VICTORIAN BUILDING AUTHORITY

BUILDING PRACTICE NOTE

Essential Safety Measures ESM 05 | Fire hydrant systems testing

SUPERSEDED on 28 July 23

Audience

The audience/s for this Practice Note include/s:

- ☒ Architects / Designers
- ☒ Builders
- ☒ Building Surveyors / Inspectors
- ☒ Engineers
- ☐ Home Owners / Residential Tenants
- ☐ Owner Builders
- ☒ Plumbers
- ☐ Real estate management agents
- ☒ Trades and Maintenance (inc. Electricians)

Other

- ☒ Building Owners

Purpose

This Practice Note provides clarity on the testing and maintenance of fire hydrants.

The content below provides guidance on:

- Required hydrant system performance
- Commissioning and testing – New installations
- Commissioning and testing – Alterations to existing installations
- Maintenance

The design, installation, and availability of required fire hydrants is essential to ensure fire protection of buildings and occupants.

Abbreviations & Definitions

The abbreviations and definitions set out below are for guidance only. They are not intended to vary those set out in the Building Act 1993, the Building Regulations 2018 or the National Construction Code.

- **Act –** Building Act 1993
- **AS –** Australian Standard
- **BAB –** Building Appeals Board
- **DtS –** Deemed-to-Satisfy
- **NCC –** National Construction Code 2022
- **Regulations** – Building Regulations 2018

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Required hydrant system performance

Designers, installers, testers, owners, and the registered building surveyor all play a critical part in ensuring that a fire hydrant system is fully functional in the event of fire. To prevent the spread of fire it is vital that new installations and alterations to existing systems conform with the relevant legislation applicable at the time of installation.

Commissioning and testing – New installations

To achieve compliance with AS 2419.1, Fire hydrant installations, system design, installation and commissioning, all tests are nominated in that Standard and must be satisfactorily carried out. The Building Surveyor must ensure that independent testing has been carried out and that compliance with the testing requirements of the Standard is demonstrated, or that the Chief Officer of Fire Rescue Victoria has granted consent under regulation 129 to non-compliance with some or all of the required testing. This must occur before issuing an occupancy permit or certificate of final inspection for an installation or alteration of a fire hydrant system.

Apart from visual inspection of the installation (hydrant and hose reel location, type and method of installation of pipework and installation adequacy), the following tests are required to confirm system integrity and hydraulic adequacy.

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Hydrostatic test

Pipework is required to be hydrostatically tested to the greater of 1700 kPa or 1.5 times the highest working pressure to which the system will be subjected, for a period of at least 2 hours. Several installations have failed this test, due mainly to inadequate or undersized flanges and thrust blocks, or poor workmanship.

Commissioning (flow) test

This test requires simultaneous discharge of the required number of the most hydraulically disadvantaged hydrants, each at not less than the required outlet pressure and flow, to confirm that the required minimum total flow rate can be achieved. In addition, these test results must be adjusted to design pressure conditions to check compliance.

Moreover AS 2419.1, stipulates that test facility provision be made for the purpose of flow testing and for the provision for disposing of test water to a suitable drain. This is important when the system is subjected to full flow testing, nominally every 3 years. Additionally, the Standard emphasises the need to dispose of water without damaging private or public property. Hydrants installed in buildings or on roofs are often difficult to test without discharging water onto adjacent properties. Fixed drainage systems will reduce the possibility of flood damage.

Booster connection and pump tests

Where a system incorporates a booster or a suction point from static storage, verification of performance is required. Pump pressure and flow tests must be conducted wherever pumps are installed.

Where boosters are connected in series with building pumps which allows for the connection of a fire brigade appliance in series with the inlet connection an additional test is to be undertaken. The most hydraulically disadvantage hydrant shall discharge water at the required. While maintaining the recorded flow rate the system shall be boosted to achieve an additional 300kPa at the hydrant outlet. The pressure on the building pump discharge pressure gauge at this condition shall not exceed the system design operating pressure as displayed at the booster.

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The tests are carried out by independent testers, using pumps that adequately simulate the performance of a fire authority pump. Verification that reasonable vehicle access is available will also be required.

These tests also enable confirmation that the maximum friction loss of 150 kPa in the pipework between the booster connection and the most hydraulically disadvantaged hydrant is not exceeded.

Commissioning and testing – Alterations to existing installations

Test criteria for new installations may not be appropriate for an existing installation. To ensure systems are adequate testing should be carried out in accordance with the pressures required when the system was installed. Older systems with existing pipework may fail if tested under current pressures. These systems should be tested in accordance with Appendix One or as required by the RBS.

Where alterations to an existing installation are carried out, the RBS should ensure that independent testing has been carried out and that it demonstrates compliance with appropriate test criteria, or that the Chief Officer have granted consent under regulation 129 to any non-compliance with some or all of the required testing. This process must be completed before issuing an occupancy permit or certificate of final inspection.

Where a new booster connection is installed, the test criteria applicable to a new system must be applied to the whole system served by the booster connection. Where an existing booster connection serves new pipework extended from existing pipework, only the new pipework must meet the test criteria applicable to a new system. However, to apply these test criteria to the new pipework, some existing pipework may need to be upgraded under an application for a building permit.

Fabricated junctions occur in both copper and steel pipe systems. Early copper pipe systems used prefabricated joints and later systems were fabricated on site. Fabricated steel pipe systems were typically above- ground systems and used square elbows. Where no test duration is specified in the Table above, the time should be sufficient to allow all joints in the system to be inspected and should not be less than 2 hours.

Some sources in the table above use terms such as 'no significant leakage' or 'no leakage'. In practice, it is very difficult to achieve complete water tightness. Leaks should be monitored, as they have the potential to affect the maintenance and reliability of the system. If the rate of leakage increases with time, the source of the leak must be located, and repair work carried out before system failure occurs.

If the leakage rate is constant and reduces with a reduction in pressure, the leak is likely to be through a valve bonnet, or similar. In this case, 'topping up' during a test to maintain the pressure is acceptable, provided that the leakage rate is less than 15 L/minute. If the hydrostatic test criteria applicable at the time of installation cannot be established, an alternative is to determine the working pressure by testing. This is done by multiplying the result by a factor of 1.5 to give a hydrostatic test pressure with a 50 per cent safety margin, which includes an allowance for water hammer caused by a sudden increase in pressure that a system may not handle.

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Maintenance

Fire hydrant systems form part of a building's essential safety measures. They are required to be maintained in accordance with Part 15 of the Building Regulations 2018. Adequate testing and maintenance can highlight design and installation faults, leading to their correction and ensuring that the system is functional and reliable.

AS 2419.1 also sets out details of the flow rate tests to be recorded and the building surveyor must require systems installed in accordance with this Standard to be maintained in accordance with AS 1851 as applicable at time of installation. All flow and hydrostatic tests should be undertaken in accordance with AS 2419.1 (or the equivalent criteria applicable at the time the system was installed), at the recommended intervals.

Although AS 2419.1 requires the source of water supply for fire hydrants to be not less than that necessary to maintain minimum specified flow rates for a duration of not less than 4 hours, it is not uncommon for hydrant systems to be used for a much longer duration. A major fire could result in the hydrant system being in continuous use for several days before the fire is brought under control and therefore the purpose of system design, installation and testing is to produce a system that is fully functional in any fire situation.

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Operation dates of legislation	Source	Hydrostatic test pressure requirements – greater of
1 May 2006 to present	AS 2419.1–2005 Published 26 November 2006. Referenced in Building Code of Australia 2006.	1700 kPa or 1.5 x highest working pressure for at least 2 hours
1 Nov 1994 to 30 April 2006	AS 2419.1–1994 Published 18 July 1994. Referenced in Building Code of Australia 1990, 1996, 2004 and 2006.	1700 kPa or 1.5 x highest working pressure for at least 2 hours.
8 April 1991 to 31 Oct 1994	AS 2419.1—1988 Published 17 June 1988. Referenced in Building Code of Australia 1990.	1400 kPa or 1.5 x highest working pressure for 2 hours.
1 Feb 1987 to 30 June 1994	Victoria Water Supply and Sewerage Plumbing Regulations 1986 (S.R. 330/1986)	System with fabricated branch junctions - 1700 kPa. Other pipework - 700 kPa or mains pressure.
29 June 1983 to 31 Jan 1987	Melbourne and Metropolitan Board of Works Act 1958 By-Law No. 193: Water Supply (S.R. 116/1983).	System with fabricated branch junctions - 1700 kPa. Other pipework - 700 kPa or mains pressure.
Not referenced in legislation	AS 2419–1980 Published 31 December 1980.	1400 kPa or 400 kPa greater than highest working pressure where the working pressure is greater than 1000 kPa.

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Related Documentation

- Building Act 1993
- Building Regulations 2018
- AS 1851 – Routine service of fire protection systems and equipment
- AS 2419.1 - Fire hydrant installations—System design, installation, and commissioning

List of Amendments

- Changes to references to align with the new NCC 2022 version.
- Update format and content review

Document history

Sector	Building
Category	Essential Safety Measures
Topic	Fire hydrant system testing
Document number	05
Version	3.0
Superseded	• Version 2.0, published 28 June 2021, supersedes Practice Note 38: Fire hydrant and system design, installation, commissioning, and testing
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