STANDARDS NEW ZEALAND
TE MANA TAUTIKANGA O AOTEAROA®

NZS 4510:2022

NEW ZEALAND STANDARD

Fire hydrant systems

Superseding NZS 4510:2008

NZS 4510:2022

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COMMITTEE REPRESENTATION

This standard was prepared by the P4510 Fire Hydrant Systems for Buildings Committee. Membership of the committee was approved by the New Zealand Standards Approval Board and appointed by the New Zealand Standards Executive under the Standards and Accreditation Act 2015.

The committee consisted of representatives of the following nominating organisations:

Association of Building Compliance
Auckland Council
Building Officials Institute of New Zealand
Engineering New Zealand
Fire and Emergency New Zealand
Fire Protection Association New Zealand
Institution of Fire Engineers New Zealand
Kāinga Ora – Homes and Communities
Ministry of Business, Innovation and Employment – Building System Performance
New Zealand Fire Equipment Manufacturers Association Incorporated
Registered Master Builders Association of New Zealand Incorporated
Society of Fire Protection Engineers (New Zealand Chapter)

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New Zealand Standard

Fire hydrant systems

Superseding NZS 4510:2008

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VALUE STATEMENT

NZS 4510 will continue to prevent loss of life and provide protection of property for all New Zealanders and enhanced safety for firefighters by ensuring the appropriate facilities to apply water are available for firefighting in and around buildings.

REFERENCED DOCUMENTS

Reference is made in this document to the following:

New Zealand standards

NZS 1170:- - - -	Structural design actions
Part 5:2004	Earthquake actions – New Zealand
NZS 3501:1976	Specification for copper tubes for water, gas, and sanitation
NZS 3604:2011	Timber-framed buildings
NZS 4219:2009	Seismic performance of engineering systems in buildings
NZS 4503:2005	Hand operated fire-fighting equipment
NZS 4510:2008	Fire hydrant systems for buildings
NZS 4510:1998	Fire hydrant systems for buildings
NZS 4510:1978	Code of practice for riser mains for fire service use
NZS 4512:2021	Fire detection and alarm systems in buildings
NZS 4515:2003	Fire sprinkler systems for residential occupancies
NZS 4541:2020	Automatic fire sprinkler systems
NZS 4781:1973	Code of practice for safety in welding and cutting
NZS 5807:1980	Code of practice for industrial identification by colour, wording or other coding
SNZ PAS 4505:2007	Firefighting waterway equipment

Joint Australian/New Zealand standards

AS/NZS 1170:- - - -	Structural design actions
Part 0:2002	General principles
AS/NZS 2980:2018	Qualification of welders for fusion welding of steels – Additional requirements for Australia and New Zealand
AS/NZS 3000:2018	Electrical installations – Known as the Australian/ New Zealand wiring rules
AS/NZS 3013:2005	Electrical installations – Classification of the fire and mechanical performance of wiring system elements
AS/NZS 4130:2018	Polyethylene (PE) pipes for pressure applications

AS/NZS ISO/IEC 17020:2013	Conformity assessment – Requirements for the operation of various types of bodies performing inspection

American standards

ASTM A53/A53M 2020	Standard specification for pipe, steel, black and hot-dipped, zinc-coated, welded and seamless
ASTM A106/A106M 2008	Standard specification for seamless carbon steel pipe for high-temperature service
ASTM A135 2021	Standard specification for electric-resistance-welded steel pipe
ASTM A312/A312M (Rev A) 2008	Standard specification for seamless, welded, and heavily cold worked austenitic stainless steel pipes
ASTM A380 2017	Standard practice for cleaning, descaling, and passivation of stainless steel parts, equipment, and systems
ASTM A795/A795M 2021	Standard specification for black and hot-dipped zinc-coated (galvanized) welded and seamless steel pipe for fire protection use

Australian standards

AS 1074:1989	Steel tubes and tubulars for ordinary service
AS 1432:2004	Copper tubes for plumbing, gasfitting and drainage applications
AS 1572:1998	Copper and copper alloys – Seamless tubes for engineering purposes
AS 4041:2006	Pressure piping
AS 4809:2017	Copper pipe and fittings – Installation and commissioning
AS 60529:2004 (R2018)	Degrees of protection provided by enclosures (IP code)

British standards

BS 2971:1991	Specification for class II arc welding of carbon steel pipework for carrying fluids
BS 4677:1984	Specification for arc welding of austenitic stainless steel pipework for carrying fluids

BS 5252:1976	Framework for colour co-ordination for building purposes
BS EN 837-1:1998	Pressure gauges. Bourdon tube pressure gauge dimensions, metrology requirements and testing
BS EN 10255:2004	Non-alloy steel tubes suitable for welding and threading. Technical delivery conditions

Other publications

Commander Region 1, New Zealand Fire Service. *Interim code of practice for charged riser compliance*. Auckland: New Zealand Fire Service, 1990.

American Petroleum Institute. *API specification 5L: Specification for line pipe*. 46th ed. Washington: API, 2018.

FM Global. *Datasheet 3-10: Installation and maintenance of private fire service mains and their appurtenances.* September 2000.

FM Global. *Datasheet 9-18: Prevention of freeze-ups.* July 2021.

Ministry of Business, Innovation & Employment (MBIE). Acceptable Solutions and Verification Methods F8/VM1 & AS1: For New Zealand Building Code clause F8 signs. 2nd ed. MBIE, 2017. Available at https://www.building.govt.nz/assets/Uploads/building-code-compliance/f-safety-of-users/f8-signs/asvm/f8-signs-2nd-edition-amendment4.pdf (retrieved 24 February 2022)

New Zealand legislation

Building (Forms) Regulations 2004

Building Regulations 1992 (New Zealand Building Code)

Fire and Emergency New Zealand Act 2017

Health and Safety at Work Act 2015

Health and Safety at Work (Hazardous Substances) Regulations 2017

Websites

www.building.govt.nz

LATEST REVISIONS

The users of this standard should ensure that their copies of the above-mentioned New Zealand standards are the latest revisions. Amendments to referenced New Zealand and joint Australian/New Zealand standards can be found on www.standards.govt.nz.

REVIEW OF STANDARDS

Suggestions for improvement of this standard will be welcomed. They should be sent to the National Manager, Standards New Zealand, PO Box 1473, Wellington 6140.

FOREWORD

This revision of NZS 4510 introduces a number of changes to the 2008 edition.

The purpose of this standard is to set out minimum technical and performance requirements for fire hydrant systems. Hydrant systems are primarily for fire brigades to use when they are dealing with fire emergencies in buildings, but hydrant systems can also be found outside buildings for use on exteriors and to cover external fire exposure and risk.

This revision accepts that demands on building hydrant systems are likely to be less for sprinkler-protected buildings than for buildings without sprinklers. However, the demands for low-rise internal hydrant systems have been simplified and aligned with those for high-rise buildings. Specifically, for buildings fitted with approved sprinkler systems, the maximum flow rate of 1500 L/min has been retained and the approach for two hose streams per outlet adopted. For unsprinklered buildings, a maximum of 12 hose streams at 440 L/min has been adopted.

The 2008 edition inferred that hydrants could be located in large, open areas with no additional provisions to allow firefighters to safely use and connect to them. This did not align with Fire and Emergency New Zealand's standard operating procedures. In many cases, these hydrants would not be usable because of issues in finding them, visibility due to low smoke levels, and the need to use the fire hose as a wayfarer device to retreat to a place of relative safety. In this revision, the rules around locating hydrant outlets have been clarified.

In addition, Appendix A has been developed to provide guidance for locating hydrants where compliance with the standard's normative requirements cannot be met or are not sufficient to provide full coverage. In such situations, Appendix A outlines a process for designing a non-standard system that considers the building's fire safety provisions as a whole.

This standard now includes the technical requirements for the installation of hydrants in certain low-rise building configurations in the normative body of the standard. Given the complexity and variations still observed within the design of low-rise buildings, those non-standard systems will require specific approval from a hydrant system certifier (HSC) as part of the design process. In such cases, it is recommended that the proposed designs also be discussed with the fire brigade early in the project's design phase.

The committee preparing this standard has provided design requirements for combined sprinkler-and-hydrant risers to allow costs to be reduced while ensuring a level of redundancy equivalent to separate hydrant and sprinkler systems (see Appendix B).

While this standard was being prepared, Fire and Emergency New Zealand was developing a guidance document on firefighting operations. The FENZ document could provide useful supplementary information for the design, installation, and use of hydrant systems.

As hydrant systems are intended to provide firefighting water supplies to where they are needed, it is expected that an adequate source of water will be provided. This standard assumes that the fire brigade will, on arrival, access the available water supply and couple to the riser system. However, in some buildings, the owner can opt to provide a permanently piped supply for the fire brigade to use. This standard permits such a permanently piped supply and provides appropriate criteria. Where there is no reticulated supply, the designer should consider where the fire brigade will source water from to meet the hydrant system's demands.

In multi-storey buildings where the combination of pressure loss due to height (static) and friction means that fire brigade pumps cannot meet the performance criteria pressure at the highest building hydrant outlet, booster pumps are required. This standard now prescribes the fire brigade pumping pressure to be used to calculate whether pumps are necessary.

Particular attention has been given to the problem of pressure control at the various levels within multi-storey buildings. It is important that firefighters not be confronted with excessively high pressures. In an effort to overcome the problems that have arisen in overseas fires as a result of incorrectly set valves, requirements regarding the setting, calibration, and testing of pressure-control valves have been included.

Building hydrant systems need to be operational during both construction and demolition periods as both activities provide a heightened fire risk. A number of construction fires in recent years have highlighted the challenges Fire and Emergency New Zealand faced when hydrant systems were not available. This standard specifies that hydrant systems (including pumps, if required) must be enlivened progressively as construction advances.

The correct operation and function of hydrant and sprinkler systems will be of critical importance to firefighting safety. This standard therefore assumes that the hydrant system certifier, the designer, and the contractor who is installing the system have appropriate technical competencies and experience. Hydrant system certification by an accredited body is a requirement of this standard, as is consultation with the fire brigade at the design stage for certain aspects of the system. Consultation with the fire brigade should also take place regarding non-standard systems as described in Appendix A of this standard.

There is additional guidance to support notification of planned impairments during the system's operating life.

NOTES

New Zealand Standard

Fire hydrant systems

1 GENERAL

1.1 Scope

1.1.1 Inclusions

This standard covers fire hydrant systems for buildings, including external hydrant systems, for use by FENZ in accordance with its standard operating procedures.

It specifies requirements for the design, installation, commissioning, and testing of hydrant systems.

1.1.2 Limitations

The standard is not intended to provide a standardised solution for all situations. Hydrants on a water supply authority's public networks are not considered as part of a hydrant system complying with this standard. Examples of buildings where this standard does not necessarily provide a detailed design solution include the following:

(a) Process plants;

(b) Underground infrastructure such as tunnels (road, rail, and infrastructure);

(c) Industrial process or plant buildings with exposed/open grate floors or platforms and gantries;

(d) Podiums and spaces such as external yard storage, external plants, and marinas.

NOTE –

(1) Guidance can be sought from international codes, standards, and data sheets to provide design criteria for such specialised risks.

(2) The location and design requirements for hydrant systems in these buildings should be specifically considered and agreed with FENZ during the design process. Refer to Appendix A.

1.1.3 Water supply

The system's primary purpose shall be to allow water supplied by pumping appliances to the inlet to be reticulated to hydrant outlets within or externally to the building. The system inlets and outlets are located to facilitate and ensure reasonable levels of safety for firefighter operations. Where the pressure available from fire brigade pumps is not able to deliver the nominated flows at the hydrant outlets within the permitted pressure ranges, pumps shall be required to achieve those flows. It is necessary to ensure that the maximum allowable hydrant pressure is not exceeded.

1.1.4 Systems

Unless otherwise approved by the HSC, the system shall be a wet pipe system, charged and pressurised with water to ensure the integrity of the system and maintained in this condition. Where required by environmental conditions, the system could be a dry pipe system, charged and pressurised with air or nitrogen.

The water supply for firefighting shall normally be supplied by the fire brigade through the hydrant inlet from an available water supply.

This standard supports hydrant systems incorporating a permanently connected pressurised water source to enable hydrant use before the main supply is supplied by the fire brigade. This standard also supports combined fire hydrant and fire sprinkler systems. See Appendix B for guidance.

1.1.5 Staff use of hydrants

A secondary option is the reticulation of firefighting water for use by adequately trained and equipped personnel before the fire brigade arrives. In such cases, the hydrant system could be supplied with a permanently connected pressurised water source sufficient to allow staff to establish hose streams directly from the hydrant system outlets. Use of this secondary option shall not diminish the standard's primary objective.

1.1.6 Manually controlled branches

Hydrant systems complying with this standard are suited to firefighting operations using manually controlled branches (also known as nozzles).

1.1.7 Automatic branches

Systems designed to this standard are not suitable for the use of automatic branches – that is, those which optimise flow rate in order to maintain a constant nozzle (branch) pressure.

1.1.8 Superseded standards

Appendix C provides guidance on maintaining and altering systems installed to superseded editions of this standard.

1.2 Objectives

The objective of this standard is to provide specifiers, users, manufacturers, suppliers, installers, and maintenance persons with requirements and guidance to assist in the design, construction, and maintenance of a fire hydrant system that will effectively aid fire brigade firefighting operations within the building during construction, demolition, and normal operation. It also applies to sites where hydrant systems are provided to cover external fire hazards.

1.3 Interpretation

For the purposes of this standard, the word 'shall' refers to requirements that are essential for compliance with the standard, whereas the word 'should' refers to practices that are advised or recommended.

The terms 'normative' and 'informative' have been used in this standard to define the application of the appendix to which they apply. A 'normative' appendix is an integral part of a standard, whereas an 'informative' appendix is only for information and guidance.

However, where an informative appendix specifies a prescribed test procedure, the word 'shall' used in it means that if users elect to conduct this test, it shall be undertaken exactly as set out in the appendix.

Statements expressed in mandatory terms in notes to tables are deemed to be requirements of this standard.

1.4 Definitions

For the purposes of this standard, the following definitions shall apply:

Approved — Approved by the building consent authority (BCA) in accordance with the New Zealand Building Code (NZBC)

NOTE – The HSC is expected to provide evidence to the BCA that the installation meets the requirements of this standard.

Approved sprinkler system — A sprinkler system that has been approved by a sprinkler system certifier to comply with NZS 4541 or NZS 4515

NOTE –

(1) The intention is to ensure that the reliability of the sprinkler system water supplies complies with published sprinkler standards.

(2) As an alternative solution to these nominated standards, a BCA or territorial authority (TA) could accept a sprinkler system that complies with other standards.

Certified hydrant system — A hydrant system installed to this standard

Chief executive — The chief executive of FENZ, appointed under the Fire and Emergency New Zealand Act 2017

Design engineer — A person who, on the basis of experience or qualifications and their fundamental education and training, is competent to design the hydrant system elements of a building

Dry barrel pillar assembly — A listed dry barrel assembly connected to the hydrant system comprising two valves, each with listed dry pipe hydrant outlets to allow water to be supplied from a reticulated water supply. When closed, the pillar hydrant and installation shall allow for automatic draining below the frost line

Dry pipe air pressure maintenance system — A listed dry pipe supervisory air pressure maintenance assembly

Dry pipe air-relief valves — A listed, automatic, float-operated air-relief valve with a nominal bore of not less than 25 mm that sits in the normally open position to allow air in and out of the hydrant main piping system

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Dry pipe direct-acting pressure-relief valve	A listed direct-acting, spring-loaded, diaphragm-type relief valve with a nominal bore of not less than 25 mm that sits directly upstream of a dry pipe air-relief valve in a cold-climate dry pipe hydrant system to allow the discharge of the supervisory air pressure to atmosphere, enabling hydraulic flooding of the dry pipe system in combination with an air-relief valve
Dry pipe hydrant outlet assembly	A listed outlet assembly complying with SNZ PAS 4505 that self-drains to atmosphere or back into the waterway and has no natural water traps that could cause an ice plug following flooding of the pipework
Dry pipe supervision control panel	A control-and-indicating panel that complies with NZS 4512 or clause 4.7.2.2.3 of NZS 4541, is capable of 'defect' and 'fire' calls, and can be incorporated into the fire hydrant index panel
Fire brigade	The expected first emergency responder to a fire alarm NOTE – At the time of publication, this would usually be FENZ.
Fire hydrant	An assembly usually contained in a pit or box below ground level and comprising a valve and outlet connection from a water supply main to permit the controlled supply of water for firefighting. A pillar upstand connected to a water supply main and fitted with a valve and instantaneous coupling(s) adaptor will also constitute a fire hydrant
Fire hydrant outlet assembly	An assembly connected to the hydrant system comprising two valves, each with female hose couplings and related fittings (including an enclosure, where provided) to allow water to be supplied from the hydrant system through fire brigade hoses
Fire resistance rating (FRR)	The term used to classify the fire resistance of primary and secondary elements as determined in the standard test for fire resistance, or in accordance with a specific calculation method verified by experimental data from standard fire resistance tests. It comprises three numbers giving the time in minutes for which each of the criteria 'stability', 'integrity', and 'insulation' are satisfied, and is always presented in that order
High fire hazard	Where the amount and type of combustibles present are such that a larger fire size is expected. Activities deemed to be 'high fire hazard' are those with an expected fire load energy density greater than 800 MJ/m². Examples are provided in Appendix D

Hydrant inlet (HI)	An assembly, which is accessible from the exterior of the building, connected to the hydrant system through pipework, and comprising male hose couplings, clapper valves, and ancillary equipment, for the purposes of allowing the fire brigade to pump water into the hydrant system
Hydrant main, charged (charged riser)	A hydrant main installed in a building for firefighting purposes, fitted with inlet connections at fire brigade access level and hydrant outlet assemblies at specified points. These are normally pressurised with water for monitoring purposes and provided with water by pumping fire brigade appliances for firefighting purposes NOTE – This is the type of hydrant main normally installed under this standard, unless a 'dry type' system is installed to protect against freezing due to environmental conditions.
Hydrant system, dry pipe	A supervised dry pipe system installed externally to a building's thermal envelope for firefighting purposes in geographical areas exposed to extended temperatures below freezing
Hydrant system, wet pipe	A hydrant system installed in a building for firefighting purposes, fitted with inlet connections at fire brigade access level and building hydrant outlet assemblies at specified points. These are pressurised with water for monitoring purposes and provided with water by pumping fire brigade appliances for firefighting purposes NOTE – This is the type of hydrant main normally installed under this standard, unless a 'dry pipe' system is installed to protect against freezing due to environmental conditions.
Hydrant system certifier (HSC)	An organisation accredited by an internationally recognised accreditation body to AS/NZS ISO/IEC 17020 (as a Type A or Type C inspection body) as competent to fulfil the role of a hydrant system certifier as described in this standard
Ladder riser	A system consisting of at least two main hydrant-supplying waterways cross-connected at each pressure zone as shown in Figure B1
Landing valve	An assembly comprising a single valve and hydrant outlet connection from a wet or dry riser
Listed, listing	Specific makes and models of equipment and materials required or permitted by this standard, and which have been determined by an HSC to be adequate for application (where permitted or required by this standard), subject to any conditions or limitations specified in the listing

Low fire hazard Where the amount and type of combustibles present are such that a smaller fire size is expected. Activities deemed to be low fire hazard are those with an expected fire load energy density of 800 MJ/m² or less. Examples are provided in Appendix D

Low-rise building A building with no more than one floor above and/or below the building's fire brigade attendance point

NOTE –

(1) It is intended that this also includes buildings such as typical shopping malls or warehouses with large floor plans and external fire brigade access to the building.

(2) Engineering judgement could allow buildings with intermediate floors to be deemed low-rise buildings.

Main waterway Pipework serving a set of hydrant outlets, where the pipe is at least 25 m long, or pipework of any length that is servicing two or more outlet assemblies

Protected lobby An enclosed part of a floor at least 6 m^2 with no dimension less than 2 m, directly accessible from a stairwell with all elements having an FRR of the adjacent fire cell, with self-closing access doors of the same FRR as the enclosure

Ratio valve A form of pressure-reducing valve in which the ratio between the hydrant inlet and hydrant outlet pressures is fixed irrespective of flow

Riser main, dry (dry riser) A vertical pipe installed in a building for firefighting purposes, fitted with inlet connections at fire brigade access level, with landing valves at specified points. It is normally dry but can be charged with water, usually by pumping from fire brigade appliances

NOTE – Dry risers were installed to NZS 4510:1978 and are no longer permitted for new buildings. It is recommended that existing dry risers be converted to charged risers, on an as nearly as reasonably practicable basis.

Riser main, wet (wet riser) A vertical pipe installed in a building for firefighting purposes, permanently charged with water from a pressurised supply sufficient for firefighting, and fitted with landing valves at specified points

NOTE – Wet risers were installed to superseded editions of this standard and are now not normally installed.

Safe path That part of an exit way which is protected from the effects of fire by fire separations, external walls, or distance when exposed to open air terminating at a final exit

Vena contracta The point in a fluid stream where the diameter of the stream is the least, and fluid velocity is at its maximum

1.5 Abbreviations

The following abbreviations are used in this standard:

BA	Breathing apparatus
BCA	Building consent authority
FENZ	Fire and Emergency New Zealand
FRR	Fire resistance rating
HI	Hydrant inlet
HSC	Hydrant system certifier
IL	Importance level
IQP	Independently qualified person
L/O	Locked open
LCD	Liquid crystal display
LED	Light-emitting diode
MCP	Manual call point, as defined by NZS 4512
N/C	Normally closed
NZBC	New Zealand Building Code
NRV	Non-return valve
PFA	Private fire alarm
PRV	Pressure-relief valve
SSC	Sprinkler system certifier, as defined by NZS 4541
TA	Territorial authority

NOTE – Some of these definitions are from the NZBC and could be amended from time to time. Users should check www.building.govt.nz for the latest definitions and revisions.

1.6 Notations

This standard uses the following notations:

C	Constant according to the internal roughness of the piping as derived from Table 4
d	Mean inside diameter (mm)
D_o	Outside diameter (mm)
f	Yield stress (kPa) as specified in the manufacturing standard
P_i	Pressure available immediately downstream of the hydrant inlet check valve
P_R	Pressure required
P_S	Pressure available at the pump suction inlet
P_w	Working pressure rating (kPa)
Q	Flow rate (L/min)
t	Tubing thickness (mm)
ΔP	Loss of pressure per metre of piping (kPa)
ΔP_H	Pressure gain or loss due to difference in height between the inlet assembly and the pump suction

1.7 Formal interpretations

1.7.1 Review requests

Requests for interpretations, rulings, or clarifications received by Standards New Zealand directly shall be reviewed by a subcommittee of the Fire Hydrant Systems for Buildings Committee (P4510), which prepared this standard.

NOTE – The Fixed Fire Protection Formal Interpretation Committee, which was constituted to deal with queries and interpretations of a number of fire protection standards, has jurisdiction to interpret the wording of the current published edition of the relevant standard only. Matters not mentioned in the standard are outside the scope of this committee and should be dealt with according to normal business practice.

Requests for formal interpretations should be sent to the National Manager, Standards New Zealand, PO Box 1473, Wellington 6140. An administration fee will be collected by Standards New Zealand for the processing of a request.

1.7.2 Formal interpretations

Formal interpretations of this standard shall be made when:

(a) An interpretation of a clause is required;

(b) Ambiguity requires clarification;

(c) Clarification of wording is required because it does not achieve the intent agreed to by the committee.

2 GENERAL REQUIREMENTS

2.1 Approval of a hydrant system

A hydrant system shall be deemed to conform to this standard when:

(a) In the case of a new system or extension to an existing system, the system has been certified by an HSC as complying with this standard; and

(b) The technical requirements of this standard are met; and

(c) The HSC is satisfied that a testing and maintenance contract is in place with a contractor.

2.2 Vehicular access

Vehicular access for the fire brigade shall comply with the requirements of the NZBC for fire brigade vehicular access.

2.3 Pipework and components

2.3.1 Appropriate materials

Materials and components shall be appropriate for ambient environmental conditions, service conditions which apply, and the intended service life.

2.3.2 Pipework materials

Pipework shall consist of the following materials manufactured to internationally recognised standards set out in 2.3:

(a) Mild steel – either black or galvanised and manufactured to a pressure tubing standard (see 2.3.3);

(b) Copper;

(c) Stainless steel;

(d) Plastic (buried pipe only).

In buried applications, the use of suitability-rated plastic pipework, such as medium- or high-density polyethylene that complies with AS/NZS 4130, shall be permitted. Attention is required to ensure that the manufacturer's recommendations for thrust blocks and the like are adhered to, and that backfill is free from sharp debris which could cause pipe failure through abrasion and the like.

Steel pipe shall not be used in buried applications.

2.3.3 Mild steel

Mild steel pipe shall comply with one of the following standards and specifications:

(a) AS 1074;

(b) AS 4041;

(c) ASTM A106/A106M – Grade B;

(d) ASTM A795;

(e) ASTM A135;

(f) ASTM A53;

(g) BS EN 10255;

(h) API specification 5L – Grade B;

or be any other pipe identified as suitable by the HSC.

2.3.4 Hose reels

Hydrant systems used to supply hose reels shall not be reticulated with black steel piping or fittings. In systems containing a booster pump, the pipework on the upstream side of the pump cooling water discharge shall not be black steel.

2.3.5 Piping requirements

2.3.5.1 General

Pipework shall conform to the following requirements concerning standard of manufacture, pressure rating, and method of jointing:

(a) Piping to AS 1074 or BS EN 10255 shall not exceed the working pressures set out in Table 1;

(b) Acceptable jointing methods are:

  (i) Lightweight piping – welded flange, mechanical coupling

  (ii) Medium or heavyweight piping – screwed and socketed, welded flange, mechanical coupling;

(c) Flanges and mechanical couplings shall have a working pressure rating of at least the maximum working pressure to which they will be subject, but not less than 1500 kPa.

Table 1 – Maximum working pressures of pipes to AS 1074 or BS EN 10255

Piping weight and jointing method					
Nominal bore (mm)	**Welded flange or mechanical coupling**			**Screwed and socketed**	
	Light (kPa)	**Medium** (kPa)	**Heavy** (kPa)	**Medium** (kPa)	**Heavy** (kPa)
15	–	8700	10700	4500	6200
20	–	7000	8500	3500	5100
25	–	6800	8500	3400	5100
32	–	5400	7600	2700	4000
40	–	4700	5900	2400	3500
50	3600	4300	5300	2400	3400
65	3200	3400	4200	1900	2700
80	2700	3200	3800	1900	2600
100	2400	2800	3300	1800	2300
150	–	2100	2300	1400	1700
NOTE – Pipework in the main waterway path shall have a minimum bore of 100 mm. The information in this table regarding smaller pipes is for the convenience of the user of the standard for designing connections to hose reel systems, pump house trim, and associated pipework (see 6.2).					

2.3.5.2 Pressure rating calculation for carbon steel piping

The working pressure rating of carbon steel piping manufactured to other AS, ASTM, or BS pressure tubing standards shall be calculated using the following equation (Barlow's formula) to provide a safety factor of 8:

$$P_w = \frac{f \times 2t}{8 \times D_o} \qquad \text{(Eq. 1)}$$

where

P_w is the working pressure rating (kPa)

f is the yield stress (kPa) as specified in the manufacturing standard

t is the tubing thickness (mm)

D_o is the outside diameter (mm)

2.3.5.3 Joints for steel piping

Pipework with a nominal bore of 65 mm or larger shall be jointed using welded flanges or mechanical couplings with a working pressure rating at least 1.5 times the maximum working pressure to which they will be subject, but not less than 1500 kPa.

Pipework with a nominal bore of 50 mm or smaller can utilise threaded joints.

Where galvanised pipe is required, it shall be hot-dipped or galvanised in the pipe mill as part of the manufacturing process. Welding of galvanised pipe is only permitted if the fabrication is then hot-dip-galvanised afterwards.

NOTE –

(1) Carbon steel piping requires a higher safety factor than copper or stainless pipe owing to external corrosion factors.

(2) Black steel piping should have at least one coat of priming paint.

(3) Care is required when selecting mill-galvanised pipe to ensure that the internal weld is adequately protected.

(4) This clause does not preclude the use of 65 mm threaded valves.

2.3.5.4 Copper piping

Copper piping shall meet the following requirements:

(a) It shall be manufactured to conform to NZS 3501, AS 1432, AS 1572, or AS 4809 and shall be jointed using brazed fittings or mechanical couplings;

(b) The minimum wall thickness shall be not less than the sizes stated in AS 1432;

(c) The working pressure rating of the piping shall be calculated by dividing the theoretical bursting pressure by 6, but shall not be less than 1500 kPa;

(d) Fittings shall have a working pressure rating at least 1.3 times the maximum working pressure to which the fittings will be subject, but not less than 1500 kPa.

2.3.5.5 Stainless steel piping

Stainless steel piping shall be manufactured to an ASTM pressure tubing standard, such as ASTM A312. To avoid corrosion, a suitable grade of stainless steel shall be selected for the environment. Grade 316 shall be used in high-corrosion areas or where threaded joints are used.

Stainless steel piping shall meet the following requirements:

(a) All sizes shall be jointed with welded flanges or threaded or mechanical couplings suitable for the working pressures involved;

(b) Post-weld pickling and passivation shall be undertaken in accordance with ASTM A380;

(c) The working pressure rating of piping shall be calculated by dividing the theoretical bursting pressure by 4 but shall not be less than 1500 kPa. Flanges, couplings, and fittings shall have a working pressure rating of at least 1.2 times the maximum working pressure to which they will be subject, but not less than 1500 kPa.

NOTE – The burst pressure of pipework can be estimated using Barlow's formula (see Equation 2):

$$P_w = \frac{f \times 2t}{6 \times D_o} \quad \text{(Eq. 2)}$$

where

P_w is the working pressure rating (kPa)

f is the yield stress (kPa) as specified in the manufacturing standard

t is the tubing thickness (mm)

D_o is the outside diameter (mm)

2.3.5.6 Plastic piping

Plastic piping shall meet the following requirements:

(a) Polyethylene pipe shall comply with AS/NZS 4130;

(b) Plastic pipe can only be used when buried;

(c) Plastic pipe shall have a working pressure rating of at least 1.3 times the maximum working pressure to which it will be subject, but not less than 1500 kPa.

2.3.5.7 Welding on steel piping

All welding on steel piping shall comply with the requirements of BS 2971 for class 2 operating conditions. The provision in BS 2971 to allow alternative joint preparation is permitted by this standard whether or not there is a specific agreement between the contracting parties, provided that for butt-welded piping there is adequate weld penetration. For stainless steel pipework, welding shall comply with the requirements of BS 4677.

2.3.5.8 Certified welders

All welds shall be completed by welders holding current certification in terms of AS/NZS 2980 for the type of welding employed.

2.3.5.9 Heat- and corrosion-resistant piping supports

Piping supports shall be heat- and corrosion-resistant. Dissimilar metals shall be separated by an insulating material to prevent corrosion.

NOTE – Consideration should be given to the exposure of chemical (epoxy) fasteners to fire, which could cause pipe support failure.

2.3.5.10 Piping supports and fixings

Piping supports and their fixings shall conform to NZS 1170.5 and 2.4 of this standard.

2.3.5.11 Explosive-driven fasteners

Explosive-driven fasteners shall not be used unless they are listed for use in fire protection services.

2.3.5.12 Threaded stubs welded to pipework

Where hydrant outlet connections are fabricated using threaded stubs welded to pipework, a suitable anti-corrosion system shall be applied to any exposed thread.

NOTE – Field experience indicates that many outlets which incorporate welded threaded stubs show signs of leakage and corrosion.

2.3.5.13 Automatic air-relief valves

Automatic air-relief valves shall be added to all high points of hydrant systems.

NOTE – To avoid over-pressurisation of the system by the thermal expansion of water, a small-bore pressure-relief valve could need to be installed.

2.4 Seismic resistance

2.4.1 General

Hydrant riser systems shall be designed, detailed, and installed so as to remain operational at the limit state derived from Table 8.1 of NZS 1170.5, or to a higher loading if specified by the building owner.

NOTE –

(1) AS/NZS 1170.0 requires New Zealand design and detail to NZS 1170.5 for earthquakes. In this context, the term 'importance level' refers to the building structure, not the hydrant system itself.

(2) Hydrant systems are classified as parts category P.4 in Table 8.1 of NZS 1170.5.

(3) In new buildings, the seismic design of the hydrant system should be developed in conjunction with that of the building.

(4) The hydrant system should not be damaged or impaired by the movement or failure of non-structural components, or by the movement of structural elements at the relevant serviceability limit state.

2.4.2 Pipework design

Hydrant system pipework shall be provided with a support system designed to resist seismic loads appropriate to the site and importance level (IL) (as defined by clause A3 of the NZBC) of the building, either:

(a) Through a qualified seismic analysis such that the pipework system performance shall be at least equal to that of the building structure under the earthquake loadings of NZS 1170.5 (parts category P.4); or

(b) By complying with the design concepts in NZS 4541 clauses 4.3.12.2 to 4.3.13.7 inclusive.

If any part of the hydrant system is to be braced in common with any other trade, then the support system shall be in accordance with NZS 4541 clause 4.3.12.1(a), taking into account the most onerous requirements of any element that is being supported.

NOTE – NZS 4541 refers to automatic sprinkler system pipework. The term 'design concepts' is intended to mean that where 'sprinkler pipework' is described in NZS 4541, in terms of this context it is synonymous with 'hydrant pipework'.

2.4.3 Heat- and corrosion-resistant materials

Piping supports and fixings shall be resistant to heat and corrosion.

2.4.4 Seismic restraint

Adequate horizontal restraint to meet the seismic loads specified in NZS 1170.5 shall be provided for all heavy components such as pumps, tanks, valves, engines, and batteries to ensure that connections to the plant are secure in a seismic event.

NOTE – NZS 4219 provides guidance for compliance with this requirement.

2.5 Hydrant protection

2.5.1 General

Fire hydrant systems require protection from physical or mechanical damage and temperature changes that can occur due to heating from fire exposure or freezing environmental conditions.

NOTE –

(1) Hydrant system components located within a building's vertical safe path are generally considered to be protected and do not require additional consideration.

(2) For internally located hydrants not within a vertical safe path or lobby, both the potential for mechanical damage and the impact of heating caused by fire exposure on the system components need to be considered.

(3) Externally located above-ground hydrant and system components require protection from possible mechanical damage by vehicles and other similar hazards. Bollards or other protection measures can be used to achieve this, provided they do not obstruct fire brigade access.

2.5.2 Frost protection

2.5.2.1 General

In areas external to the building envelope where system pipework is subject to freezing, the system shall be protected using one of the following:

(a) Trace heating and lagging of pipework as detailed in Appendix E;

(b) Installation of a dry pipe hydrant system as detailed in Appendix F;

(c) Placement of external hydrant pipes underground below the frost line, and fitted with listed dry pillar hydrants, as detailed in Appendix G.

The means of frost-protection shall be approved by the HSC.

NOTE – Appendix H provides recommendations for frost protection measures for fire hydrant systems in cold climate regions.

2.5.2.2 Antifreeze solutions

The use of antifreeze solutions to prevent pipework from freezing is not permitted.

2.5.2.3 Trace heating system limit

Trace heating systems are limited to discrete sections of pipework not exceeding 25 m or two landings.

2.5.2.4 Areas subject to freezing inside the building envelope

The use of a dry pipe hydrant system is not permitted inside the building envelope unless the area is subject to freezing.

2.5.2.5 Refrigerated environments

The use of dry pipe hydrant systems and trace heating systems is not permitted within refrigerated environments. The hydrant system shall be located outside the refrigerated space.

2.5.2.6 Booster pumps in dry hydrant systems

Dry pipe hydrant systems shall not incorporate a booster pump.

2.5.2.7 Seasonal draining of systems

Draining systems exposed to freezing conditions are not acceptable.

2.6 Labelling and signs

2.6.1 Compliance with the standard

All markings, signs, and labels required by this standard shall incorporate indelible markings and, unless otherwise specified or approved as a feature of listed equipment, shall comply with NZS 5807.

With the exception of signs required by 2.6.2 or 2.6.7, signs shall have a red background with either contrasting reflective lettering or non-reflective white lettering.

NOTE – The NZBC Acceptable Solution F8/AS1 could have requirements for signage in addition to those required by this standard.

2.6.2 Hydrant inlet and outlet labelling

Labelling on hydrant inlet enclosures, hydrant outlet enclosures, and externally located hydrant outlets shall incorporate contrasting capital lettering at least 50 mm high.

Hydrant inlet enclosures shall be labelled HYDRANT INLET – KEEP CLEAR.

Hydrant outlet enclosures shall be labelled HYDRANT OUTLET – KEEP CLEAR.

NOTE – Internal outlets that are not located in an enclosure do not require labelling.

External hydrant outlets for low-rise buildings shall be labelled HYDRANT OUTLET – KEEP CLEAR.

In stairwells which do not contain hydrant outlets, signs shall be displayed (as required by 3.2.4) stating NO HYDRANTS IN THIS STAIRWELL in lettering at least 50 mm high. Signs shall be mounted on any door where the fire brigade is likely to gain entrance to the stairwell.

2.6.3 Combined equipment enclosures

The flow gauge attachment point and the fire sprinkler inlet can be housed in the enclosure (see 5.4.3). The enclosure shall be labelled FIRE SPRINKLER INLET – KEEP CLEAR and HYDRANT INLET – KEEP CLEAR, in lettering at least 50 mm high.

The flow test outlet shall be labelled HYDRANT TEST POINT – NOT FOR FIRE SERVICE USE in lettering 25 mm high.

2.6.4 Pump signage

2.6.4.1 General

Pump components that form part of the hydrant system housed within the inlet enclosure shall have:

(a) Start switch(es) labelled either HYDRANT DIESEL PUMP START or HYDRANT ELECTRIC PUMP START;

(b) A red 'pump running' lamp labelled HYDRANT PUMP RUNNING;

(c) A pressure gauge labelled HYDRANT SYSTEM PRESSURE.

There shall also be a clearly visible sign stating CHARGE FEEDERS BEFORE STARTING PUMP in lettering at least 25 mm high.

2.6.4.2 Electric motor isolation switches for pumps

All switches on the protected premises which are capable of isolating the pump shall be clearly labelled HYDRANT PUMP – LEAVE ON in white lettering on a red background.

2.6.4.3 Pump start buttons

A green, clearly labelled manual start button shall be provided on the hydrant pump controller to directly energise the starter contactors.

Each pump start button shall be labelled HYDRANT PUMP START with lettering at least 15 mm high.

2.6.4.4 Pump stop buttons

A red, clearly labelled, easily accessible stopping device that automatically resets or returns to its normal position shall be provided at the pump controller.

2.6.4.5 Pump alarm

The alarm which shows that the pump is running or if a malfunction has been detected (see 7.6.7) shall be labelled HYDRANT PUMP RUNNING/MALFUNCTION ALARM, followed by instructions on whom to contact.

NOTE – It is suggested that the running/malfunction alarm be located at the hydrant inlet, unless another location can be shown to be more appropriate (such as one normally staffed).

2.6.5 Hydrant pipework identification

Pipework associated with hydrant systems shall be identified.

NOTE – NZS 5807 is an acceptable method of identification.

2.6.6 Pressure gauge and valve labelling

The function of pressure gauges and valves shall be clearly labelled, along with the correct normal position of valves.

2.6.7 Hydrant pump signage

The hydrant pump shall be identified by a location plate fixed to the outside of an external wall adjacent to the fire brigade entry point. If necessary, a further plate shall be placed on any opaque door within the building which has to be opened in order to gain access to the hydrant pump. Such plates shall state TO FIRE PUMPS in contrasting, reflective lettering at least 25 mm high.

NOTE – See Appendix J for further information.

2.6.8 Hydrant test points

Hydrant test points shall be labelled HYDRANT TEST POINT – NOT FOR FIRE BRIGADE USE in lettering at least 25 mm high.

2.7 Preliminary approval of basic design decisions

2.7.1 Hydrant system features to be approved before installation

Before installation begins, approval shall be obtained from the HSC for the following features of a hydrant system intended to comply with this standard:

(a) Location of hydrant outlets;

(b) Where non-standard systems are provided in accordance with 3.2.3, provide evidence of fire brigade consultation;

(c) Location of the hydrant inlet;

(d) Location of piping forming the main waterway;

(e) Location of pump units (where required);

(f) System design flow;

(g) Pressure required at the downstream connection of the inlet;

(h) Type of pump unit driver;

(i) Intended flow/pressure curve characteristics for each pump;

(j) Provisions for riser flow tests;

(k) Schedule of periodic inspections during construction (see 8.4);

(l) Notification of where water supplies can be drawn to supply the hydrant system;

(m) A copy of the fire engineering design and fire protection services design documentation (where applicable).

2.7.2 Information required

An application for such approval shall be in the form required by the HSC and shall include:

(a) Typical cross-sections and floor plans showing hose arcs;

(b) Height of the highest hydrant outlet above the hydrant inlet;

(c) A schematic drawing of the hydrant system;

(d) Hydraulic calculations that incorporate a dimensioned node diagram of the hydrant system waterway, as built, including details of pumps (where included), pressure control valves, and all fittings;

(e) Details of pump and driver selections;

(f) Details of pressure-control facilities;

(g) Basis of seismic design;

(h) Fire brigade approval of hydrant inlet location;

(i) Where the design is based on Appendix A, copies of correspondence with the fire brigade confirming acceptance of the design;

(j) Schedule of progressive inspections and flow tests;

(k) A block plan showing:

    (i) Scale

    (ii) North point

    (iii) Location of the hydrant inlets

    (iv) Location of hydrant outlets

    (v) Location of pump sets

    (vi) Power supply route for electric pumps.

2.8 Electrical bonding

All sections of the hydrant system's conductive piping system shall be equipotentially bonded to the building's electrical installation main earth bar. The hydrant piping system shall not be used as an earth continuity conductor.

The cross-sectional size and conductor material requirements of the equipotential bonding cable shall be to AS/NZS 3000 requirements.

Each and every building on the installation that is fed downstream of an underground installation connection shall require earthing in accordance with this clause.

NOTE – 'Equipotential bonding' means bonding together to prevent voltage differences between earthed items in the electrical installation and the hydrant conductive piping system.

3 DESIGN CRITERIA

3.1 Pressure required at outlet

When the number of hose streams (as specified in the design) are operating simultaneously at the flow rate stipulated by the design, the pressure available at each hydrant outlet shall be not less than that required by Table 2a or Table 2b, nor more than that permitted by 6.3.1.

NOTE – A system of external hydrants is exactly the same as an internal hydrant system in that the fire brigade is required to supply the necessary water flow and pressure to the hydrant system inlet.

3.2 Number and spacing of outlets

3.2.1 Per floor

If a multi-storey building has a hydrant system, hydrant outlets shall be located on every level, including the entrance or access level(s).

NOTE – Previous editions of this standard exempted the need for hydrant outlets on a building's main entry level. This exemption is no longer permitted.

If a low-rise building has a hydrant system, hydrant outlets shall be located so as to provide coverage as required by this clause, other than where the 75 m hose run from the hardstanding provides coverage.

NOTE – For low-rise buildings, the preferred approach is to use a system of external hydrant outlets located close to the building's entry points. These hydrant outlets are intended for interior firefighting (using the building's fire protection system) and are part of a hydrant system distinct from in-ground hydrants provided for water supply.

Sufficient hydrant outlet assemblies shall be installed in locations complying with 3.2.2 to ensure that every point on any floor is covered by an arc measured from the door entering the building or fire cell as outlined in Tables 2a and 2b. Appendix D provides examples for low and high fire hazards.

NOTE – To ensure effective hose coverage in multi-storey buildings with a complex architectural geometry, it could be necessary to demonstrate that the maximum allowable actual hose run to each remote area within the applicable coverage arc (50 m for internal hydrants and 75 m for external hydrants, as measured from the point of the outlet or hardstand) can be catered to. Typical buildings where this would apply are hotels and other residential-type buildings with long corridors. Where substantial shortfalls occur, additional hydrants will be required, or an approach suggested in Appendix A should be used.

Where the hydrant outlet is more than 5 m from the point of entry to the building or fire cell, the distance between the hydrant and the door shall be allowed for. This distance is to be subtracted from the allowed arc length, and this reduced arc distance is to be used to calculate coverage from the point of entry to the building or fire cell.

Where the hose runs are reasonably predictable, the hydrant shall be located so that the maximum allowable hose run for a high-rise building is 50 m, and 75 m for external hydrants.

NOTE – Typical buildings where this would apply include hotels and other residential buildings.

Canopies where goods are stored or handled are to be included in the arc coverage. Outlets can be located under canopies where the total wall area is at least 50% open. Such outlets shall be considered 'external outlets' with respect to 3.2 and 4.4.

Where there is door access to a roof level, provide at least one hydrant outlet at the roof-level door access. Where there are occupied spaces at roof-level, comply with 3.2 for these spaces.

NOTE – An occupied area is any space in which a person will be present from time to time during the intended use of the building. These spaces include areas such as viewing decks and plant platforms.

Table 2a – Maximum allowed arc length – Low fire hazard

Outlet location and building type	Minimum outlet pressure required[a]	Sprinklered building maximum arc length[b]	Unsprinklered building maximum arc length[b]
Internal	600 kPa	40 m	32 m
External, low-rise	750 kPa	60 m	Not permitted
External, low-rise	850 kPa	Not applicable	60 m

[a] The main reason for differences in hydrant outlet pressures is due to the different branches (nozzles) used. A 600 kPa outlet pressure is based on a low-pressure branch typically used in a multi-storey building. An 850 kPa outlet pressure is based on a high-pressure branch typically used in a warehouse or storage building. Concessions have been made for some sprinklered buildings where the sprinkler system is expected to achieve fire control, meaning the hydrant system does not need to supply as much water, so a low-pressure branch can be used.

[b] The use of 60 m arcs from an external hydrant allows for three 25 m lengths of hose to be used (75 m hose run), as opposed to a 32 m or 40 m arc from an internal hydrant allowing two lengths of hose (50 m hose run). Internal hydrant riser packs are supplied with two lengths of hose, and there is not adequate space internally to manage more lengths of hose.

Table 2b – Maximum allowed arc length – High fire hazard

Outlet location and building type	Minimum outlet pressure required[a]	Sprinklered building maximum arc length[b]	Unsprinklered building maximum arc length[b]
Internal, low-rise	600 kPa	40 m	Not permitted
Internal, low-rise	850 kPa	Not applicable	32 m
External, low-rise	850 kPa	60 m	60 m

[a] The main reason for differences in hydrant outlet pressures is due to the different branches (nozzles) used. A 600 kPa outlet pressure is based on a low-pressure branch typically used in a multi-storey building. An 850 kPa outlet pressure is based on a high-pressure branch typically used in a warehouse or storage building. Concessions have been made for some sprinklered buildings where the sprinkler system is expected to achieve fire control, meaning the hydrant system does not need to supply as much water, so a low-pressure branch can be used.

[b] The use of 60 m arcs from an external hydrant allows for three 25 m lengths of hose to be used (75 m hose run), as opposed to a 32 m or 40 m arc from an internal hydrant allowing two lengths of hose (50 m hose run). Internal hydrant riser packs are supplied with two lengths of hose, and there is not adequate space internally to manage more lengths of hose.

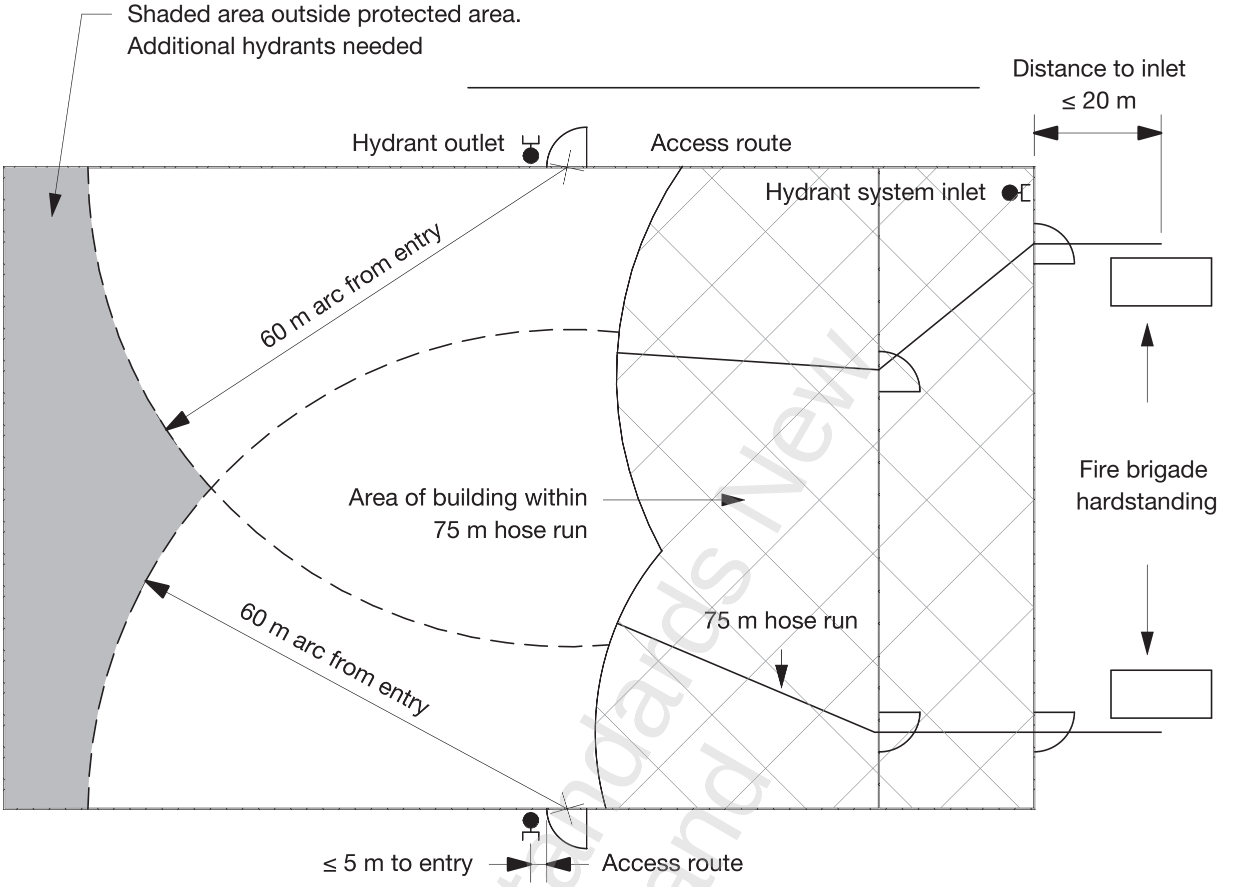


Figure 1a – Low-rise building – Hose run/arc coverage shortage

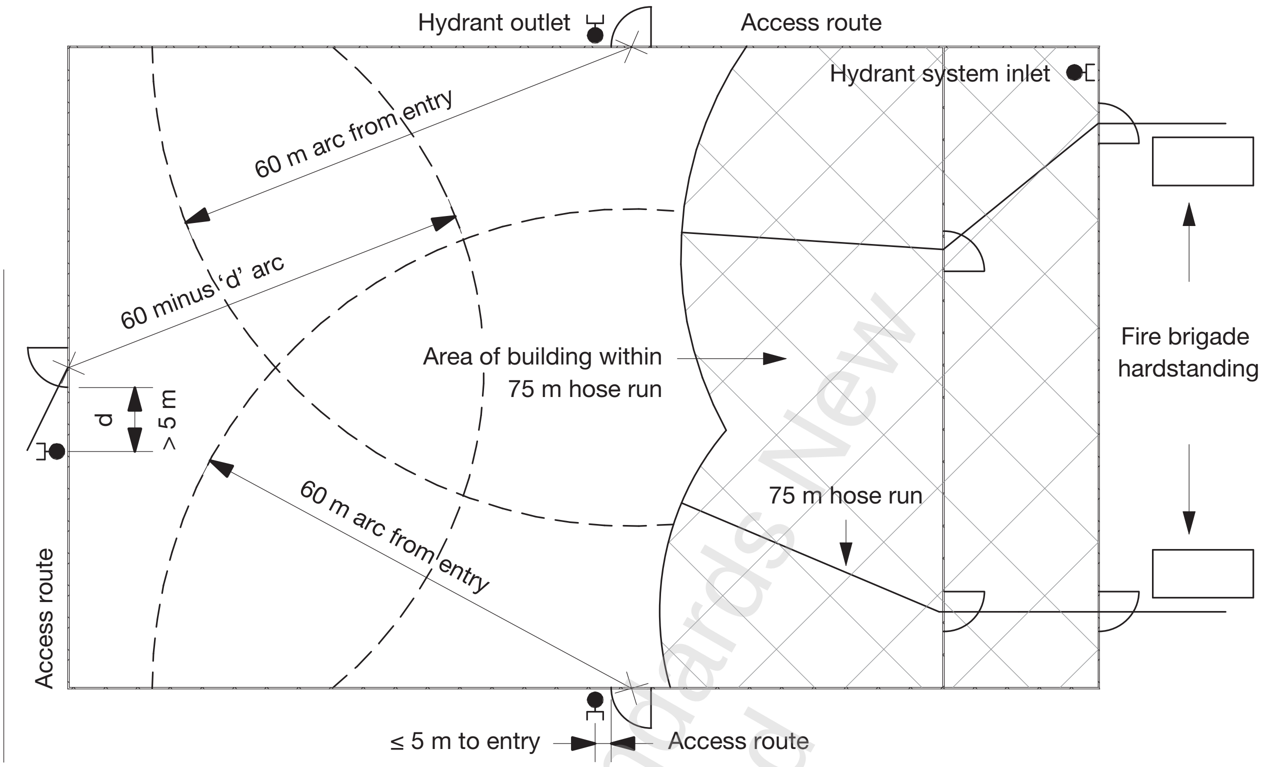
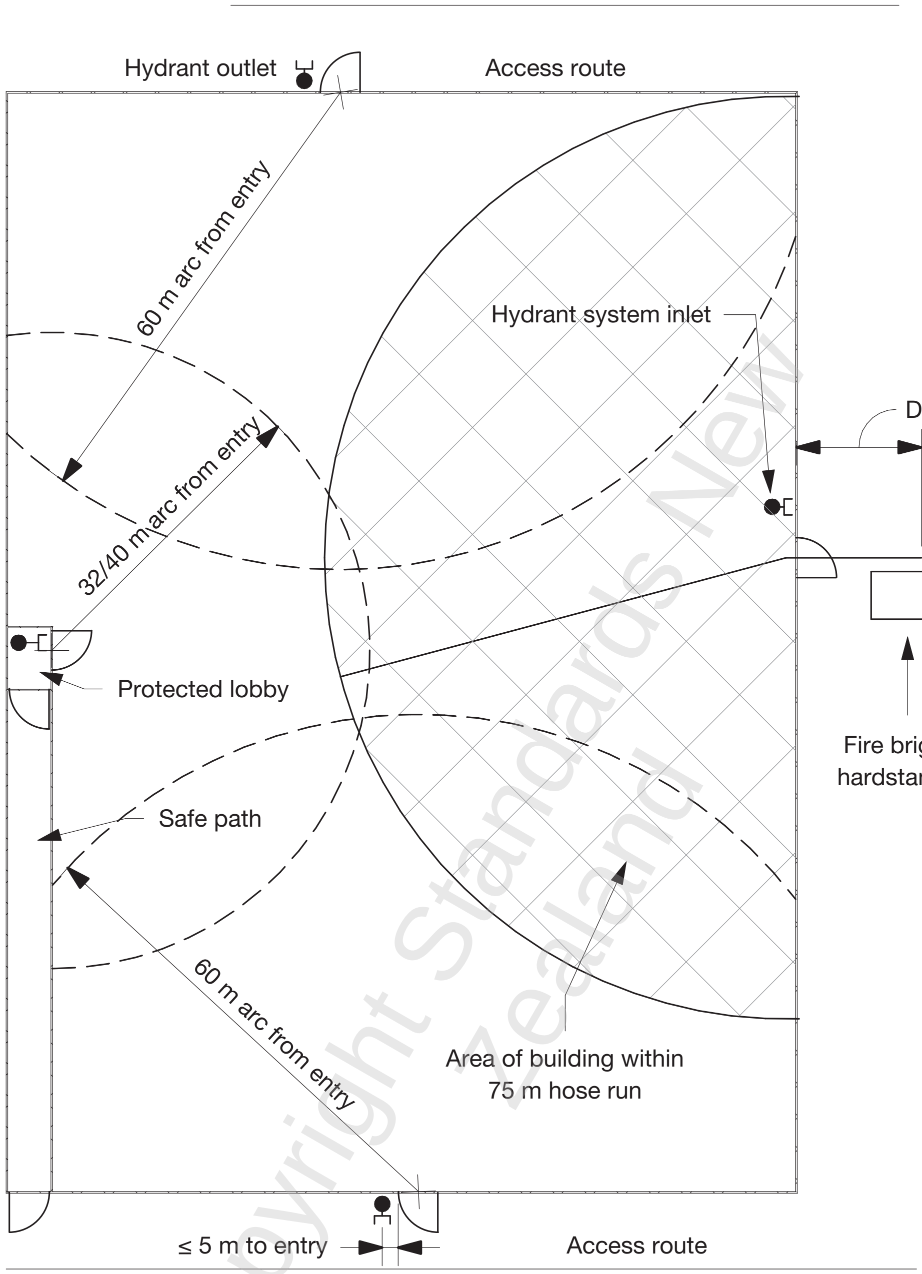


Figure 1b – Low-rise building – Addition of external hydrant to provide hose run coverage



NOTE – In Figure 1c, the shorter arc from the safe, or protected, lobby is based on there not being adequate space for three hose lengths within the lobby. The arc length is therefore 32 m for non-sprinklered buildings, and 40 m for sprinklered buildings, as opposed to 60 m.

Figure 1c – Low-rise building – Addition of safe path to provide hose run coverage

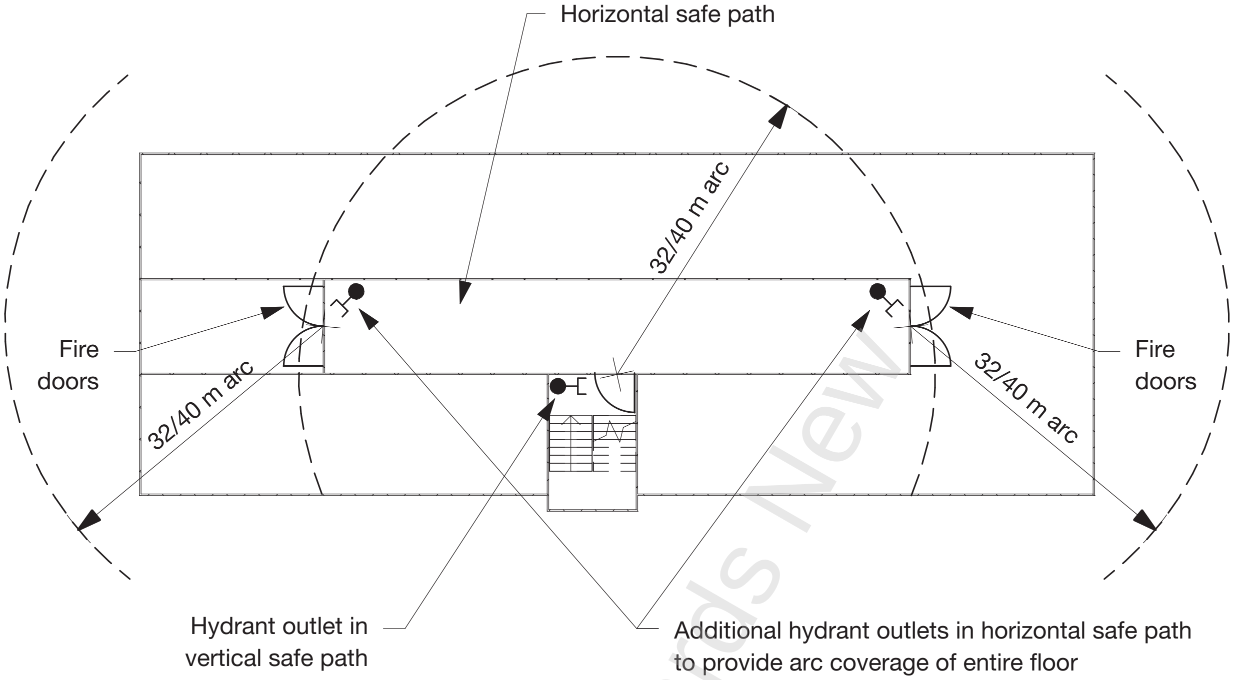
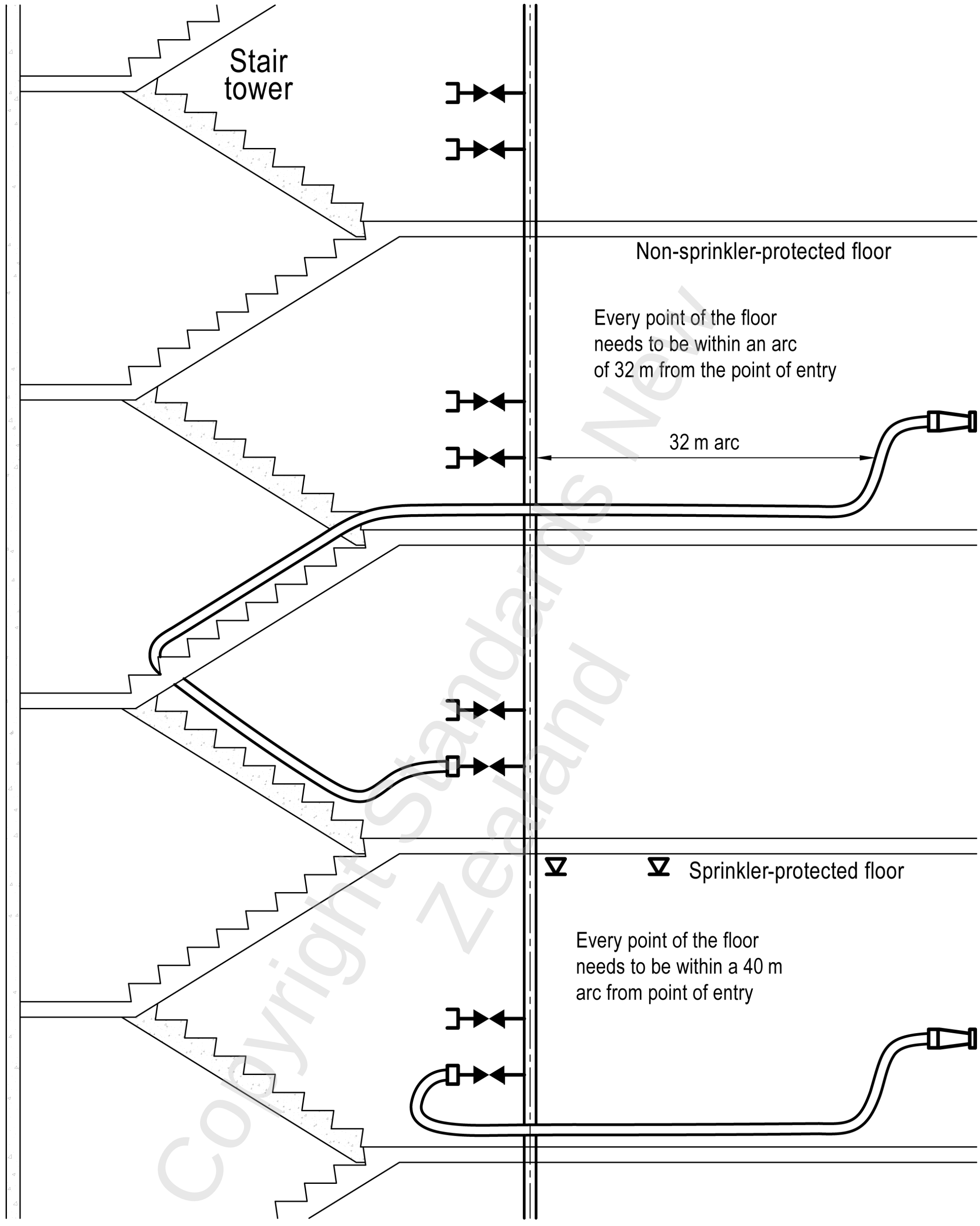


Figure 1d – Hydrants in horizontal safe paths



NOTE – See 1.5 and Appendix K for the meaning of abbreviations and graphical symbols in Figure 2.

Figure 2 – Measurement of hose length

3.2.2 Outlet locations

3.2.2.1 Permitted locations

Hydrant outlets shall be installed in locations that are safe for the fire brigade to access and allow ready and efficient usage. Locations for hydrant outlets include:

(a) Building exteriors;

(b) Protected lobbies connected to a horizontal safe path in low-rise buildings (see Figure 1c);

(c) Vertical safe paths on floor or mid-floor landings;

(d) Horizontal safe paths in multi-storey buildings provided that:

- (i) The horizontal safe path is connected to a vertical safe path that contains hydrant outlets on every level
- (ii) The outlet or outlets are within the appropriate hose arc from the vertical safe path
- (iii) There is a maximum of one additional outlet in any direction
- (iv) A fire-rated door is provided (see Figure 1d):
  - (A) To subdivide the horizontal safe path if it extends past the location of the outlet
  - (B) At the entry to a different fire cell;

(e) As an alternative to (c), outlets can be located in protected lobbies provided:

- (i) The lobby is directly adjacent and provides access to the vertical safe path
- (ii) The lobby is protected to at least the same fire rating as the vertical safe path
- (iii) The area of the lobby is at least 5 m^2 but does not exceed 20 m^2
- (iv) The lobby does not contain any fire load, and is not used for storage or any other purpose
- (v) If a lift opens into the lobby, the lift is protected by a lobby meeting the same requirements on every level it serves
- (vi) The outlet assembly is within 5 m of the door to the vertical safe path.

3.2.2.2 Excluded locations

Hydrant outlets shall be at least 10 m from any main electrical distribution equipment such as transformers and distribution boards, and from liquefied petroleum gas and other combustible yard storage.

NOTE – In the context of this clause, this is intended to apply to 400 V AC and greater electrical distribution equipment.

3.2.3 Non-standard design

Where full coverage of every floor cannot be achieved based on the criteria in 3.2.1 and 3.2.2, the design can be approved on a performance basis. In such situations, compliance with this standard shall be subject to the fire brigade's approval of the hydrant outlet layout and range of coverage. Appendix A provides guidance on considerations when developing a non-standard design. All other aspects of the standard shall be complied with.

3.2.4 Outlets in every stair

Hydrant outlets are not required in every stairwell (or protected lobby directly accessible from the stairwell), provided there is a warning sign, as specified in 2.6.1, indicating at each level with external access (or on the landing at that level) which stairwells do not have hydrant outlets.

3.2.5 Scissor staircases

Where hydrants are located in a scissor stairwell serving a common protected lobby or floor area, hydrant outlets shall be located at each floor level accessible from the stairwell designated for fire brigade use.

3.3 Required flow rates

3.3.1 Buildings fitted with an approved fire sprinkler system

For buildings fitted with an approved sprinkler system, the design number of hose streams in simultaneous use shall be three, flowing at 500 L/min each (the total design flow shall be 1500 L/min).

The design number of flowing streams per floor shall be two on the hydraulically most remote floor, with the third stream on the floor immediately adjacent.

For single-storey buildings, the three most hydraulically remote hydrants shall be designed to flow.

3.3.2 Unsprinklered buildings

For unsprinklered buildings, the design number of hose streams in simultaneous use shall be determined using Table 3. The minimum design flow rate for each hose stream shall be 440 L/min.

NOTE – An outlet assembly has two hose couplings. Therefore, the number of simultaneous hose streams operating shall be twice the number of hydrant outlet assemblies required to meet 3.2, up to a maximum of 12 hose streams flowing at a minimum rate of 440 L/min per hose stream.

Table 3 – Determination of design number of simultaneous hose streams in unsprinklered buildings

Greatest number of hydrant outlet assemblies required on any floor (see 3.2)	Design number of hose streams flowing for a single-level, low fire hazard building	Design number of hose streams flowing for a single-level, high fire hazard building	Design number of hose streams flowing for a multi-storey building
1	2	2	4
2	4	4	8
3	5	6	10
4	6	8	12
5	7	10	12
6	8	12	12

3.4 Pressure requirement for booster pumps

3.4.1 Pressure calculation

It shall be demonstrated by calculation that the pressure immediately downstream of the hydrant inlet check valve (P_i = 1000 kPa) is adequate to meet the pressure required at every hydrant outlet, using the calculation methodology outlined in 6.5.

If an inlet pressure of 1000 kPa immediately downstream of the hydrant inlet check valve is inadequate to meet the pressure required at every hydrant outlet, one or more booster pumps shall be provided in accordance with 3.4.2.

Where pumps supply a combined sprinkler-and-hydrant system as described in Appendix B, they shall be sized for simultaneous hydrant and sprinkler flows.

3.4.2 Booster pump requirements

In buildings protected by an approved sprinkler system, at least one booster pump is required.

In buildings not fitted with an approved sprinkler system:

(a) If the required boost is less than 200 kPa, one booster pump shall be required;

(b) If the required boost is greater than 200 kPa, 100% redundancy in pumping shall be provided.

3.5 Pipework to be charged with water

3.5.1 All sections at positive pressure

Unless the requirement for frost protection precludes this, every section of the hydrant system pipework shall be kept charged with water at a positive pressure of at least 15 kPa by means of a permanently connected pressurised water supply.

NOTE – If a pressurising pump is used to pressurise the system, a larger pressure differential could be required in order to detect the pressure drop required to start the pump.

3.5.2 Supply flow

The pressurised supply shall be through a pipe of not less than 15 mm nominal bore and be capable of maintaining a flow of 25 L/min. It shall be controlled only by a locked-open indicating valve labelled FIRE HYDRANT SYSTEM: NORMALLY OPEN. A backflow-prevention device (or, where the pipe is not connected to a potable water supply, a check valve) shall be provided in this connection. The backflow-prevention unit shall be in a position that allows access for inspection and maintenance.

3.5.3 Supply with booster pumps

If a system includes a booster pump or pumps, the point of connection shall be in accordance with Figure 13 or Figure 14.

The flow rate shall also be sufficient to provide the total water required for pump- and driver-cooling when all pumps are operating at maximum load under test conditions.

3.5.4 Supply with hose reels

Where the hydrant system forms part of the reticulation for hose reels in the building, the required flow rate in 3.5.3 shall be increased by a flow equivalent to the simultaneous operation of the two most favourably placed hose reels. The required pressure shall be sufficient to ensure compliance with NZS 4503 when any two reels are operating.

NOTE – The pressure limits of different hose reel assemblies vary.

3.6 Optional provision of pressurised water source

3.6.1 Permanently piped connections

An owner can elect to provide a permanently piped connection from a reliable pressurised water source to the hydrant system so that firefighting hose streams can be established prior to the fire brigade's arrival. This shall only be permitted if, with regard to the flow and pressure characteristics of the water source, there will be pressure of at least 600 kPa when the system is delivering a flow of 1500 L/min, sustained for at least 30 minutes, to any hydrant outlet.

3.6.2 Booster pump for permanently piped connections

Should it be necessary to use a booster pump to meet the requirements of 3.6.1, either an electric motor or diesel-driven pump, conforming to section 7 and arranged to start automatically on detection of a pressure drop, shall be provided for this purpose. The pump can also function as a booster pump for the primary function of the hydrant system.

The automatic starting arrangements and components shall be of a type listed in NZS 4541.

NOTE – Incorporation of a pressurised water source is not recommended unless, associated with the hydrant system outlets, there are cabinets containing adequate hose and branches, so that such equipment is routinely maintained in good condition, and staff are trained in the safe and correct use of the equipment. The fire brigade should be consulted on these matters.

4 HYDRANT OUTLETS

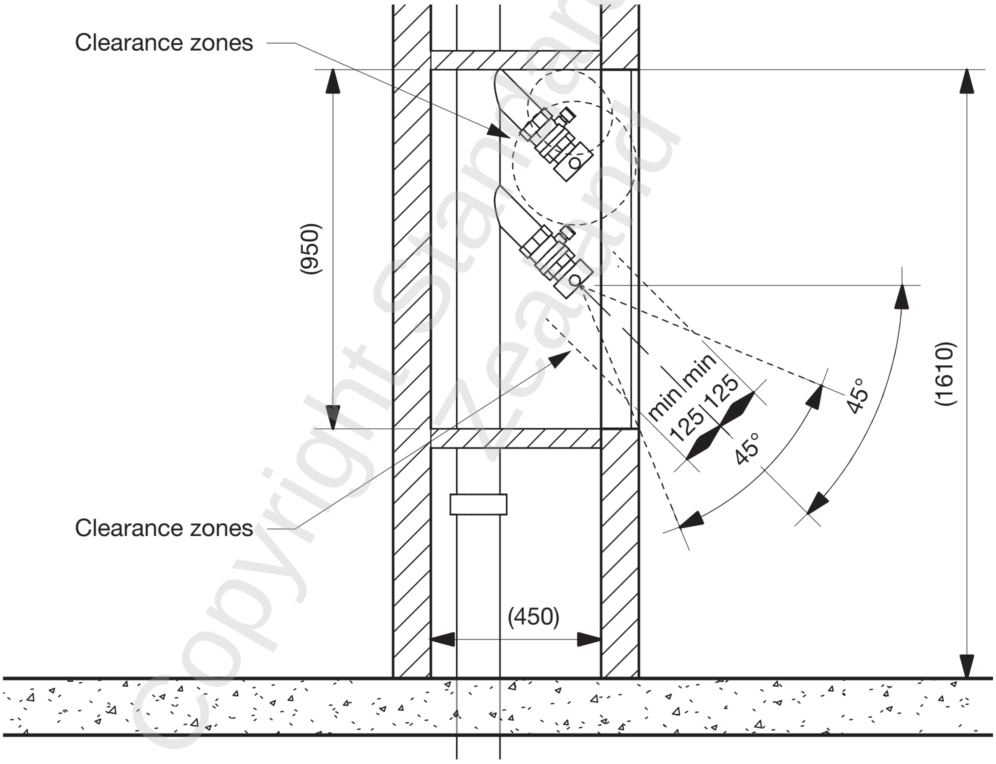
4.1 Locations

Hydrant outlets shall be located in accordance with 3.2.

4.2 Enclosures

4.2.1 Dimensions

Hydrant outlets located in an enclosure or recess shall be configured and arranged to ensure that delivery hoses can be connected to the couplings without kinking. The enclosure shall be large enough 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. Clear space around the valves is to be maintained (see 4.3.3 and Figure 3).



NOTE –

(1) Enclosures are permitted but are not required by this standard.

(2) Measurements are in mm. Dimensions in brackets are indicative only and subject to component selection, construction methods, and so on.

Figure 3 – Hydrant outlet enclosure – Section view

4.2.2 Door clearance

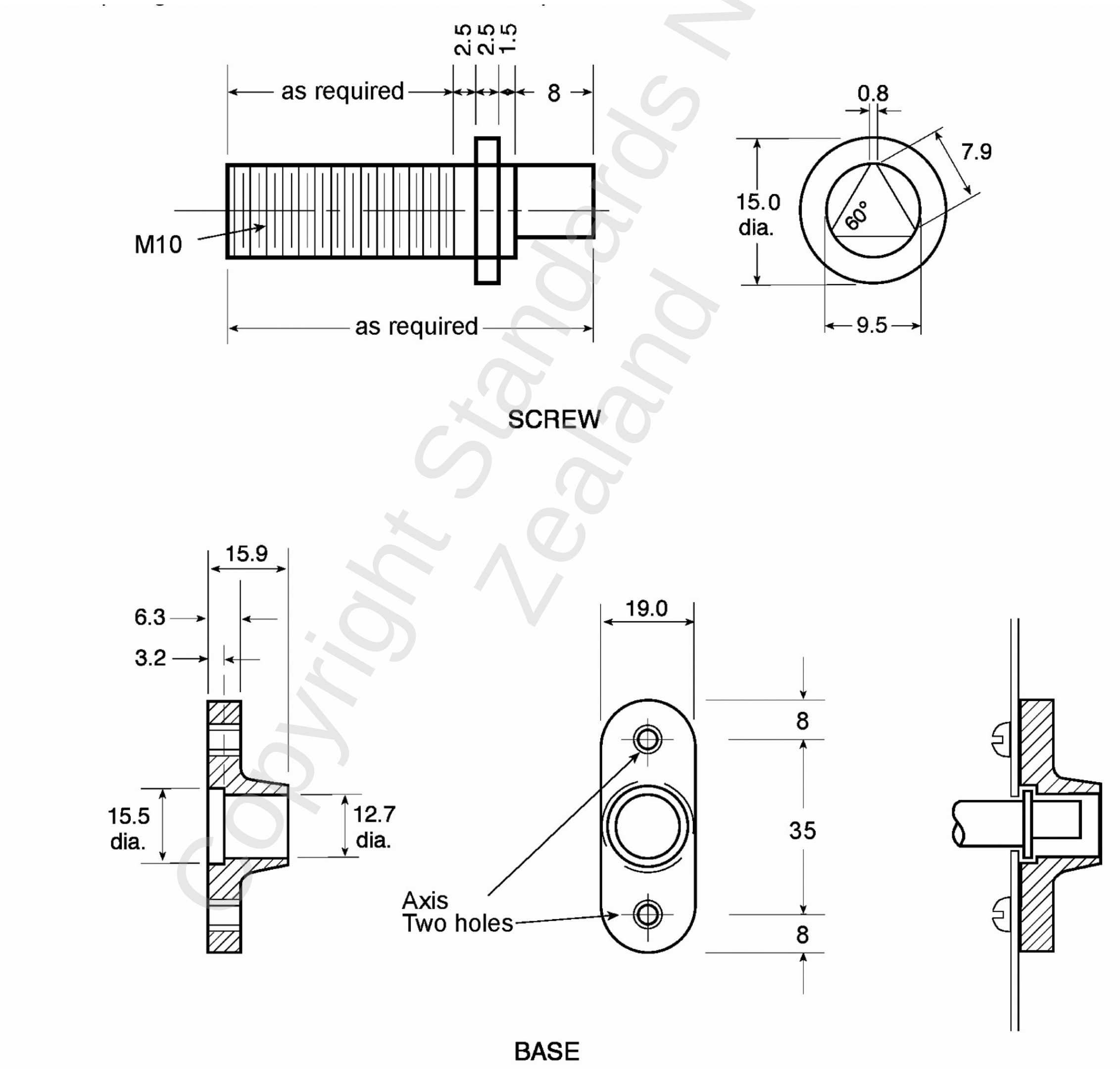
Doors shall open to allow free and clear access and efficient operation of the hydrant outlet.

4.2.3 Enclosure doors

Any locked 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 the panel.

The breakout panel should be designed so that, on removal, no sharp edges shall remain.

Any door lock shall be triangular as shown in Figure 4 and require no more than five revolutions to open.



NOTE – Measurements are in mm.

Figure 4 – Details of a triangular door lock

4.2.4 Hand-operated firefighting equipment

Hydrant outlet enclosures can incorporate a hose reel or other fire equipment; in such cases the door shall not be locked.

Hose reels shall not be mounted on the enclosure door.

In all cases, the clearances specified in 4.3.3 shall be maintained.

NOTE – Hydrant outlet enclosures should not be used to house services other than those related to fire safety.

4.3 Outlet assembly

4.3.1 General

Each hydrant outlet shall incorporate two double-lugged, instantaneous female hose couplings or double-pull, single-lever female adaptors conforming to 6.1.6 of SNZ PAS 4505. Each coupling shall be controlled by one of the following:

(a) A lever-operated ball valve;

(b) A handwheel-operated landing valve;

(c) A pressure-reducing valve that incorporates a handwheel shut-off (one per coupling), and a tool-adjusted, pressure-reducing setting which shall be sealed at the set pressure.

NOTE –

(1) An example of a location where lever-operated ball valves will not necessarily be fit for purpose is an area where environmental conditions could cause corrosion, which could seize the operating lever.

(2) Lever-operated ball valves are not suitable for throttling purposes. The type of hydrant outlet specified in this standard is based on the expectation that the fire brigade opens the hydrant outlet fully and controls the flow at the hose nozzles. Where hydrant outlets can be used by the building's occupants for non-firefighting purposes, and flow is required to be controlled at the hydrant outlet, the use of alternative valves such as landing valves described in SNZ PAS 4505 could be required.

(3) Aluminium couplings should not be used in corrosive environments.

(4) Clause 4.2 of NZS 3604 provides guidance for building exposure to wind-driven sea salt. Areas in Zone B would be normally be considered to have little risk from wind-blown salt deposits.

(5) Areas in Zone B could have areas with corrosive microclimates due to industrial contamination and corrosive atmospheres, contamination from agricultural chemicals or fertilisers, or geothermal hotspots.

4.3.2 Coupling position

The axis of each coupling shall be 45° down from the horizontal, with lugs positioned horizontally. Lever-operated ball valves shall be positioned so that the lever opens towards the operator.

NOTE – Couplings need not be side by side.

4.3.3 Clearances

There shall be at least 150 mm clear space around the outer edge of the lugs, unless lever-action lugs are provided (to operate both lugs simultaneously). In this instance, there shall be at least 100 mm clear space to allow access to operate the lever.

There shall be at least 100 mm clear space to allow access to operate the ball valves or handwheels. See Figures 5a to 5d.

There shall be unobstructed access to a clear space of 1200 mm in front of the couplings. Couplings shall be installed between 550 mm and 1350 mm above the finished floor level (see Figures 5a and 5b).

4.3.4 Operating levers

The operating lever of the ball valve shall be configured so that the hydrant opens by pulling the lever towards the user. The ball valve handle shall be in the horizontal plane.

4.3.5 Blanking caps

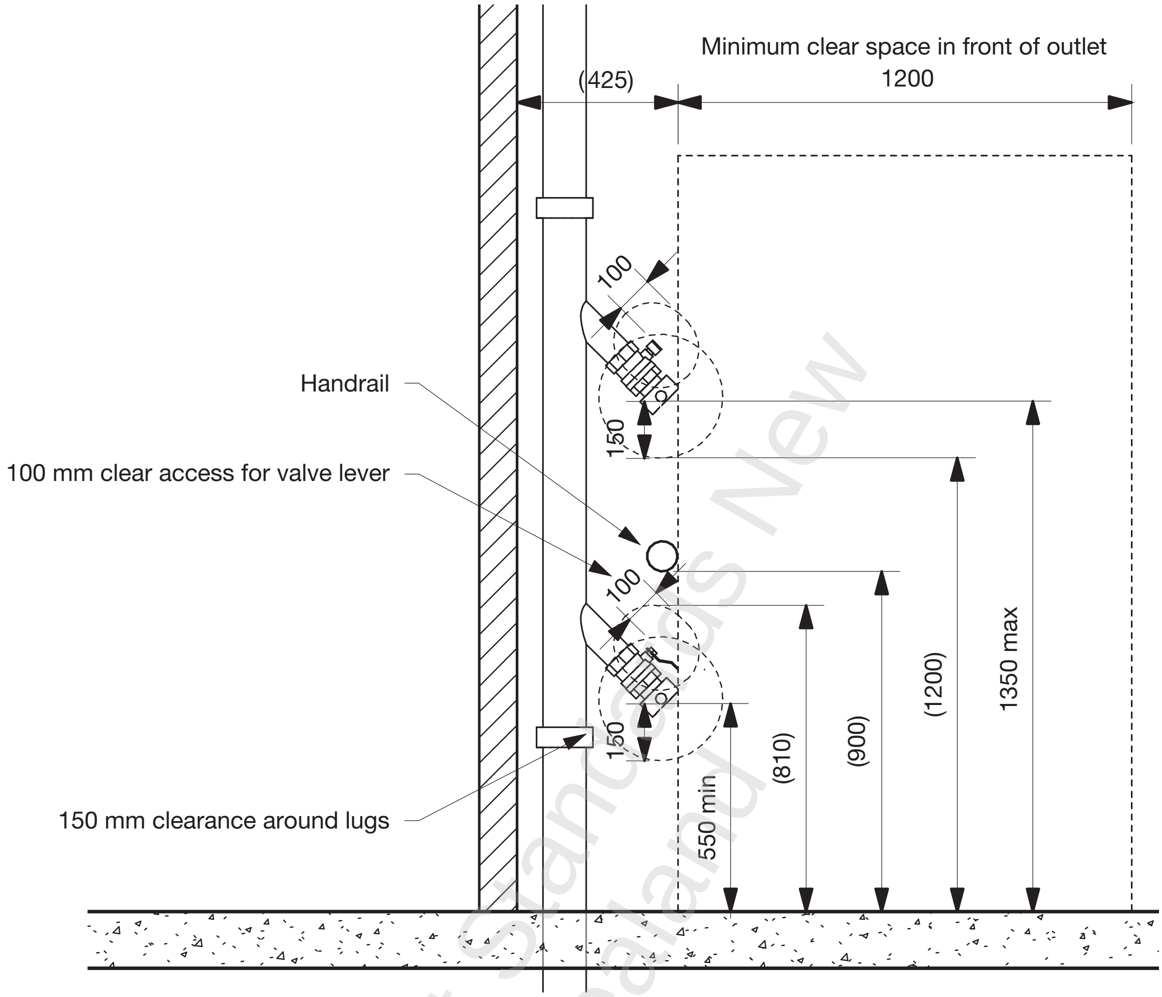
Although blanking caps are not required, if they are fitted to hydrant outlets, they shall have a nominal 5 mm hole.

NOTE – The purpose of the hole is to relieve pressure behind the blanking cap should the hydrant be inadvertently opened with the cap in place. It can be dangerous to attempt to remove the cap if the pressure cannot be relieved.

4.3.6 Valve locks

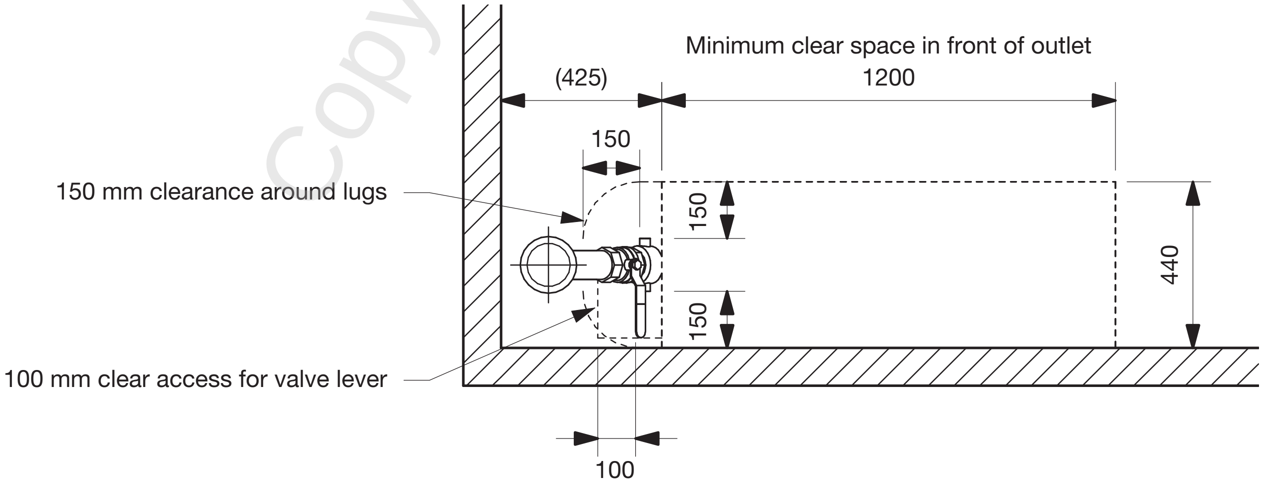
Where the building owner requires valve locks, they can be locked by a Lockwood 144 padlock or a listed equivalent.

NOTE – A listed equivalent lock is expected to be able to be opened using a Lockwood 144 key.



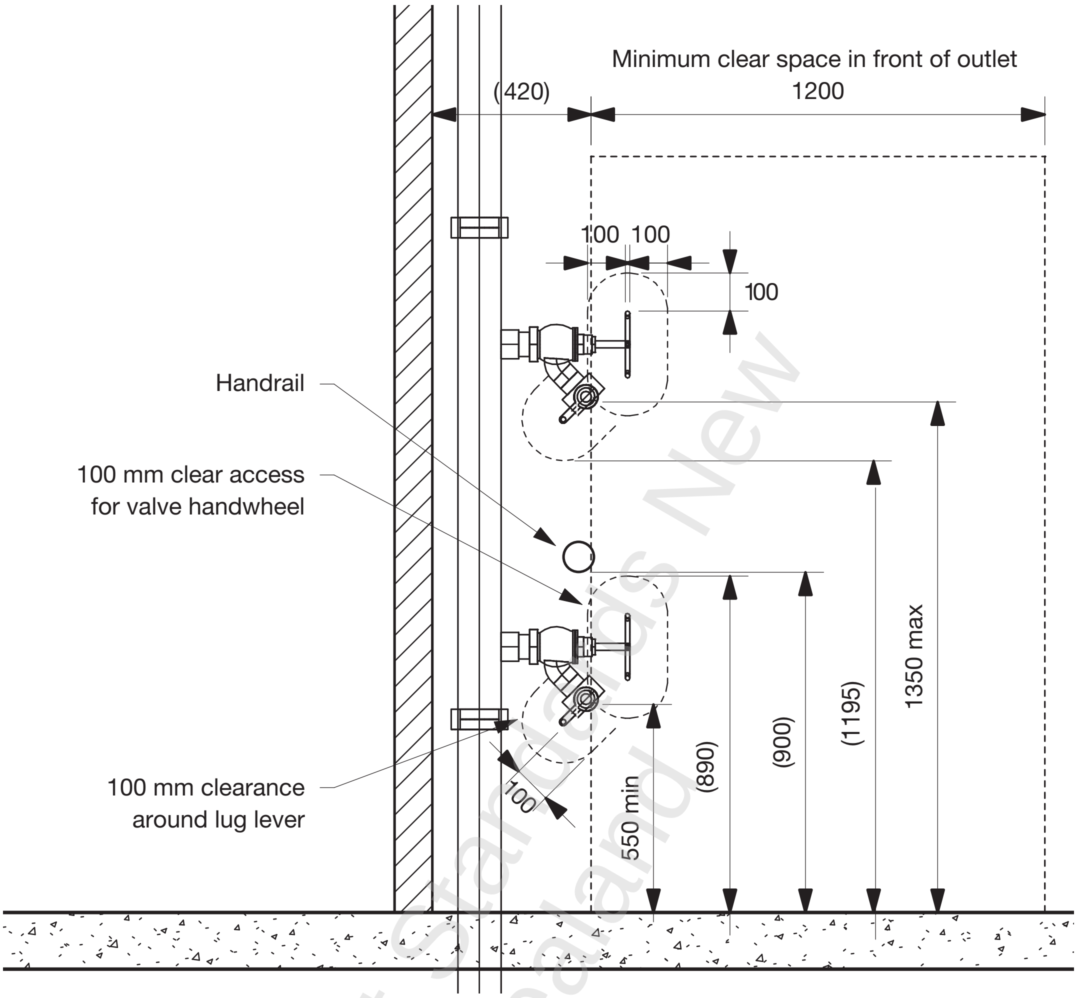
NOTE – Dimensions (in mm) in brackets are indicative only and subject to component selection, construction methods, and so on.

Figure 5a – Hydrant outlet – Section view



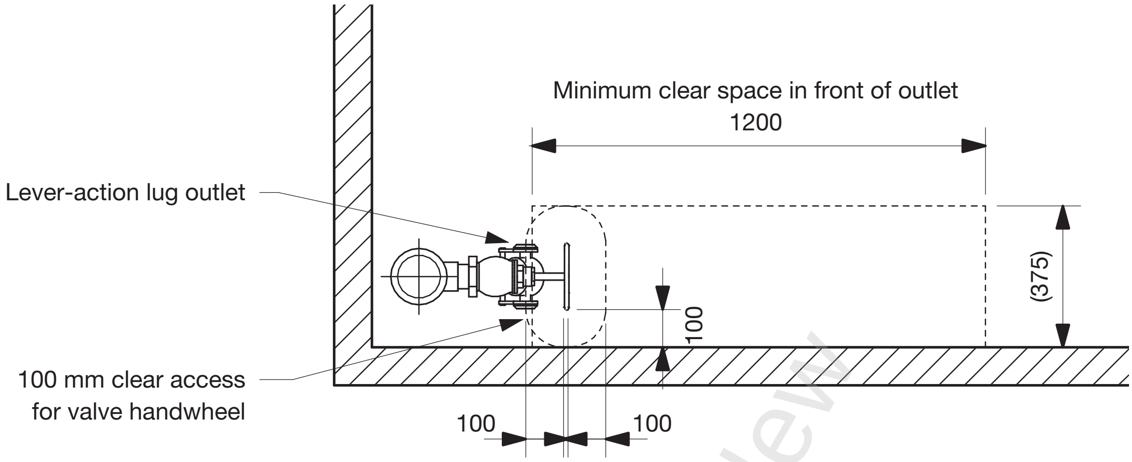
NOTE – Dimensions (in mm) in brackets are indicative only and subject to component selection, construction methods, and so on.

Figure 5b – Hydrant outlet – Plan view



NOTE – Dimensions (in mm) in brackets are indicative only and subject to component selection, construction methods, and so on.

Figure 5c – Hydrant outlet – Handwheel and lever-action lug outlet – Section view



NOTE – Dimensions (in mm) in brackets are indicative only and subject to component selection, construction methods, and so on.

Figure 5d – Hydrant outlet – Handwheel and lever-action lug outlet – Plan view

4.4 Fire protection

Where hydrant outlets are located externally to provide extended coverage (such as for large-footprint buildings) and the building is not protected by a sprinkler system, the hydrant outlets shall be protected from fire by either:

(a) Construction:

(i) Having an FRR of 60/60/60, and

(ii) Extending 2 m each side of the hydrant outlet (see Figures 6a and 6b), and

(iii) Extending not less than 3 m above the ground adjacent to the hydrant or the height of the building, whichever is the lesser (see Figure 6c), and

(iv) No closer than 2 m to a non-rated opening into the building (see Figure 6a); or

(b) A minimum 10 m horizontal separation between the nearest unrated portion of the building (including the canopy edge) and the hydrant position (see Figures 6d and 6e).

NOTE – For sprinklered buildings, there is no requirement for separation between the building and hydrants. See Figures 6f and 6g.

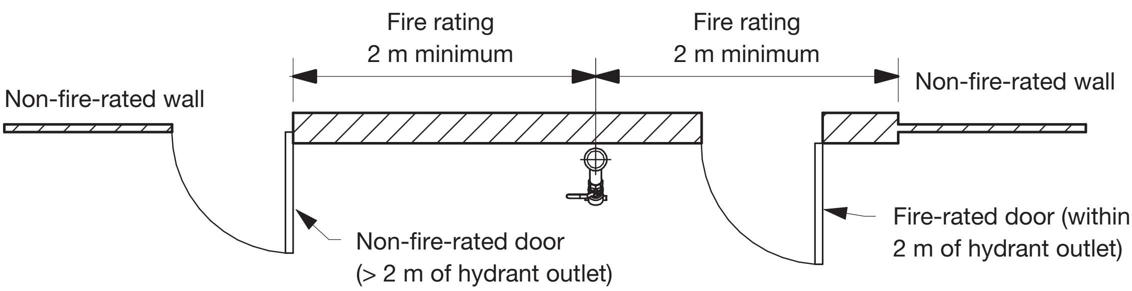


Figure 6a – Unsprinklered building – Hydrant outlet protection – Fire rating options with doors – Plan view

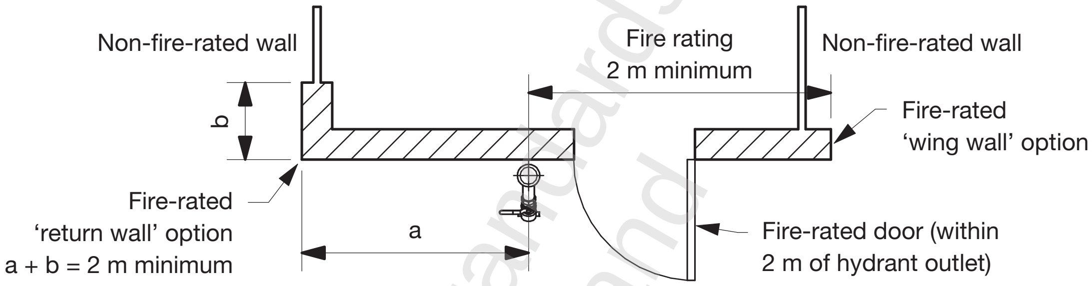


Figure 6b – Unsprinklered building – Hydrant outlet protection – Fire rating options at building corners – Plan view

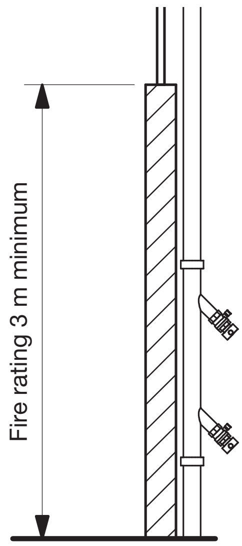


Figure 6c – Unsprinklered building – Hydrant outlet protection – Fire rating required – Section view

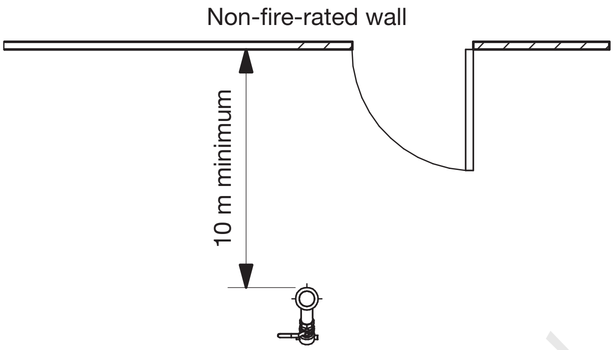


Figure 6d – Unsprinklered building – Hydrant outlet protection – Separation distance option – Plan view

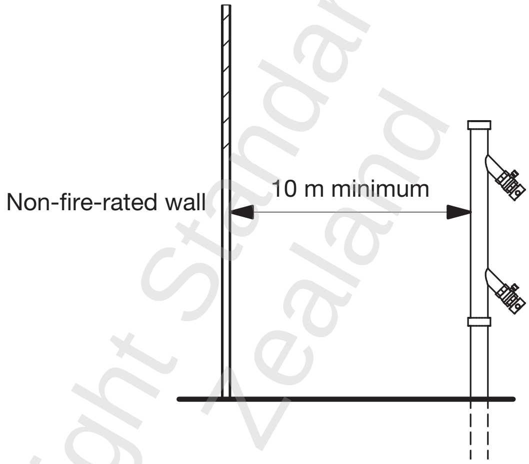


Figure 6e – Unsprinklered building – Hydrant outlet protection – Separation distance option – Section view

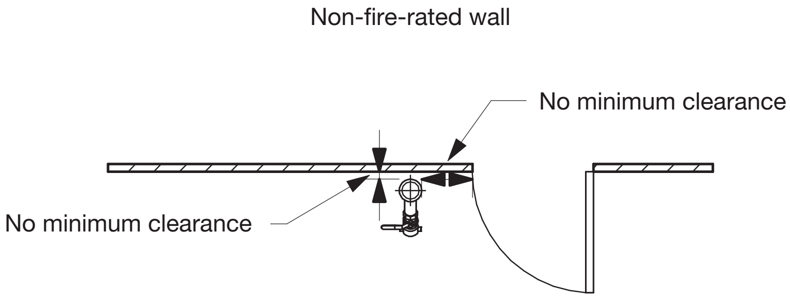


Figure 6f – Sprinklered building – Hydrant outlet protection – No distance required – Plan view

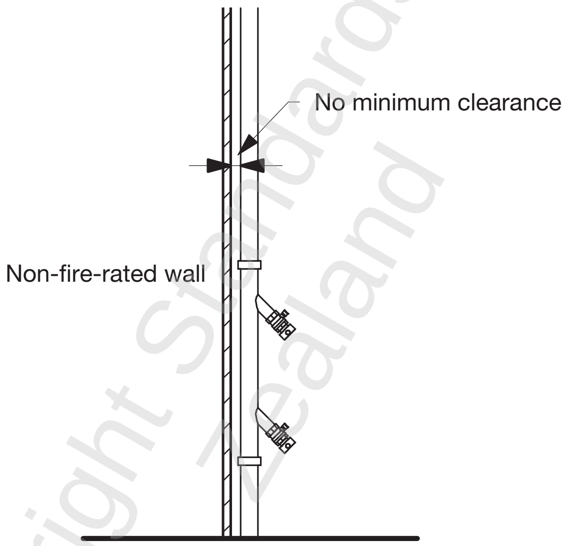


Figure 6g – Sprinklered building – Hydrant outlet protection – No distance required – Section view

5 HYDRANT INLETS

5.1 Locations

The hydrant inlet shall be on the outside of the protected premises in a location approved by the fire brigade. The hydrant inlet assembly shall be within 20 m, and in clear view, of a point on a roadway or area of hardstanding which is readily accessible by a fire appliance. Access to the inlet shall be unobstructed. The hydrant inlet can be located away from the building, provided all criteria of the standard are met.

NOTE –

(1) While this standard was being prepared, Fire and Emergency New Zealand were developing a guidance document on firefighting operations. When it is published, it could provide useful supplementary information for the design, installation, and use of hydrant systems.

(2) In certain situations, it could be appropriate, or even necessary, to provide two or more hydrant inlets. Such situations could include large buildings or buildings on steep terrain that is accessible from two sides at different levels. Where more than one hydrant inlet is provided, the system shall comply with the provisions of 5.7.

5.2 Enclosures

5.2.1 Construction

The hydrant inlet shall be housed in an enclosure constructed to ensure that delivery hoses can be connected to the couplings without kinking. The enclosure shall be large enough 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, including its door. The enclosure shall be fitted with a door compliant with 5.2.2. No part of the enclosure or the door when open shall be less 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.

This enclosure door can be omitted where the room housing the hydrant inlet is directly accessible from the exterior of the building through double doors with a total open width of at least 1.5 m. The hydrant inlet shall be located on the side of the door opening. Where there are water supply pump sets, electrical equipment, or risk of water damage to the interior of the building in the enclosure, the hydrant assembly shall be fitted with a splash guard as per 5.2.5.

NOTE – The location of the hydrant inlet needs to be approved by the fire brigade.

5.2.2 Doors

Doors can be side-hung or bottom-hung. Side-hung doors shall open through not less than 165°. Bottom-hung doors shall open through not less than 180°. The door shall be locked by a triangular-key locking device, as shown in Figure 4, requiring no more than five revolutions to open the lock.

Alternatively, they can be secured using keyed-alike standard padlocks.

5.2.3 Break-out panel size

The door shall have a break-out panel large enough to enable the connection of delivery hoses without kinking in the event that the door cannot be opened and emergency access has to be made by breaking the panel.

For areas experiencing vandalism, an alternative to a breakout panel can be approved by the HSC.

5.2.4 Break-out panel design safety

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

5.2.5 Splash guards

The sides, rear, and bottom of the enclosure shall have splash guards to ensure that the risk of water damage to the building's interior is minimised. The splash guards shall be provided with suitable drainage.

5.2.6 Usage

The enclosure can also be used to house the flow gauge attachment point and the sprinkler inlet for any fire sprinkler system serving the building. Other than 'indication' and 'control' panels for the control of hydrant systems, as per 5.4, the enclosure shall not be used to house any other equipment.

5.2.7 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 2000 mm from the surrounding standing surface, shall be clear of all objects.

5.2.8 Building access

The orientation of the enclosure and inlets shall be such that when they are being used, the hoses shall not obstruct access in and out of the building.

NOTE –

(1) This could prevent locating an inlet in an entry lobby where the inlet is perpendicular to the entry and exit doors.

(2) Consideration should be given to the fire brigade's hardstanding.

5.2.9 Falling glass

Where the enclosure's door is on a glazed exterior wall of a multi-storey building, either a veranda or another assembly shall be provided, with the veranda or other assembly extending at least 1 m in front and 1 m either side of the enclosure to provide protection from falling glass.

NOTE – The intention of this clause is to provide adequate protection so that broken glass does not enter the sheltered area.

5.3 Inlets

5.3.1 Specifications

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

5.3.2 Number of inlets

The required number of inlets shall be not less than half the design number of simultaneous hose streams specified in 3.3.2 and in no case less than two inlets.

5.3.3 Height of couplings

The hydrant inlet shall be positioned so that the axis of the couplings is between 550 mm and 1350 mm above the surrounding ground level.

5.3.4 Axis of couplings

The axis of the couplings shall be between 15° and 30° down from the horizontal. See Figure 7.

NOTE – Measurements are in mm.

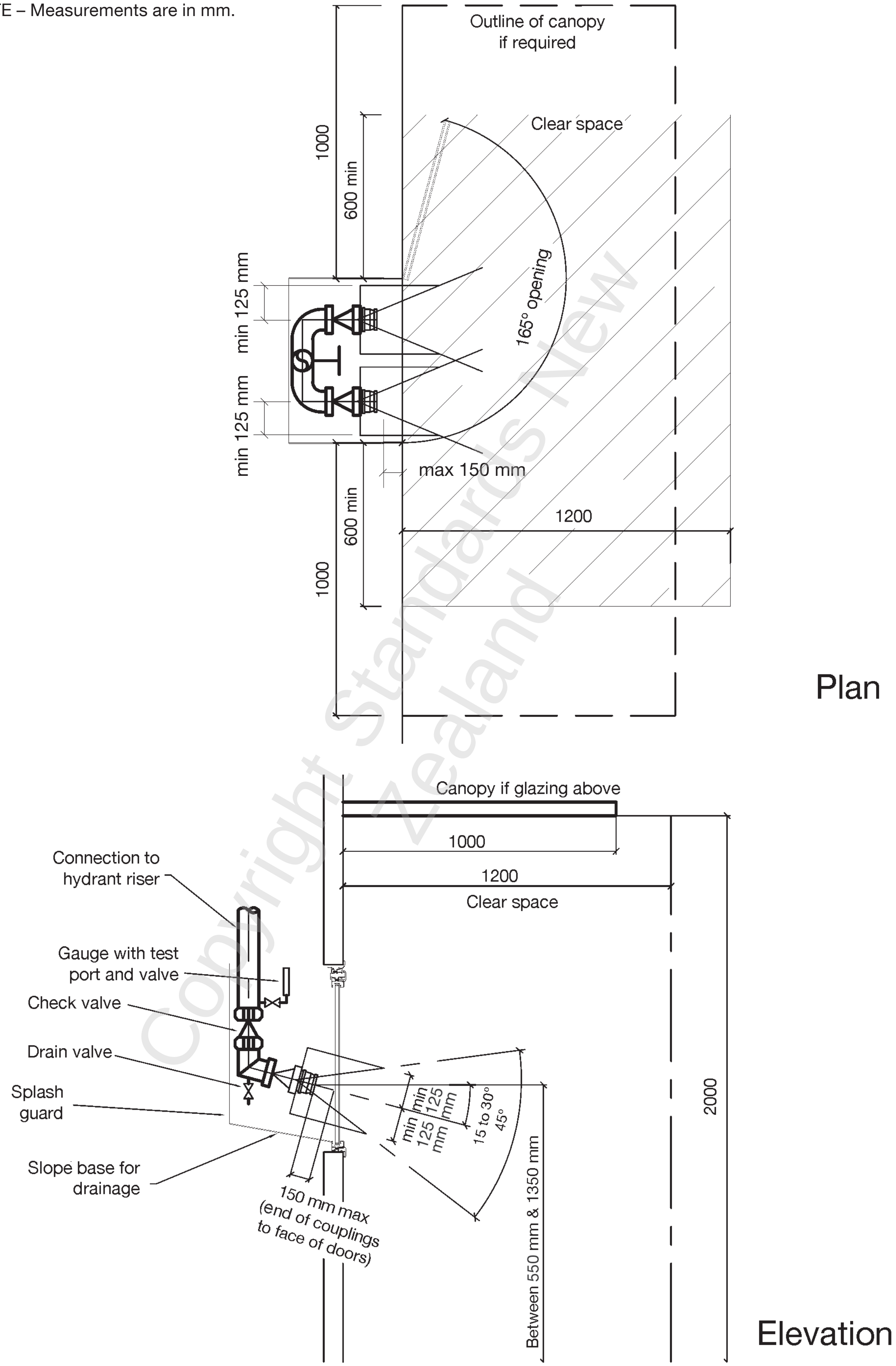


Figure 7 – Hydrant inlet standard requirements

5.4 Other equipment in enclosure

5.4.1 Pump control panels

Pump control panels (see 7.5.1) shall be housed in the enclosure. See 2.6.4.1 for labelling requirements.

5.4.2 Pressure gauges

Where a hydrant system incorporates pumps, there shall be within the enclosure a 100 mm pressure gauge fed from a tapping on the hydrant system downstream of the pump delivery check valve.

Hydrant systems that do not incorporate pumps shall have a 100 mm pressure gauge installed downstream of the system inlet check valve.

Gauges shall be provided with an isolating valve.

5.4.3 Hydrant and sprinkler system equipment

The enclosure shall only contain equipment associated with the building's hydrant and sprinkler systems. Where the enclosure contains both hydrant and sprinkler system inlets, each system shall be allocated a side of the enclosure, and all associated equipment with each system shall be contained within its allocated space.

5.5 Connection pipe to system

Inlet couplings shall be connected to a galvanised manifold, which in turn shall be connected to the hydrant system via a non-return valve (NRV). Alternatively, individual inlet couplings can be fitted directly to individual resilient seated NRVs. No part of the waterway shall be of a diameter smaller than the inlet coupling. A 15 mm stop valve shall be provided in the enclosure to release pressure in the pipework between the inlet flap valves and the NRV.

5.6 Fire brigade reference documents

A laminated or waterproof block plan shall be permanently fixed at the inlet in a location that allows it to be easily read (for example, on the inside of the cabinet door or on the splashback behind). Where multiple documents are provided, they shall be placed in a sealable, waterproof document pouch.

Installations that include a pump shall have a duplicate copy stored in a document pouch adjacent to the pump set.

Reference information shall show the following:

(a) Pipework route;

(b) Inlet and outlet locations;

(c) Valve locations;

(d) Design criteria;

(e) Design demand flow and pressure at the inlet;

(f) System schematic;

(g) Testing provisions;

(h) Commissioning flow test results, including pressure recorded at the inlet, remote hydrant outlet, and test outlet at the design flow.

NOTE – For sites with large, complex, pumped systems, it could be necessary to provide additional drawings on large-format paper (A2 or larger). These documents should be stored in the document pouch next to the pump set, with an engraved sign mounted in the inlet box confirming the documents' location.

5.7 Duplicated hydrant inlets

Where there are multiple hydrant inlet assemblies within a single building complex, they shall be interlinked so that any inlet can be used to serve any hydrant outlet and comply in all respects with 5.1 to 5.6 inclusive.

Hydrant block plans shall clearly identify inlet locations and show links between inlets.

Where multiple buildings or systems are present, links between the inlets shall be clearly identified. Separate systems shall be identified physically and labelled on the block plan.

The system, or systems, shall meet the performance requirements of section 3 from any hydrant inlet to the respective remote outlet assemblies.

6 PIPEWORK AND PRESSURE CONTROL

6.1 Piping location

When it is reasonably practical, vertical sections of the main waterway shall be located in a vertical safe path.

6.2 Piping sizing

Piping that forms the waterway of the hydrant system shall be sized using hydraulic calculations so that the design criteria set out in section 3 will be achieved, taking account of the available pressure provided by the fire brigade (see 3.4) and by booster pumps (where installed). Pipework that serves hydrant outlets shall not be less than 100 mm nominal bore.

NOTE – Test outlets can be served by pipework less than 100 mm nominal bore.

The method of calculation shall conform to 6.5.

6.3 Pressure control and test facilities

6.3.1 Outlet coupling pressure ratings

The pressure at every hydrant outlet coupling shall, under any conditions of flow from zero to the highest hydrant outlet design flow (see 3.3) at the coupling, be in the range of 600 kPa to 1200 kPa. For extensions to existing systems where hydrant outlet couplings are single-lugged, the permissible pressure range shall be 600 kPa to 1050 kPa.

6.3.2 Pressure-control assemblies

If pressure-control devices are needed to meet the requirements of 6.3.1, these shall conform to the following:

(a) Orifice plates, ratio valves, and parity valves are not permitted;

(b) Individual hydrants outlets can be controlled by a pressure-reducing valve unique to that hydrant outlet (see Figure 8), so long as this valve can be easily removed for servicing and testing (see 10.2.3(e));

NOTE – Refer to section 9 for guidelines to be followed for valve removal.

(c) A single pressure-reducing valve station can be used to control a number of hydrant outlet assemblies in a pressure zone, provided:

    (i) The maximum pressure differential in the zone shall not exceed 300 kPa

    (ii) The pressure-reducing valve is provided with facilities for testing for correct operation in situ while allowing a range of flows between a single hose stream as specified in 3.3 and the design flow for that zone. Suitable provisions to permit this testing shall be provided (see Figure 9)

    (iii) Isolation valves shall be fitted either side of each pressure-reducing valve to permit isolation, commissioning, testing, and maintenance. These shall be supervised and locked open

(iv) The pressure-control station shall have pressure gauges installed upstream and downstream of the pressure-reducing valve. Test ports for fitment of a calibrated test valve shall be provided adjacent to each pressure gauge

(v) The pressure-reducing valve shall not be located downstream of any other pressure-reducing valve

(vi) A listed 25 mm-nominal bore pressure-relief valve, set at 100 kPa above the pressure-reducing valve setting and piped to waste via a tundish or sight glass, shall be provided downstream of the pressure-reducing valve, and

(vii) A pressure-reducing valve calibration test drain shall be provided downstream of the pressure-reducing valve. The drain shall be minimum 25 mm-nominal bore and include a gate valve to regulate flow during calibration.

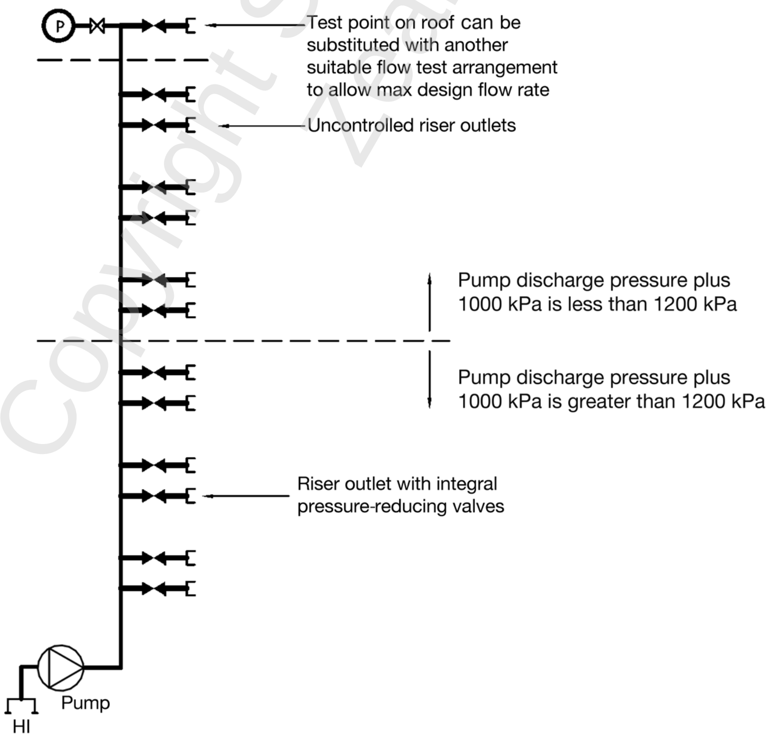
The arrangement for a typical pressure-reducing station is shown in Figure 10;

(d) The pressure-reducing valve shall be located in a position not vulnerable to impact or damage;

(e) Any pressure-control assembly or device shall be located in a position that is safely accessible, with sufficient space to allow service and maintenance operations without causing damage to the building or interior finishes;

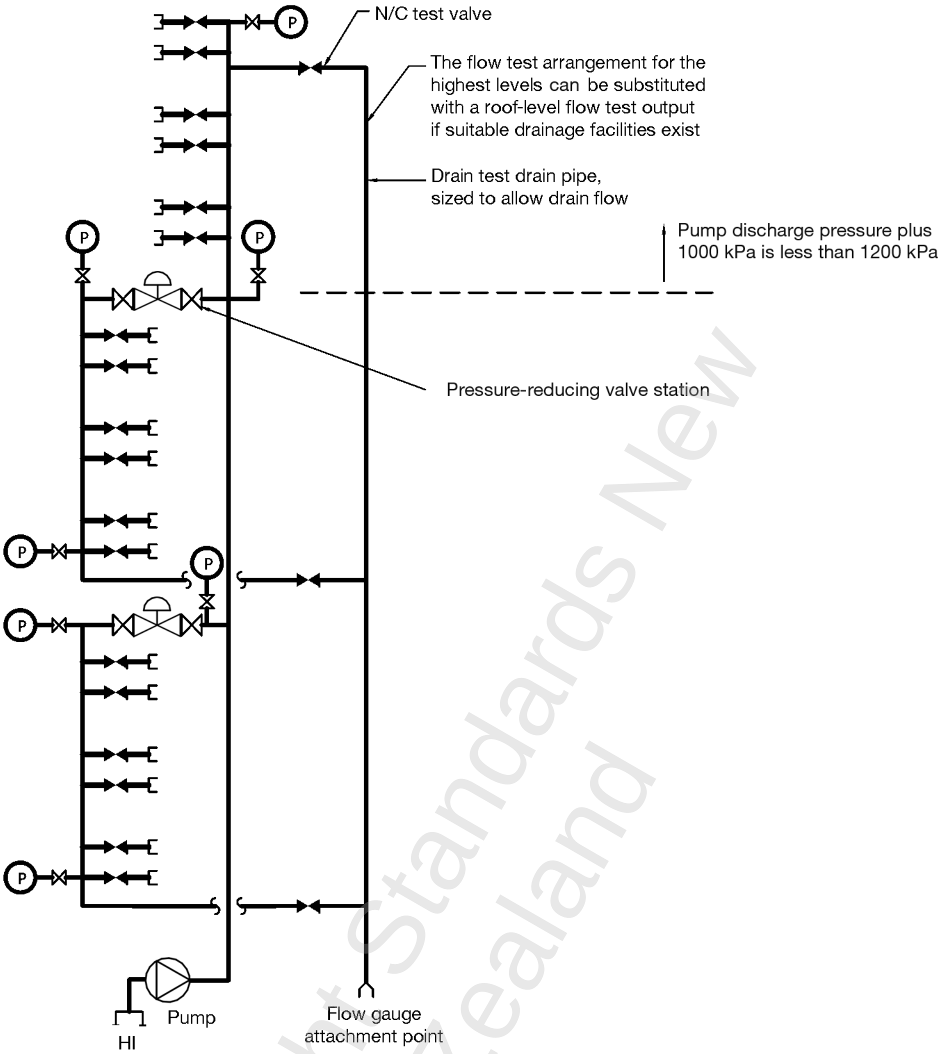
(f) Pressure-reducing valves shall have the intended pressure settings indelibly marked using an engraved label;

(g) Multi-staged pumps can have multiple pump-discharge nozzles (see Figure 9) to provide pressure control to individual zones (refer to Figure 11).



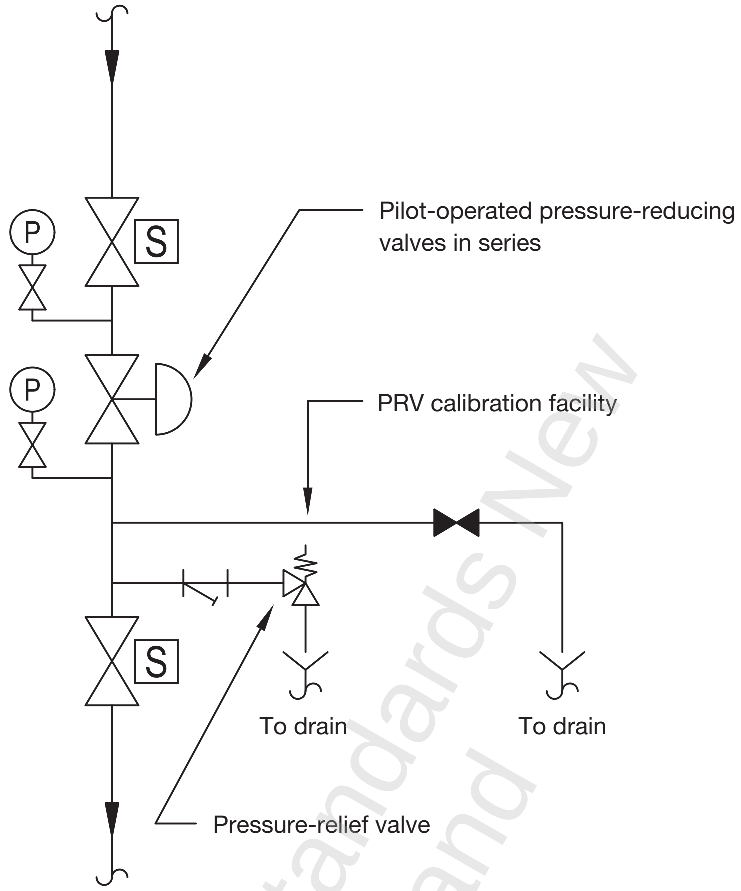
NOTE – See 1.5 and Appendix K for the meaning of abbreviations and graphical symbols.

Figure 8 – Pressure-reducing zones – Single-outlet reducing valves



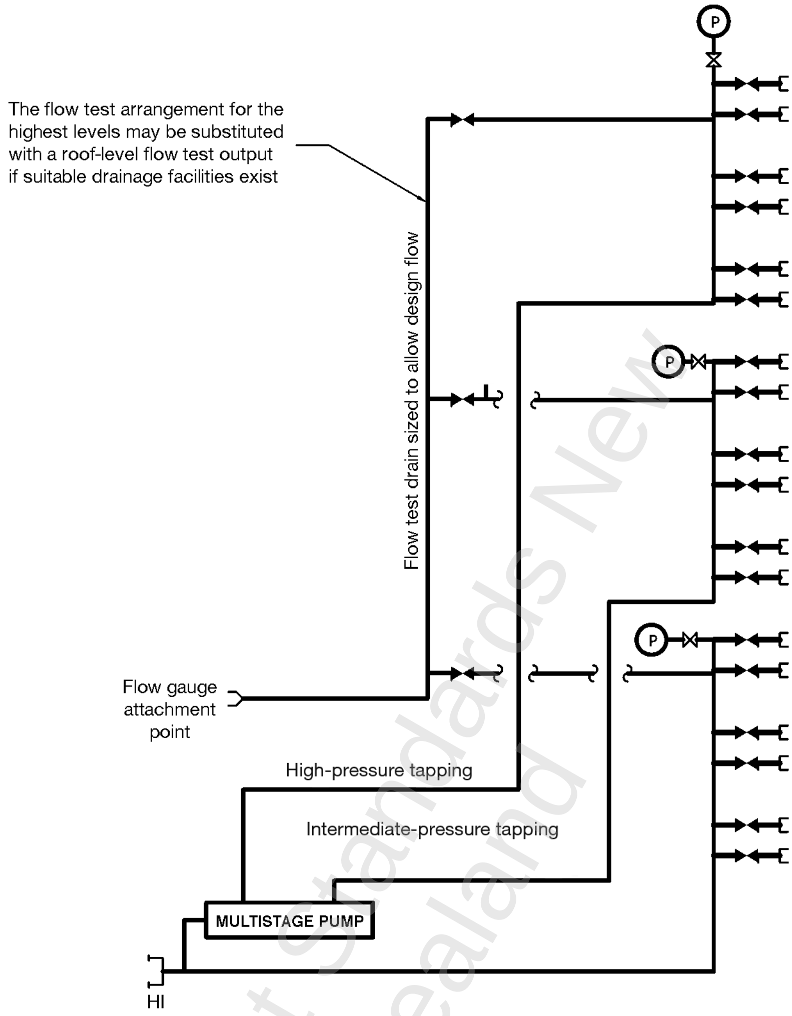
NOTE – See 1.5 and Appendix K for the meaning of abbreviations and graphical symbols.

Figure 9 – Pressure-reducing zones – Multiple-outlet reducing valves



NOTE – See 1.5 and Appendix K for the meaning of abbreviations and graphical symbols.

Figure 10 – Typical pressure-reducing valve station



NOTE – See 1.5 and Appendix K for the meaning of abbreviations and graphical symbols.

Figure 11 – Multistage pump pressure control

6.3.3 Flow testing facilities

In addition to test facilities referred to in 6.3.2, permanent flow testing facilities shall be provided to allow the design flow through each main waterway, including each pressure zone of the hydrant system (see Figures 8 to 12). The facility shall be sized to allow a flow range of between zero and 110% of the design flow through the system to be safely discharged to waste.

6.3.4 Location of test facilities

Where water is flowed through an open-air flow meter during testing, the facilities shall be located to discharge outside the building. This is to minimise the probability of water damage to the building. Where water is flowed through an in-line flow meter and tested water is discharged to waste drains or a tank, then facilities can be located inside the building.

When determining the location of flow test facilities, contractors and designers shall – where reasonably practicable – eliminate any hazard associated with 'falling from height'. Where this is not reasonably practical and flow testing facilities are in a location associated with 'falling from height', the hazard shall be minimised thus:

(a) A permanent safe access shall be provided to the flow test facility;

(b) A permanent area not less than 1 m^2 of level, non-slip, stable footing shall be provided adjacent to the flow test facility;

(c) Edge protection or fall protection shall be provided.

NOTE – Cognisance should be taken of the need to comply with the Health and Safety at Work Act.

6.3.5 Flow test facility requirements

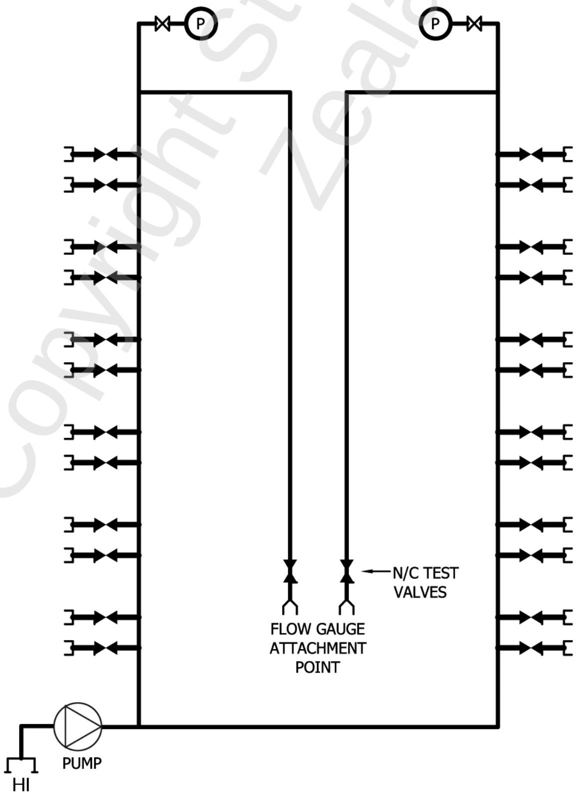
The flow test facility shall include the following arrangements:

(a) A 15 mm valved tapping for a pressure gauge at the discharge point, located upstream of the isolation valve in a position not affected by turbulent flow effects;

(b) Valved tappings of 15 mm for pressure gauges at the high points of each main waterway of the hydrant system, located in an area accessible to testing staff;

(c) Valved tappings of 15 mm for pressure gauges at the low points of each main waterway controlled by a pressure-reducing valve;

(d) Appropriate fittings as specified in 6.3.6 to allow flow test facilities to be temporarily connected without having to shut down the hydrant system.



NOTE – See 1.5 and Appendix K for the meaning of abbreviations and graphical symbols.

Figure 12 – Indicative flow test arrangements for buildings with multiple risers

6.3.6 Flow test gauges

For a flow test facility designed for a maximum flow not exceeding 2100 L/min, an appropriate fitting for the attachment of a flow test gauge shall consist of a 70 mm double-lugged, female instantaneous coupling.

For hydrant systems designed for flows exceeding 2100 L/min, an appropriate flow test gauge attachment point shall consist of a suitably sized roll-grooved connection. This roll-grooved connection shall be fitted with a vented blanking cap.

The flow test gauge attachment outlets shall be controlled by a handwheel-operated, resilient-seated isolation valve.

The flow test attachment outlets shall allow for the safe disposal of water used for flow testing.

If the discharge from testing falls in part or in total on the roof of the building, adequate permanent drainage shall be available so that no damage will occur at 110% of the design flow. In such cases, the building's designer shall provide the HSC with written notification that the roof guttering system can cater for the expected testing flows.

6.4 Gauges and valves

6.4.1 Pressure gauges

Pressure gauges shall comply with BS EN 837-1 or equivalent, be calibrated in kPa, and have a scale range not more than 150% of the highest pressure to which the gauge will be subject (see 2.6 on labelling). Dampening shall be provided where required to avoid excessive needle fluctuation. A stop valve shall be provided at each pressure gauge to allow the gauge to be removed without shutting down the piping to which it is connected.

The requirement for gauge isolation valves also applies to gauges fitted as part of a pump controller.

6.4.2 Manually operated valves

Manually operated valves (other than quarter-turn valves) shall be right-hand closing with the direction of closing clearly indicated, and ball valves and other quarter-turn valves shall have a stop to prevent operation through greater than a 90° angle.

6.4.3 Valve indicators

Each valve shall have an indicator so that it is evident whether the valve is fully open or fully closed. The valve shall be labelled for the correct normal position.

6.4.4 Valve padlocks

Valves associated with the waterway, and drain and test valves, shall be padlocked in the normal operating position (see 2.6 on labelling).

6.4.5 Exceptions for the placement of isolating valves in the waterway

Isolating valves are not permitted in the main waterway, other than:

(a) On the suction and delivery of pumps;

(b) On either side of a pressure-reducing valve;

(c) To allow the isolation of waterways with multiple branches to permit testing or maintenance on part of the hydrant system.

In such cases, these valves shall be supervised via the sprinkler control panel or the building fire alarm panel.

NOTE – In (c), such valves are permitted but not mandated.

6.4.6 Listed valves

Pressure-reducing valves and isolating valves shall be of a listed type.

6.4.7 Correct pressure ratings

All valves shall be rated for the pressure range to which they will be subject.

6.5 Hydraulic calculation

6.5.1 Pressure and flow requirements

The pressure and flow requirements of a hydrant system shall be calculated with pressure loss determined in accordance with 3.4.1. The HSC can accept computer calculations generated by a program suitable for hydraulic calculations, subject to receiving a printout of inputs and outputs.

6.5.2 Pressure loss calculation for piping friction

Pressure loss due to friction in piping shall be calculated using the Hazen-Williams equation:

$$\Delta P = \frac{0.605Q^{1.85} \times 10^{8}}{C^{1.85} \times d^{4.87}} \quad \text{(Eq. 3)}$$

where

ΔP is the loss of pressure per metre of piping (kPa)

Q is the flow rate (L/min)

d is the mean inside diameter (mm)

C is a constant according to the internal roughness of the piping as derived from Table 4

Table 4 – Hazen-Williams *C* values

Type of piping	*C* value
Steel, black, or galvanised	120
Copper	140
Stainless steel	140
Polyethylene	140

6.5.3 Piping friction constant by material

Pressure loss in piping fittings shall be based on Equation 3, with the equivalent length (in metres) determined by multiplying the nominal diameter (mm) of the smallest piping connected to the fitting by the factor obtained from Table 5.

Table 5 – Equivalent length factors for various fittings

C value (from Table 4)	120	140
Tees into branches	0.060	0.080
Elbows	0.030	0.040
Bends[a]	0.015	0.020
NOTE – Pressure loss arising from flow through valves or other waterway devices, including hydrant inlet fittings, shall be calculated according to published manufacturer's data.		
[a] A 'bend' is a fitting where the radius of the turn divided by the nominal piping diameter is at least 1.5.		

6.5.4 Pressure loss due to elevation

Pressure loss or gain due to difference in elevation shall be calculated as 10 kPa per metre difference in height.

NOTE – This provides an example of a calculation method based on flows for unsprinklered buildings. The flows would need to be adjusted to those specified in this standard for the respective system design.

6.5.5 Alternative pressure and flow calculations

The following shall also be an acceptable method of calculating pressure and flow characteristics:

(a) Determine the most hydraulically remote array of hydrant outlets required by section 3 to be considered in simultaneous operation;

(b) Assume a single-hose stream flow at the pressure as specified in 3.3 (see Tables 2a and 2b) at each coupling of the most hydraulically remote hydrant outlet;

(c) Calculate the friction and static loss/gain in pressure between the couplings of the hydrant outlet (with both couplings flowing) to the piping junction serving the next hydrant outlet in the array under consideration;

(d) Repeat step (c) for the next flowing hydrant outlet;

(e) Add hydrant outlet flows and calculate to the next junction, then repeat the process for the balance of the array.

6.5.6 Pressure requirement at every outlet

The hydraulic calculation shall also demonstrate that the available pressure at every hydrant outlet on the hydrant system will comply with 6.3.1. For systems incorporating booster pump(s), this shall be demonstrated with pump(s) operating.

The calculations shall be based on a hydrant inlet pressure (P_i) of 1000 kPa immediately downstream of the hydrant inlet check valve.

7 PUMPS

7.1 Pump set compliance

Fire pump sets shall comply with the provisions of NZS 4541 clause 6.7, except where modified by this standard.

7.2 Pump casing pressure rating

Where the pump outlet is fitted with a pressure-relief valve to regulate the hydrant system pressure, the pump casing rating shall be not less than the set pressure of the relief valve plus 300 kPa.

Where no pressure-relief valve is fitted, the pump casing rated pressure shall be at least equal to the highest head on the pump curve at duty speed (no flow) plus P_i, plus the static difference between the hydrant inlet and the pump suction, plus 300 kPa.

7.3 Pump selection

7.3.1 Pump selection criteria

The published manufacturer's curve of the selected pump shall demonstrate that:

(a) At the hydrant system design flow, the pump will produce 110% of the pressure required (P_R) at the point of connection to the water supply of the pump inlet flange in order to meet the pressure required at the reference point (see 6.3.1);

(b) At 150% of the hydrant system design flow, the pump will produce at least 65% of the pressure required (P_R) and when driven by the selected driver, the pressure will fall progressively with the rate of flow;

(c) The maximum head of the pump curve shall not be greater than 120% of P_R. However, to achieve this, it shall be permissible to use a pressure-relief valve on the pump discharge arranged to relieve to the pump suction;

(d) Where there are pumps in parallel, the curve of each pump shall show a constantly reducing head as flow increases;

(e) If more than one pump is diesel-driven, the pumps shall have identical curves;

(f) The use of pumps in series shall not be permitted.

NOTE – The additional pressure required to be generated by the pump (P_R) is calculated using the guidance provided in 3.4.1.

7.3.2 Pumps serving sprinkler and hydrant systems

Where pumps are required to boost both sprinkler and hydrant systems, the pump shall be sized to provide the simultaneous demands.

7.4 Drivers

7.4.1 Single-pump arrangements

Where only one pump is required (see 3.4.2), the driver can be either one of the following:

(a) A diesel-driven pump;

(b) Where the required pump duty is less than 200 kPa, an electric-motor-driven pump with the power supplied by an electrically reliable and physically secure source.

7.4.2 Twin-pump arrangements

If two pumps are required, one shall be a diesel-driven pump and the other can be either one of the following:

(a) A diesel-driven pump;

(b) An electric-motor-driven pump.

NOTE – In 7.4.1 and 7.4.2, the use of an engine-driven emergency generator in conjunction with an electrically driven pump does not constitute a substitute for a direct-coupled diesel-driven pump.

7.4.3 Governing

The engine shall be provided with a governor to control the engine speed within 10% of its rated value under all stable conditions of load up to full load rating.

7.4.4 Speed control

Variable speed controllers shall not be used to limit pump output pressure.

7.5 Pump starting and stopping

7.5.1 Remote starting

Each pump shall have a remote-control panel located in the hydrant inlet enclosure.

The remote-control panel shall have an ingress protection rating of IP65 in accordance with AS 60529 and be connected to the building's hydrant pump controller by means of a fire-rated cable. The cable shall have a minimum 30-minute circuit integrity rating and shall comply with AS/NZS 3013 classification WS22. Alternatively, the cable can be run in a fire-rated conduit or a fire-rated duct used solely for cabling and non-combustible services. The conduit or duct shall have a minimum FRR of -/30/-. The cable shall be protected from mechanical damage.

7.5.2 Start buttons

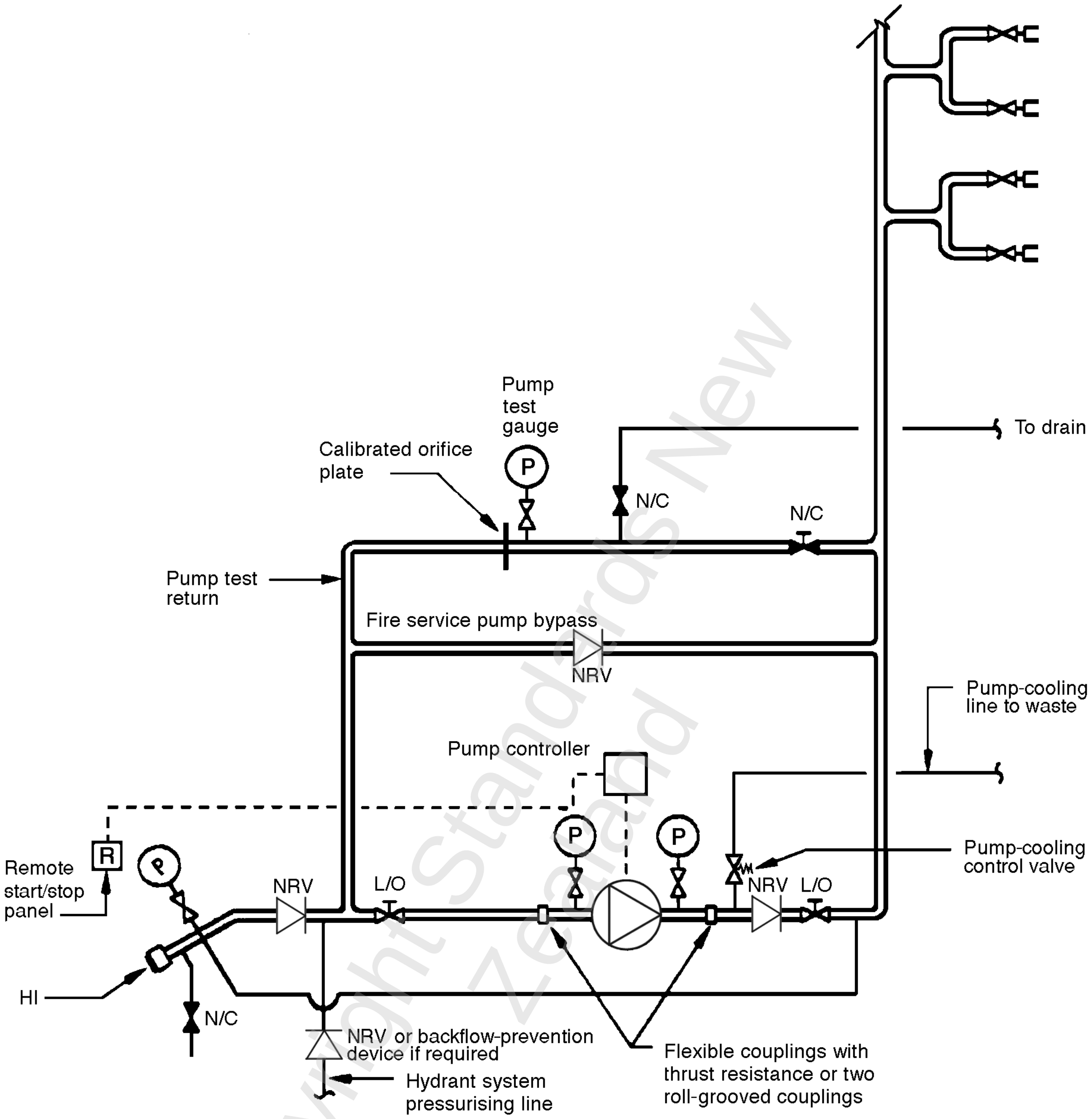
If the hydrant inlet and sprinkler inlet are located in the same enclosure, the hydrant pump start buttons shall be located immediately adjacent to the hydrant inlet. See 2.6.4.3 for labelling requirements.

7.5.3 Stopping

Once started, every pump unit shall run until manually stopped. The use of a fail-safe device such as an 'energised to stop' solenoid is acceptable, provided it meets the other requirements of this clause.

Automatic stopping is not permitted. A red, easily accessible stopping device that automatically resets or returns to its normal position shall be provided at the pump controller or engine governor. See 2.6.4.4 for labelling requirements.

Additionally, for electric motors, there shall be a lockable ON/OFF switch to isolate the power supply to the contactor.



NOTE – See 1.5 and Appendix K for the meaning of abbreviations and graphical symbols.

Figure 13 – Pump unit installation – Arrangement for single booster

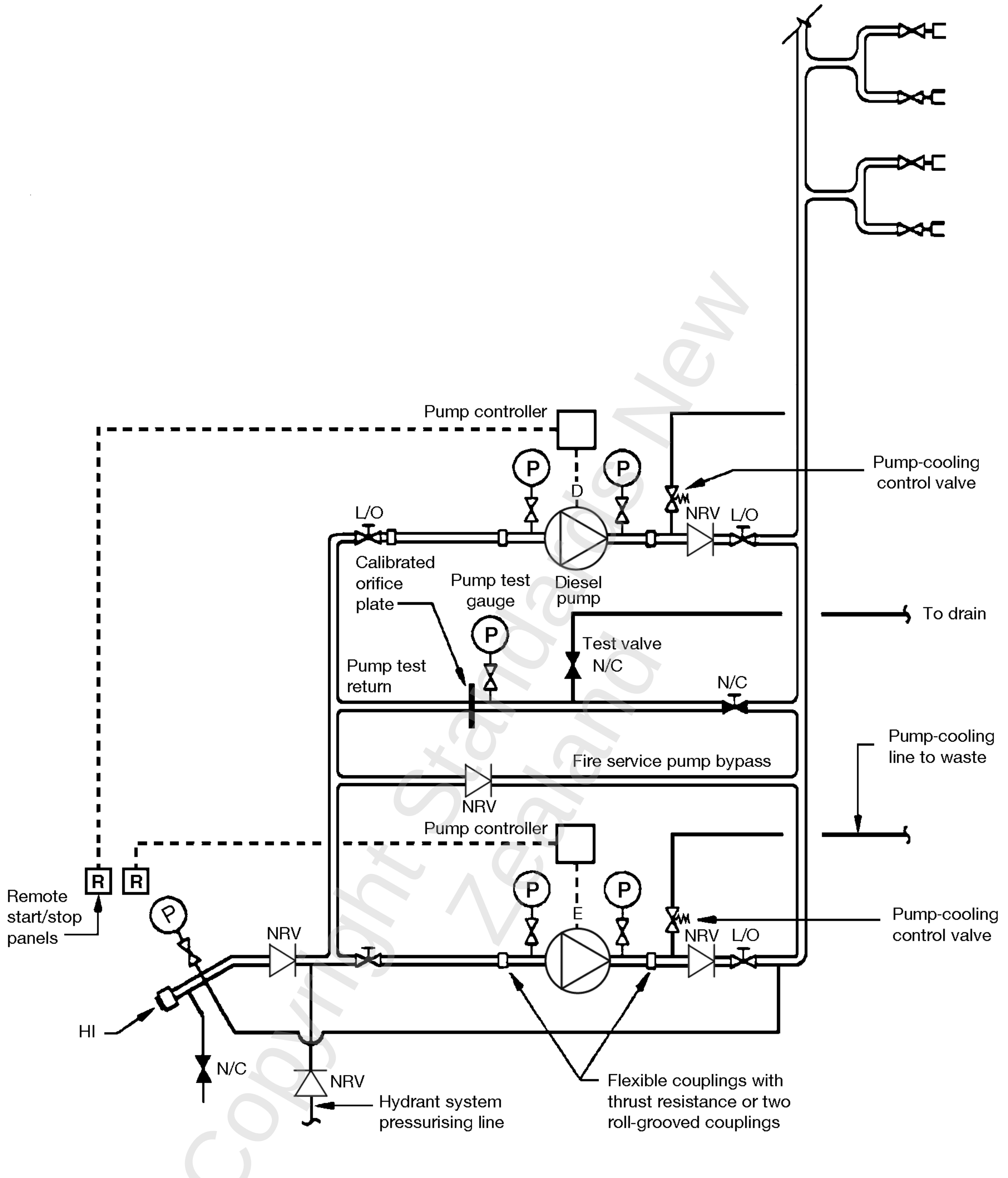


Figure 14 – Pump unit installation – Arrangement for dual boosters

7.6 Pump set installation

7.6.1 Connection

Each pump shall be installed in the waterway as shown in Figure 13 or Figure 14.

The following requirements apply:

(a) The pump suction and delivery shall be connected to the fixed piping through flexible couplings to prevent transmission of running vibration and seismic movement and ensure that the pump alignment is not stressed by the pipes. Any elastomeric couplings shall be mechanically restrained;

(b) Any valves or fittings constructed so that turbulence can be introduced through change in direction or obstruction of the waterway shall be located at least five nominal diameters of the suction inlet from the entry to the pump. An uninterrupted length of five nominal diameters of pipe (the same diameter as the pump suction) shall be installed immediately upstream of the pump suction flange to meet this requirement;

(c) The suction pipe shall be installed so that air cannot become trapped upstream of the pump suction. When a reducer is required in the pump suction pipework, it shall be installed so that no air will be trapped in it. To avoid air being trapped, it could be necessary to use an eccentric-style reducer.

7.6.2 Priming

Each pump shall be kept primed by means of a connection to the suction side of the pump capable of providing the following flows (simultaneously where there is more than one pump) at not less than 20 kPa residual pressure:

(a) Diesel-engine driver 1.0 L/min/kW;

(b) Electric-motor driver 0.25 L/min/kW.

NOTE – In terms of this clause, the power rating is the power absorbed by the pump at the highest design flow.

7.6.3 Test return

The pump test return around the pump (see Figures 13 and 14) shall be taken from the pump delivery (downstream of the flexible coupling) to the pump suction (upstream of the flexible coupling). This pipe shall be fitted with a normally closed, locked, and labelled indicating stop valve fitted with a supervisory device. If required, one or more orifice plates, sized to induce approximately 110% of the design flow, shall be fitted in the pump test return, unless the hydraulic characteristic of the pipework causes 110% of the design flow to be induced. The pump test return valve shall be supervised to signal defects in accordance with 7.9 when more than 5% open.

Orifice plates shall be installed with a minimum of five pipe diameters of straight pipe both upstream and downstream and not less than 10 pipe diameters downstream of a butterfly valve.

The test return circuit shall be designed for cavitation-free operation. Particular attention shall be paid to ensure that cavitation does not occur at the plane of vena contracta immediately downstream of an orifice plate.

7.6.4 Bypass

A bypass shall be provided around the pump of the same diameter as the main waterway and shall be fitted with an NRV to prevent recirculation.

7.6.5 Temperature

Means shall be provided to prevent the temperature of the water in the pump casing rising to more than 35°C during nil or low-flow discharge conditions over a 1-hour period. Acceptable means of achieving this include:

(a) A differential pressure valve;

(b) The diesel motor cooling water supply.

7.6.6 Gauges

The following gauges shall be provided:

(a) A pressure gauge, complete with gauge cock, connected to the suction of every pump far enough from the pump not to be influenced by pump entry turbulence; and

(b) A pressure gauge complete with gauge cock connected to the pump delivery.

Gauges shall comply with 6.4.

7.6.7 Alarms

Every pump unit shall be provided with a device which shows at an approved location that the pump is running or if a malfunction has been detected. A self-resetting device can be incorporated to suppress an electrically operated alarm for up to 60 minutes. Where the indication is made at a location which is not staffed at all times, a defect signal to the fire brigade's receiving equipment shall be generated in accordance with 7.9.

See 2.6.4.5 for alarm labelling requirements

7.7 Diesel fuel supply

The nominal fuel duration for a diesel-driven pump shall be for a minimum of 6 hours. The tank shall be fitted with a fuel gauge indicating that the top half of the tank is fuel for test running and the bottom half for fire duty running.

7.8 Pump unit enclosure

7.8.1 General

7.8.1.1

The pump unit shall be installed in a clean, dry, adequately ventilated, weathertight enclosure.

7.8.1.2

The enclosure shall not be located in an area prone to flooding.

7.8.1.3

Access to the enclosure shall be secured with either a Lockwood 197 lock or Lockwood 144 padlock or listed equivalent. The enclosure shall be readily accessible to the fire brigade. The doors shall be signposted as required in 2.6.7.

NOTE –

(1) A listed equivalent lock is expected to be able to be opened using a Lockwood 144 or 197 key.

(2) It is recommended that the pump unit enclosure be provided with direct external access.

7.8.1.4 Protection from fire

The pump enclosure shall be suitably protected from fire by either:

(a) A fire separation with an FRR of at least 45 minutes if the building is sprinklered;

(b) A fire separation with an FRR of at least 90 minutes if the building is not sprinklered;

(c) A distance of at least 3 m from any building.

No liquid or gaseous fuels, except those required as a fuel source for fire pump unit prime movers, shall be reticulated or stored in the enclosure.

NOTE – The Health and Safety at Work (Hazardous Substances) Regulations could require additional measures to those specified in this standard.

7.8.2 Protection from hazards

The enclosure shall be situated where it is as free as possible from exposure to fire, explosion, flooding, and wind damage.

If situated below ground and subject to potential flooding, the enclosure shall be at least one floor above the lowest floor.

No liquid or gaseous fuels, except those required as a fuel source for fire pump unit prime movers, shall be reticulated or stored in the enclosure. A fire extinguisher appropriate to the hazard shall be provided.

7.8.3 Plant rooms

A pump unit can be located in a screened area of a plant room if:

(a) There is no boiler or other explosion hazard;

(b) There is no uncontrolled dust problem;

(c) There is no likelihood of water from other services discharging over the pump unit;

(d) There is no uncontrolled access by unauthorised persons to the pump unit; and

(e) All other requirements for pump unit enclosures required by this standard are met.

7.9 Equipment supervision

Where equipment is required to be supervised in accordance with 7.6.3 and 7.6.7, off-normal signals shall be generated as 'defect calls' through a fire brigade monitoring station.

This shall be achieved by:

(a) A signal-generating device installed as part of the hydrant systems; or

(b) In a sprinklered building, a sprinkler system direct brigade alarm; or

(c) In a building not protected with a sprinkler system, a brigade-connected fire alarm system.

8 BUILDING CONSTRUCTION AND DEMOLITION

8.1 Hydrant system availability during construction

8.1.1 General

Where building construction includes the installation of a permanent hydrant system, the system shall be installed and brought into commission progressively as building work proceeds. The constructed hydrant riser shall be progressively charged with water.

NOTE – Buildings are often more vulnerable to fires during periods of construction. A fire hydrant system is typically the only available system to support firefighting operations and is necessary for the protection of the public, the environment, the building, and the fire brigade, as well as any persons within the building.

8.1.2 Height requirement

A hydrant riser system shall be progressively made functional as close as practical to the highest floor in construction, but no more than 8 m below the highest floor in construction.

8.2 Precautions during installation

8.2.1 Capping

As each section of the waterway is installed, it shall be immediately capped to prevent foreign material entering the pipework.

8.2.2 Pump connection to hydrant system

As soon as the highest hydrant outlet above the road surface closest to the hydrant system inlet exceeds 40 m in height, at least one pump, with the performance characteristics specified in 7.3, shall be connected to the hydrant system. The pump unit can be part of a permanent pumping installation, in which case it shall, at the stage that it is required to comply with this clause, conform with all aspects of section 7 as reasonably practicable.

8.2.3 Pressure control

Where pressure control arrangements are required to conform to 6.3, they shall be progressively installed.

8.2.4 Ease of access

The area around hydrant outlets shall be kept clear and readily identifiable, during both construction and demolition.

8.2.5 Highest functional hydrant tag

In multi-storey buildings, the highest hydrant outlet shall be provided with a temporary tag: HIGHEST FUNCTIONAL OUTLET.

8.3 Temporary inlets

8.3.1 General

During the course of construction, demolition, and building alterations, the hydrant inlet shall remain accessible for fire brigade use. This could require installation of a temporary inlet (for example, at the site security fence). Where the inlets are not readily accessible and are not located in their final approved location, FENZ shall approve temporary inlet locations.

8.3.2 Temporary inlet signage

The location of such temporary inlets shall be marked by a 1 m by 1 m sign with the words clearly marked in contrasting colour: HYDRANT INLET – KEEP CLEAR.

8.4 Progressive inspections

For buildings greater than eight floors above ground level in height, a progressive inspection by the HSC shall be carried out when the riser reaches every eighth level to ensure that it is functional.

NOTE – Appendix B provides specific guidance for the provision of construction hydrants for combined sprinkler-and-hydrant systems.

8.5 Demolition

8.5.1 General

In buildings under demolition which are fitted with a hydrant system, the system shall be maintained in a functional state for as long as possible and should be the last service decommissioned.

NOTE – Buildings are often more vulnerable to fires during periods of demolition. A fire hydrant system is typically the only available system to support firefighting operations and is necessary for the protection of the public, the environment, and the fire brigade, as well as any persons within the building.

8.5.2 Combustible contents

Decommissioning of the hydrant system shall not occur before the combustible contents of the building have been removed.

8.5.3 Functional height requirement

In multi-storey buildings, the hydrant system shall remain functional on the floor below the highest intact floor.

9 EXTENSIONS, ALTERATIONS, AND IMPAIRMENTS

9.1 Extensions and alterations

9.1.1 General

Where building alterations that affect the location of hydrant outlets, signage, the setting of pressure-control devices, or other matters result in the hydrant system no longer conforming to this standard, alterations shall be made to the hydrant system to maintain compliance with the standard.

NOTE – The hydrant system alterations should be done in accordance with the latest standard. Where this is not practical, the hydrant system can be altered in accordance with the standard that the system was installed to and should be upgraded as outlined in Appendix C.

9.1.2 Hydrants remain operational

During the course of building alterations, hydrant systems shall remain operational, where this is reasonably practical.

9.2 System impairments

9.2.1 General

This section provides minimum guidelines for parties involved in the shutdown and impairment of fire hydrant systems. All work and communications shall, in addition to the requirements here, meet all requirements of the Health and Safety at Work Act.

Fire hydrant systems can be rendered temporarily inoperative for maintenance and repairs or alterations, or they can be permanently disabled. Before isolating or disabling a hydrant system, hydrant contractors shall follow these procedures, taking the precautions specified in this section as well as precautions required by the HSC or building owner.

Except for the purposes of emergency repairs, a full risk assessment shall be undertaken before disabling a hydrant system.

9.2.2 Contributors to the risk assessment

A risk assessment should consider the safety of workers, occupants, other property, and overall building fire and life safety provisions. Among others, this risk assessment could need to include input and agreement from:

(a) The fire brigade;

(b) The building owner(s) and occupier(s);

(c) The building owner’s risk consultants and insurers.

9.2.3 Risk mitigation

Mitigating measures are required when systems are to be rendered inoperative or parts of the system isolated for extended durations. Adequate mitigating measures should be implemented before isolation proceeds and identified risks reassessed.

NOTE – An overnight isolation in buildings that contain sleeping accommodation or treatment and care, or similar, facilities would be considered to be an extended duration.

9.2.4 Hydrant systems with common or shared components

Where a hydrant system has any component that affects more than one property, or has a common ownership arrangement, and the property is owned by separate parties, or is subject to maintenance by different contractors, the risk assessment shall consider the interests of all parties who could be affected by, and need to be notified of, the impairment.

NOTE – In instances of common ownership, a statement detailing the common ownership and the names and contact details of the relevant persons should be prominently displayed adjacent to the relevant component.

9.2.5 Notification and authorisation period

Notification shall be delivered at least 24 hours before the start of planned work that will isolate or render a hydrant system inoperative. Hydrant systems shall not be isolated or rendered inoperative overnight in buildings that contain sleeping accommodation without giving at least 24 hours' notice to the building owner, building occupier, fire brigade, and building insurers.

Except in an emergency, the system shall not be rendered inoperative until the owner or their authorised representative has authorised the work by signing the appropriate section of the form set out in Appendix L. If an emergency compels immediate action to render a system inoperative, such notification shall be given as soon as possible afterwards.

9.2.6 Shutdown notice recipients

Notification in writing shall be delivered to the following:

(a) Building owner(s) or their agent or nominated representative;

(b) Building occupiers; and

(c) The fire brigade or its authorised agent (see Appendix M).

These notifications shall also advise building owner(s) that they are to inform their insurers of any isolation that exceeds 12 hours, or any lesser period if the system is within buildings that contain sleeping accommodation or treatment and care, or similar, facilities, or if specified by the building owner.

If instructed by the owner, the contractor shall provide a copy of the signed authorisation to another specified party, such as the owner's insurer or risk management consultant, and the fire brigade.

9.2.7 Shutdown notice information

Shutdown notification shall include the following information:

(a) The name and address of the premises;

(b) The type of occupancy – for example, daytime occupancy, commercial, industrial, sleeping accommodation, treatment and care facilities;

(c) The reason for rendering the system inoperative, giving details of extensions or alteration work;

(d) The date and times the system will be off;

(e) Whether blanking pieces or sectional valves will be used to isolate a section of a system; and

(f) Whether the work will involve cutting or welding and, if so, details of the precautions that will be taken.

9.2.8 Notification to the fire brigade and building insurers

Information can be provided to the fire brigade and building insurers in the form shown in Appendix L.

9.2.9 Isolation tags for sections of a hydrant system

A tag as shown in Appendix N, or similar, shall be used to identify sections of a hydrant system left isolated. This shall be attached by the contractor to the main hydrant system inlet and the sectional valve controlling the isolated area. Where multiple systems or multiple buildings are affected, an isolation tag shall be placed on every system affected by the impairment.

The contractor placing isolation tags shall maintain a written record of them, and these records shall be available for inspection by an HSC.

Part A of the isolation tag shall be completed whenever a hydrant system is isolated.

When a section of a hydrant system is isolated, Part B of the isolation tag shall be completed by the contractor and the tag affixed to the hydrant system inlets and the sectional valve controlling the isolated area.

Tags shall remain attached to the hydrant system inlets and sectional valves controlling isolated areas until the whole system is restored. The party responsible for placing the tags shall also be responsible for ensuring they are removed.

9.2.10 Hot work precautions

Any hot work required on hydrant systems shall be carried out according to the provisions of the Health and Safety at Work Act.

Cutting or welding involving hot work should normally not be carried out on the hydrant system. It shall not be carried out without the contractor first obtaining specific approval from the building owner.

Such approval, if granted, could specify precautions to be taken by the contractor to minimise the risk of ignition while the installation is inoperative.

These precautions will normally include:

(a) Having charged hose reels or suitable types of extinguishers on hand;

(b) Removing or covering combustibles in the immediate vicinity of the work;

(c) Posting a watchman during the actual hot work;

(d) Re-checking the area 30 minutes after completion of the hot work; and

(e) Complying with NZS 4781 where cutting or welding is undertaken.

9.2.11 Methods of temporarily isolating system sections

9.2.11.1 Tagging

Clause 9.2.9 sets out the isolation tag requirements when zones or sections of a hydrant system are isolated.

Where screwed plugs, screwed or grooved-end caps, or blank flanges are used for temporary isolation, a coloured tag of sufficient length shall be attached so as to be clearly visible from the occupied area of the building. This tag shall have stencilled on it the words: TEMPORARY HYDRANT ISOLATION.

9.2.11.2 Sectional valves

If there are sectional valves and it is practical to do so, they should be used so that the area in which the hydrant system installation is inoperative is kept to a minimum.

Great care shall be taken to ensure that sectional valves are reopened after work is completed.

9.2.11.3 Blanking pieces

Blanking pieces (‘frying pans’) inserted between the flanges of a pipe joint can be used to temporarily isolate sections of a hydrant system installation.

The contractor shall maintain a written record of the use of all blanking pieces, and this record shall be available for inspection by an HSC and the building owner.

Blanking pieces shall either be cut from a single piece of sheet steel or have a welded handle. The handle shall:

(a) Project at least 300 mm from the edge of the piece;

(b) Be painted with fluorescent paint;

(c) Be stamped and painted with an identification number;

(d) Be drilled and, when used in a concealed space, be connected with a coloured tag of sufficient length to be clearly visible from the occupied area of the building.

9.2.11.4 Discs not permitted in union joints

Discs inserted in union joints to effect temporary isolation are not permitted.

9.3 Interruption to water supplies

9.3.1 Caused by work on hydrant systems

Where work on hydrant systems requires a town’s main supplies to be made inoperative, this work shall be planned and executed in accordance with the by-laws and guidelines of local authorities for the area. Communications, planning, and execution of this work shall ensure minimum disruption to provision of services to neighbouring properties and other users of the water supply, ensure the safety of property and persons in the vicinity, and be executed in compliance with regulations of the Health and Safety at Work Act.

9.3.2 Main supply becomes inoperative

In the event of a town's main supplies becoming inoperative through drought or other reason, special attention should be given to keeping any other supply in efficient working condition.

Notification of an inoperative town's main water supply shall be made in writing and delivered to the building owner or their agent or representative, the owner's insurer or risk management consultant, and the fire brigade or their authorised agent 24 hours in advance of the work commencing.

If an emergency compels immediate action to render the system inoperative, such notification shall be given as soon as possible thereafter.

10 INSPECTION, TESTING, AND MAINTENANCE

10.1 Acceptance tests and inspections

10.1.1 General

A hydrant system shall not be deemed to comply with this standard unless an HSC has issued a certificate of compliance.

10.1.2 Acceptance tests

The following acceptance tests shall be carried out in accordance with this standard:

(a) A physical inspection of the entire system, including components, fastenings, supports, and braces;

(b) A low-pressure air test on the system before the hydraulic static test;

(c) A hydraulic static test of at least 1 hour's duration to 150% of the highest design pressure of each section of piping without leakage;

(d) The design flow rate shall be achieved through each main waterway at the hydraulically most distant points, consistent with the as-built hydraulic calculations;

NOTE – The intention of this clause is for each pressure zone to be flow tested to ensure that the hydraulic requirements are met. This could necessitate simultaneously flow testing adjacent zones.

(e) The correct functioning of all stop valves;

(f) A check of the settings of all pressure-reducing valves to confirm conformity with the as-built drawings and hydraulic calculations;

(g) Full inspection of pump sets, including power supplies and equipment. This shall include a 1-hour continuous run of any diesel-driven pumps, with the pump house ventilation provisions in the normal state;

NOTE – All doors to the pump house would normally be closed during the 1-hour run test.

(h) Inspection and check of all required signs;

(i) Inspection and check of the contents of the hydrant system reference documents (see 5.6);

(j) Defect alarms.

10.1.3 Flow and pressure measurement

Flow and pressure measurements associated with acceptance tests shall be by means of appropriately calibrated test gauges.

10.1.4 Completion statement

Before the final inspection, the contractor shall give the HSC, in the form specified by the HSC, a completion statement, including as-built drawings and hydraulic calculations.

10.1.5 Systems to be tested

Acceptance tests shall be undertaken on:

(a) New systems;

(b) Existing systems required to comply with this standard which have been substantially altered or extended since original installation.

10.2 Routine tests and inspections

10.2.1 General

Routine tests and inspections set out in 10.2.3 shall be undertaken by an independently qualified person (IQP).

All tests and inspections shall be completed at the specified frequency. A record of all tests and results shall be made in a logbook kept on the premises.

Before issuing a compliance certificate in order for a building warrant of fitness to be issued, the IQP shall be satisfied that the system is performing, and will continue to perform, in accordance with the design requirements of the original standard to which the system was installed. All deficiencies shall be notified to the owner and rectified in a timely manner, taking account of the impact that the deficiency will have on the probability that the system's performance will be compromised.

NOTE –

(1) A compliance certificate is commonly referred to as a Form 12A, as defined in the Building (Forms) Regulations.

(2) Deficiencies which would lead to a significant probability of system failure should be urgently rectified to ensure that the system will operate reliably. Examples of such deficiencies include a significant fault in the water supply, such as poor pump performance, or pressure-control valves causing excessively high or low pressures at the hydrant outlet(s). A compliance certificate should not be issued if such deficiencies exist.

(3) Minor deficiencies which are in the process of being rectified should not prevent the issue of a compliance certificate. Such deficiencies could include a minor water supply fault, minor pressure-reducing valve adjustment, pressure gauges requiring adjustment, and the like. If such deficiencies appear on subsequent inspection reports, a compliance certificate should not be issued until they are rectified.

(4) An element of judgement could be required when determining if other deficiencies should prevent the issuing of a compliance certificate.

10.2.2 Defect label

If, during routine tests and inspections, conditions which would prevent the hydrant system from functioning correctly are discovered, a buff-coloured rectangle with sides that are at least 150 mm and the word DEFECT in black on one side and details of the defect and date of inspection on the reverse, shall be displayed in the hydrant inlet enclosure for as long as the condition remains.

10.2.3 Test and procedure frequency

The following tests and procedures shall be carried out at the specified intervals:

(a) Monthly:

(i) Each diesel pumping unit shall be checked for correct start, run (not less than 15 minutes), and stop functions

NOTE – It is strongly recommended that all fluid levels be checked before start-up.

(ii) Any tank water supply shall be checked, and the level recorded. If the level is less than required, the building owner or designate shall be notified and the report annotated to that effect;

(b) Quarterly:

(i) Each diesel pumping unit shall be exercised under load for a period of at least 15 minutes and shall be checked for correct start, run, and stop functions; pressure characteristics; battery acid density; age; external cleanliness; belt tightness; filter state; and fuel, oil, and water levels

(ii) Electric-motor-driven pumps shall be exercised under load for a period of at least 5 minutes and shall be checked for correct start, run, and stop functions and pressure characteristics

(iii) The correct position of valves associated with the pump shall be checked;

(c) Annually:

(i) All parts of the system and components shall be visually inspected for defects and for compliance with this standard. Such inspection shall take into account building changes or other issues external to the system which relate to compliance

(ii) All hydrant outlets and hydrant inlets shall be checked to ensure they are not obstructed or obscured

(iii) All hydrant outlet valves shall be exercised in the full 'open' and 'closed' positions to ensure correct operation

(iv) Hydrant outlet gaskets shall be checked and, if they have deteriorated, replaced

(v) All padlocks shall be checked to ensure they are in operable condition

NOTE – If padlocks are seized shut, they should be removed and either they should be replaced or the building owner(s) should be notified that they have been removed and require replacement.

(vi) The waterway shall be hydrostatically tested to a pressure not less than its maximum working pressure

(vii) Where systems have pressure-reducing valves to control zones, the correct operation of each pressure-reducing valve shall be checked by flow testing the system over the range of a single-hose stream flow as specified in 3.3 to the design flow through the full length of each main waterway and through each pressure-reducing valve that controls a zone. The correct operation of each pressure-reducing valve shall be checked

(viii) Every diesel engine that forms part of a diesel-driven pump unit shall be serviced by the engine manufacturer's agent every year, with the oil changed and a check made of the air filter, the coolant for corrosion, and the fuel for bacterial sludging

(ix) Any pump set flexible couplings that rely on elastomeric elements for transmission of drive shall be inspected for obvious wear and deterioration. If any evidence of wear or deterioration is evident, the coupling's elastomeric element shall be replaced

(x) Water storage tanks are to be inspected and maintained in accordance with the recommendations of the tank's suppliers;

(d) 2-yearly:

(i) Servicing of the diesel-driven pump shall include changing the oil filters, fuel filters, belts, and thermostats. This service shall be followed by a full-load run of the pump unit for at least 2 hours

(ii) Each battery of each diesel-driven pump set shall be routinely replaced every 4 years, except that one of the batteries shall be initially replaced after 2 years so that, from then on, one battery is replaced every 2 years;

NOTE – In this context, 'battery' means a set of cells connected to a single charger.

(e) 5-yearly:

(i) Systems without pressure-reducing valve-controlled zones shall be flow tested over the range of a single-hose stream flow as specified in 3.3 to the design flow through the full length of each main waterway

(ii) Any hydrant pump unit shall be tested for operation, flow, and pressure characteristics compared with performance at the time of initial installation and the manufacturer's data sheets

NOTE – Comparison with original characteristics will not necessarily identify the need for remedial action but could forecast the need for future remedial work.

(iii) Pump set flexible couplings which rely on the integrity of the elastomeric element shall have the element replaced

(iv) The elastomeric elements of all pilot-operated pressure-reducing valves shall be replaced. The pilot valves shall be disassembled and cleaned, and any maintenance necessary – through either inspection or manufacturer's recommendations – shall be carried out. The valves shall be flow tested after reassembly to ensure that the desired control function is provided. All check valves shall be inspected and tested, and any elastomeric seals and seats replaced

(v) Every water supply tank shall be visually checked for cleanness and, if necessary, emptied and cleaned out

NOTE – Suitable underwater cleaning regimes could preclude the need to drain the tank for this purpose.

(vi) Pressure-reducing valves that control single outlets shall be tested for correct flow and pressure function. Where the described testing requires the removal of the valve, this shall be done in accordance with 9.2.

10.3 Maintenance

10.3.1 General

Hydrant systems shall be maintained in correct working order at all times.

10.3.2 Tampering

During any routine or other inspection, if there is any indication that the hydrant inlet assembly has been tampered with, such as unlocked enclosures or physical damage to enclosure doors, a visual inspection of the hydrant inlet shall be carried out to ensure that no foreign debris has been lodged inside the pipework system. This could necessitate a partial dismantling of the assembly.

APPENDIX A – GUIDELINES FOR NON-STANDARD DESIGNS

(Informative)

A1 Fire safety strategy

Where full coverage of the floor cannot be achieved via the provision of hydrant outlets located within protected spaces (that is, horizontal or vertical safe paths), additional provisions could be necessary to ensure that the hydrant system is fit for purpose and will allow firefighters to safely and efficiently carry out their duties.

The range of situations where this could occur means that it is not possible to prescribe a set solution in this standard. Further, such solutions if provided could prove too constraining and limit design flexibility. The provision of guidelines on how to approach non-standard designs is therefore deemed the most pragmatic. When considering such solutions, the designer should consider how the hydrant system integrates with other aspects of the building design to form a holistic fire strategy.

A2 Design fundamentals

A2.1 General

When developing a non-standard design solution to address shortfalls in hydrant coverage, designers need to recognise that:

(a) Ultimately, the design should achieve fitness for purpose and the fire brigade, as the end user will be key to determining this. Early and regular engagement is therefore essential;

(b) Fire brigade considerations will be driven by the equipment limitations, standard operating procedures and firefighter safety. Understanding those aspects will assist the designer in developing non-standard design solutions. The additional guidance contained in A3.1 to A3.5 below provides useful insight into these points.

A2.2 Key design considerations

A hydrant outlet will not be used by firefighters unless they can:

(a) Access it safely;

(b) Set up, operate, and advance from it efficiently;

(c) Retreat from it if conditions deteriorate.

For the purpose of developing the design, these criteria should be regarded as the performance requirements.

A3 Detailed considerations

A3.1 Accessing the outlet

Before using an outlet, firefighters need to be able to locate it and reach it.

Locating the outlet requires that it can either be seen from the starting point, or that a clear access path can be identified. For example, outlets within a protected stair are easy to locate when climbing the stairs. By contrast, outlets located in the middle of a large open-plan warehouse would be difficult to locate among the content and will not necessarily be visible if the building is smoke-logged.

When making their way towards an outlet, firefighters normally carry the hoses they will need to connect to the hydrant system. This means they do not benefit from the protection of a charged hose. The access route must therefore not be exposed to the effect of fire.

Also, the outlet's location needs to be protected so that they can set up and connect the hoses.

Outlets located in an unprotected space such as an open-plan layout or a large storage building are therefore unlikely to meet the needs of firefighters without additional enabling features.

A3.2 Setting up, operating, and advancing from the outlet

Establishing a charged delivery for an offensive fire attack requires sufficient space to operate around the location of the outlet. Setting up in tight spaces can delay operations and cause problems as firefighters advance towards a fire.

When establishing a delivery in a stair, the usual approach is to lay the hose out on the stairs in a bight. This allows the hose to be pulled directly through the stairwell door towards the objective. When establishing a delivery along the ground horizontally, for example from an external outlet, the hose would be laid in a bight, in the direction of entry into the building.

The orientation of the outlet, in relation to entry points and building features such as stairs and doors, will impact on the ability to manage the hose efficiently.

A3.3 Retreating from the outlet

When operating directly from the fire appliance, the delivery hose can be used by firefighters to retreat to their point of entry from a dangerous situation.

When operating from a hydrant system, the same principle must be adhered to. Should the conditions within the building rapidly deteriorate, requiring firefighters to retreat, they need to be able to follow the hose back to the hydrant outlet and point of entry to safety.

Hydrant outlets located in open, unprotected spaces do not permit this. On return to the outlet, firefighters would still be required to find their point of entry and hence exit from the building. Arduous conditions such as heat and smoke can easily result in disorientation, leading to firefighters becoming lost and entrapped within building.

During firefighting operations, a charged delivery hose will form a physical obstruction which will prevent a door from closing. This will allow smoke and heat into the protected area containing the outlet, potentially compromising the means of escape.

A3.4 Practical limitations associated with training and equipment

The inherent limitations of firefighting equipment and training underpin how firefighters would consider the three key principles in A2.2 identified above.

Firefighters will not progress into a building affected by a fire without adequate protection. This includes breathing apparatus (BA) and a charged hose for firefighting.

The length of hose is limited, typically 25 m per length. Hoses can be connected together to reach longer distances but this takes time, is physically demanding (due to the weight of water), and causes loss of pressure along the hose line. In practice this limits how many lengths of hose can be connected inside a building while retaining effectiveness.

BA sets have a limited duration determined by fitness and the work undertaken. Firefighters need to be able to reach clear air before the cylinder runs out. This means that unless building features ensure the hydrant outlet location is free from smoke contamination, firefighters will be forced to start using the BA set from outside and continue using it until they exit the building again. The time taken to travel to and from the hydrant outlet restricts the time available to carry out firefighting activities.

A3.5 Determining fitness for purpose of outlet locations

When considering whether a design is fit for purpose, or whether particular outlet locations are adequate, the fire brigade will typically look at it in the light of the points above. This will help determine whether the proposed design supports operational requirements.

Understanding these criteria will assist in developing design solutions that are more likely to achieve the desired outcomes.

A3.6 Practical examples

As outlined above, the intent of this appendix is to provide guidelines to designers to assist in developing non-standard solutions. This approach was specifically intended as an alternative to prescriptive requirements which will not necessarily offer sufficient flexibility for more complex or unusual buildings.

Notwithstanding, it is also recognised that some specific examples could be beneficial to direct the development of a solution and inform discussion.

The use of passive fire separations can assist in reducing distances firefighters have to travel while exposed to fire conditions or in protecting hydrant outlets from other parts of the building. If relying on passive systems, the designer should give consideration to how such systems could be affected by the actions of firefighters. For example, a hose passing through a door would generally prevent the door from closing.

The use of active systems can also assist by improving conditions within the building. Various systems can be used, either individually or in combination to affect any (or all) of the three key objectives identified above. Active systems could be used for a range of purposes, including controlling the fire size and/or limiting the spread of smoke.

The two examples below are provided to illustrate how passive and active systems can be used in line with the general concept of this appendix. These should not be taken as prescriptive solutions.

Example 1 – Outlet located at the end of a fire-rated corridor

The provision of a protected lobby at the end of the corridor of sufficient space containing the hydrant outlet will meet all three objectives.

It will allow firefighters to access it easily by following the corridor from the point of entry.

Provided sufficient space is available in the lobby, it will enable firefighters to set up and once ready, to make entry and progress towards the fire.

The provision of the lobby and the presence of a door between the lobby and the corridor will ensure that the corridor remains protected to safeguard firefighter egress.

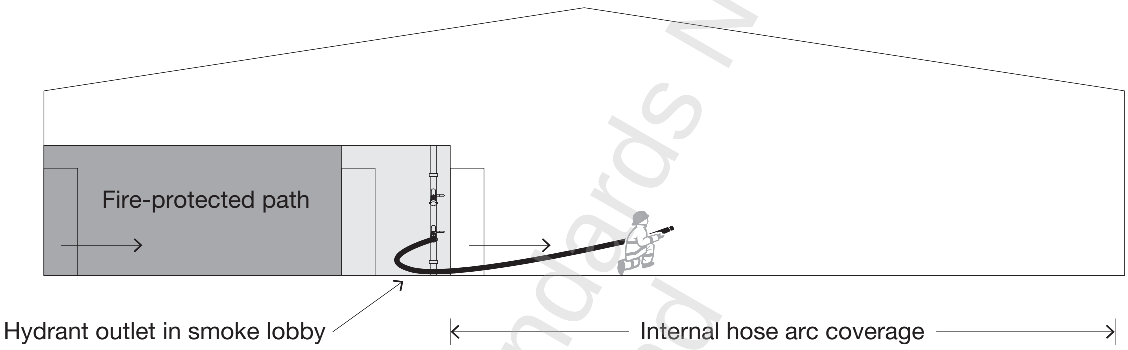


Figure A1 – Outlet located at the end of a fire-rated corridor

Example 2 – Use of smoke management to create clear zones

In this example, outlets are located in the open but through the use of a smoke control system, their location is in a separate zone to the fire.

Similar to Example 1, access and egress are provided, this time by the smoke control system. The space around the outlet in the unaffected zone allows setting up. This is illustrated in Figure A2.

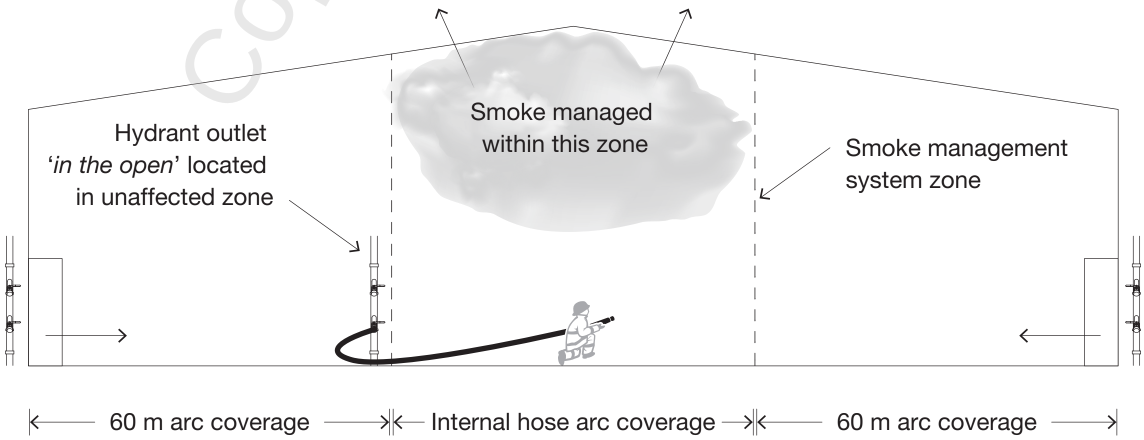


Figure A2 – Use of smoke control to protect hydrant outlets

A4 Approval of hydrant system

Hydrant system designs that do not comply with the normative requirements of this standard can, on approval by the HSC, be considered to meet compliance with this standard. Preliminary approval of design decisions for non-standard designs should be submitted to the HSC during the design stage of the project for preliminary approval and in accordance with 2.7.

APPENDIX B – COMBINED SPRINKLER-AND-HYDRANT RISERS FOR INCREASED RESILIENCE

(Normative)

B1 Introduction

This appendix can be used to design an installation that meets or exceeds the levels of resilience of separate fire sprinkler and fire hydrant systems.

For low-rise buildings, firefighters can fight the fire internally, externally, or both internally and externally. They can provide water to the building using either a fixed system (sprinklers and hydrants) or (external) fire appliances. External resources provide capacity and resilience if the internal systems fail.

With high-rise buildings, external resources (for example, water from the fire appliance) are lost and firefighters have to commit to internal firefighting operations.

To ensure that it is safe for them to enter a high-rise building, firefighters need to know if the building has functioning sprinkler and hydrant riser systems. Therefore, careful consideration needs to be given to the design of such systems to ensure they possess suitable resilience and redundancy to allow firefighters to carry out their rescue and firefighting operations safely.

This appendix describes a combined system configuration (a sprinkler-and-hydrant riser) with better resilience than separate sprinkler and hydrant risers.

The combined sprinkler-and-hydrant riser consists of a class A2 (as defined in NZS 4541) water supply and a ladder riser that has been designed so that the sprinklers' and the hydrant flow's combined functions can be still be met even if any of the following fail:

(a) The infill supply;

(b) One tank;

(c) One pump;

(d) One pipe section;

(e) One pressure-reducing station.

The design also allows testing by returning the test water to the water supply tanks through a flow meter (to reduce water wastage) and for ease of testing and proving of the system.

Using a combined sprinkler-and-hydrant riser shall only be permitted for fully sprinklered buildings. Except as modified by this appendix, the fire sprinkler system shall comply with the provisions of NZS 4541.

B2 Scope

Combined sprinkler-and-hydrant riser systems can be installed in:

(a) Buildings with more than six levels of outlets;

(b) Buildings with a fire sprinkler system categorised as 'extra-light hazard', 'ordinary hazard groups 1, 2, and 3', 'ordinary hazard group 3', or 'special and discrete storage areas of no greater than ordinary hazard group 4', as defined in NZS 4541.

NOTE – It is not envisaged that this appendix will allow combined sprinkler-and-hydrant systems to be installed in large, low-rise buildings or buildings with occupancies defined as 'extra-high hazard' by NZS 4541.

B3 Definitions

B3.1

'Listed' is as defined in NZS 4541.

B3.2

'Supervised' is as required by NZS 4541.

B3.3

'Sprinkler system certifier' (SSC) is as defined in NZS 4541.

B4 Certification

As both NZS 4541 and NZS 4510 require that systems be certified, the SSC and the HSC shall be the same person.

B5 Water supply

B5.1

The combined sprinkler-and-hydrant riser shall have a class A2 water supply, as defined in NZS 4541.

B5.2

Unless additional storage volume is required by B5.3, the water storage shall be divided between two tanks, each storing 50% of the required water to meet the sprinkler system duty for the period required by NZS 4541 6.4.3.2, plus 22.5 m^3 in each tank for the hydrants.

B5.3

Each tank shall have an in-fill connection from an inexhaustible water source (for example, a town main). The in-fill rate shall be sufficient to meet the highest sprinkler duty flow of the system and be achievable by flowing into either tank individually to allow for the possibility that one tank is out of service. If an inexhaustible water supply is not available to meet the highest sprinkler duty flow, the volume of each tank specified in B5.2 shall be increased to 75% of the sprinkler duty flow, plus 22.5 m^3 in each tank for the hydrants.

B6 Riser general arrangement

B6.1

Figure B1 shows a typical schematic for a combined sprinkler-and-hydrant riser system that complies with the requirements of this standard.

B6.2

Figure B2 shows a suitable arrangement when a third riser stack is required.

B6.3

The water supply shall be independently piped from the discharge of each pump to the riser isolation valves at the top of the building (see Figures B1 and B2).

B6.4

If the building has two independent vertical safe paths, the water supply risers and hydrant outlet risers shall be run with one water supply riser and one hydrant outlet riser in each safe path.

B6.5

If the building has a scissor staircase arrangement, both water supply risers should be run in the scissor stairwell and one hydrant outlet riser shall be run on each side of the scissor stairwell.

B6.6

Where there is only one vertical safe path staircase, one water supply riser and one hydrant outlet riser shall be run in the vertical safe path stairwell. To complete the ladder riser configuration, the other water supply riser, plus a hydrant riser without outlets, shall be run in a separate services riser.

NOTE – To achieve the required resilience, the combined sprinkler-and-hydrant riser system will need at least two riser stacks.

B6.7

Where more than two riser stacks are needed to meet the required hydrant coverage, these additional riser stacks shall be tied in to form an additional loop at each pressure zone.

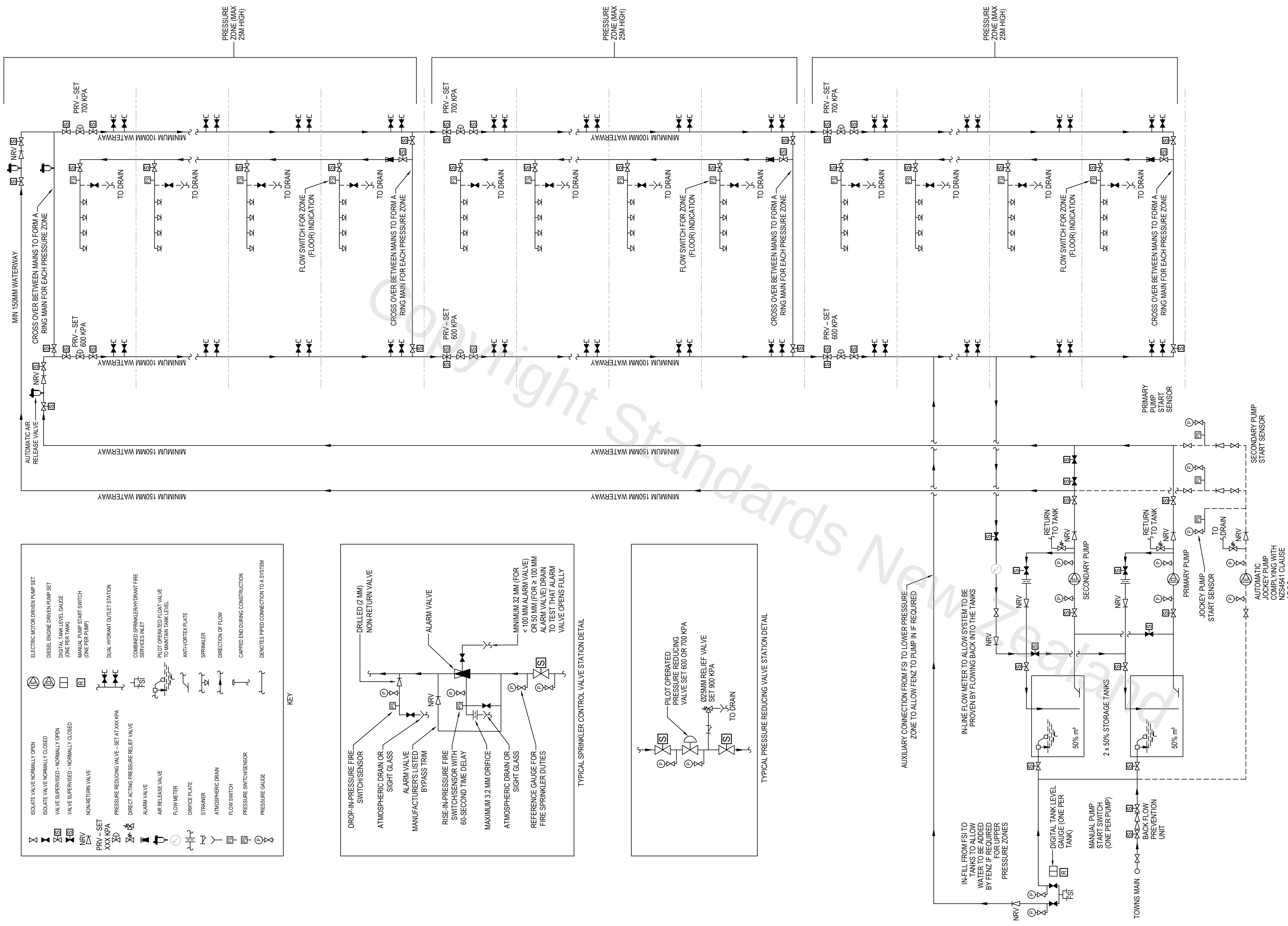
B6.8

A crossover link shall be provided between the risers at each pressure zone. This link shall be fitted with two supervised locked isolation valves to allow one valve to be removed for repairs while maintaining protection of the building.

B7 Pressure-control zones

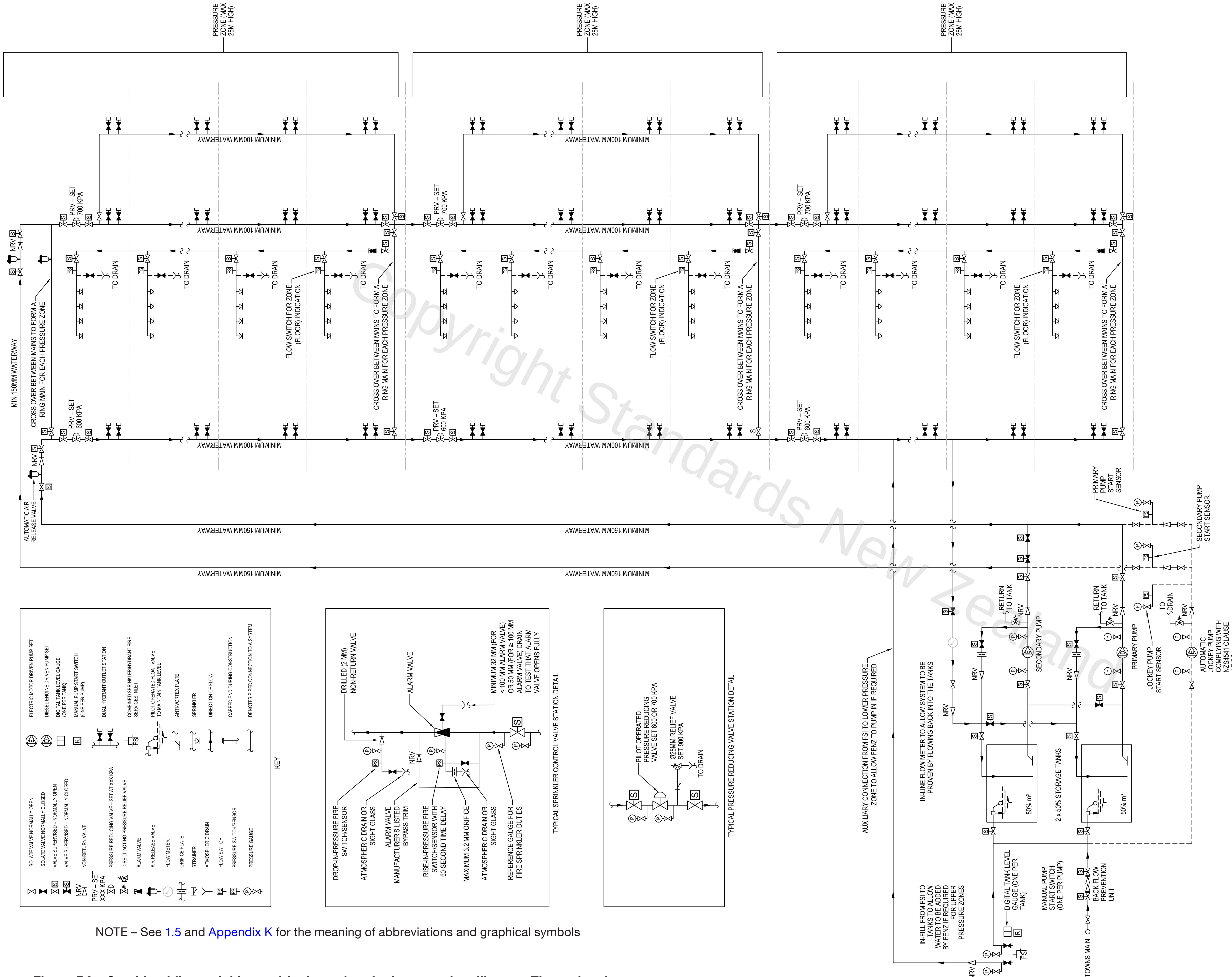
The hydrant system shall be divided into pressure zones, each of not more than 25 m in height and configured into a ring main at each zone as shown in Figure B1 or Figure B2.

NOTE – The intention of this configuration is that if one pressure-reducing valve fails in the closed position, the other pressure-reducing valve admitting water to the zone shall allow the system duties for the zone, and those below, to be met. Then, in the event of one pressure-reducing valve failing in the open position, the pressures developed within the zone will be within the safe working pressure limitations of the fire brigade's equipment.



NOTE – See 1.5 and Appendix K for the meaning of abbreviations and graphical symbols.

Figure B1 – Combined fire sprinkler-and-hydrant riser for increased resilience – Two-riser layout



NOTE – See 1.5 and Appendix K for the meaning of abbreviations and graphical symbols

Figure B2 – Combined fire sprinkler-and-hydrant riser for increased resilience – Three-riser layout

B8 Riser-control valves

B8.1

The control valves shall be arranged as shown in Figure B1 or Figure B2. The control valves shall include:

(a) A listed automatic air-relief valve at the top of each riser stack and the top crossover link;

(b) A non-relief valve at the top of each riser stack;

(c) Listed pressure-control valves at the entry to each pressure zone;

(i) The pressure-control valves on one riser stack shall be factory-set at 600 kPa

(ii) The pressure-control valves on the alternate riser stack shall be factory-set at 700 kPa;

NOTE – The 100 kPa pressure differential between the two riser stacks is intended to prevent hunting between the two pressure-control valves.

(d) A minimum 25 mm-nominal bore pressure-relief valve set at 900 kPa and piped to waste via a tundish or sight glass shall be provided downstream of each pressure-control valve;

(e) Pressure gauges meeting the requirements of NZS 4541 shall be provided upstream and downstream of each pressure-control valve;

(f) A listed supervised isolation valve shall be installed on both sides of the non-return and pressure-control valves required by (b) and (c).

B8.2

Refer to Figure 10 for a layout of a typical pressure-reducing station.

B9 Sprinkler zone control valves

B9.1

Each sprinkler zone shall consist of a 'shotgun riser' assembly, consisting of:

(a) A listed supervised locked isolation valve;

(b) A listed alarm valve;

(c) A drain valve piped to waste of:

(i) 32 mm nominal bore for alarm valves less than 100 mm nominal bore

(ii) 50 mm nominal bore for alarm valves 100 mm nominal bore or larger;

(d) A rise-in-pressure switch/sensor with a maximum 60-second electronic time delay:

(i) The pipe downstream of the rise-in-pressure switch shall drain through a maximum 3 mm orifice to a tundish or sight glass to allow the pressure switch to reset when the alarm valve reseats

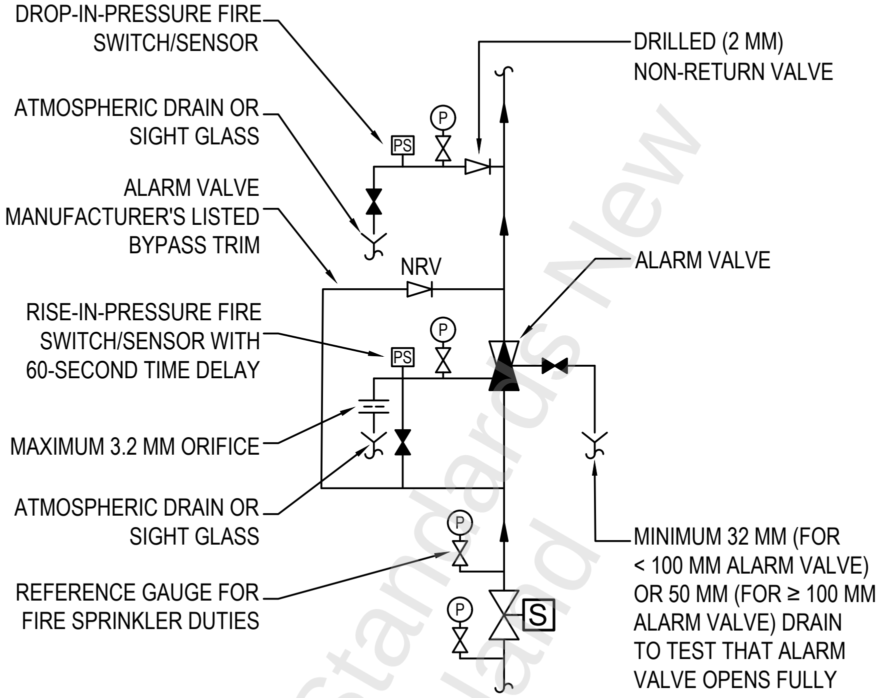
(ii) A test valve shall be provided to allow for the pressure switch to be tested;

(e) A drop-in-pressure switch/sensor installed downstream of a maximum 2 mm drilled check valve; and

(f) A test drain installed and piped to a tundish or sight glass to allow for testing of the pressure switch.

B9.2

A typical arrangement is shown in Figure B3.



NOTE – See 1.5 and Appendix K for the meaning of abbreviations and graphical symbols.

Figure B3 – Typical zone-control valve station

B9.3

The sprinkler zone-control valves shall be located in either:

(a) A vertical safe path; or

(b) A services duct or cupboard close to and visible from the entry to a vertical safe path.

B9.4

If the valves are located in a safe path, where it is practical to do so, one entry used by firefighters or service personnel to access the stairwell shall provide access to all sprinkler zone-control valves.

B9.5

The door or access panel to a services duct or cupboard shall be labelled SPRINKLER ZONE CONTROL VALVE in reflective lettering at least 25 mm high.

B9.6

The isolation, drain, and test valve handles shall be located between 1150 mm and 1800 mm above floor level.

B10 Hydraulic duties and calculations

B10.1

The duties for the sprinkler system shall be determined in accordance with the requirements of NZS 4541 sections 7 and 8 as appropriate to the hazard and calculated using the methodology given in NZS 4541 section 10.

B10.2

Additionally, the sprinkler system shall be designed to allow a simultaneous hydrant flow of 1500 L/min from the most hydraulically disadvantaged hydrants on the floor for which the sprinklers have been calculated.

NOTE –

(1) The design basis for unusual situations, such as atria and internal drenchers, should be agreed by the HSC.

(2) In order for pressure-reducing valves to regulate correctly, they must have a differential across the valve (that is, the inlet pressure must exceed the outlet pressure sufficiently to allow for operation of the valve). This needs to be considered in the hydraulic design.

B10.3

The hydraulic design shall demonstrate that the simultaneous sprinkler and hydrant duties can be met with each of the following scenarios:

(a) One pump impaired;

(b) One pipe section impaired (that is, closed off with adjacent isolate valves to deal with a leak);

(c) One pressure-reducing station impaired and failed in the closed position;

(d) One pressure-reducing station impaired and failed in the open position.

NOTE –

(1) Failure analysis should only consider one component or pipe failure for each scenario.

(2) When calculating the scenario of a pressure-reducing valve failed in the open position, it should be considered that the adjacent pressure-reducing valves supplying water to the zone will be closed due to the downstream pressure being higher than their set pressure.

(3) These design scenarios shall be proven during commissioning and in subsequent 2-yearly inspections.

B10.4

The design duties shall be carried out to a reference datum point located immediately below the alarm valve for each sprinkler zone-control valve, immediately below the highest hydrant outlet, and at the discharge of each pump. A calibrated reference gauge shall be provided at this location.

B10.5

The design duties shall be tabulated in a water-resistant format and located in the fire pump room.

B11 Fire sprinkler control panel – signalling/supervision/operation

B11.1

The combined hydrant-and-sprinkler system shall be monitored and supervised by a fire sprinkler control panel complying with NZS 4541 4.7.2.2.3.

B11.2

Each valve, pressure switch, flow switch, pump, and device monitored by the fire sprinkler control panel shall have its own independent address at the panel. The address shall have a descriptor on the panel's liquid crystal display (LCD) indicating what the device is (for example, a hydrant valve) and the location (for example, L30 stairwell).

B11.3

All off-normal, defect, and fire events triggered by equipment supervised by the fire sprinkler control panel shall be indicated on the panel.

B11.4

The sprinkler rise-in-pressure and drop-in-pressure switches shall be configured to generate a fire call on operation.

B11.5

Unauthorised closure of the isolation valves shown in Figures B1, B2, B3, and B4 as 'supervised normally open' shall generate a 'fire' signal to the fire brigade's alarm-monitoring station.

B11.6

Unauthorised opening of the isolation valves shown in Figures B1, B2, B3, and B4 as 'supervised normally closed' shall generate a 'defect' signal to the fire brigade's alarm-monitoring station.

B11.7

A 'defect' signal shall be generated on the running of any fire pump or from any pump fault condition reported by the fire pump controller.

B11.8

A light-emitting diode (LED) display shall be located next to each sprinkler zone-control valve station with a labelled LED to give local indication of rise-in-pressure switch operation, rise-in-pressure switch time delay completed, drop-in-pressure switch operation, and off-normal operation of the isolate valves associated with the sprinkler zone-control station. The LEDs shall be fitted with engraved labels indicating their function.

NOTE – The purpose of the LEDs is to assist with routine testing of the sprinkler zone-control valve station.

B11.9

Where flow switch operation is used for control of evacuation sequencing, or other building services, the fire sprinkler control panel shall be configured to require double-knock operation of both the flow switch and either the sprinkler zone control rise-in-pressure switch or the drop-in-pressure switch.

NOTE –

(1) The double-knocking of flow switches and the alarm valve is to avoid spurious fire alarms.

(2) It is suggested that where only the alarm valve is operated and there is no flow switch or other means of fire detection (for example, MCP, smoke detector, and so on), then the area covered by the alarm valve should be evacuated.

(3) This guidance is provided as basic guidance only. The design of the fire alarm matrix is outside the scope of this standard and should be undertaken by a competent fire engineer and fire protection engineer.

B11.10

The fire sprinkler control panel shall be provided with a key-operated switch labelled ISOLATION VALVE OVERRIDE. Operation of this switch shall:

(a) Place the fire sprinkler control panel into a 'defect' state;

(b) Allow the isolation valves to be closed without generating a fire signal;

(c) Allow the control panel to generate a fire signal should a sprinkler control-zone pressure switch operate;

(d) Be operable by a Bulgin 6083/C patterned key.

B11.11

The requirement for a hydraulic water motor alarm ('gong') given in NZS 4541 shall be deleted. Instead, a red electric bell shall be located at the main fire brigade attendance point to sound on sprinkler operation. This bell shall be labelled SPRINKLER OPERATING in white lettering at least 50 mm high on a red background.

B12 Pump starting

B12.1

Both pumps shall be simultaneously started by an electronic signal from the dedicated fire sprinkler control panel required by B11.1.

B12.2

As a back-up to the sprinkler system, the pumps shall also be fitted with a pressure switch to start when there is a drop in pressure of the riser downstream of the pumps.

B12.3

Manual start switches for each pump shall also be provided at the sprinkler-and-hydrant system inlet as required by 7.5.2.

B13 Pressure-maintenance (jockey) pump

An automatic pressure-maintenance pump (complying with NZS 4541 4.7.5.2) shall be installed and configured to maintain pressure at the top of the riser of not less than 850 kPa.

B14 In-line flow meter

B14.1

An in-line flow meter shall be provided to allow the pumps and pressure-control valves to be tested by discharging back into the water supply tanks.

B14.2

The flow meter shall be a proprietary device installed in accordance with the manufacturer's recommendations.

B14.3

Flow meter gauges shall be selected so that the highest flow rate is in the centre third of the scale.

B14.4

The gauge shall be correct to within 2% over the centre third of its scale and within 3% over the remaining two thirds.

NOTE –

(1) Flow meters approved by FM Global meet this requirement.

(2) Gauges should be calibrated before the annual pump and pressure-control valve flow tests are carried out.

B15 Tank-level gauges

B15.1

A tank sight glass or level gauge complying with the requirements of NZS 4541 shall be located at each water tank.

B15.2

A remote digital tank-level gauge shall be located adjacent to the fire brigade inlet at the main fire brigade attendance point for each water tank.

NOTE – The intention of the remote gauge is to allow firefighters to monitor the tank level and determine whether they need to provide additional water through the fire appliance.

B16 Signage and labelling

The combined sprinkler-and-hydrant fire brigade inlet shall be labelled COMBINED SPRINKLER AND HYDRANT INLET – KEEP CLEAR in contrasting lettering that is at least 50 mm high.

B17 Very tall buildings

B17.1

Where the height of the building is such that it is not practical to pump water from the base, it shall be permitted to install a second set of water tanks and pumps higher up the building, with a second combined sprinkler-and-hydrant riser installed to supply the higher levels.

B17.2

The additional tanks shall be sized as in-fill tanks, with the in-fill water supplied by the combined sprinkler-and-hydrant riser serving the levels below. To maintain independence and redundancy, each high-level tank shall be served by only one of the water supply pumps/tanks below.

B17.3

The riser system above the new tanks shall follow the design approach documented in this standard for a combined fire sprinkler-and-hydrant riser system. The design shall be agreed with the SSC and HSC.

B18 Routine testing, maintenance, and inspections

B18.1

The combined sprinkler-and-hydrant system shall be routinely tested, maintained, and inspected in accordance with the provisions of NZS 4541 section 11. In addition, the following tests shall be carried out annually:

(a) All hydrant outlet valves shall be exercised to full ‘open’ and ‘closed’ positions to ensure their correct operation;

(b) Each pressure-control valve shall be flow tested through the riser back to the tank to ensure it is correctly modulating the pressure;

(c) Each fire sprinkler alarm valve shall be subjected to a full flow drain test to ensure it is operating correctly;

(d) Each fire pump shall be independently flow tested back to its tank through the in-line gauge;

(e) Pressures shall be checked immediately upstream of each sprinkler zone-control valve and at the pump discharge;

(f) Each section of the hydrant system shall be individually flow tested at its full duty flow to verify correct operation and performance.

B18.2

In addition to the documentation required by other sections of this standard and NZS 4541, the following documentation, in a water-resistant format, shall be provided within the fire pump room:

(a) A gauge schedule, with a schedule of design duties which, considering the requirements of B8, should be checked on a yearly or 2-yearly basis;

(b) A system schematic.

NOTE – It is envisaged that the two documents required to be provided within the fire pump room will be laminated or protected in a similar manner. The documents should be mounted in a frame and mechanically affixed (with screws, cavity anchors, bolts, masonry anchors, or similar) to the pump house walls.

B18.3

A detailed draft compliance schedule shall be prepared, with a copy submitted to the SSC and HSC. This draft compliance schedule shall clearly outline the inspection and test programme required to meet the provisions of B18.

NOTE – It is envisaged that the compliance schedule will list a combined sprinkler-and-hydrant system under 'Automatic systems for fire suppression (for example, sprinkler systems)'. The system would not also be expected to fall under 'Riser mains for use by fire brigades'.

B18.4

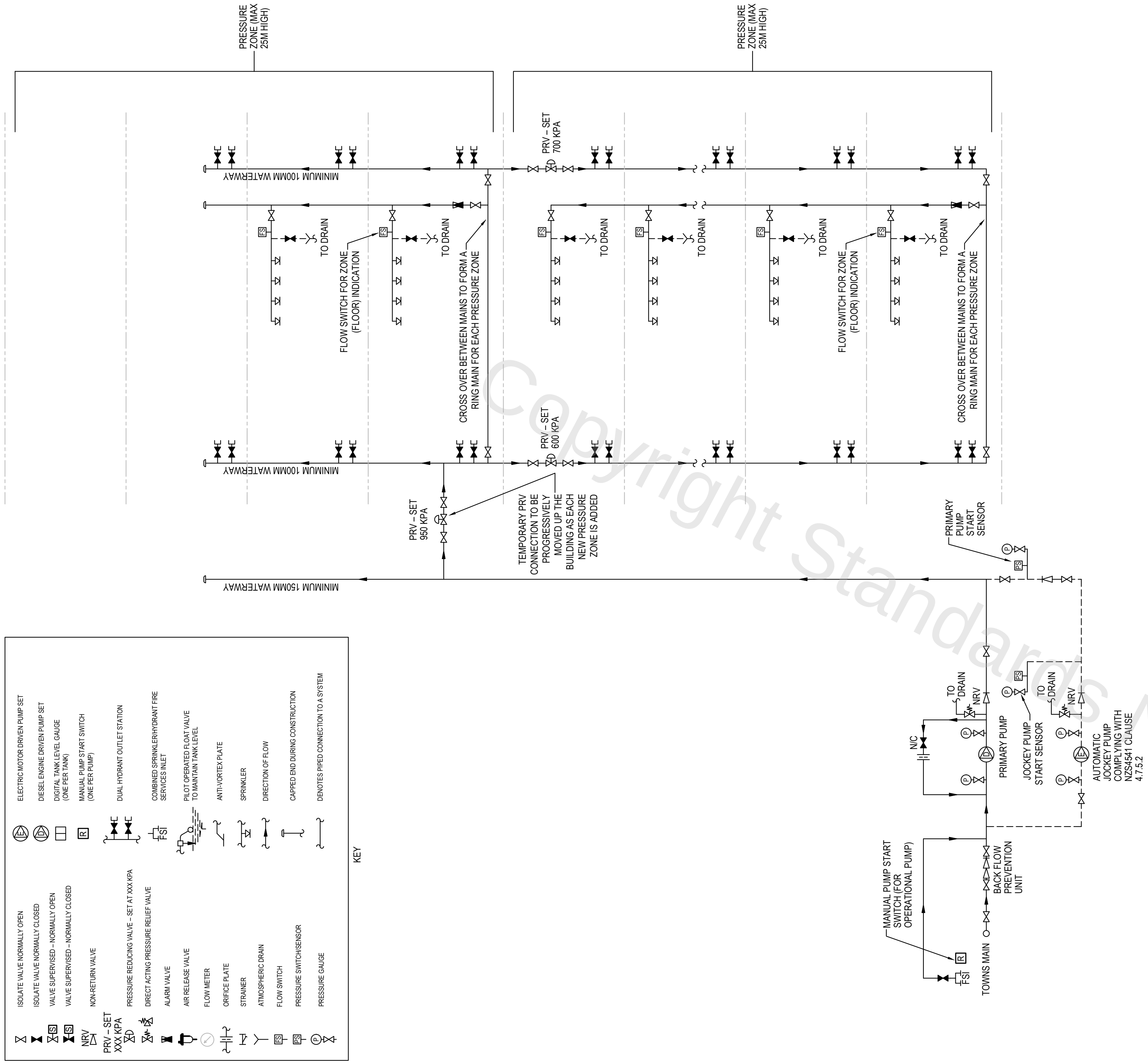
Valve overhauls shall be carried out at 5-yearly frequency for all key valves.

B19 Construction riser

During construction, it will be necessary to make a temporary connection from one of the high-pressure risers to the bottom level of a riser pressure zone. The temporary connection shall be fitted with a pressure-reducing valve set at 900 kPa, to ensure that a minimum hose pressure of 600 kPa is available at the top of the construction zone.

As the building progresses up, the temporary connection will need to be relocated up the building at each 30 m pressure zone increment.

Figure B4 shows a typical schematic that will meet the requirements of this standard for a construction riser.



NOTE – See 1.5 and Appendix K for the meaning of abbreviations and graphical symbols.

Figure B4 – Combined fire sprinkler-and-hydrant riser for increased resilience – During construction

APPENDIX C – SYSTEMS INSTALLED TO SUPERSEDED STANDARDS

(Informative)

C1

For extensions to existing systems where hydrant outlet couplings are single-lugged, the permissible pressure range shall be 600 kPa to 1050 kPa.

C2

Existing riser systems have been installed to superseded standards, which include the following:

(a) NZS 4510:2008;

(b) NZS 4510:1998;

(c) NZS 4510:1978;

(d) The 1990 Interim Code of Practice for Charged Riser Compliance, issued by the Commander Region 1, New Zealand Fire Service;

(e) Other specifications or standards.

C3

It is recommended that existing riser systems, other than those complying with NZS 4510:1998 and NZS 4510:2008, be upgraded to meet the relevant criteria of this standard specified in either (a) or (b) below as appropriate:

(a) Hydrant systems designated as 'dry risers' which:

(i) Are charged with water and comply with 3.5

(ii) Are provided with booster pumps as required by 3.4, and conform to section 7

(iii) Have pressure-control devices, where required, installed to conform with section 6 to ensure that pressures at hydrant outlets are within the limits specified in 6.3

(iv) Incorporate in the riser inlet assembly a pressure gauge to conform to 5.4.2 and 6.4.1

(v) In areas having a seismic factor greater than 0.13, as defined in NZS 1170.5, either conform to 2.4 or, in the opinion of a design engineer, are capable of remaining functional at the earthquake loadings specified in NZS 1170.5

(vi) Have the hydrant inlet enclosure labelled in conformance with 2.6

(vii) Have fire brigade reference documents provided in conformance with 5.6;

(b) Hydrant systems designated as 'wet risers' which:

(i) Are provided with one or more booster pumps capable of developing the pressure required at each hydrant outlet as specified in section 3 when flowing either:

(A) The number of simultaneous hose streams required in 3.3 at the design flow rate specified in 3.3; or

(B) At a flow calculated as 1200 L/min multiplied by the largest number of hydrant outlets on any one floor, whichever is the lesser flow;

(ii) Have pressure-control devices, where required, installed to conform to section 6 to ensure pressures at hydrant outlets are within the limits specified in 6.3

(iii) Have each booster pump unit found on inspection, and to the satisfaction of the HSC, to be in good working order

(iv) Incorporate in the riser inlet assembly a pressure gauge to conform to 5.4.2 and 6.4.1

(v) In areas having a seismic factor greater than 0.13, as defined in NZS 1170.5, either conform to 2.4 or, in the opinion of a design engineer, be capable of remaining functional at the earthquake loadings specified in NZS 1170.5

(vi) Have the hydrant inlet enclosure labelled in accordance with 2.6

(vii) Have fire brigade reference documents provided in accordance with 5.6.

C4

In the event that an existing system requires substantial extension or alteration as a consequence of building alterations, the BCA could require the system to be suitably altered so that new systems comply with the requirements of this standard. In such cases, it shall be a permitted exception, subject to the agreement of the HSC, to reuse components of the original system which remain in good order.

C5

It is recommended that systems installed to any previous standards be tested against this standard as reasonably practical. Where this is not practical, the testing requirements of the standard to which the system was installed should be referenced.

C6

It is recommended that any existing hydrant outlets with single-lugged connections be replaced with double-lugged connections. In such cases, the use of double hydrant outlets controlled by ball valves is encouraged.

C7

In systems without pumps and pressure-control facilities, there could be provisions to allow a visual (camera) inspection of all sections of the hydrant systems that cannot be safely flow tested to demonstrate that the pipe is unobstructed.

APPENDIX D – FIRE HAZARD EXAMPLES

(Informative)

Fire hazard examples are given in the tables below.

Table D1 – Low fire hazard examples

Activities in the space or building	Examples
Display or other large open spaces; or other spaces of low fire hazard	Art galleries, auditoriums, bowling alleys Churches, clubs, community halls, court rooms, day care centres Gymnasiums, indoor swimming pools
Seating areas with upholstered furniture, or spaces of low or moderate fire hazard	School classrooms, lecture halls, museums Nightclubs, restaurants, eating places Early childhood centres Cinemas, theatres, libraries
All spaces where occupants sleep	Household units, motels, hotels Hospitals, residential care institutions
Spaces for working or storage with low fire hazard	Manufacturing and processing of non-combustible products, or products with a slow heat-release rate (for example, wineries, wet meat areas, horticultural products)
Support activities of low fire hazard	Car parks Locker rooms, toilets and amenities, service rooms Plant rooms with plant not using flammable or combustible fuels
Spaces for business	Banks, personal or professional services, police stations (without detention), offices
Spaces for the display of goods for sale (retail, non-bulk)	Exhibition halls, shops and other retail (3 m high or less)
NOTE – This is based on buildings with an expected fire load energy density of 800 MJ/m² or less.	

Table D2 – High fire hazard examples

Activities in the space or building	Examples
Spaces for working or storage with moderate or high fire hazard	Manufacturing and processing of combustible products, or processes that use high heat Chemical manufacturing and processing, feed mills, flour mills Storage of foamed plastics (any height) Storage over 3 m high of combustible materials, including temperature-controlled storage
Workshops and support activities of moderate or high fire hazard	Maintenance workshops, plant and boiler rooms other than those described in the low fire hazard table
Spaces for the display and sale of goods in bulk retail format	Bulk retail (over 3 m high)
Spaces for multi-level vehicle stackers	Vehicle-stacking systems of more than two levels
NOTE – This is based on buildings with an expected fire load energy density greater than 800 MJ/m².	

APPENDIX E – TRACE HEATING

(Normative)

E1 Trace heating and/or lagging

Trace heating and/or lagging is permissible where:

(a) It is constrained to two landings and 25 m of pipe;

(b) It is used for above-ground pipework between buildings.

E2 Electrical requirements

E2.1

Listed trace heating systems shall be permitted in accordance with this appendix.

E2.2

Trace heating systems shall be designed to maintain a temperature between 4°C and 49°C.

E2.3

The calibration and the setting of the thermostat shall be checked at the time of installation.

E2.4

The trace heating system shall operate automatically.

E2.5

Trace heating shall utilise self-regulating heating cable.

E2.6

The trace heating system shall be supervised by either the fire alarm panel or the sprinkler fire brigade alarm to generate defect signals in any of the following off-normal conditions:

(a) Short-circuit or shock faults;

(b) Loss of power.

E2.7

The electrical supply for the trace heating systems shall be from a reliable source via a separately fused, switched, and labelled circuit with a tell-tale indicator light from the main switchboard to ensure that supplies are not inadvertently switched off during holiday shutdowns or maintenance periods. There shall be a label at the switch stating, FIRE PROTECTION TRACE HEATING SYSTEM – DO NOT SWITCH OFF.

E2.8

In addition to the installation of the trace heating cable, the pipe shall be overwrapped with suitable insulation in accordance with the trace heating manufacturer's listed system.

E2.9

Ongoing maintenance at a minimum shall include:

(a) Monthly – power check;

(b) Quarterly – power defect check;

(c) Annually – inspection of pipework, an electrical insulation (megohmmeter) test, end-of-line LED operation, and thermostat setting.

NOTE – Informative guidance on the installation of trace heating systems can be found in FM Global *Datasheet 9-18: Prevention of Freeze-Ups* – Appendix C.

APPENDIX F – DRY PIPE HYDRANT SYSTEM

(Normative)

F1 General requirements

Where installed, the following requirements shall apply:

(a) Fire brigade inlet connection(s) shall comply with section 5;

(b) Each fire brigade hydrant inlet shall serve any dry and wet riser hydrant outlet;

(c) Check valves shall be provided immediately upstream of the inlets on each dry and wet hydrant pipework branch;

(d) Hydrant outlet connection(s) shall comply with 3.2;

(e) The pipework system shall be graded back to a drainage point, or points, that ensure all water can be drained after pipework flooding;

(f) An automatic, normally open air-relief valve shall be installed directly upstream in combination with a listed, direct-acting, spring-loaded, diaphragm-type relief valve at every high point in the auxiliary portion of the system reticulation;

(g) The air-pressure-maintenance system shall be supervised with fault and activation monitoring;

(h) The minimum system air pressure shall be 70 kPa;

(i) The maximum direct-acting pressure-relief valve pressure shall be 300 kPa;

(j) Pipework volume shall be limited to 1900 litres;

(k) There shall be drainage points at every low point in the system reticulation;

(l) Site procedures shall be provided for draining of the system after flooding of the pipework to ensure all water is removed from the installation and the system is recommissioned;

(m) Flooding of the installation shall generate a maintenance agent service call.

F2 Installation

F2.1

Dry pipe hydrant systems shall comply with the requirements of NZS 4541 for dry pipe installation including pipe jointing methods.

F2.2

Roll-grooved joints shall be of the ‘flush seal’ type.

F2.3

Hemp shall not be used to seal threaded joints.

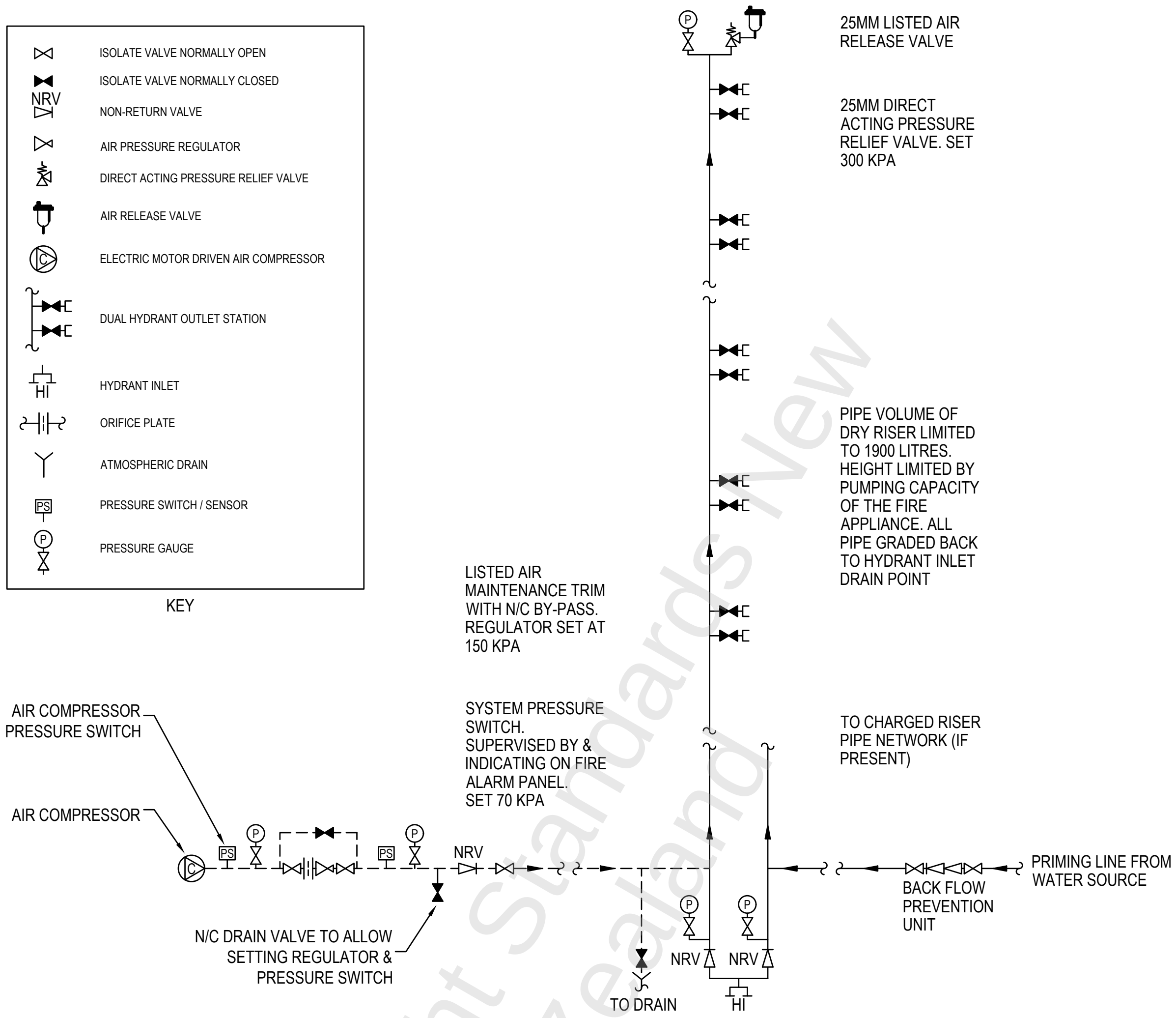


Figure F1 – Supervised dry pipe hydrant system

F2.4 Additional commissioning provisions for dry pipe hydrant systems

Supervised dry pipe hydrant systems shall require a pneumatic air test in compliance with NZS 4541 1.11.7.

A maximum pressure drop of 10 kPa over a 24-hour period after being adjusted for temperature fluctuations is permitted.

F2.5 Additional maintenance provisions for dry pipe hydrant systems

The minimum requirements for maintenance shall include the following additional items:

(a) Quarterly:

 (i) Any alarm functions, such as low air pressures and the like, should function and indicate correctly

 (ii) An inspection should be carried out of any ancillary plant, such as air dryers, compressors, and the like, to ensure they are functioning correctly; and

(b) Annually: A hydrostatic test of the riser.

APPENDIX G – DRY BARREL PILLAR HYDRANTS FOR EXTERNAL USE

(Informative)

G1

External dry pillar hydrants shall be permitted for use on a wet hydrant system or as part of a site fire water main such as an NZS 4541 class B2 water supply in accordance with this appendix. The arrangement shall be approved by the HSC or SSC.

G2

The hydrant shall be of a type that admits water into the barrel only when the hydrant is opened and that drains automatically via weep holes below the frost line when closed.

G3

Each hydrant shall be installed on an isolatable spur from the water supply.

G4

The underground water supply shall be installed below the frost line.

G5

The following installation requirements shall apply:

(a) Independently operated dual dry pipe outlet assemblies and double-lugged female instantaneous couplings complying with SNZ PAS 4505 shall be used;

(b) All parts of the assembly shall be installed in such a manner that no residual water can remain in the outlets, valves, and dry pillar waterway after use, as residual water could cause freeze-ups;

(c) Drainage bedding, such as crushed rock or gravel below the frost line for the weep holes, shall be provided;

(d) A 33.5 mm, square stem nut shall be used;

(e) At least two pillar hydrant stem nut keys shall be readily available, either secured to the hydrant, within the fire brigade inlet enclosure, or within the main fire pump rooms, up to a quantity the design number of dual outlets determined to operate. They shall be provided with a dedicated cabinet or rack and suitable signage.

G6

Additional testing, maintenance, and impairments shall be in accordance with the listing criteria and, as a minimum, shall include:

(a) Acceptance tests that include inspection and check of the automatic pillar drain after use;

(b) Annual exercising of all hydrant outlets and pillars to ensure the correct operation of flooding and subsequent automatic draining, including correct operation of the seat ring.

NOTE – Informative guidance on the installation and maintenance of dry pillar hydrants can be found in FM Global *Datasheet 3-10: Installation and maintenance of private fire service mains and their appurtenances.*

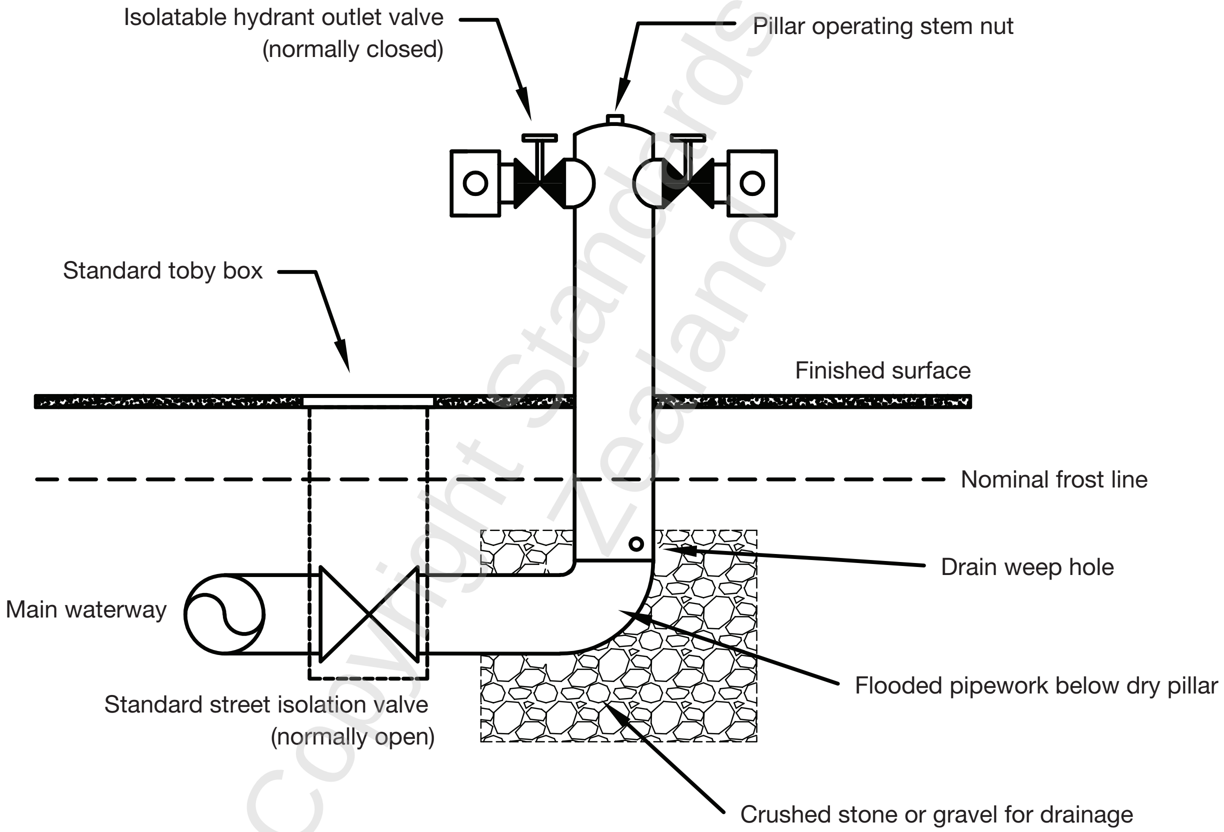


Figure G1 – Dry pillar hydrant

APPENDIX H – RECOMMENDATIONS FOR FROST-PROTECTION MEASURES FOR FIRE HYDRANT SYSTEMS IN COLD CLIMATE REGIONS

(Informative)

H1 General

The need to protect a fire hydrant system from the effects of freezing is easily understood. Freezing of water within hydrant waterways could result in two effects:

(a) Damage to the pipework and fittings of ancillary equipment, causing subsequent water leakage and property damage;

(b) Systems rendered inoperative due to ice blockage and hence not able to deliver water to the fire brigade for firefighting purposes.

Predicting when a fire hydrant system, or part of a system, will freeze is not always obvious, and careful consideration of the relevant environmental and other consequential factors is required. For a building located in an area subject to freezing ambient temperatures, for example, it does not necessarily follow that the fire hydrant system installed within that building will also be subject to those temperatures.

Examples of areas prone to freezing include:

(c) Cold climate areas;

(d) Unheated or inadequately heated buildings and structures;

(e) Parts of heated buildings exposed to frost, such as ceiling voids, areas near open doors at loading bays, or external hydrant outlets;

(f) External pipelines;

(g) The fire brigade inlet and pump house enclosure;

(h) Areas normally heated but temporarily unheated during out-of-hours, weekends, or winter holidays.

NOTE – Hydrant systems, including the outlets, inside the thermal envelope of a heated building will normally be adequately protected against low ambient temperatures when they are maintained above 4°C at all times. When this is not the case, such as out-of-hours, weekends, or winter holidays, an assessment will need to be carried out to ascertain what freeze-protection options could be required. Current building practice tends to ignore heating to buildings during periods of non-occupancy that will allow heating to maintain a background temperature of 4°C during out-of-hour periods.

In certain types of buildings, current practices lean toward the building insulation membrane being placed directly above the ceiling as opposed to under the roof cladding. This leaves the ceiling space outside of the heated area of the building and potentially subjects services to low ambient temperatures. In buildings that will be provided with an internal fire hydrant system, the requirement for the system to be located within the thermal envelope will need to be stressed to building designers to ensure the operation of the fire hydrant system.

Where the hydrant system is generally inside a heated building but some parts of it are exposed to low ambient temperatures, such as unheated roof spaces, or an unheated annex or loading dock, these parts of the system should be trace heated and lagged. Careful consideration should be given to the bulkiness of pipe lagging, as it is essential that hydrant inlets and outlets, their operating valves, and any other ancillary devices are not obstructed by lagging or trace heating cables.

H2 Frost-protection methods

For more information on frost protection, see the following;

(a) Appendix E for trace heating and lagging;

(b) Appendix F for dry pipe hydrant system installation.

NOTE –

(1) Informative guidance on the installation of trace heating systems can be found in FM Global *Datasheet 9-18: Prevention of Freeze-Ups* – Appendix C.

(2) Because the foregoing is not an authoritative guideline, more or less onerous measures could be applicable to reflect both local climatic conditions and topography (such as low-lying areas and micro-climates). Therefore, the hydrant designer and/or installation contractor is responsible for ensuring that the installation is not susceptible to freezing.

APPENDIX J – SIGNS

(Informative)

J1 Introduction

This appendix sets out the signage requirements that should be followed in applying this standard.

J2 Lettering type and proportioning of signs

Lettering type and proportioning of signs should be as follows:

(a) Vertical block lettering using full strokes;

(b) Letter proportions as set out in Table J1 and Figure J1; and

(c) Thickness of the letter (d) can vary between 15% and 30% of the height of the letter (h).

NOTE –

(1) Acceptable fonts are Helvetica and Univers.

(2) Helvetica bold d = 0.3h and Helvetica condensed d = 0.15h.

Table J1 – Proportion of lettering

Dimensions	Ratio	Examples of dimensions (mm)							
h	(10/10) h	10	20	25	40	50	75	100	125
c	(7/10) h	7	14	17.5	29	35	52.5	70	87.5
a	(2/10) h	2	4	5	9	10	15	20	25
b	(14/10) h	14	28	35	56	70	105	140	175
e	(6/10) h	6	12	15	24	30	45	60	75

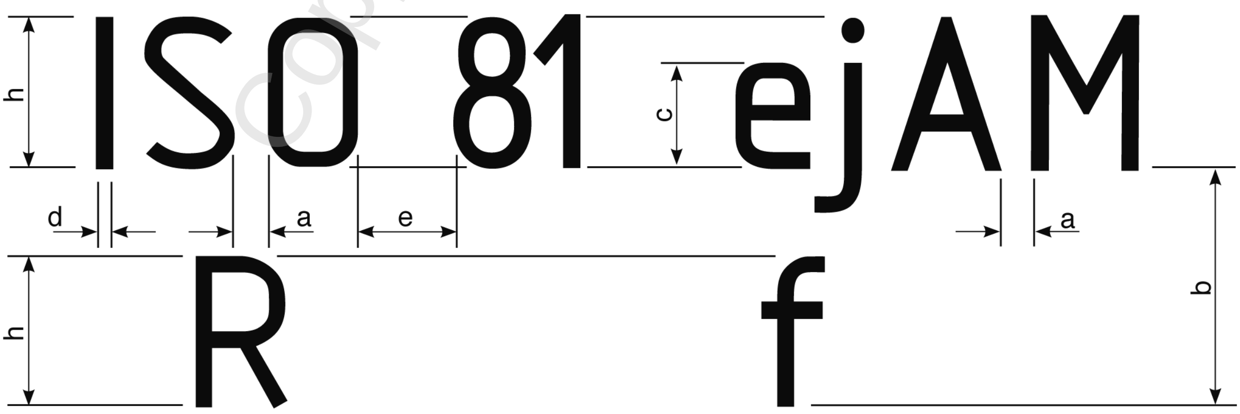


Figure J1 – Proportion of lettering

J3 Safety colours

The colours for safety signs should comply with Table J2.

Table J2 – Safety colours

Safety colour	Specification	
	Reference standard	Colour number
Safety Red	BS 5252	04E53
Safety Yellow	BS 5252	08E51
Safety Green	BS 5252	14E53

J4 Stairs used by fire brigade personnel

Stairs used by fire brigade personnel should be provided with signs to identify the floor level. They should be clearly visible from each floor level landing.

Where hydrants are located in spaces containing a stairwell, stair doors which give access to those hydrants should be identified. This requirement only applies to those doors located on floors to which fire brigade personnel have direct access from the street and where one or more stairs leads away from these floors. An acceptable sign is shown in Acceptable Solution F8/AS1.

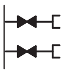
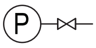
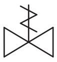
Where hydrants are located in spaces using scissor stairs, the stairwell door at each level providing direct access from the street for fire brigade personnel should display a sign indicating the floor level location of hydrants which can be accessed from that particular door. An acceptable sign is shown in Acceptable Solution F8/AS1.

Signs should comply with the requirements of this appendix and have lettering not less than 50 mm in height. Signs required to identify the location of hydrants on stairwells should comprise white lettering on a red background.

APPENDIX K – DRAWING CONVENTIONS FOR USE IN HYDRANT SYSTEM DIAGRAMS

(Informative)

Table K1 – Drawing conventions for use on hydrant system diagrams

	Building hydrant outlets		Direction of flow
	Pressure gauge (with isolate valve)		Non-return valve (check valve)
	Hydrant inlet		Remote pump control panel
	Fire system inlet		Orifice plate
	Pump set		Float valve
	Pressure-reducing valve		Pressure switch/sensor
	Valve normally open		Flow switch
	Valve normally closed		Water flow meter
	Supervised items		Alarm valve
	Strainer		Sprinkler
	Pressure-relief valve		Anti-vortex plate
	Atmospheric drain		Air-relief valve

APPENDIX L – FIRE SYSTEM SHUTDOWN NOTIFICATION FORM

(Informative)

Notification to the fire brigade shall include all Section A details. The building owner shall be advised to inform their insurers of Sections A and B.

<table>
<tr><td colspan="4">FIRE SYSTEM SHUTDOWN FORM</td></tr>
<tr><td>Form from</td><td colspan="2">Company and author</td><td>Date / /</td></tr>
<tr><td>Building name</td><td colspan="3"></td></tr>
<tr><td>Contractor</td><td colspan="3"></td></tr>
<tr><td>Contractor details</td><td colspan="3">Phone no. Email</td></tr>
<tr><td>To</td><td>Building owner</td><td colspan="2"></td></tr>
<tr><td></td><td>FENZ</td><td colspan="2">Insurer/Broker</td></tr>
<tr><td colspan="4">Instructions: At least 24 hours' notification of all programmed isolations shall be given in writing to FENZ and the building owner prior to a hydrant system being rendered inoperative. If an emergency compels immediate action to render a system inoperative, such notification shall be given as soon as possible thereafter.
Sections A and B are to be completed prior to a hydrant system shutdown and sent to the following:
1) FENZ or their agents, and 2) Building owner or their agent. Section B requires OWNER'S APPROVAL and for the owner to notify their insurer if the systems are isolated for more than 12 hours.</td></tr>
<tr><td colspan="4">NOTE: Partially isolated systems – If a section or zone of a hydrant system is isolated, blanked off, or left impaired whilst the main system is restored, a tag label shall be attached to the hydrant system inlets indicating which sections are affected. The building owner must inform FENZ and their insurer that the system has been partially restored. They must also inform FENZ and their insurer when the isolated sections have been restored.</td></tr>
<tr><td colspan="4">OWNER (or agent) Please sign your approval of this shutdown in Section B of this form and send to your Insurer/Broker/Agent.</td></tr>
<tr><td>Building owner's email:</td><td colspan="2"></td><td>Date / /</td></tr>
<tr><td>FENZ email:</td><td colspan="2"></td><td>Date / /</td></tr>
<tr><td>Insurer/broker's email:</td><td colspan="2"></td><td>Date / /</td></tr>
<tr><td colspan="3">Section A – Fire system/building/site details</td><td>PFA (private fire alarm) no.</td></tr>
<tr><td>Building name</td><td colspan="3"></td></tr>
<tr><td>Building street address</td><td colspan="3"></td></tr>
<tr><td>Building occupancy</td><td colspan="3"></td></tr>
<tr><td>Number of occupied floors</td><td colspan="3"></td></tr>
<tr><td colspan="4">Type of system</td></tr>
<tr><td>Fire hydrants in buildings NZS 4510 ☐</td><td>Fire alarm system NZS 4512 ☐</td><td>Fire sprinkler system NZS 4515 ☐</td><td>Fire sprinkler system NZS 4541 ☐</td></tr>
<tr><td>Sprinkler pumps ☐</td><td>Water supply ☐</td><td>Fire alarm ☐</td><td>Automatic fire detection ☐</td></tr>
<tr><td>Heat detectors ☐</td><td>Smoke detectors ☐</td><td></td><td></td></tr>
<tr><td>Areas or zones affected</td><td colspan="3"></td></tr>
<tr><td>Alarms monitored by</td><td colspan="3"></td></tr>
<tr><td colspan="4">Shutdown</td></tr>
<tr><td>Shutdown date start
/ /</td><td>Shutdown time</td><td>System will be reinstated daily</td><td>Continuous shutdown for days</td></tr>
<tr><td>Reinstatement date</td><td>/ /</td><td>Reinstatement time</td><td></td></tr>
</table>

Figure L1 – Fire system shutdown form

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<table>
<tr><td colspan="4">Section of system left isolated whilst main system restored</td></tr>
<tr><td>Area or zone
to be isolated</td><td>Date due for completion
/ /</td><td colspan="2">Date completed and whole system restored
/ /</td></tr>
<tr><td colspan="4">Work to be completed during shutdown</td></tr>
<tr><td>Alterations ☐</td><td colspan="2">Repair/replace damage to system ☐</td><td>Routine maintenance ☐</td></tr>
<tr><td>Other:</td><td colspan="3"></td></tr>
<tr><td colspan="4">Please use this form to notify your BUILDING INSURER of all shutdowns, reinstatements and of any sections of a system left isolated.
NOTE: If a section of a fire hydrant system is isolated, blanked off or left impaired whilst the main system is restored, a tag label must be attached to the main hydrant system inlet indicating which sections are affected.</td></tr>
<tr><td colspan="4">Section B – Owner's approval</td></tr>
<tr><td>Date / /</td><td colspan="2">Name</td><td>Insurer notified
YES ☐ NO ☐</td></tr>
<tr><td>Time</td><td colspan="2">Signature</td><td>Date / /</td></tr>
<tr><td colspan="4">NOTE: Failure by the owner to notify the insurer of an impairment or partial isolation of hydrant system can void cover.</td></tr>
<tr><td colspan="4">Owner's safety precautions to be taken during fire system shutdown</td></tr>
<tr><td colspan="4">Forbid smoking in the area affected by the fire system shutdown.
No hot work during shutdown.
Detail fire wardens to patrol affected areas (one person per 1000 m²).
Stop hazardous processes.
Notify all staff and contractors working on site of the impairments.</td></tr>
<tr><td colspan="2">Service company name</td><td>Telephone no.</td><td>Email</td></tr>
<tr><td colspan="2">Contact name for any queries</td><td>Telephone no.</td><td>Cell phone</td></tr>
</table>

Figure L1 – Fire system shutdown form (continued)

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APPENDIX M – CONTACT DETAILS OF AGENCIES TO BE INFORMED WHEN A HYDRANT SYSTEM IS RENDERED INOPERATIVE

(Informative)

At the time of publication, the contact details below were valid for notifying FENZ when a hydrant system is rendered inoperative.

The building owner and hydrant contractor should ensure that these contact details are still valid.

Fire and Emergency New Zealand (FENZ):

(a) Notification of the hydrant system impairment: comcen.notifications@fireandemergency.nz;

(b) For submitting the risk assessment for the hydrant system impairment: fireinfo@fireandemergency.nz.

NOTE – The subject of the emails should be ‘Risk assessment for hydrant system impairment’.

APPENDIX N – HYDRANT SYSTEM ISOLATION TAG

(Informative)

DO NOT REMOVE THIS NOTICE UNTIL THE SYSTEM HAS BEEN FULLY RESTORED
Part A
Impairment notice number:
Date: _____/ ______/ _______
Contractor: ______________________
Work permit number: _____________
Hydrant system number __________ isolated
Part B
Section of hydrant system isolated: **(Give details of location for isolated valve or blanking plate used and areas or zones in the building that are not covered):** ______________________________ ______________________________ ______________________________ ______________________________
Date of isolation: _____/ ______/ _______
Proposed date of reinstatement: _____/ ______/ _______
Contractor: ______________________
Signed: _________________________

Figure N1 – Typical isolation tag card

APPENDIX P – MATTERS DECLARED BY FIRE AND EMERGENCY NEW ZEALAND'S CHIEF EXECUTIVE

(Normative)

The chief executive can declare such fire brigade standard operating procedures for the use of hydrant systems as are necessary and require consideration in the application of this standard. To the extent that this standard provides for such consideration, the chief executive's declaration shall be binding and form part of this standard.

NOTE – It is expected that this clause would only be invoked in exceptional circumstances where there are unacceptable risks identified to the safety of firefighters, the public, or the environment.

NOTES

Approved by the New Zealand Standards Approval Board on 2 March 2022 to be a New Zealand Standard pursuant to section 12 of the Standards and Accreditation Act 2015.

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HĪKINA WHAKATUTUKI

New Zealand Government