Fire hydrant and sprinkler system commissioning and periodic maintenance procedure

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Queensland Fire and Rescue Service (QFRS)—*Guideline for conducting fire hydrant flow tests.*
1. Legislative background

This procedure is made under Queensland Development Code Mandatory Part 6.1. It is unlawful not to follow this procedure.

The following legislation and subordinate legislation is applicable:

**Building Act 1975:**

- Section 74 applies to a building development approval for a building served by a special fire service. It provides that the person installing the system must provide QFRS notice to inspect prior to finalising installation as well as after the installation, but prior to interior surface finishes being applied. The assessment manager must also be given a copy of the notices at the same time.

**Building Regulation 2006:**

- Section 39 sets out that the QFRS may inspect the building work, or inspect or test the service to check the relevant aspects comply with the building development approval. It also outlines relevant timelines for inspections or advising of no inspection or testing; as well as relevant timelines regarding the outcome of the inspection or testing.
- Section 40 outlines what actions a building certifier can or must take in response to action under section 39.
- Section 41 sets out the consequences if a notice issued under Section 39(3) does not comply with Section 39(3).

**Queensland Development Code:**

- Mandatory Part 6.1 outlines the commissioning, testing and maintenance requirements for fire safety installations including fire hydrants and sprinkler systems.

**The Sustainable Planning Regulation 2009:**

- Schedule 7 sets out that the QFRS is a referral agency for certain building work assessable against the BA and the jurisdiction for QFRS.
- Schedule 8, outlines the referral jurisdiction of QFRS which includes special fire services such as fire hydrants and sprinklers.
2. Justification

The owner of a building is required to ensure that it complies with the building development approval. This includes special fire services such as fire hydrants and sprinklers systems that were required to be installed to meet the requirements of the relevant Building Code. Under the BA, the QFRS has a role to play in assisting in the testing, inspection and monitoring of maintenance of fire hydrants and sprinklers. For example, a QFRS officer may witness a test, which may occur during an inspection of all other systems.

Australian Standard (AS) 2419.1 Fire hydrant installations and AS 1851-2005 Maintenance of fire protection systems and equipment does not explain how the test should be performed and therefore to ensure accuracy and consistency throughout the state, the procedure (Item 4, Procedure for flow testing) shall be conducted at all times when flow and pressure tests are carried out.

3. Hydrant testing equipment

The following hydrant testing equipment will be required for conducting flow and pressure tests. The equipment required will be dependent upon the fire hydrant system installed and whether the system is internal or external to the building.

Required equipment:
- McCrometer—one McCometer is used for every 10 litres per second requirement of the system. Therefore multiple McCrometers may be required.
- One blank cap fitted with the pressure gauge removed from the McCrometer and an on/off cock. Before recording the gauge pressure during the test the air must be released from the blank cap using the on/off cock on the cap.
- One dividing breeching (preferably alloy construction).
- Sufficient 64 millimetre hose. This will be in varying lengths from short feeds to 30 metre lengths.

Optional equipment:
- water diverter for external testing.

Appendix A illustrates the varying items of equipment required and their placement.

Required system performance:
The flow and pressure requirements will be determined utilising Tables 2.1, 2.2 and 2.3 of AS 2419.1.
4. Most hydraulically disadvantaged hydrant

A test at the most hydraulically disadvantaged hydrant will be conducted for all on-site fire hydrant systems servicing a building. The most hydraulically disadvantaged hydrant is generally:

- the fire hydrant farthest from the incoming water main, or on a boosted system, the farthest from the booster connection; and
- in a multi-level building, the fire hydrant at the highest level.

It must be noted that the terrain may affect the most disadvantaged hydrant due to elevated conditions experienced on the site. Due to head pressure experienced at these fire hydrants this situation may need to be considered.

5. Procedure for flow testing

This maintenance procedure is designed for conducting flow and pressure tests only. It must be used in conjunction with the relevant Australian Standards and inspection checklists for achieving compliance when commissioning or testing a hydrant system.

Fire hydrant system—flow test: external (onsite) system

10 litres per second systems
The test will consist of connecting one McCrometer to the most hydraulically disadvantaged fire hydrant outlet. The blank gap with pressure gauge will then be fitted to the second outlet of the fire hydrant. The McCrometer will then be flowed at 10 litres per second with the residual pressure within the system determined from the gauge on the blank cap.

The system must achieve the performance as detailed in AS 2419.1.

More than 10 litres per second systems
For a system requiring a flow rate of 20 litres per second, the test will initially be set out as per the 10 litres per second test, but an additional McCrometer will be required on the second most disadvantaged hydrant and this will be flowed at 10 litres per second. Should the system require 30 litres per second, the third most disadvantaged fire hydrant will require a McCrometer flowing at 10 litres per second. All three McCrometers to run concurrently and measurements taken from each.

Where the system requires a flow of 20 litres per second and there is only one fire hydrant on the system, the first McCrometer should be set-up as per the 10 litres per second test on one outlet. The second outlet should be connected with the dividing
breeching fitted with a McCrometer and the blank cap with pressure gauge as per the 10L/s internal system test. For further information on this test see page seven under the note section from Table 2.1 of AS 2419.1. Each McCrometer can then be flowed at a maximum of 10 litres per second.

**Note:** While street hydrants may be used to provide coverage in system design, most water agencies do not design their systems to cater for individual property firefighting flow and pressure requirements. AS2419.1 is not applicable to water agency street hydrants. Permission from water agencies must be gained before QFRS test street hydrants.

The system must achieve the performance as detailed in AS 2419.1.

Appendix A supplies a photo of the fitted equipment to an external fire hydrant.

**Fire hydrant system—flow test—internal system**

**10 litres per second systems**
The test will consist of connecting the dividing breeching to the most hydraulically disadvantaged fire hydrant. To one outlet of this breeching one McCrometer will be connected and to the other outlet the blank cap with pressure gauge and on/off cock connected. A suitable length of 64 millimetre hose will then be connected between the McCrometer outlet and the test facility provided for disposing of test water.

**Note:** The McCrometer and breeching may require support owing to the weight that is realised by the fire hydrant outlet. Without support the fire hydrant outlet may drop or turn within its joint.

The system will then be flowed and must achieve the performance as detailed in AS 2419.1.

**More than 10 litres per second systems**
For a system requiring a flow rate of 20 litres per second, the test will initially be set up as per the 10 litres per second internal system test, but an additional McCrometer will be required on the second most disadvantaged hydrant and this will be flowed at 10 litres per second. Should the system require 30 litres per second, the third most disadvantaged fire hydrant will require a McCrometer flowing at 10 litres per second. All three McCrometers to run concurrently and measurements to be taken at each location

**Note:** Systems requiring greater than 10 litres per second flow rate will require additional test facilities to cater for this test to be conducted.

The system must achieve the performance as detailed in AS 2419.1.

Appendix A supplies a photo of the fitted equipment to an internal fire hydrant.
Fire hydrant system—non-return valve test (with fire hydrant booster)

For all fire hydrant flow tests involving a fire brigade booster, a check to ensure the non-return valve is functioning correctly will initially be conducted. This test ensures the integrity of the non-return valve to make certain the reticulated water main feeding the system does not pressurise and thereby causing possible damage.

The fire appliance will connect to the fire booster inlet with one length of sufficient 64 millimetre hose. The pump operator will then boost the fire hydrant system to 900 kilopascals and then shut down the hose line boosting the system. At this time the BAO will check the pressure gauge above the booster inlets and ensure an unacceptable pressure loss is not experienced. A significant drop over a short period (usually one minute) will indicate a leak in the system or possible faulty non-return valve.

Fire hydrant system—flow test with fire brigade booster

Following a successful non-return valve test, two hose feeds should be connected from feed (suction) side of the fire brigade booster assembly to the fire appliance. The fire appliance will then provide flow and pressure via two delivery hose lines connected from the fire appliance pump to the delivery (boost) side of the fire brigade booster assembly. This arrangement is required for 20 litres per second systems and will need to be increased if the flow required exceeds this figure. For example, a 30 litres per second systems will require three feeds from and three deliveries to the fire brigade booster assembly.

Any fixed pump sets on-site must be isolated and then the system should be tested to achieve the required flows as specified within AS 2419.1. The required residual pressure must achieve 700 kilopascals at the most disadvantaged hydrant/hydrants within the system. The fire appliance pump pressure must be noted at this time to ensure the correct signage for ‘Boost Pressure’ is fitted within the booster cabinet.

Step 1—connect the required number of hose feeds from the feed (suction) side of the booster assembly to the fire appliance
Step 2—connect the required number of delivery hose lines from the fire appliance to the delivery (boost) side of the booster assembly
Step 3—engage the fire appliance pump and increase the pressure and flow to achieve the required pressure and flow at the most disadvantaged hydrant/hydrants.

McCrometers shall be set-up as per the previous instructions for internal or external! fire hydrant systems.
Fire hydrant systems—with fixed pumpsets

McCrometers shall be set-up as per the previous instructions for internal or external fire hydrant systems. The system will then be flowed and must achieve the performance as detailed in AS 2419.1.

Where two fixed pumpsets are required and fitted to a system, each pumpset must be tested. When flow is occurring within the fire hydrant system the operating pump should be isolated (either stopped in the control circuit or the valves closed) to ensure the second pump automatically kicks in and supplies the required flows and pressures.

**Note:** The total hydraulic loss due to friction in pipes, valves and fittings between the inlet connection of the booster assembly and the outlet of the most hydraulically disadvantaged fire hydrant, shall not exceed 150 kilopascals when the required number of most hydraulically disadvantaged fire hydrants are each discharging 10 litres per second.

**Test facility**

Where practicable, a closed loop flow testing arrangement, incorporating a permanent or temporary on-site tank should be provided. All testing should meet environmental requirements and should not cause a nuisance. If testing a major installation where substantial flows are required, the service provider should be notified, since testing may reduce supply to other consumers or may result in dirty water problems if the velocity in the reticulation is high enough to strip slimes or any other deposits.

Fire sprinkler system commissioning and testing

Water pressure and flow test results when commissioning or maintaining sprinkler systems, shall be recorded on the Fire hydrant and sprinkler system commissioning and periodic test form—Form 70. The test form is available through the Department of Local Government and Planning’s website: [www.dlgp.qld.gov.au/forms-templates/approved-plumbers-and-drainers-forms.html](http://www.dlgp.qld.gov.au/forms-templates/approved-plumbers-and-drainers-forms.html) Test results recorded on the approved form shall comply with the testing requirements of the relevant deemed-to-satisfy provisions of the Australian Standards.

**Sprinkler systems:**

- For systems installed to AS 2118.4, 2118.6 or 2118.9, the required pressure specification shall be noted on the form prior to undertaking the test.
- Running test: fire sprinkler system specifications are documented on the fire sprinkler system block plans outlining design requirements and required test points. Information shall be recorded stating the required flow rate in litres per second, available pressure in kilopascals and location of test points from which information was recorded. Test results will indicate the system's test performance and the tester shall indicate pass or fail in the required format on
the Fire hydrant and sprinkler system commissioning and periodic test form— Form 70.

- This commissioning and maintenance procedure is designed for conducting the flow and pressure tests only. It must be used in conjunction with the relevant Australian Standards and their inspection checklists for achieving compliance and when commissioning or testing a sprinkler system.

- This section is to be used for sections 4.14 of AS2118.1-1999, 4 of AS2118.6-1995 and 2.2.3 (b) and (c) of AS2118.4-1995 as well as section 2 of AS1851-2005. Notes: (i) For AS2118.1 and AS2118.6 systems multiple testing points may be required. For buildings in which the test involves opening a valve to discharge a volume of water to achieve the accepted design flow, the system test points shall be recorded for each different system and locations.
Appendix 1
Photos of fire hydrant testing equipment

McCrometer and blank cap fitted to an external hydrant

Blank cap with pressure gauge and on/off cock

These two photos provide different arrangements for fitting the pressure gauge and on/off cock to the blank cap.
McCrometer and blank cap fitted to an internal hydrant

This arrangement is used for connecting the McCrometer and blank cap with pressure gauge to the dividing breeching and internal fire hydrant.

Dividing breeching
Water diverter (optional equipment)

This device is optional and may be used for diverting water while conducting a flow test on external fire hydrants.