(a) Enable the fire brigade to pump water into the installation by the use of their own equipment during a fire;
(b) Permit proving tests of the water supplies to the installation to be regularly carried out; and
(c) Facilitate the connection of an emergency water supply to the sprinkler installation if the usual supplies have been disabled.

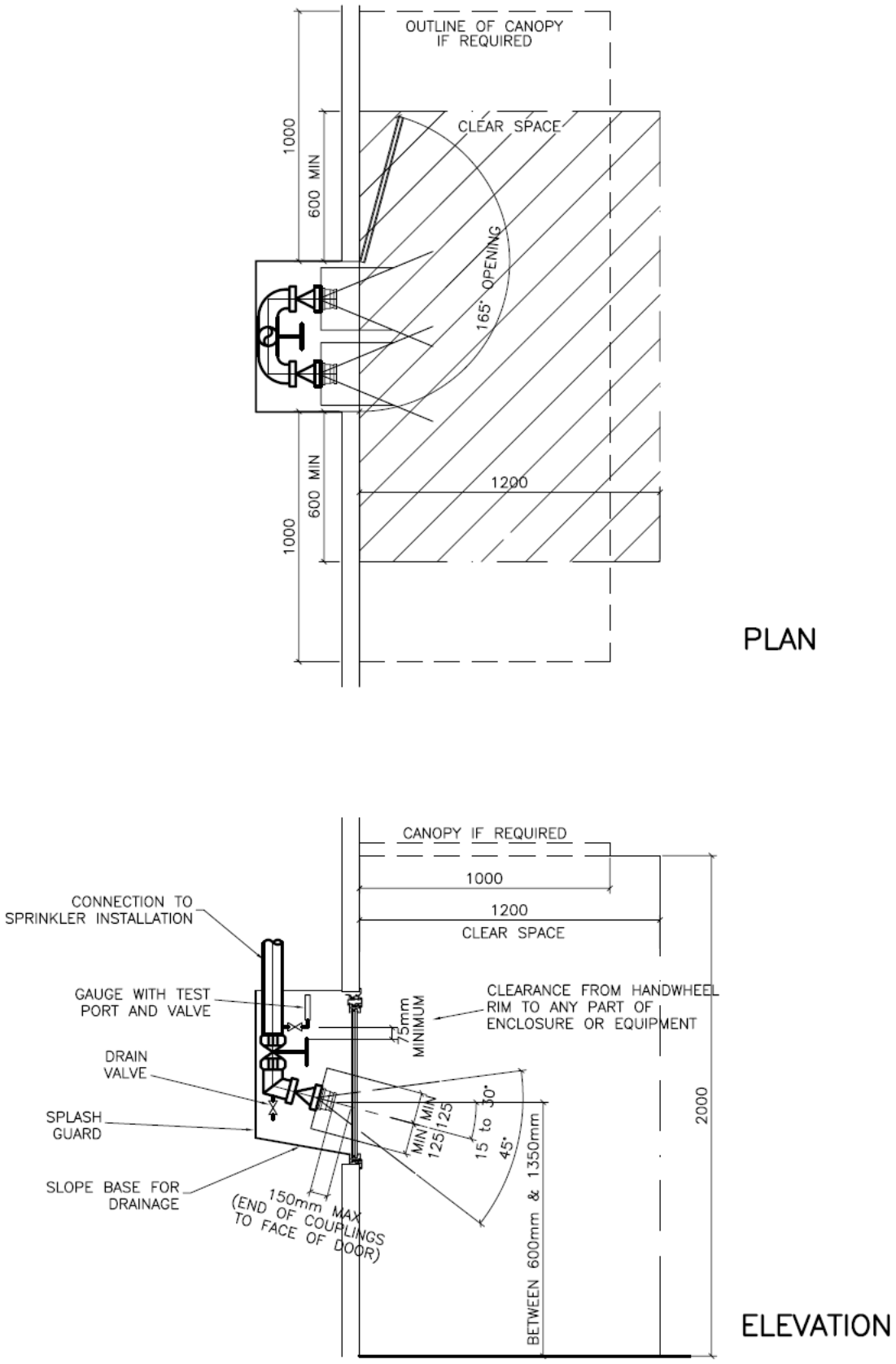
### 6.10.2 *Location*

Fire sprinkler inlets shall be on the outside of the protected premises in a location approved by the fire brigade so as to permit effective fulfilment of each function. The fire sprinkler inlets may be located remote from the building provided that all criteria of the standard are met.

### 6.10.3 *Enclosure*

#### 6.10.3.1 *Construction*

The following requirements shall be met:
(a) Fire sprinkler inlets shall be housed in enclosures constructed to ensure that delivery hoses can be connected to the couplings without kinking. The enclosure shall be of such dimensions to allow a solid cone having an included angle of 45° to be placed in each connection coaxially with the connection, without the cone touching any part of the enclosure or open door. No part of the enclosure or the door when open shall be a lesser distance than 125 mm from the axis of any connection projected. Couplings shall be located no more than 150 mm from the internal face of the enclosure door. The axis of the couplings shall be between 15° and 30° down from the horizontal. See Figure 6.15;
(b) A clearance of at least 75 mm shall be provided between the rim of any handwheel and any part of the enclosure or equipment;
(c) This enclosure may be deleted where sprinkler valve enclosures open to the exterior of the building through double doors with a total open width of at least 1.5 m. The fire sprinkler inlet shall be located on one side of the door opening. Where there are water supply pump sets in the enclosure, the fire sprinkler inlet assembly shall be fitted with a splash guard as per 6.10.3.3; and
(d) This enclosure may be deleted where valve sets are installed within self-contained cabinets designed for mounting on the exterior face of the building.




NOTE – Dimensions are in mm unless otherwise stated.

**Figure 6.15 – FSI standard requirements**

6.10.3.2 *Door*

Doors may be side hung or bottom hung and shall, in either case, open through not less than 165°. The door shall be locked by a triangular key locking device, as shown in Figure 6.16, requiring no more than 5 revolutions to open the lock.

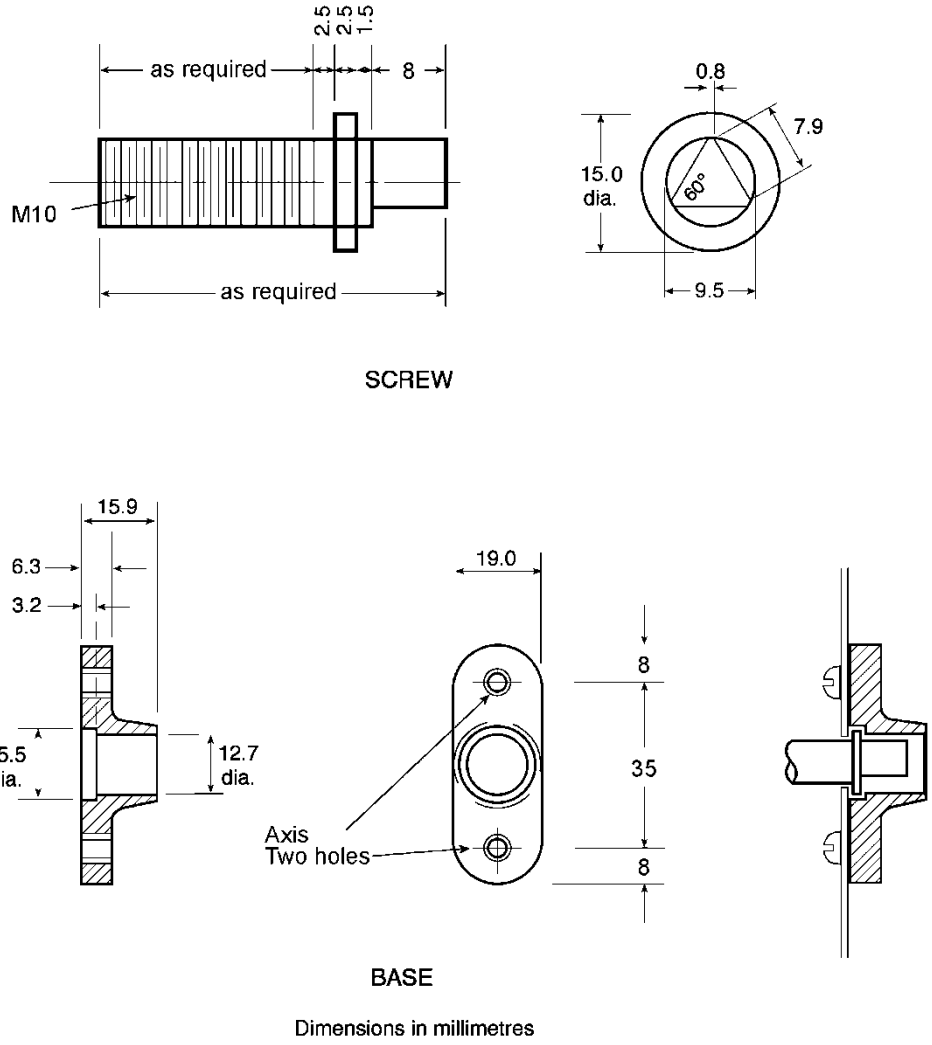



**Figure 6.16 – Details of box lock**

The door shall have a break-out panel large enough to enable delivery hoses to be connected without kinking, so that if the door cannot be opened, emergency access can be made by breaking out the panel.

The break-out panel should be designed so that on removal no sharp edges shall remain.

The outside of the enclosure door shall bear the words ‘FIRE SPRINKLER INLET – KEEP CLEAR’ in contrasting letters of at least 50 mm high.

The inside of the enclosure shall have an engraved label bearing the words ‘FIRE BRIGADE! BOOST PRESSURE IF GAUGE IN RED SECTOR’. In the case of enclosures housing more than one stop valve the words ‘FIRE BRIGADE! BOOST PRESSURE ON ANY INSTALLATION WITH GAUGE IN RED SECTOR’ shall be used. The sign shall be collocated to the gauge specified in 6.10.5.3.

6.10.3.3 *Splash guards*

With the exception of fire sprinkler inlets installed in compliance with 6.10.3.1(c) and (d), a splash guard shall be provided to the sides, rear, and bottom of the enclosure to ensure that the risk of water damage to the interior of the building is minimised. The splash guard shall be provided with suitable drainage.

6.10.3.4 *Usage*

The enclosure may also be used to house the fire sprinkler inlet for any fire hydrant system serving the building. In such cases, the fire hydrant system and the fire sprinkler inlet shall be separate assemblies, each bearing the words 'FIRE SPRINKLER INLET' and 'FIRE HYDRANT INLET' in contrasting letters of at least 50 mm high, respectively.

Other than any indication and control panels for the control of fire hydrant systems, the enclosure shall not be used to house any other equipment.

**6.10.4** *Inlets*

6.10.4.1 *Specification*

Each inlet shall consist of a 70 mm male instantaneous hose connection and shall comply with SNZ PAS 4505. It shall be fitted with a clapper valve of the swing-hinged type.

The inlet assembly shall be listed by the SSC. In considering listing, the SSC shall confirm that:

(a) The manufacturer has a documented quality system such as AS/NZS ISO 9000, with a scope conducive to manufacturing fire brigade waterway equipment complying with SNZ PAS 4505;
(b) The couplings are clearly identified with the manufacturer's mark, manufacturing date or batch number, and manufacturing standard; and
(c) If the check valve is not an integral part of the inlet assembly, it is manufactured of LG2 gunmetal complying with BS EN 1982 or equivalent.

NOTE – SNZ PAS 4505 currently does not permit FSI assemblies to be manufactured out of aluminium alloys. Should SNZ PAS 4505 be amended, see 4.1.1.

6.10.4.2 *Number of inlets*

The number of inlets shall be provided in accordance with Table 6.3.

**Table 6.3 – Number of inlets**

| **Highest system design flow** (L/min) | **Minimum number of inlets required** |
|---|---|
| Up to 1350 | 1 |
| Up to 2700 | 2 |
| Up to 4050 | 3 |
| Up to 5400 | 4 |
| Up to 6750 | 5 |
| Greater than 6750 | 6 |

6.10.4.3 *Height of couplings*

The fire sprinkler inlet shall be positioned so that the axis of the highest and lowest coupling is not closer to the surrounding standing surface than 600 mm or further than 1350 mm.

6.10.4.4 *Clear working space*

A space measuring 600 mm either side of the inlet enclosure, 1200 mm out from the face of the enclosure, and extending up 2000 mm from the surrounding standing surface shall be clear of all objects.

6.10.4.5 *Falling objects*

To guard against building elements and other objects falling from above in the event of a fire, where the door of the enclosure is on an exterior wall of a multistorey building, either a verandah or other assembly shall be provided extending at least 1 m in front and 1 m either side of the door.

6.10.4.6 *Routine testing*

A valved connection shall be permitted between the FSI manifold and a fire hydrant system manifold to permit the routine (5 yearly) testing of the fire hydrant system. The valve shall be chained and padlocked in the closed position

**6.10.5** *Connection pipe to system*

6.10.5.1 *Point of connection*

The following requirements apply:

(a) The inlets shall be connected by pipework through a stop valve directly into the installation downstream of the alarm valve and main stop valve;
(b) Where there is more than one alarm valve, they may all be connected through check valves and a manifold to the same inlet provided that a normally open, locked, supervised isolation valve is fitted to each connection. The isolation valve shall signal 'Fire' when closed for more than two turns or 5%;
(c) Where there is more than one alarm valve, and the provisions of (b) are incorporated into the fire sprinkler inlet design, a normally locked, closed, and monitored test valve shall be installed to bypass the manifold check valve for the system with the highest design flow. Where multiple alarm valves are not collocated at one valve house a bypass test valve shall be located at each valve house;
(d) Where there is more than one alarm valve and the provisions of (b) are incorporated into the FSI design, install an FSI check valve test valve (normally locked close) to allow the check valves to be exercised in accordance with 12.2.5(g);
(e) In wet pipe and antifreeze systems, the pipework downstream of the manifold check valves shall be primed from the water supply by a 15 mm NB connection via a locked open isolation valve. See Figure 6.17;
(f) Where a second stop valve is installed downstream of the alarm valve (as in a dry pipe valve situation), the fire sprinkler inlet connection shall be connected upstream of such a stop valve, to permit flow testing; and
(g) The pipework and manifold(s) shall comply with the requirements of 1.12.

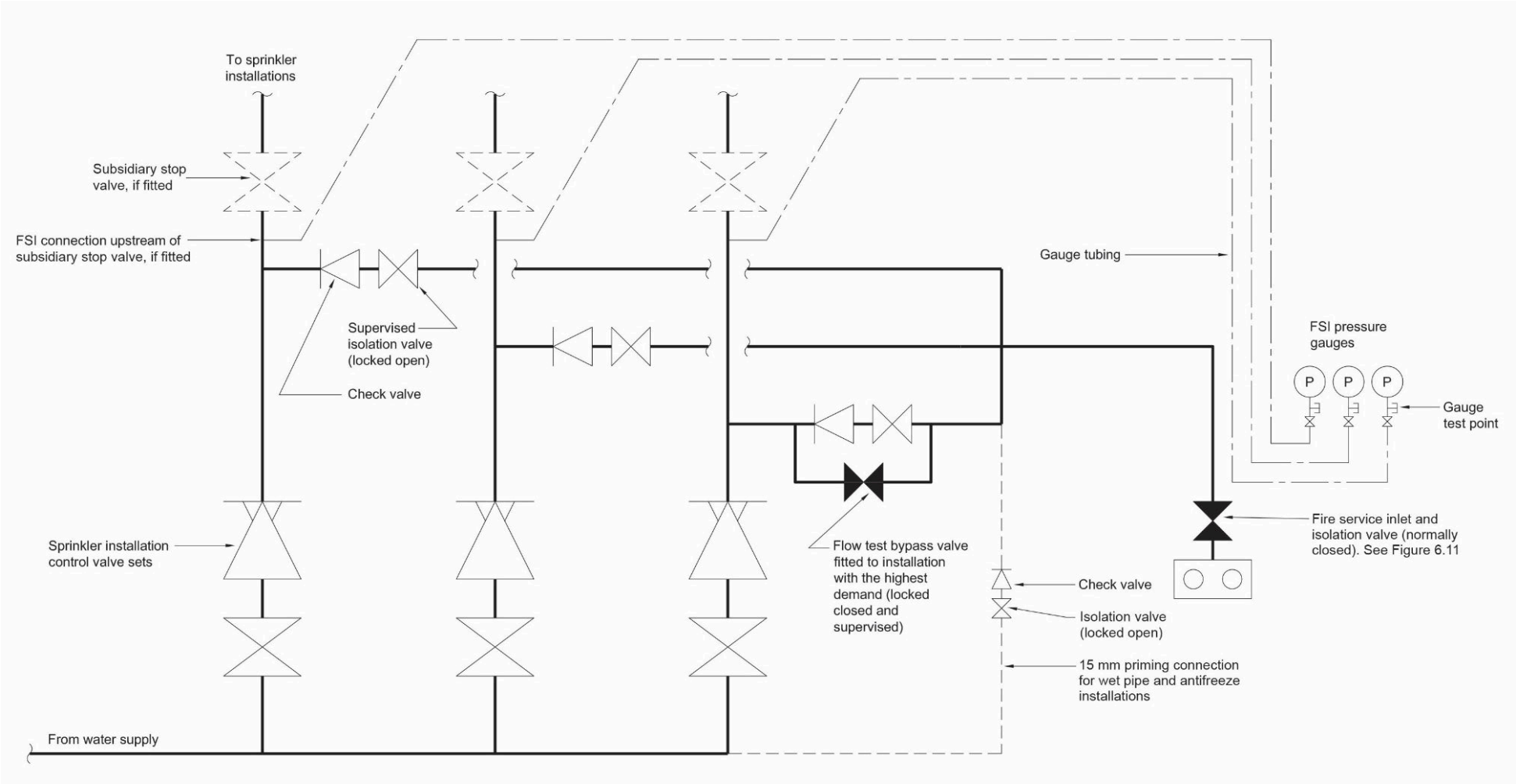



**Figure 6.17 – Fire sprinkler inlet arrangement for multiple valve sets**

6.10.5.2 *Stop valves*

Stop valves shall be suited to the duty pressure, be slow closing, provide a drip tight seal, and not incorporate metal to metal seating. The valve shall be housed in the cabinet. A metal or plastic label bearing the words 'OPEN BEFORE PUMPING' shall be fitted to the handwheel or collocated directly adjacent.

Where there is more than one stop valve, each valve shall be numbered in contrasting numerals at least 40 mm high according to the installation which it controls.

6.10.5.3 *Pressure gauges*

A pressure gauge shall be fitted in the cabinet, connected to the installation side of each stop valve and shall be marked with a red sector between zero pressure and a pressure 100 kPa above the highest design pressure requirement for that particular installation. The remainder of the scale shall be shaded green. Where there is more than one pressure gauge, it shall be labelled with the number of the installation to which it is connected. Where the direct access to the fire sprinkler inlet is via the valve house doors, it shall be permissible, in a single installation system, to comply with this requirement by shading the installation gauge.

6.10.5.4 *Pipe size*

The size of the connecting pipework and stop valve shall be such that at the highest design flow, the pressure loss due to friction between the inlet coupling and the alarm valve does not exceed 100 kPa. In the case of any secondary fire sprinkler inlets installed on the installation, connecting pipework to the system shall be such that at the highest design flow, the pressure loss due to friction between the secondary FSI and the most hydraulically remote area of operation, plus the design point pressure, does not exceed $P_{NC}$ (refer to NZS 4510).

6.10.5.5 *Pipework bracing*

The fire sprinkler inlet valves and pipework (including any permanent test outlet) shall be braced to withstand the forces developed during flow testing of sprinkler system water supplies.

6.10.5.6 *Duty pressures exceeding 1050 kPa*

If, in the event of failure of the sprinkler system water supply, the maximum required boost pressure at the fire sprinkler inlet exceeds 1050 kPa then special provisions in the fire sprinkler inlet design shall be provided. These special provisions shall be approved by an SSC.

Such special provisions may include the provision of a valved connection which would allow the building's wet riser diesel-driven pump set (designed and installed in accordance with NZS 4510) to boost the sprinkler system fire sprinkler inlet pipework. In such cases, the valve shall be operable from the sprinkler system fire sprinkler inlet cabinet and its purpose clearly and indelibly marked in letters at least 50 mm high.

NOTE – It is not acceptable to connect the sprinkler system fire sprinkler inlet to the suction side of the sprinkler system pumps, as this does not cater for any event where the sprinkler system water supply has failed. In such cases, it is expected that the sprinkler system pumps may have seized, prior to the fire brigade providing water to them.

## 6.11 Proving of water supplies

### 6.11.1 *Test outlets*

To facilitate tests to verify that each of the sprinkler installations water supplies satisfies the pressure/flow requirements appropriate to the installation, provision is to be made for water flow testing. This provision shall be as follows: Where the water supply is taken from a stored water source in proximity to the installation control valves, a test pipe with in-line flow meter shall run from downstream of the installation control valves back to the stored water source, terminating at a level that is at least 1 m below the nominal level of the water storage tank. The installation of the flow meter in this situation shall be permanent unless deemed otherwise by the SSC who may accept other configurations in certain circumstances. The pipe and in-line flow meter shall be sized to allow flow testing at least 125% of the highest design flow.

Where the water source is from a town's main or from a stored water source that is remote from the installation control valves, a test outlet for the connection of a portable flow measuring device to the fire sprinkler inlet or a permanent test outlet shall be provided.

In the case of a supplemented town's main, a facility shall be provided to allow the water level in the tank to be lowered to permit a displacement test to be undertaken to measure the infill rate into the tank.

### 6.11.2 *Location of test outlet*

Where testing involves discharge of water to atmosphere, the location of the test outlet shall consider the following:

(a) The location of the test outlet shall allow free discharge of at least 125% of the highest duty flow without causing damage to property;

(b) Where practicable the test outlet shall be located to avoid discharging across footpaths and roadways.

NOTE –

(1) The test outlet does not need to be co-located with the fire sprinkler inlet.

(2) It is not desirable to have water from test outlets jet across footpaths and roadways as this may necessitate traffic management plans for testing and may restrict the times at which testing can be undertaken or may render testing impracticable.

(3) Where storm water retention tanks are installed on site, consideration should be given to whether sprinkler test water could be better directed to these via a fixed in-line flow meter and discharge pipe.

### 6.11.3 *Fixed in-line flow meters*

Fixed in-line flow meters shall be a simple device such as an orifice plate, venturi nozzle, or pitot tube type configuration that measures differential pressure and converts this to a flow reading. The differential gauge for the meter shall be permanently mounted adjacent to the meter.

The flow meter shall be listed and shall be installed in accordance with the manufacturer's listing instructions.

A laminated differential pressure to flow chart, in the units of kPa and l/min, shall be permanently fixed in place adjacent to the flow meter.

The outlet connections from the flow meter shall be fitted with isolate valves and connection ports to allow an inspector to attach a portable differential pressure gauge.

Alternatively, other flow meter arrangements, such as ultrasonic or magnetic flow meters may be used with specific approval of the SSC.

NOTE – A current calibration certificate will be required for differential gauges when used during routine biennial inspections.

### 6.11.4 *Portable flow meters*

Provision for connection of a portable flow measuring device to the fire sprinkler inlet or permanent test outlet, as applicable, shall be provided.

The provision of the test device shall be located to allow free discharge of at least 125% of the design flow without causing damage to property.

For design flows exceeding 3500 L/min, a permanent test outlet shall be connected between the fire sprinkler inlet stop valve(s) and the inlet clapper valve(s) to allow the connection of large flow testing devices. The test connection shall consist of either a 100 mm or 150 mm rolled groove fitting with, under normal conditions, a blank cap. For design flows in excess of 9000 L/min, two independently valved test connections shall be provided.

### 6.11.5

Where a number of installation control valves are sited together and all are associated with installations of the same hazard class, this testing facility is necessary only on one installation control valve provided that it is fitted to the valve which is hydraulically the least favourably situated.

### 6.11.6

Where more than one hazard class is involved, whether on the same or separate installation control valves, testing facilities shall be provided to enable the full range of flows to be measured. This requirement may be waived by an SSC where it is obvious, from testing of the higher flow rate, that the lower pressure/flow requirements are satisfied.

### 6.11.7

Where the fire pump is remote from the sprinkler valves, a test point local to the fire pump shall be provided for proving tests of the fire pumps.

Where the pump draws from a water tank, a test pipe with in-line flow meter shall run from the pump discharge back to the stored water source, terminating below the level of the anti-vortex plate. The pipe and in-line flow meter shall be sized to allow flow testing at least 125% of the highest design flow. Flow meters shall comply with 6.11.3.

## 6.12 Private site fire mains (see 6.2.1 Class B2)

### 6.12.1 *Piping*

6.12.1.1

Pipework may be reticulated throughout the site through a combination of buried or above-ground pipework. Where pipe is above ground, it shall be located to minimise the potential that it may be damaged, by natural events, or by explosions, vehicle accidents and the like.

6.12.1.2

Buried pipework shall be provided with thrust restraint in accordance with best trade practice and with allowance for anticipated vehicle movements.

6.12.1.3

Pipework above ground shall be installed on suitably constructed pipe supports or pipe bridges designed to AS/NZS 1170 series as applicable.

6.12.1.4

Piping shall be sized by hydraulic calculation to allow for the isolation and/or repair of any section of the fire main, or the impairment of either of the water supplies, and still provide the design flow and pressure.

### 6.12.2 *Valves*

All valves shall comply with 6.2.1, 6.2.4, and 6.4.1.7.1(d).

### 6.12.3 *Water supply*

Each water supply to the fire main shall conform to this standard except that:

(a) Where the ring main forms part of a dual supply (6.2.1), pumps may be started by detection of pressure drop in the fire main, providing the normal means of pressurisation can be maintained for a minimum period of 24 hours without reliance on the standard power supply (see also 6.7.1.6.3);

(b) The continuous rating of diesel engines forming part of a water supply shall provide the power requirements of the pump under any condition of pump discharge; and

(c) To facilitate tests to verify that the fire pump satisfies the pressure/flow requirements appropriate to the facility, provision for connection of a portable flow measuring device to a permanent test outlet shall be provided local to any fire pump.

Where the pump draws from a water tank, a test pipe with in-line flow meter shall run from the pump discharge back to the stored water source, terminating below the level of the anti-vortex plate. The pipe and in-line flow meter shall be sized to allow flow testing at least 125% of the highest design flow. Flow meters shall comply with 6.11.3.

NOTE – Details of how the ring main will be pressurised are to be supplied to an SSC as part of the information required within the basic design decision submission (see 1.14.1(p)).

### 6.12.4 *Other*

6.12.4.1

Details of the site fire main shall be incorporated on a block plan in every fire pump enclosure supplying the fire main.

6.12.4.2

The flow and pressure characteristics of each connection to the private site fire main shall be determined by applying the requirements of Appendix R2 as if the site fire main was a town's main.

# 7 Extra light hazard system design data

## 7.1 Water supplies

### 7.1.1 *Design criteria*

ELH systems shall be designed to meet one of (a) to (c):

(a) To allow the hydraulically most remote six heads to provide a flow of at least 57 L/min from each sprinkler regardless of the area covered by an individual sprinkler;

(b) In areas where residential sprinklers are fitted, to provide for the four most hydraulically demanding sprinklers; or

(c) In areas where ECLH sprinklers are fitted, to include an assumed area of operation of five sprinklers, but not less than 140 $m^2$, discharging in accordance with the listing for the sprinkler head.

In (a) above, the hydraulically most remote group of sprinklers shall be selected to form as near as possible a square with the longest side positioned so that it imposes the greatest hydraulic demand. Except as varied by this clause, hydraulic calculation methods shall conform to the requirements of Part 10. Sprinklers in cupboards and wardrobes need not be included in the calculation.

In (b) above, the minimum discharge from each sprinkler is to be the greater of the following: the listed flow rates for NFPA 13D and NFPA 13R systems; or a minimum discharge density of 4.1 mm/min over a design area of the four most hydraulically demanding sprinklers for the actual coverage areas for the sprinklers.

NOTE – Users of this standard should be aware that the use of outdated data sheets may not provide the latest listing data called up for residential heads. Attention is also drawn to the need to apply the more onerous of the two design criteria provided above.

In (c) above, interpolation of criteria between listed spacings shall not be used. The minimum discharge density shall be 4.1 mm/min.

### 7.1.2 *Water supplies*

7.1.2.1

Each water supply shall be capable of providing at the installation control valves, the design flow at the design pressure. The design pressure for systems having any sections fitted with residential sprinklers shall not be less than the pressure required to operate any single residential sprinkler at its appropriate listed flow and pressure.

7.1.2.2

Pipe sizes shall be determined by full hydraulic calculation in accordance with Part 10.

7.1.2.3

Where external sprinklers impose a demand greater than that of the protected area, the values of the design flow and design pressure shall be increased accordingly.

### 7.1.3 *Extensions to existing systems*

7.1.3.1

Existing systems, installed in accordance with superseded editions of this standard, may be extended by a maximum of four sprinklers with pipe sizes in accordance with the method set out in 7.3. Where the array pipework beyond the design points is sized to Table 7.1, the design flow shall be 270 L/min and the design pressure 190 kPa plus whichever is the greater of 90 kPa or the pressure equal to the distribution pipe losses between the control valves and the hydraulically most remote design point, plus the pressure equivalent of the difference in height between the valves and the highest sprinkler. In such cases, only 10 mm sprinklers may be used.

**Table 7.1 – Minimum pipe sizes for pre-calculated extra light hazard sprinkler arrays**

| | Normal diameter of pipe | | | |
|---|---|---|---|---|
| | **From last to 2nd head** (mm) | **Between 2nd and 3rd head** (mm) | **Between 3rd and 4th head** (mm) | **Between 4th head and design point** (mm) |
| Option A* | 20 | 25 | 32* | – |
| Option B | 20 | 25 | 40 | 50 |
| Option C | 25 | 25 | 32 | 40 |
| Option D | 25 | 32 | 32 | 32 |
| Option A* provides for a three head range and the 32 mm diameter and, therefore, relates to the pipe between the third head and the design point. | | | | |

7.1.3.2

Where the ranges in an area of operation are connected to a section of looped distribution pipe, the design point is the hydraulic mid-point of that section of distribution pipe.

7.1.3.3

Design points are those points on the pipework at an equivalent hydraulic length not greater than 7 m upstream from the fourth sprinkler on any range under consideration, or on ranges of less than four heads at the junction of the next upstream range on the distribution pipework.

7.1.3.4

The designs of hydraulically calculated systems may incorporate any pipe sizes that are permitted by Part 10 and proven to satisfy the design requirements of that part.

## 7.2 Sprinkler type and spacing

### 7.2.1 *Sprinkler types*

7.2.1.1

In sleeping areas, sprinkler heads shall be residential type or quick response standard spray.

In this context, ‘sleeping areas’ includes bunkrooms; hospital wards; bedrooms; dormitories; and individual suites in hotels, motels, and apartment buildings. ‘Individual suites’ means that area (whether partitioned or not) to which access is controlled by the room key that is, bedrooms, bathroom suite, lobby, lounge, and kitchen where provided.

Hospital wards containing more than four beds per room shall not be protected with residential sprinklers. Quick response standard spray sprinklers shall be used.

NOTE – To achieve comparable detection, some ECLH sprinklers are fitted with a more responsive heat activated element, they are not necessarily listed as quick response sprinklers.

7.2.1.2

In all other areas, except as provided for in 7.2.1.3, either quick response or standard response spray pattern 10 mm or 15 mm sprinkler heads shall be used.

7.2.1.3

In areas related to sleeping areas, including corridors, lift lobbies, stairways and foyers, and in care institutions, day rooms or lounge areas, residential or quick response or standard response spray pattern sprinklers may be used. Residential sprinklers shall not be used in kitchens, cafeterias, restaurants, bars, storerooms, laundries, plant rooms, ceiling spaces, or roof spaces.

NOTE – This needs to be read in context with 7.2.1.1 and 7.2.1.4. The intention of this clause is to relax the requirements for quick response heads outside sleeping areas, such as hotel corridors and the like. It is not the intention to relax the requirement for quick response heads within sleeping areas, such as internal apartment corridors and the like.

7.2.1.4

Standard response sprinklers may be used in small ancillary spaces, related to sleeping occupancies, such as cupboards, laundries, and toilets and bathrooms, where such spaces are protected by one head.