

**Plumbing Assessment of
FPAA101D/HFS101D Technical Specification and HFS102
Design
for
Home Fire Sprinkler Coalition Australia**

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Aim

To determine if the automatic fire sprinklers, FPAA101D/HFS101D Technical Specification and HFS102 Design meet the requirements of the National Construction Code (NCC) Volume 3, Plumbing Code and AS 3500 for Class 1 buildings.

Sources of Information

- National Construction Code Volume 3, Plumbing Code of Australia.
- AS 3500 Part 1.
- AS 2118.4
- FPAA101D/HFS101D Technical Specification, Automatic Fire Sprinklers.
- HFS102 Design for Automatic Fire Sprinklers for Class 1 Homes.

The Objectives of Home Fire Sprinkler Coalition Australia

Include but are not limited to:

- a) Ensuring that FPAA101D/HFS101D and HFS102 comply with relevant regulations
- b) Safeguarding people from illness

- c) Preventing loss of amenities due to the failure of a fire-fighting water installation
- d) Ensuring that a fire-fighting water installation is suitable; and
- e) Conserving water and energy; and
- f) Safeguarding the environment; and
- g) Safeguarding public and private infrastructure.

AS 2118.4 Compliance

FPAA101D/HFS101D and HFS102 comply in all ways and meet the requirements of AS 2118.4 that states:

“Sprinklers in residential buildings must be designed and installed to prevent the fire reaching the stage at which ‘flashover’ occurs (i.e. total involvement of a room), including the room’s contents in a fire, thus reducing the risks to occupants.”

In particular, AS 2118.4 provides for the domestic / potable water and the fire sprinkler service to be a combined supply, for which FPAA101D/HFS101D and HFS102 comply.

AS 2118.4 allows the fire sprinkler services to be split after entering the property and passing through the water meter, thus creating a two-pipe system.

This has long been considered an unsafe method due to the control valves on the incoming water service in typical being installed close to the water meter and often visible to passing pedestrians, in which case the valves can be deliberately closed off by people wanting to cause inconvenience to the occupants, thereby elevating the risk of the fire sprinklers not working when required.

Further, it is possible for the occupants to inadvertently close the fire sprinkler system off. Under AS 2118.4 provisions, the result can be that the fire sprinkler system will be out of service indefinitely without the occupant’s knowledge.

Contrary to that, the FPAA101D/HFS101D and HFS102 systems are impossible to close off without the occupant’s knowledge, as they will immediately lose water to all connected plumbing fixtures, alerting them to the loss of amenities.

As the amenities will be reinstated in the shortest possible time, the integrated automatic fire sprinklers become functional without additional testing, providing the safety level required.

FPAA101D/HFS101D Technical Specification and HFS102 Design for Automatic Fire Sprinklers comply with all requirements of the NCC Volume 3 and AS 3500 Compliance.

Issues considered in this report

1. Backflow prevention from fire sprinklers
2. Stagnant water from pipe dead-legs
3. Cross connections
4. Water pressures for fire sprinklers, and
5. Testing of fire sprinkler system.

1. Backflow prevention in domestic/potable drinking water systems

Backflow can cause contamination of the drinking water and serious illness to occupants. It occurs when the incoming pressure is lower than the discharge pressure. However, the water supply outlet of a plumbing fixture or in this case the sprinkler head would need to be in some way in contact with the waste water from a bath, basin or plumbing fixture that could cause backflow should there be a reduction in the incoming pressure resulting in siphonage.

The sprinkler heads / outlets in FPAA101D/HFS101D and HFS102 are higher than 2100mm above floor level and are not in contact with plumbing fixtures.

The sprinkler head when installed is not capable of causing backflow as outlined in AS 3500.

2. Stagnant water caused by pipe dead-legs

A dead-leg is a section of pipe, regardless of its length, which does not have a plumbing fixture at the point of termination that will flush the water. The result is the water can become stagnant and increase the risk of contamination, such as Legionnaires' disease.

It is only in recent years that the authorities responsible for plumbing codes have turned their attention to the importance of dead-legs; however, the plumbing codes have not yet been amended to state the maximum length for the safety of occupants.

While not mandated, a maximum length of 300mm is the accepted industry standard for dead-legs in Class 1 buildings. It is appreciated that AS 2118.4 provides for longer dead legs due to the water supply being for fire services and not for drinking purposes. In the case of the HFS102 Design and FPAA101D/HFS101D for Class 1 use, the specified distance is 300mm thereby reducing if not eliminating the possibility of stagnant water.

This distance is unlikely to be required as the majority of droppers from the supply pipe to the sprinkler head will not exceed 125mm, allowing sufficient movement in the pipe from the flow velocity to cause the water to refresh on a regular basis.

Further, the FPAA101D/HFS101D and HFS102 designs provide for a loop system, requiring a plumbing fixture to be located at the end of a branch that includes a fire sprinkler head, thus eliminating the risk of stagnant water forming in the pipe.

3. Cross connections

AS 3500 adequately sets down the regulations for the interconnection of water services. As FPAA101D Sub-metered configuration, HFS101D and HFS102 only add additional outlets to the domestic / potable drinking system, there is no possibility of a cross connection being caused by an automatic fire sprinkler system.

4. Water flows, velocities and pressures

AS 3500 sets out the flows, velocities and pressures for plumbing fixtures, which exceed the specified flows and pressure requirements for FPAA101/HFS101D and HFS102 systems, there is a reasonable expectation for occupants to be confident there will always be sufficient water flow and pressure to meet the requirements of their fire sprinkler system.

The NCC and AS 2118.4 allow for fire services to have a velocity of 3.0 m/s; However, drinking water services are designed and installed for velocities ranging between 1.20 m/s and 2.40 m/s, with 1.80 m/s being the optimum flow. The result is less friction and pressure loss in the FPAA101D/HFS101D and HFS102 designs.

Where the velocity increases to 3.0 m/s, the friction in the pipe will increase and noise in the pipes will be experienced. In the event of a fire, the occupants will vacate the building and there will be no other draw-off caused by plumbing fixtures, allowing 100% of the flow to be available for extinguishing the fire. Also, additional noise that may be caused due to a higher velocity will not be of consequence as there will be no occupants in the building.

Where water pressures exceed 500 kPa in the Authorities' water mains, AS3500 requires a pressure reduction valve to restrict the pressure from exceeding 500 kPa for Class 1 buildings.

The pressure valve can be adjusted by a qualified service contractor to ensure there is always adequate pressure to maintain the Automatic Fire Sprinklers.

FPAA101D/HFS101D and HFS102 designs meet the safety requirements for adequate water pressure.

5. Testing

The testing is minimal, as the two main requirements happen without service contractors.

- a) Testing for flow is constant as the plumbing fixtures are used on a daily basis, this provides a clear indication that the automatic fire sprinklers have an adequate flow. In the event of a service contractor testing the system, the flow can be measured at the most disadvantaged fixture on each branch.
- b) The water pressure required to operate plumbing fixtures is higher than that required for fire sprinkler heads, therefore where there is adequate pressure for fixtures it will meet the specifications for fire sprinklers. A service contractor can at any time take a pressure reading at one of the garden hose taps. This will accurately show the water pressure in the system.

Conclusion

The FPAA101D/HFS101D and HFS102 designs meet all the requirements of the NCC Volume 3, Plumbing Code of Australia and AS 3500.

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