

Approved Document for New Zealand Building Code Water Supplies Clause G12 Second Edition

Prepared by the Building Industry Authority
This Approved Document is prepared by the Building Industry Authority, which is a statutory body established by the Building Act 1991.

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Status of Approved Documents

Approved Documents are prepared by the Building Industry Authority in accordance with section 49 of the Building Act 1991. They are non-mandatory guidance documents offering only one method of compliance with specific performance criteria of the New Zealand Building Code.

Users should make themselves familiar with the preface to the New Zealand Building Code Handbook, which describes the status of Approved Documents and explains alternative methods of achieving compliance.

Classified uses and defined words which are italicised in the text are explained in clauses A1 and A2 of the New Zealand Building Code.

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New Zealand Building Code

Clause G12 Water Supplies

The mandatory provisions for building work are contained in the New Zealand Building Code (NZBC), which comprises the First Schedule to the Building Regulations 1992. The relevant NZBC Clause for Water Supplies is G12.

Schedule	Building Amendment Regulations 2001
Schedule New clause G12 substituted in First Schedule of principal regulations	
Clause G12–Water Supplies	
Provisions	Limits on application
Objective G12.1 The objective of this provision is to– (a) safeguard people from illness caused by contaminated water; (b) safeguard people from injury caused by hot water system explosion, or from contact with excessively hot water; (c) safeguard people from loss of <i>amenity</i> arising from– (i) a lack of hot water for personal hygiene; or (ii) water for human consumption, which is offensive in appearance, odour or taste; (d) ensure that <i>people with disabilities</i> are able to carry out normal activities and functions within <i>buildings</i>. Functional requirement G12.2 <i>Buildings</i> provided with water outlets, <i>sanitary fixtures</i> or <i>sanitary appliances</i> must have safe and <i>adequate</i> water supplies. Performance G12.3.1 Water intended for human consumption, food preparation, utensil washing or oral hygiene must be potable G12.3.2 A potable <i>water supply system</i> shall be– (a) protected from contamination; and (b) installed in a manner which avoids the likelihood of contamination within the system and the <i>water main</i>; and (c) installed using components that will not contaminate the water. G12.3.3 A non-potable <i>water supply system</i> used for personal hygiene shall be installed in a manner that avoids the likelihood of illness or injury being caused by the system. G12.3.4 Water pipes and outlets provided with non-potable water shall be clearly identified.	Objective G12.1(d) shall apply only to those <i>buildings</i> to which section 47A of the Act applies.

Building Amendment Regulations 2001	Schedule
Provisions	Limits on application
Performance—continued G12.3.5 <i>Sanitary fixtures and sanitary appliances</i> must be provided with hot water when intended to be used for— (a) utensil washing; and (b) personal washing, showering or bathing. G12.3.6 Where hot water is provided to <i>sanitary fixtures</i> and <i>sanitary appliances</i>, used for personal hygiene, it must be delivered at a temperature that avoids the likelihood of scalding. G12.3.7 <i>Water supply systems</i> must be installed in a manner that— (a) pipes water to <i>sanitary fixtures</i> and <i>sanitary appliances</i> flow rates that are <i>adequate</i> for the correct functioning of those <i>fixtures</i> and <i>appliances</i> under normal conditions; and (b) avoids the likelihood of leakage; and (c) allows reasonable access to components likely to need maintenance; and (d) allows the system and any backflow prevention devices to be isolated for testing and maintenance. G12.3.8 Vessels used for producing or storing hot water must be provided with safety devices that— (a) relieve excessive pressure during both normal and abnormal conditions; and (b) limit temperatures to avoid the likelihood of flash steam production in the event of rupture. G12.3.9 A <i>hot water system</i> must be capable of being controlled to prevent the growth of legionella bacteria. G12.3.10 Water supply taps must be <i>accessible</i> and usable for <i>people with disabilities</i>.	Performance G12.3.5(b) shall apply only to <i>housing</i>, retirement homes and early childhood centres. Performance G12.3.10 applies only to those <i>buildings</i> to which section 47A of the Act applies.
Clerk of the Executive Council.	

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References

For the purposes of New Zealand Building Code compliance, acceptable reference documents include only the quoted edition and specific amendments as listed below.

Standards New Zealand		Where quoted	
NZS/BS 1387: 1985	Specification for screwed and socketed steel tubes and tubulars and for plain end steel tubes suitable for welding or screwing to BS 21 pipe threads	AS1 Table 1	
NZS 3501: 1976	Specification for copper tubes for water, gas, and sanitation <i>Amends: 1, 2, 3</i>	AS1 Table 1	
NZS 4602: 1988	Low pressure copper thermal storage electric water heaters <i>Amend: 1</i>	AS1 Table 5	
NZS 4603: 1985	Installation of low pressure thermal storage electric water heaters with copper cylinders (open-vented systems) <i>Amend: 1</i>	AS1 6.9.1, 6.11.5	Amend 5 Feb 2004
NZS 4606: Part 1: 1989	Storage water heaters General requirements <i>Amends: 1, 2, 3</i>	AS1 Table 5	
Part 2: 1989	Specific requirements for water heaters with single shells <i>Amend: A</i>	AS1 Table 5	
Part 3: 1992	Specific requirements for water heaters with composite shells <i>Amend: A</i>	AS1 Table 5	
NZS 4607: 1989	Installation of thermal storage electric water heaters: valve-vented systems	AS1 6.10.1	Amend 5 Feb 2004
NZS 4608: 1992	Control valves for hot water systems	AS1 Table 6	
NZS 4613: 1986	Domestic solar water heaters	AS1 Table 5	
NZS 4617: 1989	Tempering (3-port mixing) valves	AS1 6.14.2 b)	Amend 5 Feb 2004
NZS 5807: 1980	Code of practice for industrial identification by colour, wording or other coding		
Part 2: 1980	Identification of contents of piping, conduit and ducts <i>Amends: 1, 2</i>	AS1 4.3.1	
NZS 6214: 1988	Thermostats and thermal cutouts for domestic thermal storage electric water heaters (alternating current only)	AS1 6.5.1	Amend 5 Feb 2004
NZS 6335: 1993	Safety of household and similar electrical appliances. Particular requirements for instantaneous water heaters <i>Amends: 1, 2</i>	AS1 Table 5	
NZS 6401: 1973	Specification for PVC-insulated cables for electric power and lighting	AS1 9.3.2	

		Where quoted	
NZS/BS 6920:	Suitability of non-metallic products for use in contact with water intended for human consumption with regard to their effect on the quality of the water		
Part 1: 1990	Specification	AS1 2.1.2	
Part 2: 1990	Methods of tests	AS1 2.1.2	
Part 3: 1990	High temperature tests	AS1 2.1.2	
NZS 7601: 1978	Specification for polyethylene pipe (Type 3) for cold water services	AS1 Table 1	
NZS 7602: 1977	Specification for polyethylene pipe (Type 5) for cold water services <i>Amend: 1</i>	AS1 Table 1	
NZS 7610: 1991	Specification for blue polyethylene pipes up to nominal size 63 for below ground use for potable water <i>Amends: 1, 2, 3</i>	AS1 Table 1	
NZS 7643: 1979	Code of practice for the installation of unplasticized PVC pipe systems <i>Amend: 1</i>	AS1 7.4.1, 7.5.2	
British Standards Institution			
BS 6283:	Safety devices for use with hot water systems		
Part 1: 1991	Specification for expansion valves for pressures up to and including 10 bar	AS1 Table 6	
Part 3: 1991	Specification for combined temperature and pressure relief valves for pressures up to and including 10 bar	AS1 Table 6	
Part 4: 1991	Specification for drop-tight pressure reducing valves of nominal size up to and including DN 54 for supply for pressures up to and including 12 bar	AS1 Table 6	
Standards Australia			
AS 1308: 1987	Electric water heaters – Thermostats and thermal cut-outs <i>Amend: 1</i>	AS1 6.5.1	Amend 5 Feb 2004
AS 1357:	Water valves for use with unvented water heaters		
Part 1: 1992	Protection valves <i>Amend: 1</i>	AS1 Table 6	
Part 2: 1998	Control valves	AS1 6.14.2 b), Table 6	Amend 5 Feb 2004
AS 1460:	Fittings for use with polyethylene pipes		
Part 1: 1989	Mechanical jointing fittings	AS1 Table 1	
Part 2: 1989	Electrofusion fittings	AS1 Table 1	
AS 2712: 1993	Solar water heaters – Design and construction	AS1 Table 5	

AS 2845:	Water supply – Mechanical backflow prevention devices
Part 3: 1993	Field testing and maintenance
AS 3147: 1992	Approval and test specification – Electrical cables – Thermoplastic insulated for working voltages up to and including 0.6/1 kV <i>Amends: 1, 2, 3</i>

Australia/New Zealand Standards

AS/NZS 2642:	Polybutylene pipe systems
Part 1: 1994	Polybutylene (PB) pipe extrusion compounds
Part 2: 1994	Polybutylene (PB) pipe for hot and cold water applications
Part 3: 1994	Mechanical jointing fittings for use with polybutylene (PB) pipes for hot and cold water applications <i>Amend: 1</i>
AS/NZS 2845:	Water supply
Part 1: 1998	Materials, design and performance requirements
AS/NZS 3500:	National plumbing and drainage code
Part 1.2: 1998	Water supply acceptable solutions
Part 4.2: 1997	Hot water supply acceptable solutions
AS/NZS 1477: 1999	PVC pipes and fittings for pressure applications
AS/NZS 4130: 1997	Polyethylene (PE) pipes for pressure applications

New Zealand Regulations

Gas Regulations 1993

Where quotedAS1 3.6.1 b),
3.7.2 a) b) c)Amend 5
Feb 2004

AS1 9.3.2

AS1 Table 1

AS1 Table 1

AS1 Table 1

AS1 3.6.2

Amend 5
Feb 2004VM1 1.0.1 a),
AS1 3.5.2
VM1 1.0.1 b)
AS1 6.15.1Amend 5
Feb 2004

AS1 Table 1

AS1 Table 1

AS1 Table 5

Definitions

This is an abbreviated list of definitions for words or terms particularly relevant to this Approved Document. The definitions for any other italicised words may be found in the New Zealand Building Code Handbook.

Adequate *Adequate* to achieve the objectives of the *building code*.

Amenity means an attribute of a *building* which contributes to the health, physical independence, and well being of the *building's* users but which is not associated with disease or a specific illness.

Air gap The vertical distance through air between the lowest point of the water supply outlet and the *flood level rim* of the equipment or the *fixture* into which the outlet discharges.

Backflow The unplanned reversal of flow of water or mixtures of water and *contaminants* into the *water supply system*. See *back-siphonage* and *back-pressure*.

Backflow prevention device A device that prevents *backflow*.

Back-pressure A *backflow* condition caused by the downstream pressure becoming greater than the supply pressure.

Back-siphonage A *backflow* condition caused by the supply pressure becoming less than the downstream pressure.

Building has the meaning ascribed to it by the Building Act 1991.

Check valve A valve that permits flow in one direction but prevents a return flow and is part of a *backflow prevention device*.

Contaminant includes any substance (including gases, liquids, solids, and micro-organisms) or energy (excluding noise) or heat, that either by itself or in combination with the same, similar, or other substances, energy, or heat

- a) When discharged into water, changes or is likely to change the physical, chemical, or biological condition of water, or
- b) When discharged onto or into land or into air, changes or is likely to change the physical, chemical, or biological

condition of the land or air onto or into which it is discharged.

This is the meaning ascribed to it by the Resource Management Act 1991.

Cross connection Any actual or potential connection between a *potable water* supply and a source of contamination.

Diameter (or bore) The nominal internal *diameter*.

Fixture An article intended to remain permanently attached to and form part of a *building*.

Flood level rim The top edge at which water can overflow from equipment or a *fixture*.

Free outlet (push through) In the context of *storage water heaters* means a *water heater* with a tap on the cold water inlet so designed that the hot water is discharged through an open outlet.

Household unit means any *building* or group of *buildings*, or part of any *building* or group of *buildings*, used or intended to be used solely or principally for residential purposes and occupied or intended to be occupied exclusively as the home or residence of not more than one household; but does not include a hostel or boardinghouse or other specialised accommodation.

Network utility operator means a person who:

- a) Undertakes the distribution or transmission by pipeline of natural or manufactured gas, petroleum, or geothermal energy; or
- b) Is an electricity operator or electrical distributor as defined by section 2(1) of the Electricity Act 1992 for the purposes of any works defined by that Act; or
- c) Undertakes the piped distribution of *potable water* for supply, or

d) Is the operator of a sewerage system or a stormwater drainage system.

Non-return valve A valve that permits flow in one direction but prevents a return flow and is part of a hot or cold water system.

Open vented storage water heater A *water heater* incorporating a *vent pipe* which is permanently open to the atmosphere.

Potable (and potable water) Water that is suitable for human consumption.

Sanitary appliance An appliance which is intended to be used for *sanitation* and which is not a *sanitary fixture*. Included are machines for washing dishes and clothes.

Sanitary fixture Any *fixture* which is intended to be used for *sanitation*.

Sanitation The term used to describe the activities of washing and/or excretion carried out in a manner or condition such that the effect on health is minimised, with regard to dirt and infection.

Storage water heater A *water tank* with an integral *water heater* for the storage of hot water.

Toxic environment An environment that contains *contaminants* that can contaminate the water supply in concentrations greater than those included in the New Zealand Drinking Water Standard 1995.

Valve vented storage water heater (Also known as an unvented *storage water heater*.) A *storage water heater* in which the required venting to the atmosphere is controlled by a valve.

Vent pipe A pipe which is open to the atmosphere at one end and acts as a pressure limiting device.

Water heater A device for heating water.

Water main A water supply pipe vested in, or is under the control, or maintained by, a *network utility operator*.

Water supply system Pipes, fittings and tanks used or intended to be used for the storage and reticulation of water from a

water main or other water source, to *sanitary fixtures*, *sanitary appliances* and fittings within a *building*.

Water tank (vessel) A covered fixed container for storing hot or cold water.

Verification Method G12/VM1

1.0 Water Supply System

1.0.1 A design method for *water supply systems* may be verified as satisfying the Performances of NZBC G12 if it complies with:

- a) AS/NZS 3500.1.2 Section 3 and Appendix B (note that Appendix B is part of this Verification Method even though it is included in the standard as an “Informative” Appendix), and
- b) AS/NZS 3500.4.2.

Acceptable Solution G12/AS1

1.0 Scope

1.0.1 This acceptable solution applies to below ground and above ground piped *water supply systems*.

2.0 Materials

2.1 Water quality

2.1.1 Components of the *water supply system* shall not contaminate *potable water*.

2.1.2 Non-metallic components complying with NZS/BS 6920 or AS 4020 materials complying with Table 1 shall be acceptable.

2.2 Pipe materials

2.2.1 Pipe materials shall comply with Table 1.

2.2.2 All pipes and pipe fittings used for the piping of water shall be:

- a) Suitable for the temperatures and pressures within that system,
- b) Compatible with the water supply and environmental conditions in the particular location, and
- c) Where installed in an exposed situation, resistant to UV light.

Note: Where fire hose reels are served by the above ground cold *water supply system* the pipe system shall comply with NZS 4503 as referenced in C/AS1 Table 4.1.

Table 1:	Pipe Materials for Hot and Cold Water Paragraphs 2.1.2, 2.2.1 and 6.7.2
Material	Relevant Standard
Hot and Cold	
Copper	NZS 3501
Galvanised steel	NZS/BS 1387
Polybutylene	AS/NZS 2642: Parts 1, 2 and 3
Cold Only	
uPVC	AS/NZS 1477
Polyethylene	NZS 7601 for pressures up to 0.9 MPa (Type 3) NZS 7602 for pressures up to 1.2 MPa (Type 5) NZS 7610 for pressures up to 1.2 MPa AS 1460: Part 1 Mechanical jointing fittings Part 2 Electrofusion fittings AS/NZS 4130 for pressures up to 1.5 Mpa

3.0 Protection of Potable Water

3.1 Drawn water not to be returned

3.1.1 Water drawn from the *water main* shall be prevented from returning to that system by avoiding *cross connections* or *backflow*.

3.2 Cross connections prohibited

3.2.1 The *water supply system* shall be installed so that there is no likelihood of *cross connection* between:

- a) A *potable water supply system* and a non-*potable water supply system*,
- b) A *potable water supply system* connected to a *water main*, and any water from another source including a private water supply,
- c) A *potable water supply system* and any bathing facilities including swimming, spa or paddling pools, and
- d) A *potable water supply system* and pipes, *fixtures* or equipment (including boilers and pumps) containing chemicals, liquids, gases or other non-*potable* substances.

3.3 Cross Connection Hazard

3.3.1 High hazard

Any condition, device or practice which, in connection with the *potable water supply system*, has the potential to cause death.

COMMENT:

High hazard may include but not necessarily be limited to:

- a) Autoclaves and sterilisers
- b) Systems containing chemicals such as anti-freeze, anti-corrosion, biocides, or fungicides
- c) Beauty salon and hairdresser's sinks
- d) Boiler, chiller and cooling tower make-up water
- e) Car and factory washing facilities
- f) Chemical dispensers
- g) Chemical injectors
- h) Chlorinators
- i) Dental equipment
- j) Direct heat exchangers
- k) Fire sprinkler systems and fire hydrant systems that use toxic or hazardous water

- l) Hose taps associated with High hazard situations like mixing of pesticides
- m) Irrigation systems with chemicals
- n) Laboratories
- o) Mortuaries
- p) Pest control equipment
- q) Photography and X-ray machines
- r) Piers and docks
- s) Sewage pumps and sump ejectors
- t) Sluice sinks and bed pan washers
- u) Livestock water supply with added chemicals
- v) Veterinary equipment

Note: The examples given are not an exhaustive list. Where there is doubt comparison must be made to the hazard definitions.

3.3.2 Medium hazard

Any condition, device or practice which, in connection with the *potable water supply system*, has the potential to injure or endanger health.

COMMENT:

Medium hazard may include but not necessarily be limited to:

- a) Appliances, vehicles or equipment
- b) Auxiliary water supplies such as pumped and non-pumped fire sprinkler secondary water
- c) Deionised water, reverse osmosis units and equipment cooling without chemicals
- d) Fire sprinkler systems and *building* hydrant systems
- e) Hose taps and fire hose reels associated with Medium hazard
- f) Irrigation systems with underground controllers
- g) Irrigation without chemicals
- h) Livestock water supply without added chemicals
- i) Untreated water storage tanks
- j) Water and steam cleaning
- k) Water for equipment cooling
- l) Drink dispensers with carbonators
- m) Swimming pools, spas and fountains

Note: The examples given are not an exhaustive list. Where there is doubt comparison must be made to the hazard definitions.

3.3.3 Low hazard

Any condition, device or practice which, in connection with the *potable water supply system*, would constitute a nuisance, by colour, odour or taste, but not injure or endanger health.

COMMENT:

Low hazard may include but not necessarily be limited to:

- a) Drink dispensers (except carbonators).

Note: The example given is not an exhaustive list. Where there is doubt comparison must be made to the hazard definitions.

3.4 Backflow protection

3.4.1 Backflow protection shall be provided where it is possible for water or *contaminants* to *backflow* into the *potable water supply system*.

COMMENT:

The protection of non-*potable water* used for personal hygiene is contained in Paragraph 4.1.

3.4.2 Backflow protection shall be determined by identifying the individual *cross connection* hazard(s) and *backflow* protection required. Water from each hazard shall be regarded as non-*potable* until an appropriate *backflow* protection is installed.

3.4.3 Backflow protection shall be achieved by:

- a) An *air gap*, in accordance with Paragraph 3.5, or
- b) A *backflow prevention device* selected in accordance with Paragraphs 3.4.4 and 3.4.5.

3.4.4 Backflow protection shall be appropriate to the *cross connection* hazard contained in Paragraph 3.3.

3.4.5 The selection of the appropriate *backflow* protection for the *cross connection* hazard is given in Table 2.

COMMENT:

Table 2 includes *air gap* separation.

Table 2: Selection of Backflow Protection
Paragraph 3.4.5

Type of backflow protection	CROSS CONNECTION HAZARD					
	HIGH		MEDIUM		LOW	
	back-pressure	back-siphonage	back-pressure	back-siphonage	back-pressure	back-siphonage
<i>Air gap</i> (see Note 1)	✓	✓	✓	✓	✓	✓
Reduced pressure zone device	✓	✓	✓	✓	✓	✓
Double <i>check valve</i> assembly (see Note 2)			✓	✓	✓	✓
Pressure type vacuum breaker (see Note 3)		✓		✓		✓
Atmospheric vacuum breaker (see Note 4)		✓		✓		✓

Note:

- Air gaps* must not be installed in a *toxic environment*.
- Double *check valves* can be installed in a medium and low hazard *toxic environment*.
- Pressure type vacuum breakers are designed to vent at 7 kPa or less. However, they require a significantly higher pressure to reseal and must be installed only in systems which provide pressures sufficient to ensure full closing of the valve.
- Hose outlet vacuum breakers are a specific type of atmospheric vacuum breaker.

3.4.6 All *backflow prevention devices* must be testable in service to verify effective performance.

3.5 Air gap

3.5.1 An *air gap* shall be an unobstructed distance between the lowest opening of a water supply outlet and the highest level of the overflow water. The *air gap* separation shall be the greater of 25 mm or twice the supply pipe *diameter*, as shown in Figure 1.

3.5.2 To ensure the *air gap* distance is maintained the overflow pipe discharge flow rate shall be no less than the inlet pipe flow rate.

COMMENT:

AS/NZS 3500.1.2 Appendix F may be used to calculate the size of the overflow.

3.5.3 *Air gaps* shall not be used in a *toxic environment* to prevent contaminated air entering the water and piping system through the *air gap*.

3.5.4 Where any *fixture* or tank has more than one supply pipe, the *air gap* separation shall be the greater of 25 mm or twice the sum of the inlet pipe *diameters* and shall also comply with Paragraph 3.5.2.

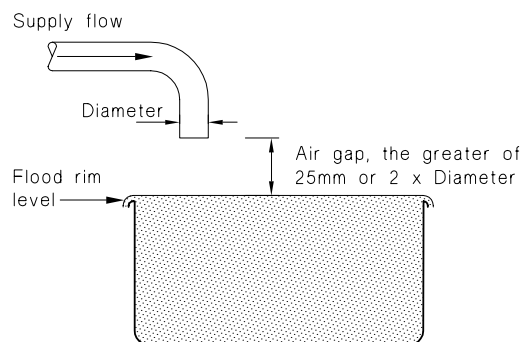
3.6 Backflow prevention devices

3.6.1 Location

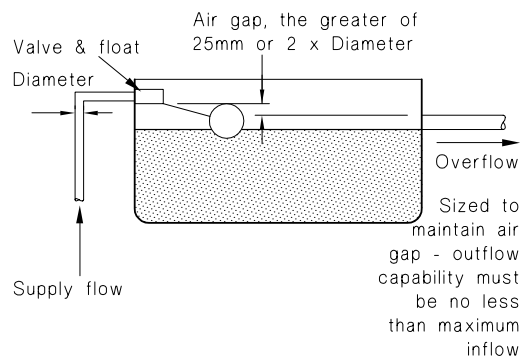
Backflow prevention devices and *air gaps* shall be located:

- a) As near as practicable to the potential source of contamination, and

Figure 1: Air Gap Separation
Paragraph 3.5.1



(a) Water tank with inlet pipe above flood level rim



(b) Water tank with ball valve and overflow pipe below flood level rim

- b) In an accessible position for maintenance and testing to AS/NZS 2845.3.

3.6.2 Manufacture

Backflow prevention devices shall be manufactured as follows:

- a) Reduced pressure zone devices to AS/NZS 2845.1 Section 11 (see Figure 2 (a)),
- b) Double *check valve* devices to AS/NZS 2845.1 Section 10 (see Figure 2 (b)),
- c) Pressure type vacuum breakers to AS/NZS 2845.1 Section 9, (see Figure 2 (c)), and
- d) Atmospheric vacuum breakers to AS/NZS 2845.1 Section 4 for atmospheric vacuum breakers (see Figure 2 (d)), and Section 5 for hose tap vacuum breakers.

3.6.3 General installation requirements

Backflow prevention devices shall be:

- a) Fitted with a line strainer upstream to prevent particles and corrosion products from the pipework rendering the device ineffective,
- b) A by-pass may only be fitted where the by-pass contains another *backflow prevention device* appropriate to the same hazard rating,
- c) Protected from the effects of corrosive or *toxic environments*, and
- d) Protected from damage.

COMMENT:

1. The device should be attached only after the pipework has been flushed.
2. Corrosive environments may cause the malfunction of the device. Polluted air from a *toxic environment* may enter the piping system through the *air gap* or open port vent thus negating the effective *air gap* separation.
3. The device should be protected from physical and frost damage and installed without the application of heat.

3.6.4 Specific installation requirements

Backflow prevention devices shall be installed as follows:

- a) Reduced pressure zone devices. These devices shall:

- i) have free ventilation to the atmosphere for the relief valve outlet at all times,
- ii) be located in an area that is not subject to ponding,
- iii) have the relief drain outlet located not less than 300 mm above the surrounding surface, and
- iv) be installed horizontally with the relief valve discharge facing vertically down, unless different orientations are specifically recommended by the device manufacturer.

- b) Double *check valve* devices. There are no additional requirements to those in Paragraph 3.6.3.

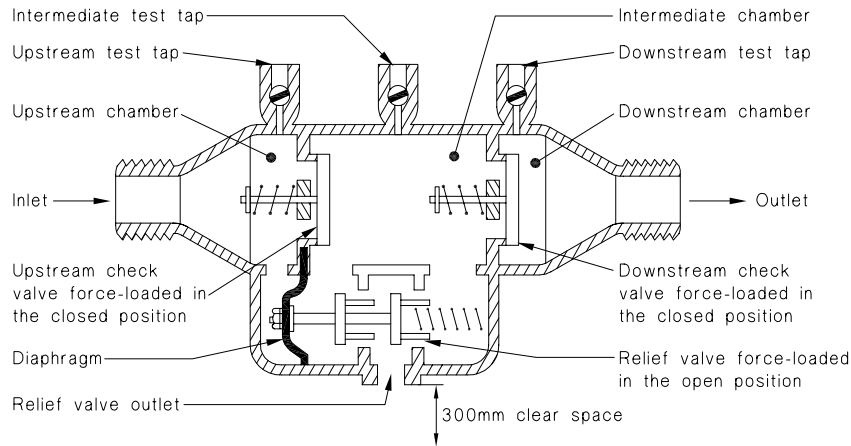
- c) Pressure type vacuum breakers. These devices shall:

- i) be located not less than 300 mm above the highest outlet, measured from the highest outlet to the lowest part of the valve body,
- ii) be installed vertically with the air ports at the top, and
- iii) have free ventilation to the air ports at all times.

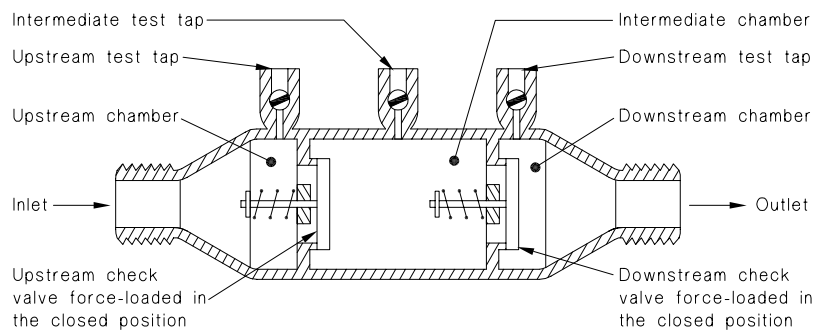
- d) Atmospheric vacuum breakers. These devices shall:

- i) be located not less than 150 mm above the highest outlet, measured from the highest outlet to the lowest part of the valve body,
- ii) have no valves located downstream of the vacuum breaker,
- iii) under normal operation, not remain continuously pressurised for more than 12 hours,
- iv) be installed vertically with the air ports at the top, and
- v) Have free ventilation to the air ports at all times.

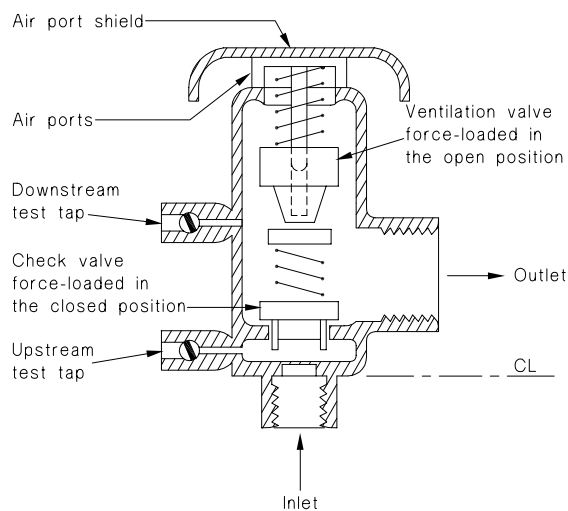
Figure 2: Backflow Prevention Devices
Paragraph 3.6.2



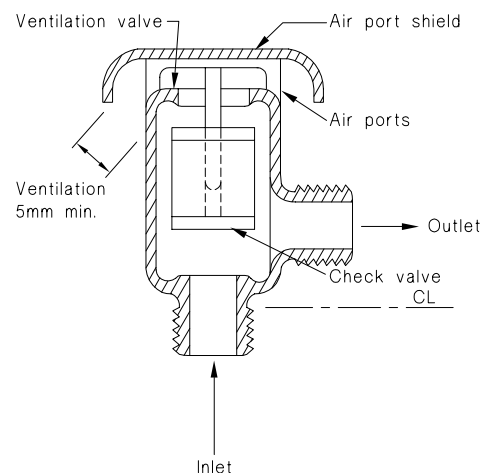
(a) Schematic diagram of a reduced pressure zone device



(b) Schematic diagram of a double check valve



(c) Schematic diagram of a pressure type vacuum breaker



(d) Schematic diagram of an atmospheric vacuum breaker

3.7 Testing

3.7.1 Backflow protection installations shall have the following provisions to enable routine testing of their operational effectiveness:

- a) Resilient seated isolating valves shall be located immediately upstream and downstream of a reduced pressure zone device, double *check valve* assembly, or a pressure vacuum breaker,
- b) A resilient seated isolating valve shall be located immediately upstream of an atmospheric vacuum breaker, and

COMMENT:

Full ported valves will provide the best flow characteristics.

- c) Reduced pressure zone devices, double *check valve* assemblies and pressure vacuum breakers shall have sufficient test points to enable testing of each *check valve* and relief valve.

COMMENT:

Atmospheric vacuum breakers do not require test points.

3.7.2 Reduced pressure zone devices, double *check valves* and pressure vacuum breakers shall be tested and verified as meeting the test requirements of AS 2845.3.

3.7.3 Atmospheric vacuum breaker devices shall comply with the following test:

- a) Operate the device by turning on the *fixture* or equipment and observe the operation. The poppet or float must close on increase in pressure, and
- b) Operate the device by turning off the *fixture* or equipment and observe the operation. The poppet or float must open on decrease in pressure.

3.7.4 Backflow prevention devices shall be tested after installation or repair. Before testing the strainer shall be cleaned, the pipework flushed and the system commissioned.

COMMENT:

Testing is also required annually in accordance with Compliance Schedule CS 7, except for devices installed in single residential dwellings.

4.0 Non-potable Supply

4.1 Protection of non-potable water supplies

4.1.1 Where non-potable water supplies are used for personal hygiene they shall be protected from High and Medium hazards (see Paragraph 3.3). Where backflow protection is required it shall be in accordance with Paragraphs 3.1 to 3.7 of this Acceptable Solution.

4.2 Outlet identification

4.2.1 NZBC F8 requires signs to be provided to all potential hazards. Outlets for non-potable water shall be identified non-potable, by displaying the safety sign shown in Figure 3.

Figure 3: Non-potable Water Sign
Paragraph 4.2.1



4.3 Pipeline identification

4.3.1 Where a non-potable water supply is reticulated around the building, the potable and non-potable pipelines shall be identified in accordance with NZS 5807: Part 2.

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5.0 Water Supply

5.1 Water tanks

5.1.1 To ensure the health and safety of people in the event of the *water main* supply being interrupted, *buildings* having the classification of Community Care (e.g. hospitals, old people's homes, prisons) shall be provided with cold water storage of no less than 50 litres per person.

COMMENT:

1. Cold water storage is required only to maintain *adequate* personal hygiene within *buildings* where the principal users are legally or physically confined.
2. Refer to the NZBC A1 for classification of *buildings*.
3. *Network utility operators* cannot guarantee a continuous supply of water. *Building* owners may therefore wish to provide water storage to *buildings* having a classification other than Community Care, to enable continuation of a business, service, industrial process or other reason.
4. The "litres per person" is based on a daily use of 20 litres WC, 25 litres washing, 5 litres drinking.

5.2 Water tank installation

5.2.1 Location

Water tanks in roof spaces shall be located and supported as detailed in Figure 4.

5.2.2 Overflow pipes

Water tanks shall have an overflow pipe to discharge any overflow to a visible place within the same property that does not create a nuisance or damage to *building elements*. The overflow pipe shall be sized so that the discharge capacity is no less than the maximum inlet flow. The outlet of the overflow pipe shall not permit the entry of birds or vermin. Overflow from a WC cistern may discharge internally into a WC pan.

5.2.3 Safe trays

Performance E3.3.2 requires water to be prevented from penetrating another *household unit* within the same *building*. An acceptable method of preventing water damage is to locate a safe tray below the *water tank* (see Figure 4). The safe tray shall incorporate an overflow pipe with a minimum *diameter* of 40 mm. Where the tank overflow discharges

into the safe tray the *diameter* of the drain shall be greater than the overflow pipe from the tank and comply with Paragraph 5.2.2.

5.2.4 Covers

Covers shall be provided to:

- a) *Potable water tanks* to prevent contamination and the entry of vermin, and
- b) All tanks located in roof spaces to prevent condensation damaging *building elements*.

5.2.5 Access

Covers to *water tanks* shall be removable or shall contain a covered opening to allow access for inspection and maintenance. A minimum height clearance of 350 mm above the opening is necessary for easy access.

5.2.6 Supporting structure

The supporting structure for *water tanks* shall be protected from damage due to condensation where durability of the supports could be compromised by moisture. A material such as H3 treated timber shall be installed under the *water tank*.

5.2.7 Structural support

NZBC B1 requires *water tanks* to be adequately supported including seismic restraint. The method illustrated in Figure 4 is acceptable for *water tanks* up to 150 litre capacity and the maximum height to breadth ratio of 1:1.

5.3 Water pipe size

5.3.1 Pipe sizing

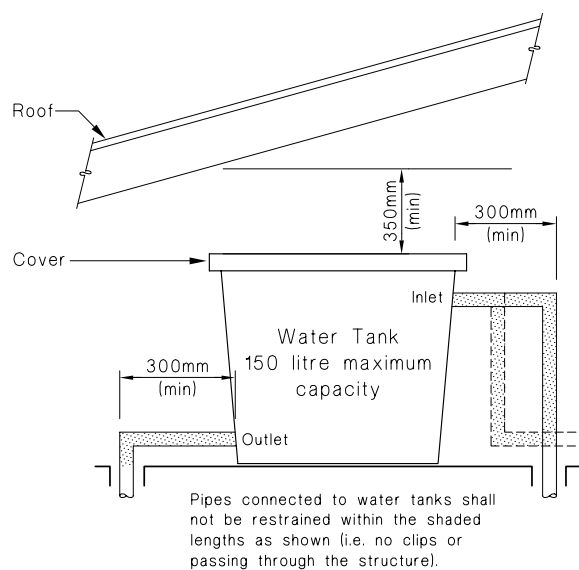
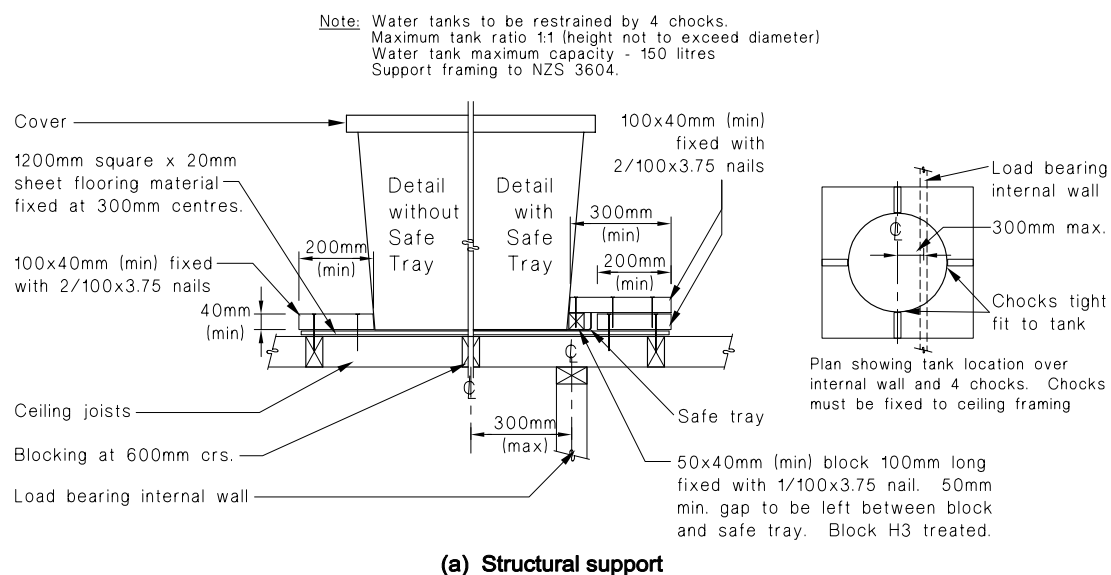
Pipes shall be sized:

- a) To achieve the flow rates given in Table 3, or
- b) Using the sizes given in Table 4.

COMMENT:

Manufacturers' literature must be referenced for pressure and flow information on tempering valves and tapware. Outlets (e.g. shower mixers and showerheads) must be appropriate for the available flow and pressure. Note the limitations on lengths and pipe sizes given in Table 3.

Figure 4: Structural Support for Water Tanks (150 litre maximum capacity)
Paragraphs 5.2.1, 5.2.3 and 5.2.7



5.3.2 Where a pressure reducing or pressure limiting valve is installed, the available head shall be taken as the outlet pressure of the valve plus or minus the pressure to the outlet or valve.

Figure 5 illustrates how to determine available head to the outlet or valve.

Table 3: Acceptable Flow Rates to Sanitary Fixtures
Paragraph 5.3.1

Sanitary fixture	Flow rate and temperature l/s and °C	How measured
Bath	0.3 at 45°C	Mix hot and cold water to achieve 45°C
Sink	0.2 at 60°C* (hot) and 0.2 (cold)	Flow rates required at both hot and cold taps but not simultaneously
Laundry tub	0.2 at 60°C* (hot) and 0.2 (cold)	Flow rates required at both hot and cold taps but not simultaneously
Basin	0.1 at 45°C	Mix hot and cold water to achieve 45°C
Shower	0.1 at 42°C	Mix hot and cold water to achieve 42°C

* The temperatures in this table relate to the temperature of the water used by people in the daily use of the *fixture*.

Note:
The flow rates required by Table 3 shall be capable of being delivered simultaneously to the kitchen sink and one other *fixture*.

Table 4: Tempering Valve and Nominal Pipe Diameters
Paragraphs 5.3.1 and 6.12.1

	Low pressure (i.e. header tank supply or low pressure)	Low and medium pressure unvented (valve vented) and open vented	Mains pressure
Pressure of water at tempering valve (kPa)	20 – 30	30 – 120	over 300
Metres head (m)	2 – 3	>3 – 12	over 30
Minimum tempering valve size	25 mm	20 mm	15 mm
Pipes to tempering valve	25 mm (see Note 3)	20 mm	20 mm (15 mm optional) (see Note 1)
Pipes to shower	20 mm	20 mm (see Note 4)	20 mm (see Note 5) (15 mm optional) (see Note 1)
Pipes to sink/laundry (see Note 2)	20 mm	20 mm	15 mm
Pipes to bath (see Note 2)	20 mm	20 mm	15 mm
Pipes to basins (see Note 2)	15 mm	15 mm	10 mm

Notes:

1. If supplied by separate pipe from *storage water heater* to a single outlet.
2. This table is based on maximum pipe lengths of 20 metres.
3. 2 m maximum length from *water heater* outlet to tempering valve.
4. 15 mm if dedicated line to shower.
5. 10 mm if dedicated line to shower.
6. Table 3 pipe sizes have been calculated to deliver water simultaneously to the kitchen sink and one other *fixture*.

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5.4 Maintenance facilities

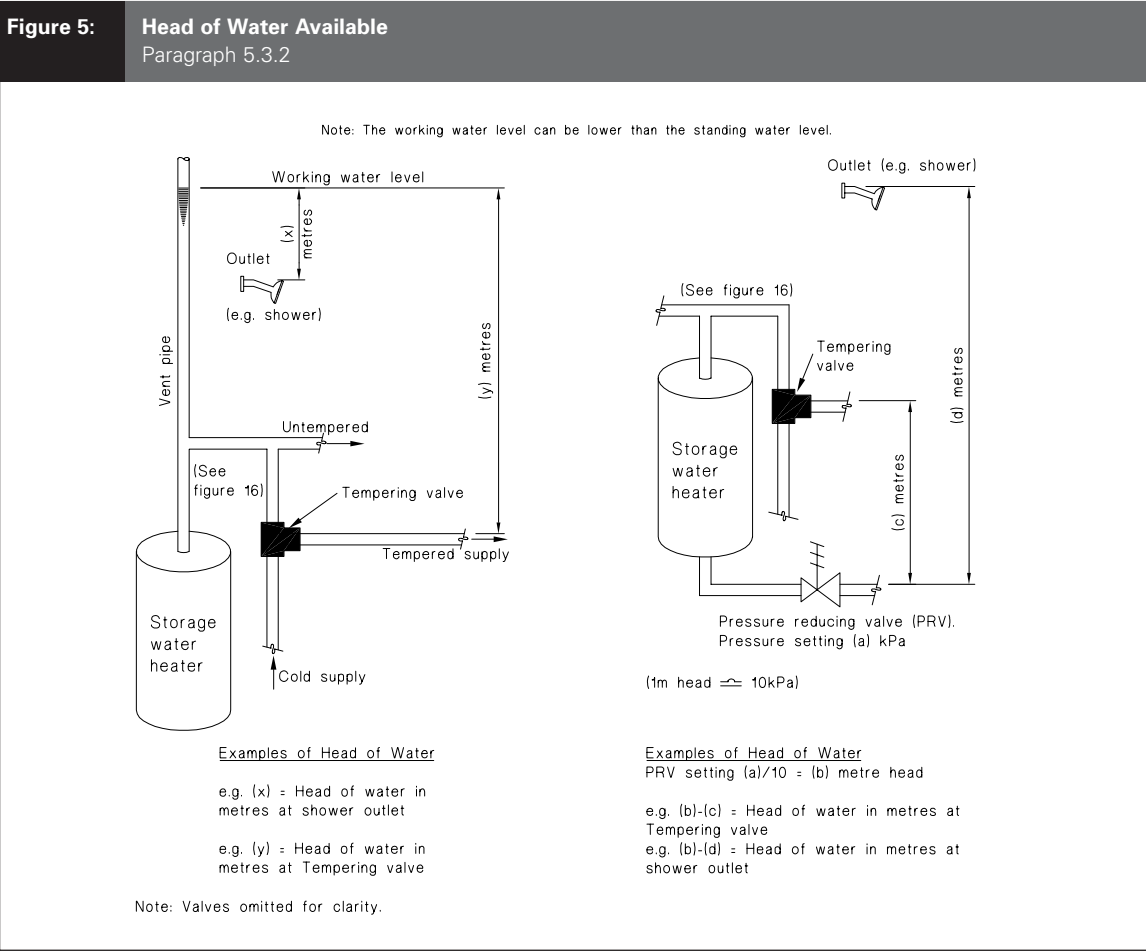
5.4.1 The *water supply system* shall be provided with an isolating valve where a supply pipe enters the *building* or at each Dwelling unit within a Multi-unit dwelling.

5.4.2 Where the water supply pipe serves a Detached dwelling, the isolating valve required by Paragraph 5.4.1 may be located at the property boundary.

COMMENT:

Additional isolating valves may be provided for the maintenance of *storage water heaters*, valves and components.

5.4.3 Provision shall be made for draining *storage water heaters* in accordance with Figure 7.



6.0 Hot Water Supply System

6.1 Water heaters

6.1.1 Water heaters shall comply with Table 5.

6.1.2 Hot water supply systems are given in Figures 6 to 11. (Note: Pipe insulation is not shown for clarity.)

6.2 Water supply to storage water heaters

6.2.1 Storage water heaters shall be supplied with cold water at a pressure not exceeding their working pressure by means of a: Amend 5 Feb 2004

- a) Water tank,
- b) Pressure reducing valve,
- c) Pressure limiting valve, or
- d) Mains pressure supply.

Water heater type	Standard/Regulation
Electric low pressure copper storage water heater	NZS 4602
Electric storage water heater	NZS 4606: Parts 1, 2 and 3
	AS 1056: Part 1
Electric instantaneous water heater	NZS 6335
Gas storage water heater	Gas Regulations
Gas instantaneous water heater	Gas Regulations
Solar storage water heater	NZS 4613
	AS 2712

6.2.2 *Storage water heaters* supplied by other than a *water tank* shall include a *non-return valve* as shown in Figures 7, 8, 9 and 10 to prevent the *storage water heater* emptying and hot water flowing into the cold water supply and thence from the cold water taps.

6.2.3 Filters or strainers shall be installed upstream of any valves that could be damaged or malfunction due to solids in the water supply.

6.3 Operating devices

6.3.1 Electric and gas *storage water heaters* shall have their temperature controlled by a thermostat on each heating unit.

6.3.2 *Open vented storage water heaters* shall have a *vent pipe* complying with Paragraph 6.8.

6.3.3 Valve vented (unvented) systems shall have:

- An expansion control valve
- A vacuum relief valve to prevent collapse of the *storage water heater* where it is not designed to withstand a full vacuum, and
- Valves complying with Table 6.

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Figure 6: Open Vented Storage Water Heater System – Water Tank Supply
Paragraphs 6.1.2, 6.8.2

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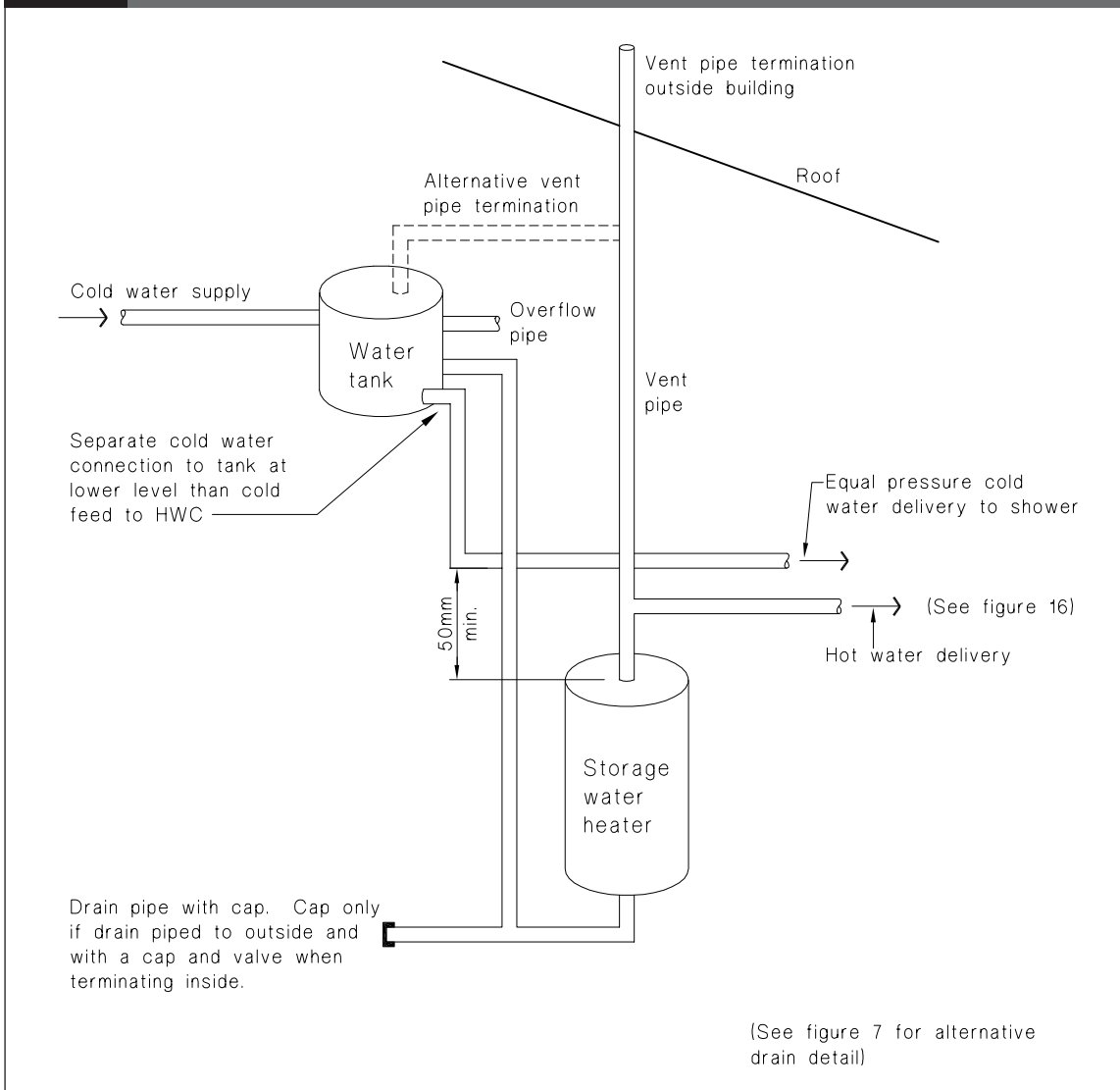


Figure 7: Open Vented Storage Water Heater System – Pressure Reducing Valve
Paragraphs 5.4.3, 6.1.2, 6.2.1 b), 6.8.2 d)

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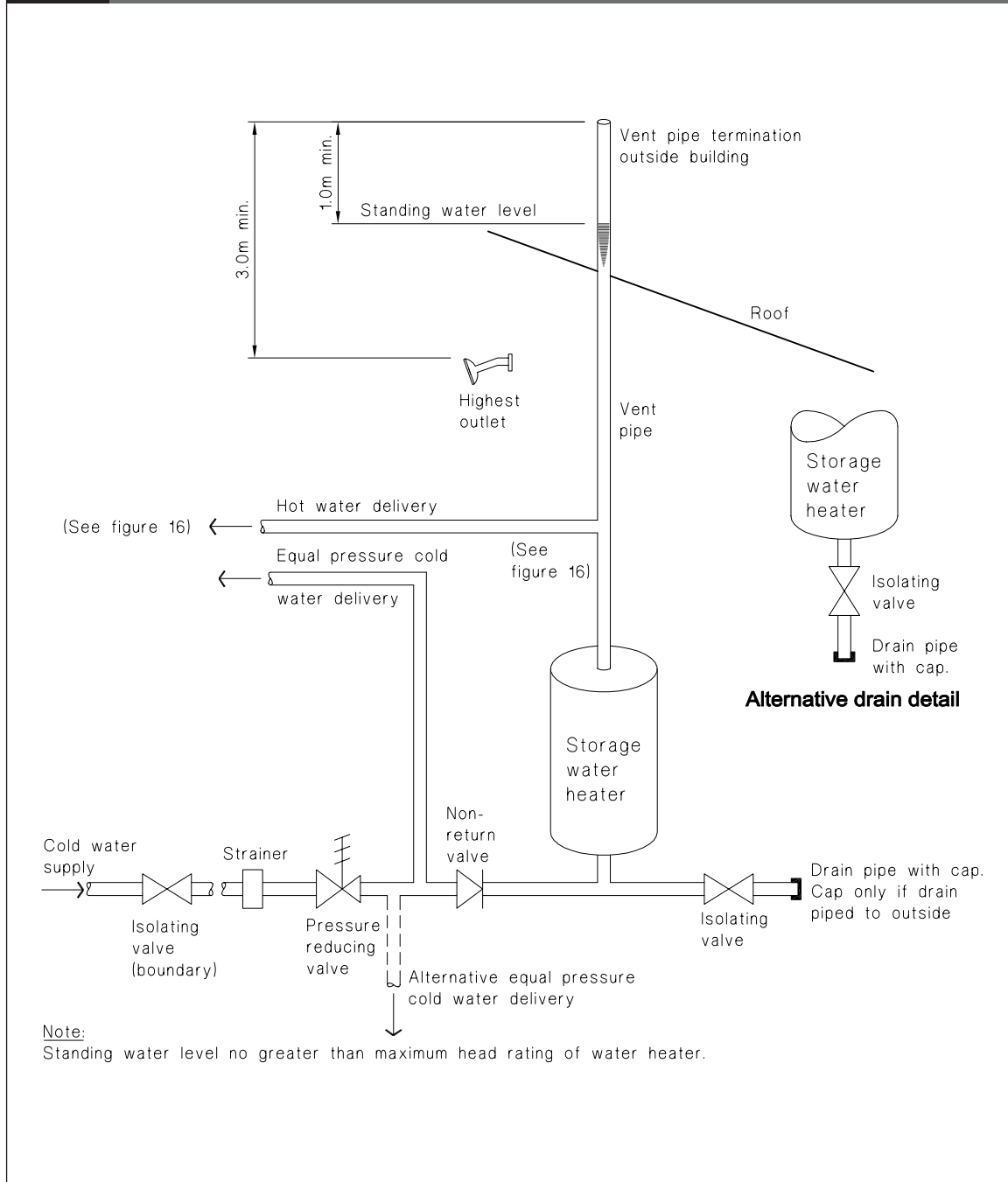


Figure 8: Mains Pressure Storage Water Heater System (unvented)
Paragraphs 6.1.2 and 6.2.1 b)

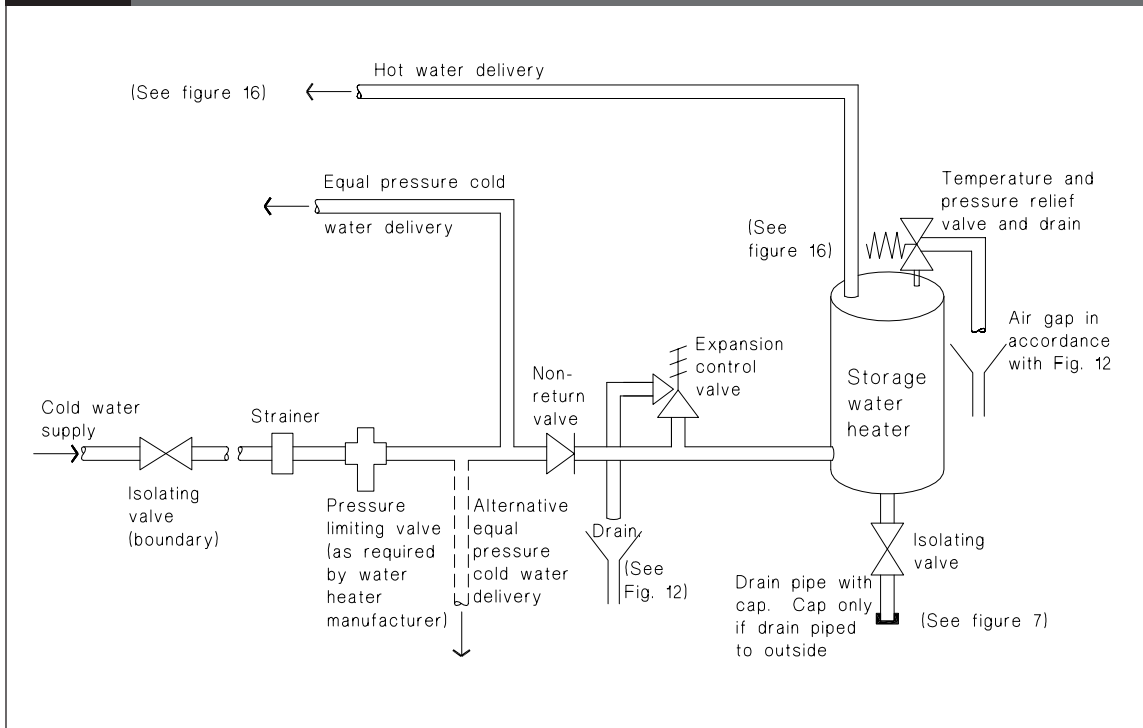


Figure 9: Low Pressure Valve – Vented Water Heater System – Temperature and Pressure Relief Valve
Paragraphs 6.1.2 and 6.2.1 b)

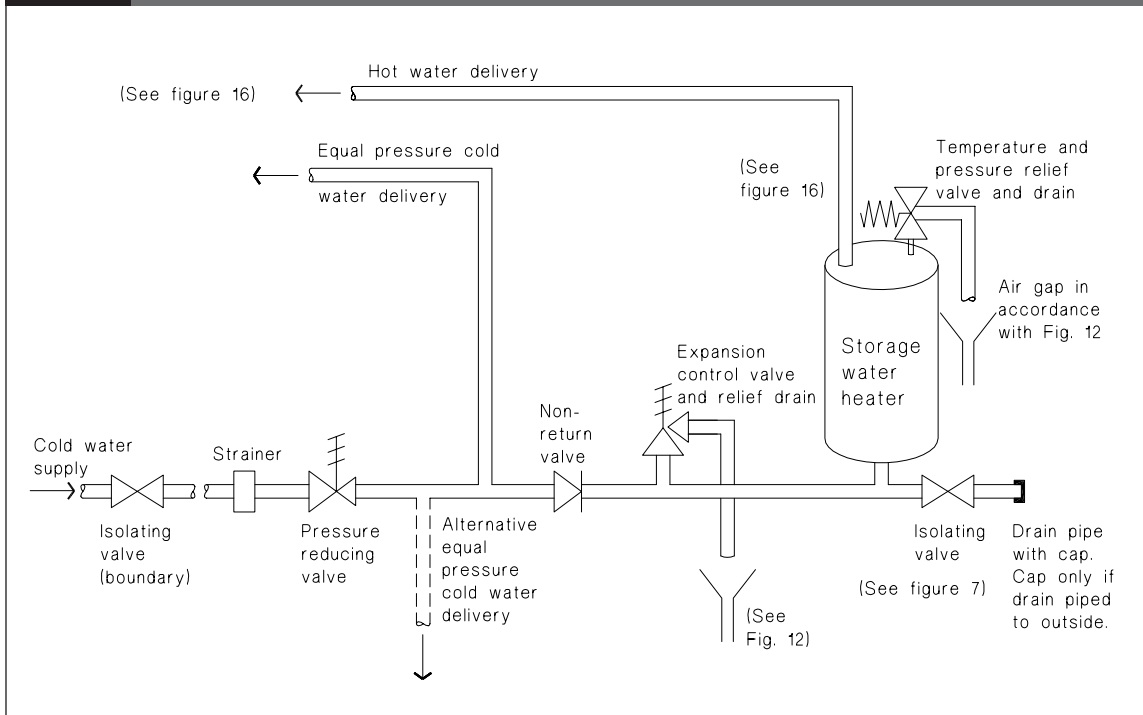


Figure 10: Low Pressure Valve – Vented Storage Water Heater System – Pressure Relief Valve
Paragraphs 6.1.2 and 6.2.1 b)

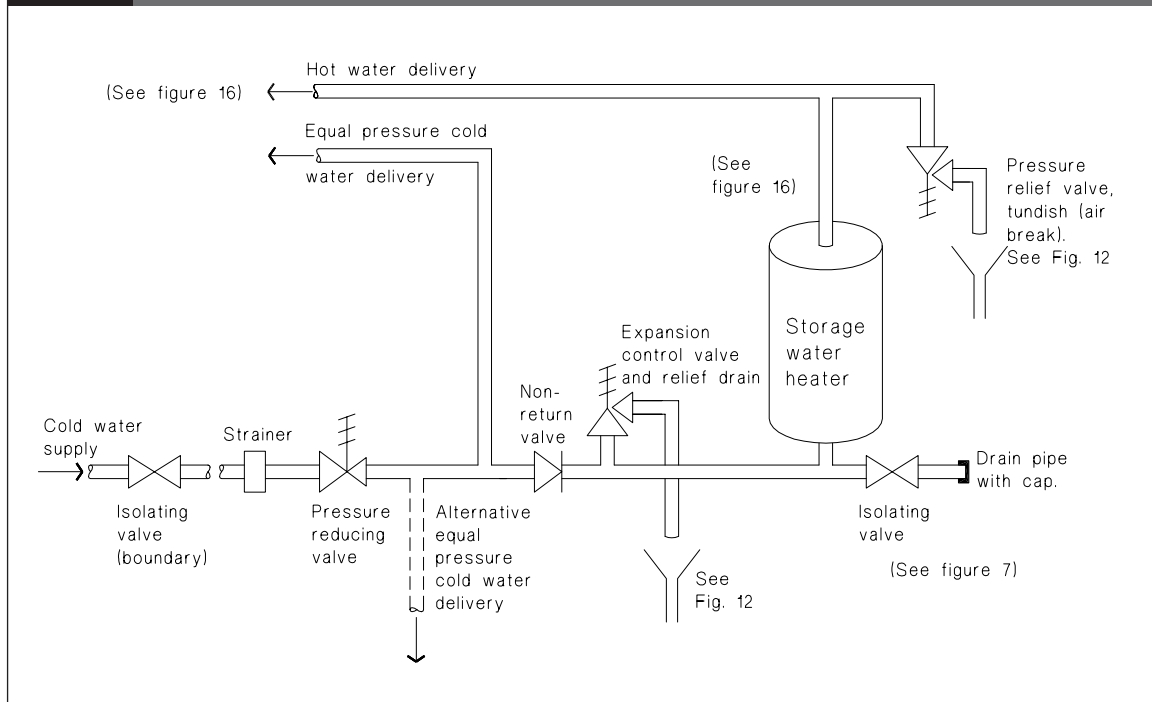
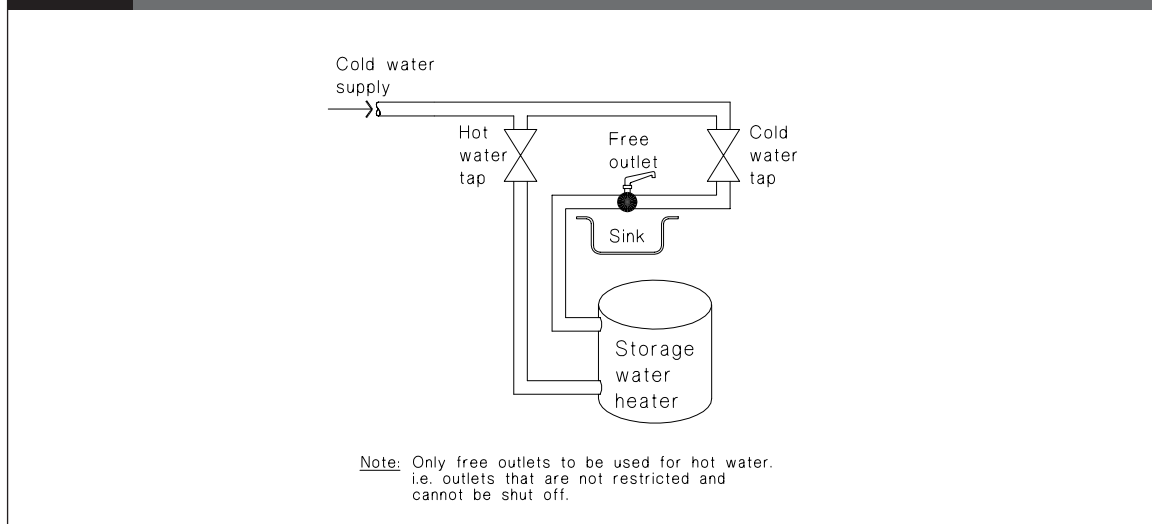


Figure 11: Free Outlet System (push through)
Paragraph 6.1.2



6.4 Safety devices

6.4.1 Valve vented (unvented) systems shall have in addition to Paragraph 6.3.3 the following safety devices:

- a) Combined temperature/pressure relief valve for systems with a working pressure greater than 120 kPa,
- b) Combined temperature/pressure relief valve or a pressure relief valve for systems with a working pressure less than 120 kPa,
- c) An energy cut-off for each heating unit on gas and electric systems, and
- d) Valves complying with Table 6.

6.4.2 *Free outlet (push through) water heaters* shall have a relief valve. No relief valve drain is required.

6.5 Temperature control devices

6.5.1 Electric thermostats shall comply with NZS 6214 or AS 1308.

6.5.2 Energy cut-off devices shall be designed to:

- a) Be reset manually, and
- b) Disconnect the energy supply before the water temperature exceeds 95°C.

6.6 Relief valves

6.6.1 All valves shall have flow rates, pressure and *diameter* compatible with the system they serve.

6.6.2 Pressure relief valves and expansion control valves shall have:

- a) A flow rate capacity of no less than the rate of cold water supply, and
- b) A maximum pressure rating of no more than the working pressure of the hot water storage vessel.

COMMENT:

The provision of cold water expansion valves satisfies two objectives of the New Zealand Building Code:

1. Safety: Protects the pressure relief or combined temperature/pressure relief valve from blockage due to calcium and other similar deposits where hard water is frequently discharged through the valve.
2. Energy Efficiency (NZBC H1): Cold water instead of hot water is discharged to waste during the frequent warm up cycles.

6.6.3 Expansion control valves shall have a pressure rating of no less than that of the water supply pressure to the *storage water heater*, but less than the pressure rating of the relief valve.

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Table 6: Storage Water Heater Valves
Paragraph 6.3.3 c) and 6.4.1 d)

Valve type	Standard
Cold water expansion valves	NZS 4608 BS 6283: Part 1 AS 1357: Part 1
Temperature/pressure relief valve	NZS 4608 BS 6283: Part 3 AS 1357: Part 1
Non-return valves	NZS 4608 AS 1357: Part 1
Vacuum relief valves	NZS 4608 AS 1357: Part 2
Pressure reducing valves and pressure limiting valves	NZS 4608 BS 6283: Part 4 AS 1357: Part 2
Pressure relief valves	NZS 4608

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6.6.4 The following valves shall have an energy rating greater than that of the energy sources heating the water:

- a) Temperature/pressure relief valve, and
- b) Pressure relief valve.

6.6.5 Valve installation

- a) Temperature/pressure relief valves shall be located with their probe within the top 20% of the water capacity and no more than 150 mm from the top of the container,
- b) Pressure relief valves shall be located no further than 1 metre from the *storage water heater*, and
- c) Valves shall be installed in a manner which provides for easy access for replacement, servicing or maintenance of devices.

6.6.6 There shall be no valve or restriction between the relief valve and the *storage water heater*.

6.7 Relief valve drains

6.7.1 Relief valve drains (see Figures 12 and 13) shall be fitted to:

- a) Temperature/pressure relief valves,
- b) Pressure relief valves, and
- c) Expansion control valves.

6.7.2 Relief valve drains shall:

- a) Be of copper pipe,
- b) Have no restrictions or valves,
- c) Have a continuous fall from the relief valve to the outlet,
- d) Discharge in a visible position which does not present a hazard or damage to other *building elements* (except when used in association with *free outlet storage water heaters*),
- e) Have a minimum *diameter* of the same size as the valve outlet,
- f) Have the number of changes in direction plus the length of the relief drain (in metres) not exceeding 12,

COMMENT:

For example: 7 metres of pipe allows the total number of bends to be 5.

- g) Be connected to a relief valve in accordance with the valve manufacturer's specification,
- h) Comply with Paragraph 6.7.3 when relief valve drains are combined, and
- i) Comply with Paragraphs 6.7.4 and 6.7.5 when freezing is likely.

6.7.3 Combined relief valve drains

When relief valve drains are combined the combined drain shall (see Figure 13):

- a) Receive discharges from one temperature/pressure relief valve or the pressure relief valve and one expansion control valve,
- b) Discharge via a minimum air break of 25 mm, and
- c) Have a minimum size of 20 mm *diameter* and be one size larger than the largest relief valve outlet.

COMMENT:

The drain from the *storage water heater* may also be connected into the combined relief valve drain.

6.7.4 Water heaters located where freezing is likely

Additional requirements for relief valve drains are (see Figure 12):

- a) Relieve one valve only, and
- b) Comply with Paragraph 6.7.5 when freezing of the drain is likely.

COMMENT:

This paragraph applies to *water heaters* that are installed outside the *building's* thermal envelope in cold climates.

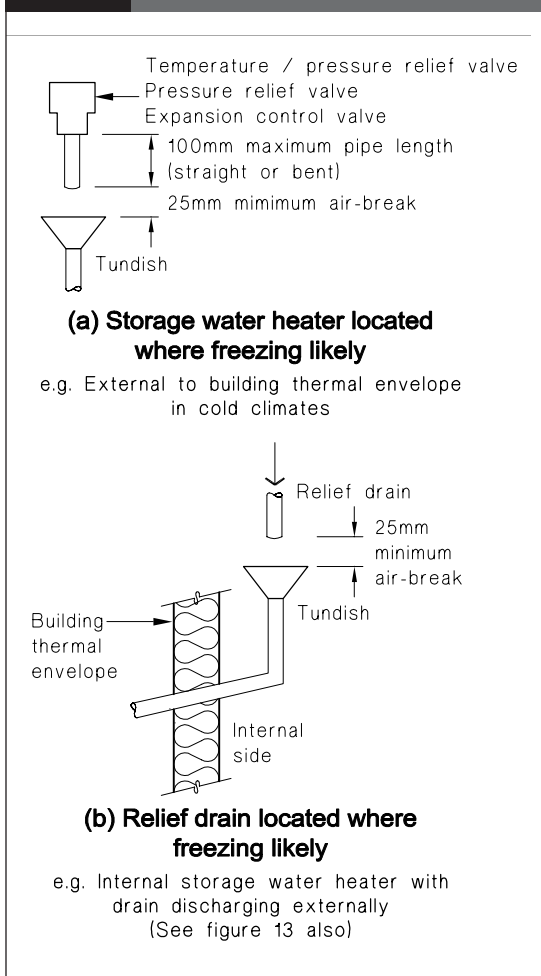
6.7.5 Relief drains located where freezing is likely

Additional requirements for relief drains located where freezing is likely (see Figure 12) are that:

- a) Relief valve drain pipes shall discharge over a tundish with a 25 mm air break before the drain pipe enters a zone where freezing is likely, and
- b) Relief valve drains from a tundish shall be one size larger than the outlet *diameter* of the relief valve.

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Figure 12: Relief Valve Drains – Freezing Protection
Paragraphs 6.7.1, 6.7.4 and 6.7.5

**COMMENT:**

This paragraph applies to *storage water heaters* located inside the *building's* thermal envelope with relief valve drains discharging where freezing of the drain is likely.

6.7.6 Closed cell foam polymer insulation or fibre glass insulation which is preformed to the shape of the pipe and not less than 13 mm thick, is acceptable material for preventing pipes less than or equal to 40 mm *diameter* from freezing. Any insulation material that absorbs moisture shall be protected in a waterproof membrane.

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Feb 2004**6.8 Vent pipes**

6.8.1 *Vent pipes* for *open vented storage water heaters* shall comply with the provisions of Paragraphs 6.8.2 and 6.8.3.

6.8.2 Installation

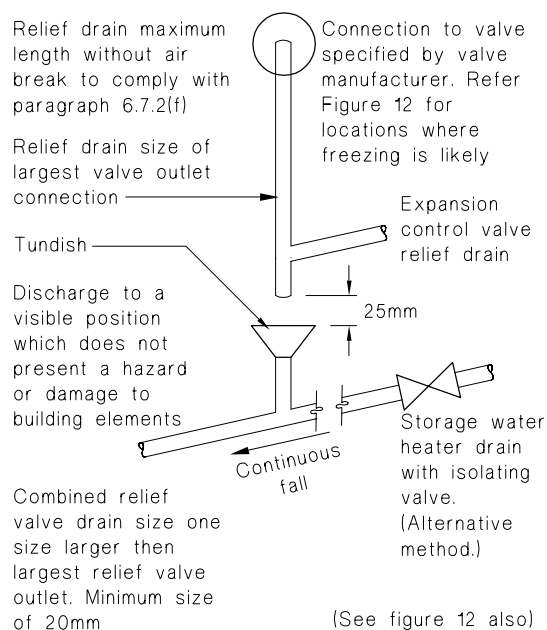
- Materials:** The pipe material shall be copper complying with Table 1,
- Diameter:** The *diameter* of the *vent pipe* shall be no less than that of the hot water outlet fitting on the *storage water heater* and no less than 20 mm where the energy input rating is greater than 3 Kw,
- Termination:** The *vent pipe* (see Figure 6) shall terminate either:
 - outside the *building*, or
 - over a water tank supplying the *storage water heater*, and
- Height:** The *vent pipe* height, measured in metres from the base of the *storage water heater*, shall not exceed the height (in metres) that equates to the maximum pressure rating of the *storage water heater*, and
- Water level:** The normal standing water level in the *vent pipe* shall be a minimum of 3.0 metres above the highest outlet. The height of the *vent pipe* shall be:
 - 300 mm above the standing water level of the *vent pipe*, for tank fed systems, and
 - 1.0 m above the standing water level, for pressure reducing valve fed systems.

COMMENT:

- The 1.0 m height has been found to prevent hot water loss due to the pressure reducing valve creeping.
- The 3.0 m height is measured from the highest fitting in order to ensure sufficient working head to that fitting.
- 9.81 kPa = 1 metre in head = 1 metre in height.

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Figure 13: Relief Valve Drains – Combined
Paragraphs 6.7.1, 6.7.2 f) and 6.7.3



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6.8.3 Insulation

- Where the *vent pipe* is likely to be subjected to freezing, it shall be insulated between the top of the *storage water heater*, and a point no less than 300 mm above the normal standing water level in the *vent pipe*.
- Insulation material is to comply with Paragraph 6.7.6.

6.9 Alternative acceptable solutions for the installation of open vented storage water heaters

6.9.1 NZS 4603 is an acceptable solution for open vented low pressure *storage water heaters*, but may exceed the performance criteria of NZBC G12.

6.10 Alternative acceptable solutions for the installation of unvented (valve vented) storage water heaters.

6.10.1 NZS 4607 is an acceptable solution for unvented (valve vented) *storage water*

heaters, but may exceed the performance criteria of NZBC G12.

6.11 Water heater installation

6.11.1 *Water heaters* shall be installed in accordance with the manufacturer's instructions.

6.11.2 Where heating units, sacrificial anodes, thermostats, pipework connections, valves, or other accessories being components of a *storage water heater* are installed, they shall be accessible for inspection, maintenance and removal.

6.11.3 *Storage water heaters* shall have:

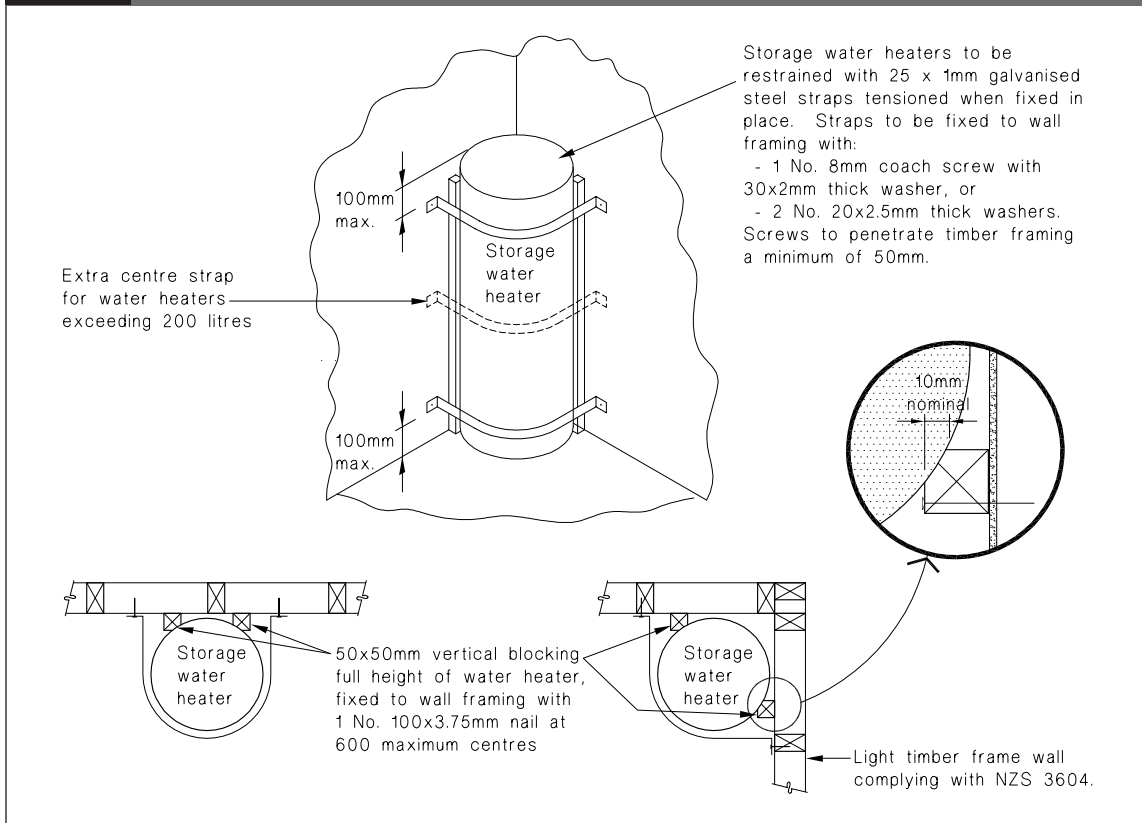
- Safe trays complying with Paragraph 5.2.3 where water could penetrate another *household unit* within the same *building*.
- Connections compatible with the pipe material used, and
- Drain pipes (for every *storage water heater* of more than 45 litres capacity) which:
 - have a conveniently located isolating valve, and terminate with a cap or plug

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Figure 14: Seismic Restraint of Storage Water Heaters 90 – 360 litres
Paragraph 6.11.4



suitably located to easily empty the vessel for maintenance, or

- ii) terminate outside the *building* with a cap only.

6.11.4 Structural Support

NZBC B1.3.2 requires *building elements* (including *storage water heaters*) to be adequately supported including support against earthquake forces. The method illustrated in Figure 14 is acceptable for *water heaters* up to 360 litre capacity. Where fittings and pipework are attached to the *water heater* through the supporting platform or floor a 50 mm minimum clearance shall be provided between the fitting and the support structure.

6.11.5 An alternative acceptable solution for securing *storage water heaters* against seismic forces is given in Section 203 of NZS 4603.

6.12 Hot water pipe sizes

6.12.1 The *diameter* of hot water supply pipes from *storage water heaters* and to *sanitary fixtures* shall be no less than those required by Table 4.

6.13 Wet-back water heaters

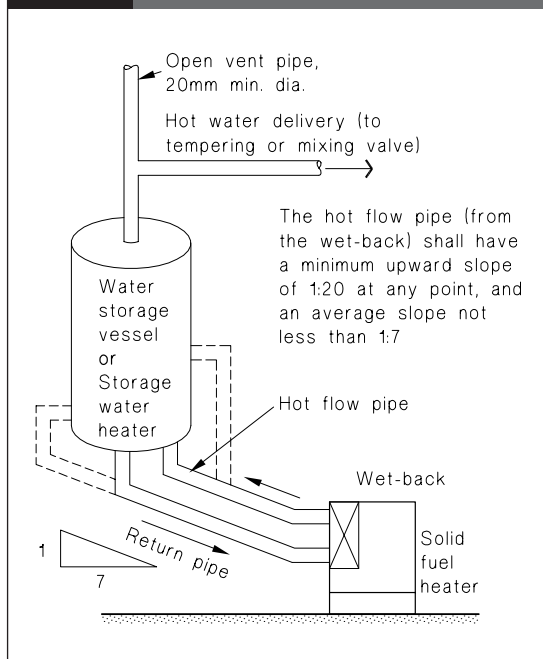
6.13.1 Wet-back *water heaters* shall be:

- a) Connected only to *open vented storage water heaters*, or a water storage vessel (see Figure 15), and
- b) Made of copper.

6.13.2 Copper pipework shall be used between the wet-back and the *water tank*.

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Paragraph 6.13.1 a)

6.14 Safe water temperatures

6.14.1 Maximum temperatures

The delivered hot water temperature at any *sanitary fixture* used for personal hygiene shall not exceed:

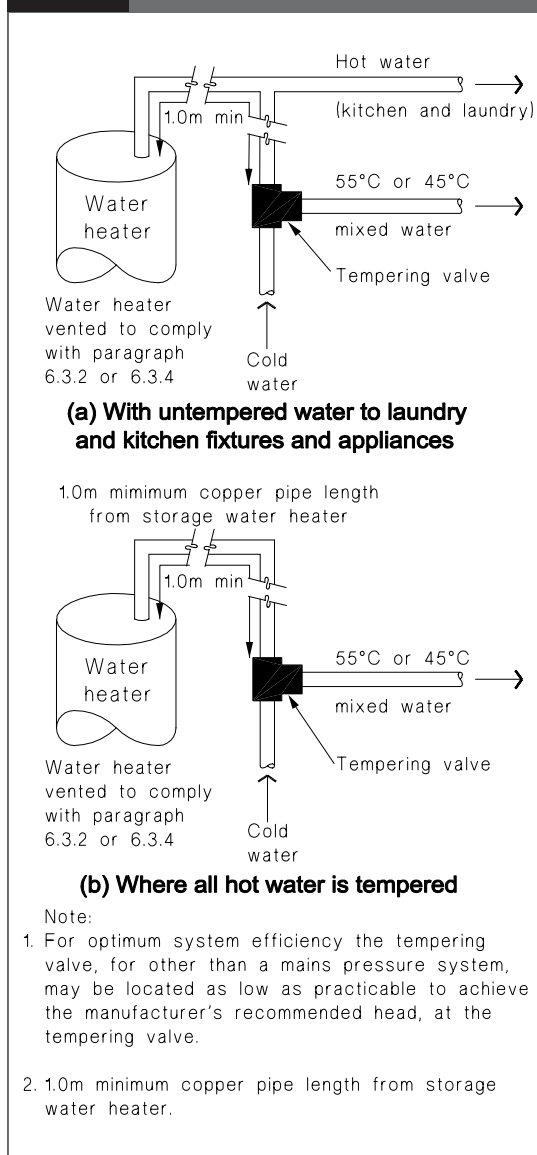
- 45°C for early childhood centres, schools, old people's homes, institutions for people with psychiatric or physical disabilities, hospitals, and
- 55°C for all other *buildings*.

COMMENT:

- At greatest risk from scalding are children, the elderly, and people with physical or intellectual disabilities, particularly those in institutional care.
- Sanitary fixtures* used for personal hygiene includes showers, baths, hand basins and bidets.

6.14.2 Hot water delivered from storage water heaters

- An acceptable method of limiting hot water temperature delivered from *storage water heaters* is to install a mixing device between the outlet of the *water heater* and the *sanitary fixture* (see Figure 16).

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Paragraph 6.14.2 a)Amend 5
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- Tempering valves shall comply with NZS 4617 or AS 1357.2.

6.14.3 Legionella bacteria

Irrespective of whether a mixing device is installed, the *storage water heater* control thermostat shall be capable of being set at a temperature of not less than 60°C to prevent the growth of Legionella bacteria.

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Table 7: Water Supply Pipework Support Spacing
Paragraph 7.1.3

Pipe material	Pipe diameter (mm)	Maximum distance between supports (m)	
		Vertical pipe	Graded and horizontal pipe
Copper	10 – 15	1.5	1.2
	20 – 25	2.0	1.5
Galvanised steel	15 – 20	2.0	1.5
	25	3.0	2.5
uPVC	15 – 20	2.0	1.0
	25	2.4	1.2
Polyethylene and polybutylene (cold water supply)	15 – 20	1.5	0.75
	25	1.8	0.9
Polybutylene (hot water supply)	15 – 18	1.0	0.6
	20 – 22	1.4	0.7

Note:
The spacing for these pipe materials is based on the pipes being located within the *building* structure.

6.14.4 The water temperatures within flow and return circulating systems shall be maintained at not less than 60°C.

COMMENT:

Alternative methods of controlling Legionella within hot water circulating or warm water systems may include chlorine disinfection, UV sterilisation, high temperature pasteurisation combined with system flushing as part of a documented maintenance programme.

6.15 Solar water heaters

6.15.1 AS/NZS 3500.4.2 Section 5 provides an acceptable solution for the installation of solar *water heaters* providing the solar water heating system maintains an average daily temperature of 60°C.

7.0 Installation Methods

7.0.1 *Water supply systems* shall be installed to comply with the durability requirements of NZBC B2.

7.1 Pipe supports

7.1.1 Pipes and their supports shall be electrochemically compatible.

7.1.2 Except where anchor points are necessary, the pipes shall be installed and supported in a manner which permits thermal movement.

7.1.3 Support spacing

Above ground water supply pipework shall be securely supported at centres of no greater than those given in Table 7.

7.1.4 Anchor points

Anchor points shall be provided where:

- Seal ring joints are used, and
- The joint is not able to resist the thrust imposed by the water pressure.

7.2 Protection from freezing

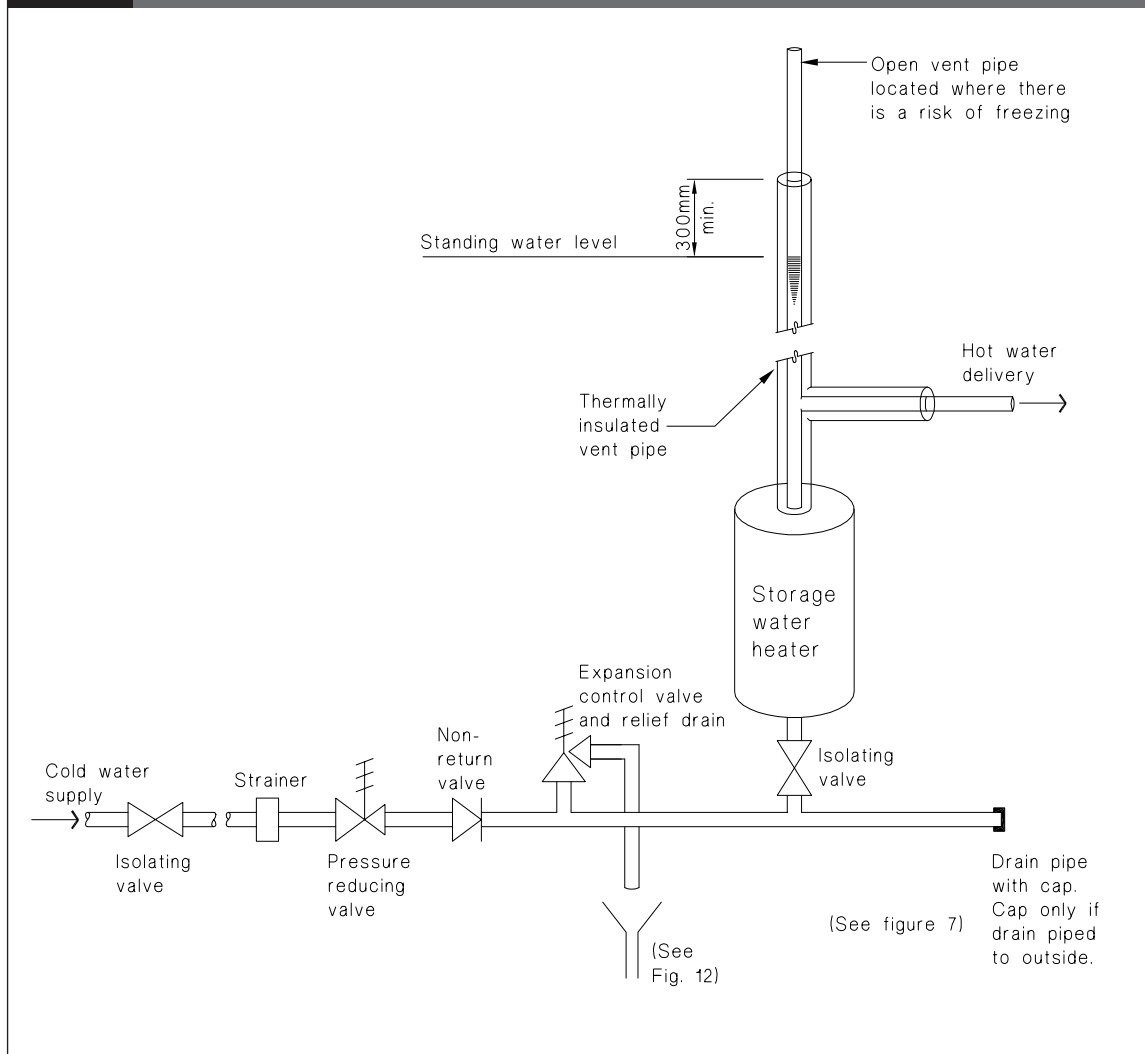
7.2.1 Where there is the likelihood of freezing, hot and cold *water supply systems* shall be protected in the following manner:

- Piping outside of the *building* thermal envelope shall be insulated,
- Piping buried in the ground shall be insulated or installed below a level affected by freezing, and
- Storage water heater vent pipes* shall be insulated (see Figure 17).

7.2.2 In climates where freezing temperatures are likely for a period of greater than 24 hours an expansion control valve is required in addition to *vent pipe* insulation (see Figure 17).

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Figure 17: Open Vented Storage Water Heaters in Climates Subject to Freezing
Paragraphs 7.2.1 c) and 7.2.2



7.3 Protection from damage

7.3.1 Water supply pipes shall be protected from the likelihood of damage.

7.3.2 Pipes below ground level

An acceptable method of protecting water supply pipes is to provide the minimum covers given below:

Cover	Location
600 mm	Residential driveways and similar areas subjected to occasional heavy traffic
450 mm	Gardens, lawns or other areas not subjected to traffic

7.3.3 Movement in concrete or masonry

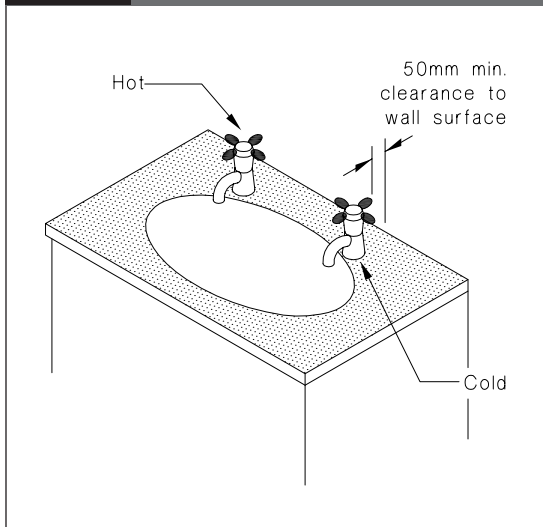
Pipes penetrating concrete or masonry elements shall be either wrapped with a flexible material, or passed through a sleeve or duct, to permit free movement for expansion and contraction.

Pipework in or under a concrete slab must be installed in a manner to achieve a 50 year durability.

7.4 Installation of uPVC Pipes

7.4.1 An acceptable method of installing uPVC pipe is given in NZS 7643.

Figure 18: Usable Water Taps
Paragraph 8.0.1



7.5 Watertightness

7.5.1 The *water supply system* shall be tested to ensure watertightness. An acceptable testing method is to:

- Subject the hot and cold system to a pressure of 1500 kPa for a period of not less than 15 minutes, and
- Inspect the system to ensure that there are no leaks.

COMMENT:

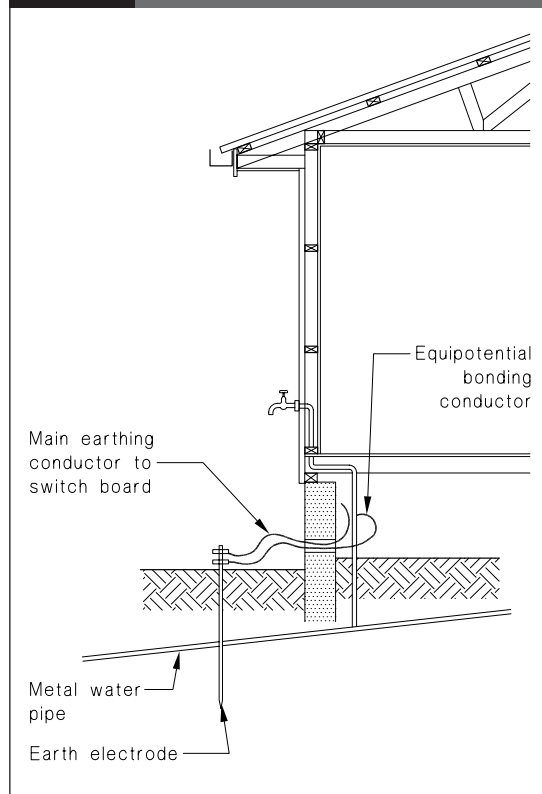
- Testing should be carried out before concealing pipework behind interior linings, flooring or within concrete, or before backfilling trenches.
- All *fixtures*, appliances, *water tanks*, *storage water heaters* and other equipment, which may be damaged during pressure testing, should be isolated before testing.

7.5.2 An alternative solution for testing uPVC water piping systems is given in Section 9 of NZS 7643.

8.0 Usable Facilities for People with Disabilities

8.0.1 Where taps are likely to be used for personal hygiene or the washing of utensils by *people with disabilities*, they shall have (see Figure 18):

Figure 19: Equipotential Bonding of Metallic Water Supply Pipe
Paragraph 9.2.1 a)



- Lever or capstan handles,
- 50 mm clearances to wall surfaces, and
- The hot tap located to the left of the cold tap.

COMMENT:

This requirement does not apply to *Housing*, *Outbuildings*, *Ancillary buildings*, and *Industrial buildings* employing fewer than 10 people.

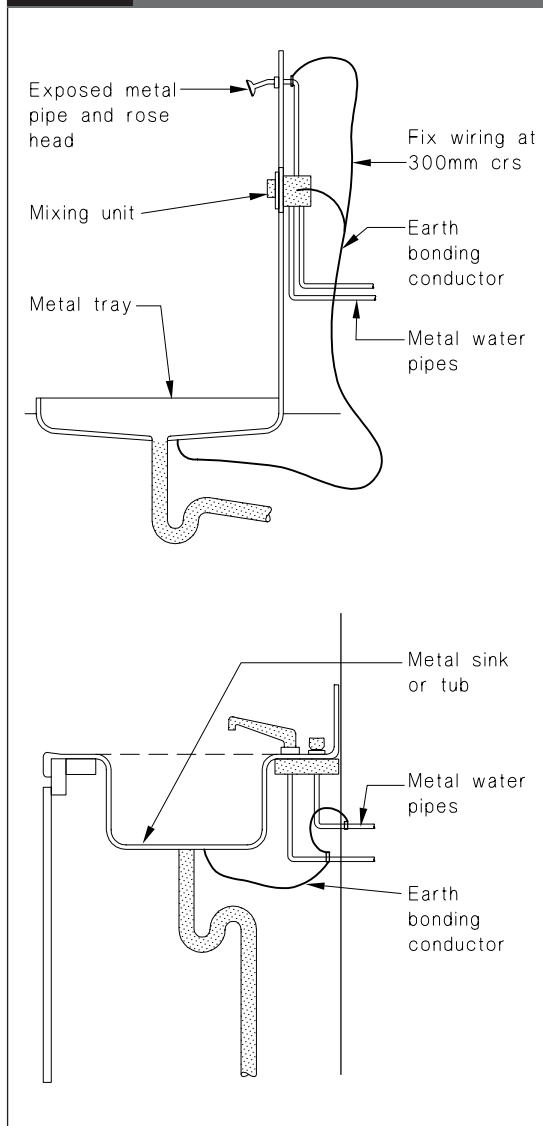
9.0 Equipotential Bonding

9.1 General

9.1.1 NZBC G9 requires any electrical installation within a *building* to be constructed to protect users from the dangers of contact with parts of the *building* that may become live during fault conditions.

9.1.2 Equipotential bonding is required where all of the following conditions are likely to exist:

Figure 20: Equipotential Bonding of Metallic Sanitary Fixtures
Paragraph 9.2.2 a)



- a) Electricity is provided within a *building*,
- b) The water supply pipe is metallic,
- c) *Building* users are able to make contact with exposed parts of metal water supply pipe, or any metallic *sanitary fixtures* connected to it, and
- d) The metal pipe is in contact with the ground, and forms a continuous metallic link from the ground to those parts of the pipe exposed to *building* users.

COMMENT:

No equipotential bonding is required if the water supply piping is plastic.

9.2 Installation of equipotential bonding conductors

9.2.1 Water supply pipe

- a) Metallic water supply pipe shall be bonded to the earth electrode with an equipotential bonding conductor, as shown in Figure 19. The connection to the water pipe shall be as close as practicable to the point where the pipe leaves the ground, and
- b) Metallic hot and cold water supply pipes shall be bonded together.

9.2.2 Metallic sanitary fixtures

- a) Metallic *sanitary fixtures* shall be bonded to the metallic water supply pipe with an equipotential bonding conductor, as shown in Figure 20.

COMMENT:

Metallic *sanitary fixtures* are only required to be bonded to metallic water supply pipes where it is possible for a person to simultaneously touch the pipe (via a tap) and the *fixture*.

- b) The bonding conductor shall be connected directly to the *sanitary fixture*. The bonding conductor may connect to the waste pipe where a metallic waste pipe is connected to the *sanitary fixture* and a continuous metallic link is formed between the waste pipe and the *fixture*.

9.3 Earth bonding conductors

9.3.1 Earth bonding conductors shall be:

- a) Made of copper and have a cross-sectional area no less than 4.0 mm²,
- b) Sheathed with insulating material coloured green, and
- c) Fixed at intervals of no greater than 300 mm with aluminium cable fixings.

9.3.2 Earth bonding conductors shall comply with NZS 6401 or AS 3147.

Index G12/VM1 & AS1

All references to Verification Methods and Acceptable Solutions are preceded by **VM** or **AS** respectively.

Alternative acceptable solutions

- open vented storage water heaters **AS1** 6.9.1
- storage water heaters
 - seismic restraint **AS1** 6.11.4
- unvented (valve vented)
 - storage water heaters **AS1** 6.10.1, Figure 14
- watertightness testing **AS1** 7.5

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Backflow protection **AS1** 3.4

- air gaps **AS1** 3.5
- backflow prevention devices **AS1** 3.6
 - atmospheric vacuum breakers ... **AS1** 3.6.2, 3.6.4, 3.7.1, Table 2
 - double check valves **AS1** 3.6.2, 3.7.2, Table 2
 - pressure vacuum breakers **AS1** 3.6.1, 3.6.4, 3.7.1, Table 2
 - reduced pressure zone devices . **AS1** 3.6.2, 3.6.4, 3.7.2, Table 2
- installation **AS1** 3.6.3, 3.6.4, 3.7.1
- testing **AS1** 3.7

Cold water expansion valves

- (expansion control valves) **AS1** 6.3.3, 6.6.2, 6.6.3,
Figures 8 to 10, Table 6
- installation **AS1** 6.6.5
- relief valve drains **AS1** 6.7, Figures 8 to 10, and 13

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Cross connections **AS1** 3.1, 3.2

- hazard **AS1** 3.3

Energy cut-offs **AS1** 6.4.1 c), 6.5.2

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Equipotential bonding **AS1** 9.0

- earth bonding conductors **AS1** 9.3
- installation of conductors **AS1** 9.2
 - metallic sanitary fixtures **AS1** 9.2.2, Figure 20
 - metallic water supply pipes **AS1** 7.2.1, Figure 19

Filters see Strainers

Hot water supply **AS1** 6.0

- pipe sizes **AS1** 6.12, Table 4

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Identification of non-potable water supply **AS1** 4.2.1

Isolating valves **AS1** 3.7.1, 5.4.2

Legionella bacteria **AS1** 6.14.3

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Mixing devices

- tempering valves **AS1** 6.14.2, Figure 16

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Non-potable water supply **AS1** 4.1

- outlet identification **AS1** 4.2.1, Figure 3

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Pressure reducing valves	AS1 5.3.2, 6.2.1, Figures 7 and 9, Table 6	
Pressure relief valves	AS1 6.4.1 b), 6.6, Table 6	
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