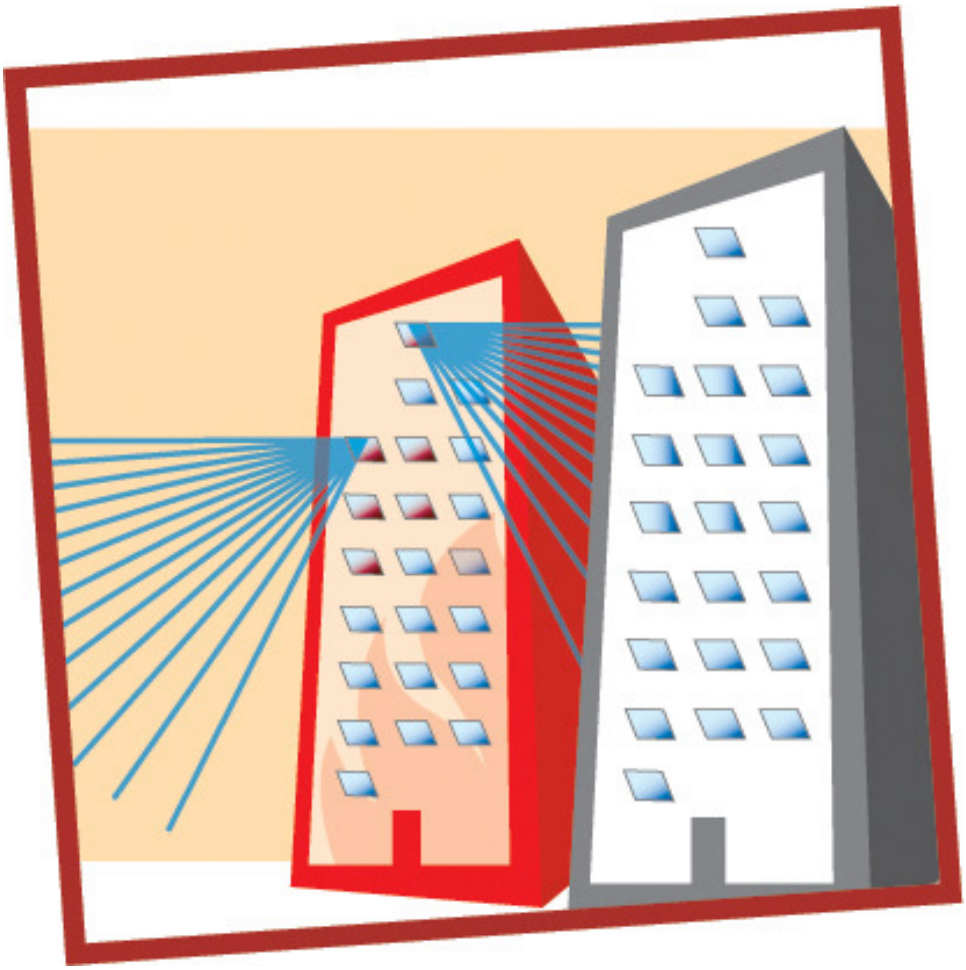
DISCUSSION PAPER



Conservation and Sustainable Use of Water in Fire Protection Systems

An Initiative of Fire Protection Association Australia

FPA AUSTRALIA
Fire Protection Association Australia

FPA Australia recognises that water conservation is a major community priority. It also recognises that by quickly extinguishing a small fire, water based fire protection systems save millions of litres of water as well as lives and property.

Fire protection systems may operate infrequently over the life of a building. However, they must be ready at all times and this requires regular testing and maintenance. While this requires the use of some water, its use must be minimised while still ensuring that systems will operate effectively.

Fire Protection Association Australia (FPA Australia)

FPA Australia is the major technical and educational fire safety organisation in Australia. It combines skills and technical expertise from all areas of fire protection and is supported by a number of technical committees. This paper was prepared by one of the FPA Australia Technical Committees, TC/4 – Fire Sprinkler Systems and Hydrants and has been endorsed by the FPA Australia Board.

Comments on this paper should be forwarded to FPA Australia (see page 11 for details).

1 Introduction

Fire remains one of the community's greatest hazards, causing loss of life and property. Companies that experience a major fire often never recover.

Protection from fire is therefore a major issue and water remains the community's main fire protection agent as it is readily available and can be applied rapidly.

Systems that apply water include hydrants in street and hose reels, hydrants and sprinkler systems in buildings. Fire systems may be simple, such as street hydrants, or complex, such as automatic electronically controlled fire pump and sprinkler systems in high rise buildings. Regardless of the system, they must all be completely reliable and this requires ongoing testing and maintenance.

Fire systems are activated every day around Australia to extinguish small fires, saving lives and property. By extinguishing fires before they develop they also remove the need for fire brigades to use millions of litres of water. However, testing and maintenance of these systems does use some water and FPA Australia recognises that any unnecessary use of water must be minimised.

During times of drought, saving water is not the only issue of concern to the for the fire protection community. In some cases town main water supply pressures are being reduced to provide protection to aging underground pipe-work infrastructure and even to reduce overall water consumption. These changes must be addressed effectively to manage fire systems and water use while also continuing to promote community safety.

FPA Australia recognises that water consumption can be reduced and has prepared this Discussion Paper to show a pathway to conservation and sustainable use of water, while still ensuring that human life and property are protected from fire.

2 Current Water Use in Fire Protection

Fire brigades use million of litres of water fighting major building fires. Sprinklers and other extinguishing systems extinguish fires before they develop and as a result play a major role in reducing water consumption as well as protecting the community.

For example, of 9,022 fires reported between 1886 and 1986 in buildings where sprinklers were fitted 64.6% were extinguished by one sprinkler and a further 15.9% were extinguished by 2 sprinklers.

Fire systems must always be ready to respond quickly and effectively. This necessitates regular testing and maintenance. While this uses a comparatively very small amount of water, FPA Australia recognises that any waste must be minimised.

Historically, when there was abundant water, the amount used in testing and maintenance was not a major concern. Now Governments, water authorities and the community have made it clear that these practices are no longer appropriate. FPA Australia supports these concerns.

Already many of the high water use practices of the past have been abolished. New test procedures are also being included in Australian Standards to reduce test water use even further. Significantly *AS 1851:2005 Maintenance of Fire Protection Systems and Equipment* now specifies test procedures that significantly reduce test water discharge. Under this standard, water use can be reduced to nearly a quarter of that previously used in major high rise buildings although this standard is not enforceable under law in most States. As a result the procedures in this Standard are not generally being applied to the testing of existing fire protection systems.

3 Water Conservation Principles

In developing this strategy, FPA Australia was guided by the following key principles:

- FPA Australia has the responsibility and technical skills to continue to drive water conservation while still ensuring that lives and property are protected from fire.

- The greatest water saving strategy in fire protection is the installation of automatic fire sprinkler systems which prevent fires developing.

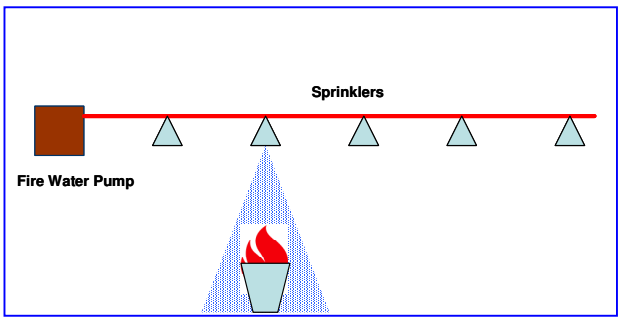
- The primary purpose of fire system testing is to ensure that systems meet fire safety performance standards and are always ready to operate immediately and effectively.

- System testing and maintenance water re-use proposals should conform to state health and water authority regulations and standards.

- Test water from fire system testing should be considered non-drinking water.

- Flow test water from a fire system water supply, i.e. hydrant or sprinkler system, town main, fire pumpset boosted town main or fire storage tank supply, should be able to be retained or returned to the fire system.

- Three grades of water tanks can be used in a fire system:
  - Fire system water supply tanks complying with the proposed new standard *AS2304 Water storage tanks for fire protection systems.*
  - Non drinking water, fire system maintenance recycling tanks complying with state government health & water authority requirements.
  - Grey Water recycling treatment system water storage tanks complying to state government health & water authority requirements.



A single sprinkler can prevent a major fire developing

4 Key Australian Standards

A number of Australian Standards relate to fire system design, installation and maintenance. Each of these standards should continue to be reviewed to identify opportunities for achieving further water conservation.

Principal amongst these is the extensively revised *Australian Standard 1851 – 2005 Maintenance of fire protection systems and equipment*. This standard describes the methods for undertaking the testing of fire systems and includes a number of strategies to significantly reduce water usage. This standard should be applied to all fire protection systems, including to existing fire systems.

Fire system design and installation standards are equally important and this group of standards needs to be re-worked to include requirements for re-cycling and/or re-use of system test water. Revisions should provide clear options for building owners with existing fire systems as well as for future fire systems. These standards include:

- *AS2118.1-2006 Automatic fire sprinkler systems.*
- *AS2419-2005 Fire hydrant installations.*
- *AS2941-2002 Fire pump-set systems.*
- *AS2441 Installation of fire hose reels.*

Other standards that can impact on water usage include:

- *Australian Standard 3500 - 2003, National Plumbing and Drainage.*
- *AS2304 Water storage tanks for fire protection systems (proposed standard).*

5 Key Strategies for Sustainable Use of Water

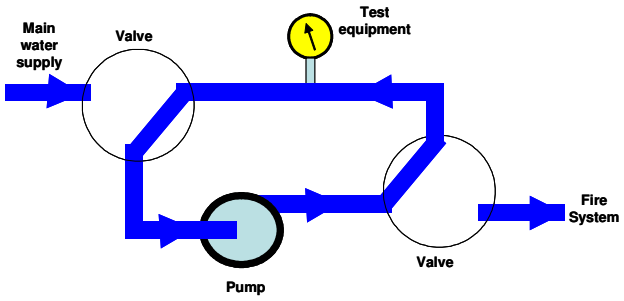
There are a number of strategies that can be applied to minimise the water used in fire system testing. Furthermore, test water can be re-circulated within a system or captured for use outside the system.

Where water is lost from the fire protection system, it can be used for other purposes and replace the need to use drinkable water.

5.1 Test water savings

Testing of fire protection systems has previously been achieved under full flow conditions, with water sent directly to a drain. This is no longer acceptable and the amount of test water lost must be minimised, while still enabling the system to be properly tested.

While it is necessary to test the performance of a system at full load, the length of time at full load, open cycle can be minimised. For example, the annual fire pump load tests in *AS1851-2005* specify 30 minutes at full load. These could be 10 minutes at full load on an open cycle, followed by a further 20 minutes with a shut-off head and water circulated through the pump.



Testing with a shut-off head – water supply and fire system isolated from the pump during the test

Flow testing of hydrants to ensure that they are receiving sufficient water quantities and pressure should be limited to the shortest time necessary to prove free passage through pipework and the adequacy of the water supply.

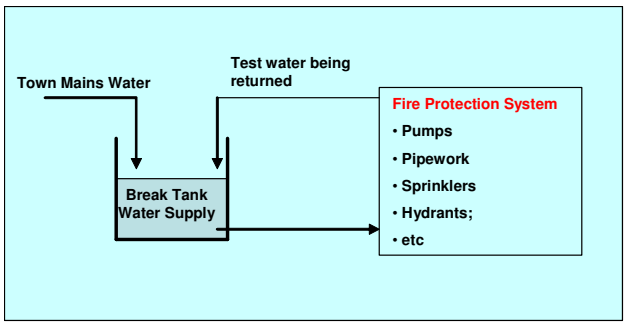
Significant water savings can be achieved by adopting *AS 1851-2005* across Australia and applied it to all fire systems, including existing systems. FPA Australia recognises that this would require legislation in most States. In addition, Government incentives would assist building owners to meet the costs of modifications to reduce water use while maintaining fire protections systems.

Test methods and procedures in *AS 1851 – 2005* and other relevant Standards should continue to be reviewed to ensure they support water conservation.

5.2 Test water re-use

Where possible, test water should be recirculated within a system during testing. In cases where this is not possible water should be captured and either returned to the fire system or redirected to another use.

Where fire systems are supplied by a pump fed directly from town mains, the inclusion of a “break tank” into the water supply line will enable system test, pump test and flow test water to be returned for re-use. Note, this will be likely to require a slightly more powerful fire pump.



A schematic diagram of a break tank separating town main water supplies from the fire system enabling water to be recirculated during a fire system test.

For existing systems, the addition of a recirculating tank would permit discharge test water from a pump to be recirculated back to the tank and pump suction line. This would require the town main water supply to be isolated and the water supply proving test to be conducted separately.

Water re-use could be achieved by directing test water into a grey water recycling plant, where one already exists at the premises. This water could be used either at the building or elsewhere to replace the need for fresh drinkable water.

Water could be directed directly into a storm-water soak pit or through a “surge” tank onto a building’s own gardens. Alternatively, it could be sent directly to a tanker for taking off-site for re-use in council gardens, sporting facilities, road maintenance or other uses. Such as approach would require immediate re-use to prevent the non-drinkable water becoming contaminated black water.

Hydrant test water could be captured and delivered to a grey water recycling tank, to a building’s own gardens or to a tanker for off-site use.

5.3 Water savings through water pressure management

Sprinkler systems depend on an appropriate pressure range to operate effectively. If the pressure is too low, sprinklers will not operate effectively. If it is too high, pressure relief values will dump excess water during testing. To control water use, systems need to be designed for a known range of town main water pressures.

Where possible, actual maximum and minimum town main flowing pressures should be provided to fire system designers.

Variable water supply pressures can be managed using a variable speed fire system pump. Although not included in the current pump standard, variable speed pumps can manage a range of input pressures so that excess pressure (and water) is not required to be dumped.

Variable speed pumps can also be used when town main water supply pressures are not able to be provided with confidence or have a large pressure range.

FPA Australia proposes to work with water supply authorities to establish and provide accurate information on town main water supply pressures.

5.4 Water savings through Preventative Maintenance

Preventative maintenance is important to maintain fire sprinkler system integrity.

Preventative maintenance includes the periodic inspection and maintenance of water supply tanks and this may require them to be drained. This water must be temporarily stored or used for other purposes. Temporary storage could be achieved by constructing additional water tank capacity to enable one tank to be drained into another (or into more than one) while inspection and maintenance is carried out.

Additional storage tanks could be permanent or temporary tanks, including bladder (pillow) tanks. These may not need to be constructed to fire tank standards where they are only used for temporary storage.

As with pump testing, the water from a tank may also be used for a non-fire related purpose if temporary storage is not available.

Automatic sprinkler systems could be sub-divided into zones when protecting large buildings or where tenancy alterations are common. Zoning is able to reduce the quantity of water lost during system alterations. When relocating sprinklers wire braided flexible tube could also be used to help reduce the need for disassembling pipe, potentially avoiding drain down.

5.5 Review and Amend Relevant Australian Standards

The national application of *AS1851 – 2005 Maintenance of Fire Protection Systems and Equipment* would result in significant water savings in sprinkler testing. In some cases saving of nearly 75% could be achieved in high rise buildings compared to previous test procedures. However, to continue to drive down water usage, further reviews of this standard and all other relevant standards should be undertaken on an ongoing basis.

For example, *AS 2118.1-2006 Automatic fire sprinkler systems* and *AS 2419-2005 Fire hydrant installations* currently do not include provision for pump re-circulating tanks and *AS 2941-2002 Fire pump-set systems* does not recognize variable speed pumps.

FPA Australia and Standards Australia will continue to work closely to ensure that standards support water conservation.

6 Cost Benefit Implications

Water currently has a low financial value and the cost of water to consumers such as building owners and operators in Australia is not a major expense. While this cost may increase considerably in the future, it is unlikely that such increases will, even over an extended period, offset the costs to modify fire protection systems.

However as water is a major social, environmental and political issue, incentives to encourage property owners to implement water saving initiatives in fire protection systems need to be considered. These considerations could include subsidies to property owners and “green ticks” recognising the environmental credentials of the buildings that implement water conservation measures.

7 National Fire System Water Conservation Summit

To further develop these strategies, FPA Australia will coordinate a national summit to provide key stakeholders with the opportunity to contribute to the development of an effective strategy for water conservation.

Invited stakeholders would include key representatives from water authorities, building owners and the fire protection community including the Water Services Association of Australia, Australasian Fire Authorities Council, Australian Building Codes Board, Standards Australia, Australian Construction Industry Forum, Insurance Council of Australia, Green Building Council, Property Council of Australia, Bushfire CRC and relevant Federal, State and Local Government Agencies.

The outcomes of the Summit would be the basis for the preparation of a White Paper supporting the conservation and sustainable use of water used in fire protection.

8 Conclusions

Water based fire protection systems provide essential protection to human life and property. They also minimise water usage by extinguishing the majority of fires quickly and efficiently.

However, to ensure that these systems are always ready to operate, they must be regularly tested and maintained.

FPA Australia recognises that all parties involved in fire protection have a responsibility to ensure that no water is unnecessarily wasted during testing and maintenance. It therefore supports the key strategies outlined in this Discussion Paper. In particular FPA Australia supports:

1. The National application of *AS 1851 – 2005 Maintenance of Fire Protection Systems and Equipment,* including its application to existing fire protection systems.
2. An ongoing review of all relevant standards to ensure they support water conservation during fire system testing and maintenance.
3. Incentives to ensure the earliest possible application of standards and procedures including those discussed in this Discussion Paper.
4. The holding of a National Fire System Water Conservation Summit.
5. The development of a White Paper supporting the conservation and sustainable use of water used in fire protection.

In partnership with government, water authorities and industry, FPA Australia will continue to lead in water conservation and seeks comments on this paper from all interested parties.

Comments

Comments on this Discussion Paper should be forwarded to:

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AS 2441 2006 Installation of fire hose reels.

AS 3500 - 2003, National Plumbing and Drainage

*AS 2304 Water storage tanks for fire protection systems (*proposed Standard).