires that, where a booster assembly for use by a fire authority is provided, a certificate of occupancy cannot be granted until a report has been sought from the fire authority as to whether those facilities for firefighting have been installed and operate satisfactorily. To fulfil this statutory obligation, the MFS conducts full performance testing of a boosted fire hydrant system to confirm compatibility with MFS equipment, verify that the system meets the minimum performance requirements, and determine whether the system generally operates satisfactorily. This testing by the MFS does not constitute nor is it a replacement for the commissioning testing by the installing contractor required under Section 10 of AS 2419.1.

It is the opinion of the MFS that all fire hydrant systems must be fully commissioned and tested to verify the minimum performance requirements of AS 2419.1 and/or as approved in accordance with the building rules consent are met. This applies to any fire hydrant system, irrespective of the water supply arrangement.

6.2 Maintenance

The maintenance requirements for building systems classified as ESPs are detailed in *Ministerial Building Standard MBS 002, Maintaining the performance of essential safety provisions*, enforced by the *Planning, Development and Infrastructure (General) Regulations 2017*. Essential safety provisions installed in a building must be maintained and tested to the extent necessary to ensure that they continue to perform at least to the level or standard they were required to achieve by the applicable approved installation standard, construction practice or baseline data (as applicable)².

Nominated in *Ministerial Building Standard MBS 002* as ESPs are:

- *Fire hydrant installations, including fire mains and booster assemblies*
- *Street hydrants*

Therefore, the MFS considers that the maintenance requirements include not only flow and performance testing of the nominated street plug from which a water supply to the site or building is to be sourced, but also full performance testing of the fire hydrant system within the building itself – including dry or charged fire hydrant systems – as per the schedule nominated in *Ministerial Building Standard MBS 002*.

² *Ministerial Building Standard MBS 002, Maintaining the performance of essential safety provisions*, June 2021 edition.

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If a building owner fails to provide an annual proof (Form 3 certification) to the council that the ESPs in that building have been maintained and tested as required, the council has the power to take enforcement action and may revoke a certificate of occupancy.