

Dear Customer

Please find enclosed Amendment 10, effective 1 January 2017, to the Acceptable Solutions and Verification Methods for Clause G12 Water Supplies of the New Zealand Building Code. The previous amendment to G12 (Amendment 9) was in February 2014.

Section	Old G12	January 2017 Amendment 10
Title pages	Remove title page and document history page 1-2B	Replace with new title page and document history pages 1-2B
References	Remove page 9/10	Replace with new page 9/10
G12/AS1	Remove pages 17/18, 21-24, 31/32, 35/36	Replace with new pages 17/18, 21-24, 31/32, 35/36
G12/AS2	Remove page 43/44, 51/52	Replace with new page 43/44, 51/52



MINISTRY OF BUSINESS,
INNOVATION & EMPLOYMENT
HĪKINA WHAKATUTUKI

Acceptable Solutions and Verification Methods

For New Zealand Building Code Clause
G12 Water Supplies

G12
BUILDING CODE

Status of Verification Methods and Acceptable Solutions

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Defined words (italicised in the text) and classified uses are explained in Clauses A1 and A2 of the Building Code and in the Definitions at the start of this document.

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**Verification Methods and Acceptable Solutions
are available from www.building.govt.nz**

New Zealand Government

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Document Status

The most recent version of this document (Amendment 10), as detailed in the Document History, is approved by the Chief Executive of the Ministry of Business, Innovation and Employment. It is effective from 1 January 2017 and supersedes all previous versions of this document.

The previous version of this document (Amendment 9) will cease to have effect on 30 May 2017.

People using this document should check for amendments on a regular basis. The Ministry of Business, Innovation and Employment may amend any part of any Verification Method or Acceptable Solution at any time. Up-to-date versions of Verification Methods and Acceptable Solutions are available from www.building.govt.nz

G12: Document History				
	Date	Alterations		
First published	July 1992			
Amendment 1	September 1993	pp. vi–viii, References p. ix, Definitions p. 15, Table 4 p. 16, 4.5.1, 4.5.3	p. 19, 5.2.2 b) p. 22, Table 7 p. 26, Index	
Amendment 2	19 August 1994	pp. i and ii, Document History p. v, Contents p. viii, References p. 3, 2.2.1 e)	p. 6, 2.6, 2.6.1 p. 19, 4.13.1, 4.14, 4.14.1 p. 26, 29, Index	
Amendment 3	1 December 1995	p. ii, Document History pp. vi–viii, References	p. 5, Table 1 p. 6, 2.5.2	
Second edition published July 2001	Effective from 1 October 2001	Document revised – Second edition issued		
Amendment 4	6 January 2002	pp. 3–5 Code Clause G12		
Amendment 5	25 February 2004	p. 2, Document History p.7, Contents pp. 9–11 References	pp. 23–38, 3.7.1, 3.7.4, 4.1, 6.2.1, 6.3.2–6.15, Figure 13 pp. 43–45 Index	
Amendment 6	23 June 2007	p. 2, Document History, Status pp. 9 and 11, References	p. 13, Definitions p. 15, VM1 1.0.1	
Third edition published October 2007	Effective from 1 December 2007	Document revised – Third edition issued	G12/AS1 amended: p. 27, Table 5 p. 32, 6.5.1 p. 35, 6.9, 6.10 p. 36, 6.11.5	p. 37, 6.14.3 p. 38, 6.15 (deleted) p. 40, 7.5.2 New Acceptable Solution G12/AS2 included
Amendment 7	Published 30 June 2010 Effective from 30 September 2010	p. 2, Document History, Status pp. 3 and 4, Code Clause G12 pp. 7–10, References	p. 17, G12/AS1 2.1.2, Table 1 p. 27, G12/AS1 Table 5 p. 32, G12/AS1 Table 6	p. 41, G12/AS1 9.3.2
Amendment 8	Effective from 10 October 2011 until 14 August 2014	p. 2, Document History, Status pp. 7–10, References p.12, Definitions p. 21, G12/AS1 3.6.1	p. 23, G12/AS1 3.7.2 p. 41, G12/AS1 9.3.2 p. 43, G12/AS2 1.1.1	
Amendment 9	14 February 2014 until 30 May 2017	p. 2A, Document History, Status pp 7, 8, 10 References p. 11 Definitions	p. 17 G12/AS1 2.1.2 p. 27 G12/AS1 Table 5 p. 40 G12/AS1 7.5.2	pp. 44–47, 49–50, 64, G12/AS2 2.1.4, 3.1.1, 3.2.1, 3.6.1, 3.6.2, 7.2.3, Tables 1, 2 and 3
Amendment 10	Effective 1 January 2017	pp. 9, 10 References p.17 G12/AS12.2, Table 1 p. 21 G12/AS1 3.6.2	p. 23 G12/AS1 3.7.4 p. 24 G12/AS1 5.2.3 p. 32 G12/AS1 Table 6	p. 35 G12/AS1 6.11.3 p. 43 G12/AS2 1.1.1 p. 51 G12/AS2 4.2.2, 5.0.1
Note: Page numbers relate to the document at the time of Amendment and may not match page numbers in current document.				

Standards Australia

AS 1308: 1987 Electric water heaters – Thermostats and thermal cut-outs
Amend: 1

AS 1357: Water valves for use with unvented water heaters
Part 1: 2009 Protection valves
Amend: 1, 2
Part 2: 2005 Control valves
Amend: 1, 2

Amend 7
Sep 2010

AS 2845: Water supply – Mechanical backflow prevention devices

Amend 8
Oct 2011

Part 3: 1993 Field testing and maintenance
Amend: 1

Amend 7
Sep 2010

Australia/New Zealand Standards

AS/NZS 1170: Structural Design Actions
Part 0: 2002 General principles
Amend: 1, 2 and 4

Part 1: 2002 Permanent, imposed and other actions
Amend: 1, 2

Part 2: 2011 Wind Actions
Amend: 1, 2 and 3

Part 3: 2003 Snow and ice actions
Amend: 1

Amend 10
Jan 2017

Amend 8
Oct 2011

NZS 1170:
Part 5: 2004 Earthquake design actions – New Zealand

AS/NZS 1477: 2006 PVC pipes and fittings for pressure applications
Amend: 1

Amend 7
Sep 2010

AS/NZS 2032: 2006 Installation of PVC pipe systems
Amend: 1

Amend 8
Oct 2011

AS/NZS 2642: Polybutylene pipe systems
Part 1: 2007 Polybutylene (PB) pipe extrusion compounds
Part 2: 2008 Polybutylene (PB) pipe for hot and cold water applications

Amend 8
Oct 2011

Part 3: 2008 Mechanical jointing fittings for use with polybutylene (PB) pipes for hot and cold water applications
Amend: 1

Where quoted

AS1 6.5.1

AS1 Table 6

AS1 6.14.2 b),
Table 6

AS1 3.6.1 b),
3.7.2

AS2 1.1.1

AS2 1.1.1

AS2 1.1.1

AS2 1.1.1

AS2 1.1.1

AS1 Table 1

AS1 7.4.1, 7.5.2

AS1 Table 1

AS1 Table 1

AS1 Table 1

		Where quoted
Amend 9 Feb 2014	AS/NZS 2712: 2007 Solar and heat pump water heaters – Design and construction <i>Amend: 1, 2 and 3</i>	AS2 3.1.1, 3.6.1
Amend 10 Jan 2017	AS/NZS 2845: Water supply – Backflow prevention devices Part 1: 2010 Materials, design and performance requirements <i>Amend: 1</i>	AS1 3.6.2
Amend 10 Jan 2017	AS/NZS 60335.2.35: 2013 Household and similar electrical appliances. Safety – Part 2.35 Particular requirements for instantaneous water heaters	AS1 Table 5
Amend 9 Feb 2014	AS/NZS 3500: Plumbing and drainage Part 1: 2015 Water services	VM1 1.0.1 a), AS1 3.5.2 VM1 1.0.1 b) AS1 6.15.1, AS2 1.1.1, 4.2.2, 5.0.1
Amend 9 Feb 2014	Part 4: 2015 Heated water services	
Amend 9 Feb 2014	AS/NZS 4020: 2005 Testing of products for use in contact with drinking water	
Amend 10 Jan 2017	AS/NZS 4129: 2008 Fittings for polyethylene (PE) pipes for pressure applications <i>Amend: 1</i>	AS1 Table 1
Amend 7 Sep 2010	AS/NZS 4130: 2009 Polyethylene (PE) pipes for pressure applications <i>Amend: 1</i>	AS1 Table 1
Amend 7 Sep 2010	AS/NZS 4692: Electric water heaters Part 2: 2005 Minimum Energy Performance Standards (MEPS) requirements and energy labelling	AS2 3.1.2
Amend 7 Sep 2010	AS/NZS 5000.1 2005 Electric cables – Polymeric insulated – For working voltages up to and including 0.6/1 (1.2) kV <i>Amend: 1</i>	AS1 9.3.2
Amend 8 Oct 2011	AS/NZS 5000.2 2006 Electric cables – Polymeric insulated Part 2: For working voltages up to and including 450/750 v.	AS1 9.3.2
	New Zealand Regulations	
	Gas Regulations 1993	AS1 Table 5
	Master Plumbers, Gasfitters and Drainlayers NZ Inc and Water New Zealand	
Amend 8 Oct 2011	NZ Backflow testing standard 2011 Field testing of backflow prevention devices and verification of air gaps	AS1 3.6.1 b), 3.7.2

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 Water supply materials and components shall comply with:

- a) BS 6920 if non-metallic, or
- b) AS/NZS 4020 if metallic or non-metallic.

Amend 7
Amend 9

2.2 Pipe materials

2.2.1 Pipe and pipe fitting 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.

Amend 10
Jan 2017

Amend 10
Jan 2017

Amend 10
Jan 2017

Table 1: 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	
PVC-U	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/NZS 4129 for fittings
	AS/NZS 4130 for pressures up to 2.5 MPa

Amend 7
Sep 2010

Amend 7
Sep 2010

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.

Amend 8
Oct 2011

- b) In an accessible position for maintenance and testing to AS 2845.3 or NZ backflow testing standard.

3.6.2 Manufacture

Backflow prevention devices shall be manufactured as follows:

Amend 10
Jan 2017

- a) Reduced pressure zone devices to AS/NZS 2845.1 Section 12 (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.

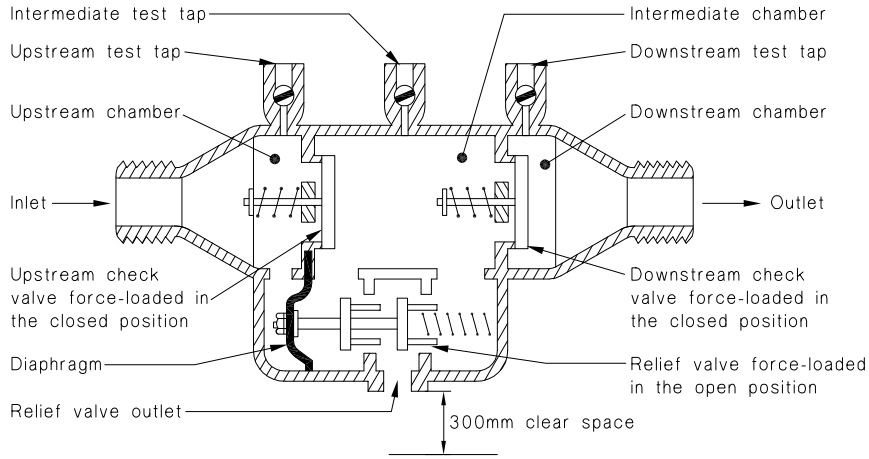
3.6.4 Specific installation requirements

Backflow prevention devices shall be installed as follows:

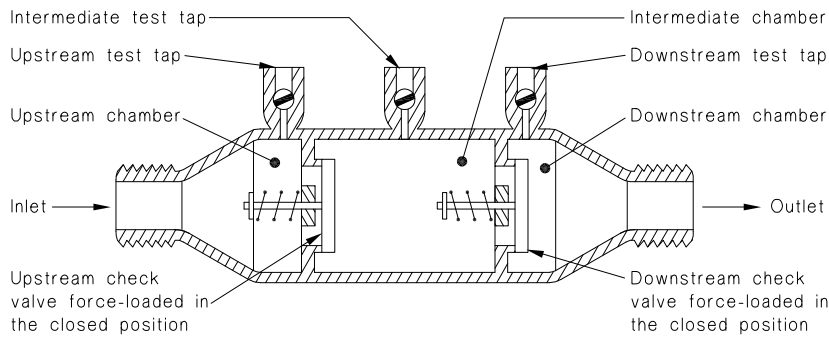
- a) Reduced pressure zone devices. These devices shall:

- 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.

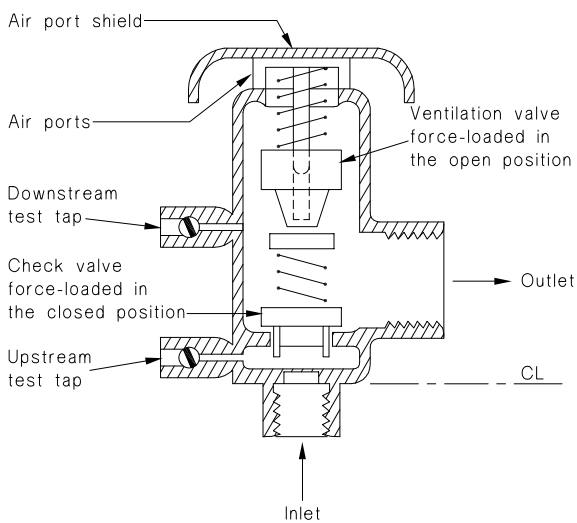
Figure 2: Backflow Prevention Devices
Paragraph 3.6.2



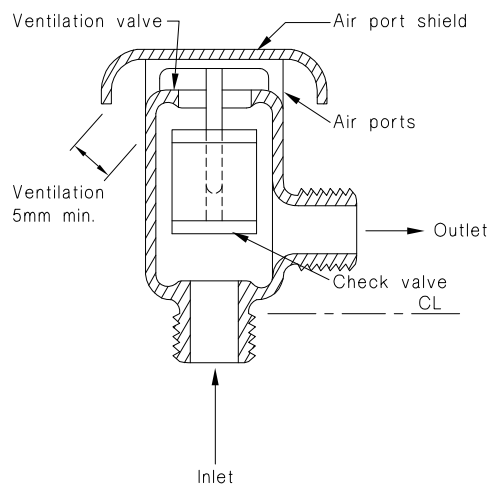
(a) Schematic diagram of a reduced pressure zone device



(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 or NZ backflow testing standard.

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 the compliance schedule for Specified System SS 7, except for devices installed in single residential dwellings.

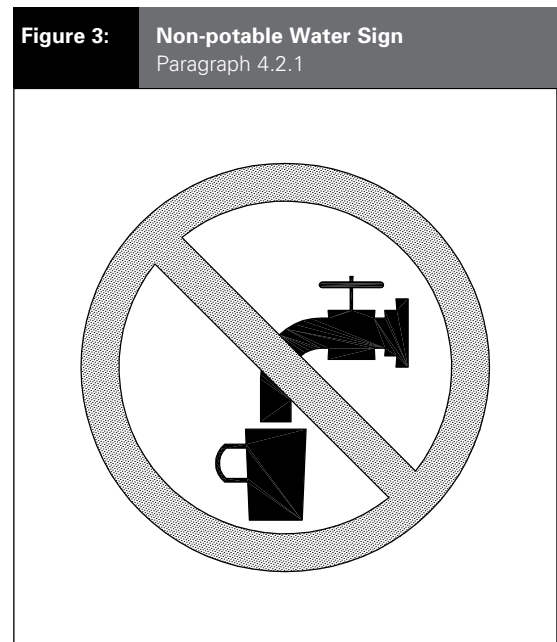
4.0 Non-potable Supply

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.



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.

Amend 5
Feb 2004

Amend 5
Feb 2004

Amend 5
Feb 2004
Amend 8
Oct 2011

Amend 5
Feb 2004

Amend 10
Jan 2017

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: states that; Free water from accidental overflow from *sanitary fixtures* or *sanitary appliances* must be disposed of in a way that avoids loss of *amenity* or damage to *household units* or *other property*. 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 a drain with a minimum diameter of 40 mm. Where the tank overflow discharges into the safe tray, the diameter of the safe tray 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.

Amend 10
Jan 2017

Amend 10
Jan 2017

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

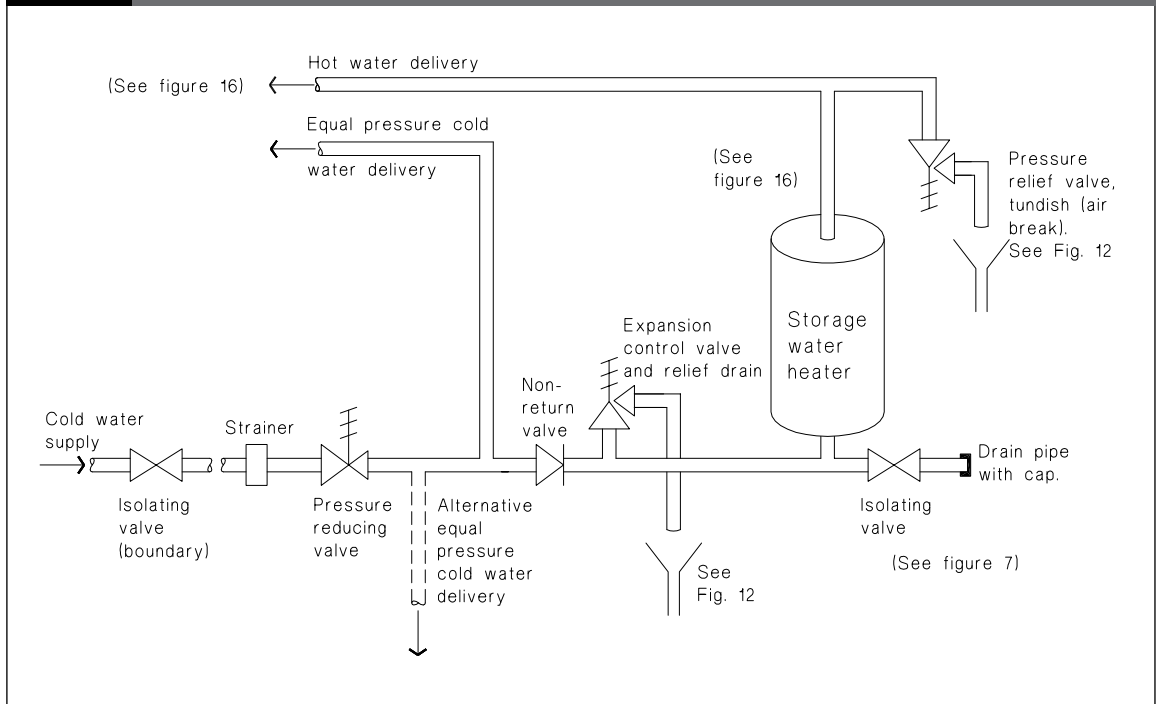
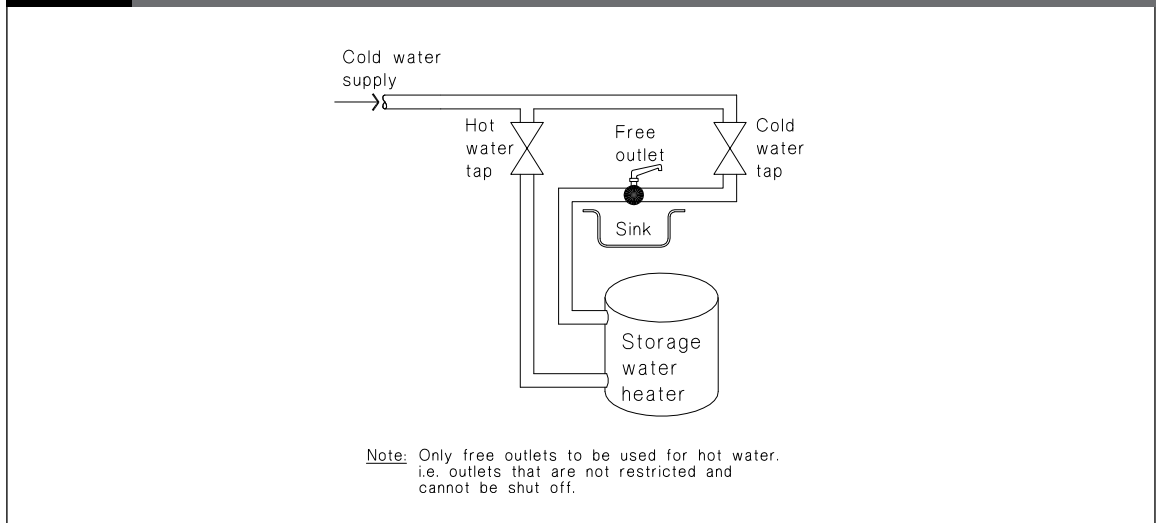


Figure 11: Free Outlet System (push through)
 Paragraph 6.1.2



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 and energy cut-off devices 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.

Third Edition
Dec 2007

Amend 5
Feb 2004

Amend 5
Feb 2004

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 EN 1491 AS 1357: Part 1
Temperature/pressure relief valve	NZS 4608 BS EN 1490 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 EN 1567 AS 1357: Part 2
Pressure relief valves	NZS 4608

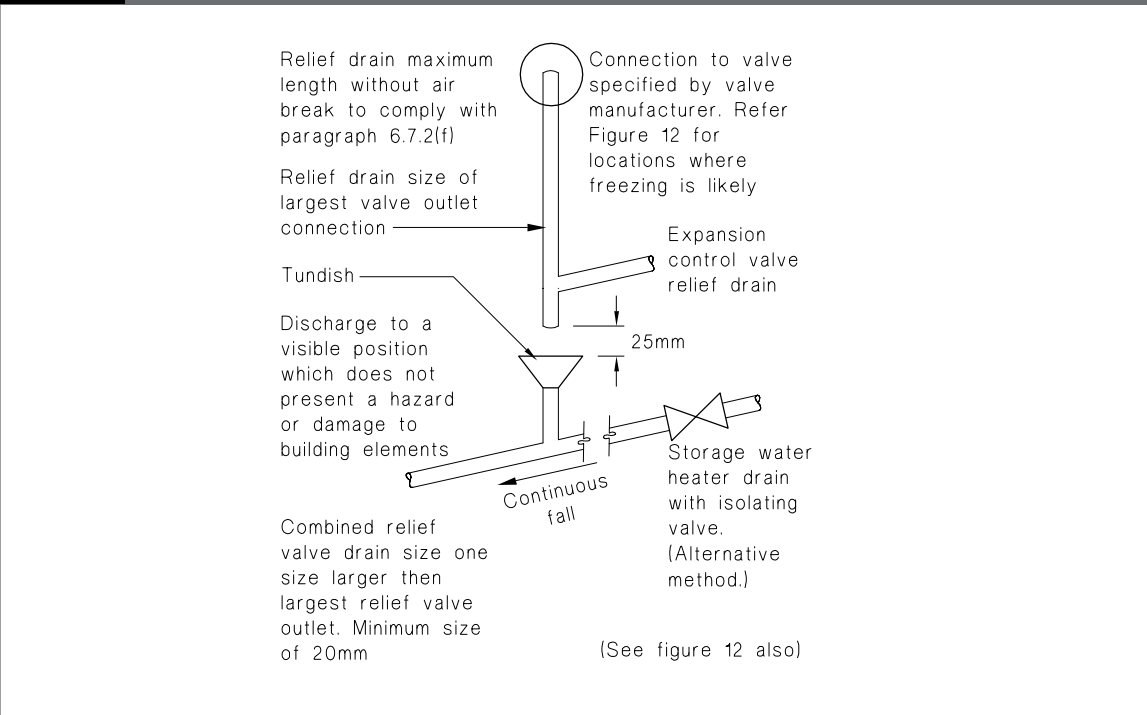
Amend 7
Sep 2010

Amend 7
Sep 2010

Amend 5
Feb 2004

Amend 10
Jan 2017

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



Amend 5
Feb 2004

6.8.3 Insulation

- a) 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*.
- b) Insulation material is to comply with Paragraph 6.7.6.

6.9 Another acceptable solution 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 Another acceptable solution 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:

- a) Safe trays complying with Paragraph 5.2.3
- b) Connections compatible with the pipe material used, and
- c) Drain pipes (for every *storage water heater* of more than 45 litres capacity) which:
 - i) have a conveniently located isolating valve, and terminate with a cap or plug suitably located to easily empty the vessel for maintenance, or
 - ii) terminate outside the *building* with a cap only.

Third Edition
Dec 2007

Third Edition
Dec 2007

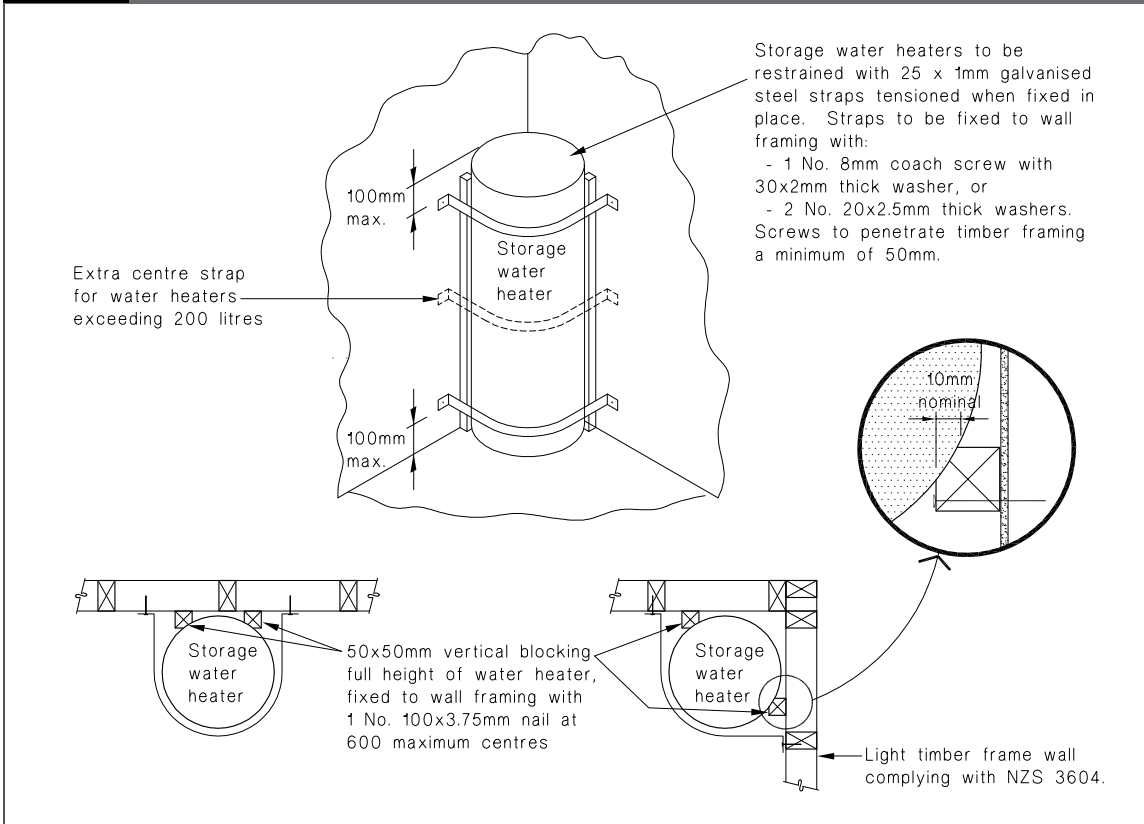
Amend 5
Feb 2004

Amend 10
Jan 2017

Amend 5
Feb 2004

Amend 5
Feb 2004

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



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 Another 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*.

Third Edition
Dec 2007

Amend 5
Feb 2004

Amend 5
Feb 2004

Acceptable Solution G12/AS2

Solar Water Heaters

1.0 Scope

1.0.1 This Acceptable Solution applies to solar *water heaters* installed in or on *buildings*.

1.0.2 To comply with this Acceptable Solution solar *water heaters* must also comply with the appropriate requirements of G12/AS1. This Acceptable Solution meets the requirements of NZBC Clauses B1, B2, E2, G12 and H1.

1.0.3 Text boxes headed '**COMMENT**' occurring throughout this document are for guidance purposes only.

1.1 Structural support limitations

1.1.1 Where a *building* has not been specifically designed to support a solar *water heater*, this Acceptable Solution can be used for the support and fixing of a solar collector on *buildings* that meet the structural requirements specified in any one of the following:

- NZS 3604: 1990
- NZS 3604: 1999
- NZS 3604: 2011
- NZS 4203
- AS/NZS 1170: Parts 0, 1, 2, 3 and NZS 1170: Part 5.

But only when all of the following requirements are met:

- a) the weight of solar collector, including frames, fittings, and heat transfer fluid, has a combined weight of no more than 22 kg per square metre (based on the gross area of the solar collector), and
- b) the hot water storage tank is not installed on or above the roof, and
- c) where the hot water storage tank is located within a roof it has a maximum size of:
 - i) 200 litres when installed in accordance with NZS 3604: 1999 Section 14, or
 - ii) 450 litres when installed in accordance with AS/NZS 3500 Part 4 Section 5, and

- d) the roof has a pitch no steeper than 45°, and
- e) the *building* is in a *wind zone* where wind speeds do not exceed 50 m/s (VH *wind zone* defined in NZS 3604: 1999), and
- f) the solar collector has an area no greater than 4 m², and
- g) the design ground snow loading for the building is less than:
 - (i) 0.5 kPa as determined by NZS 4203, or NZS 3604: 1990 or NZS 3604: 1999 Section 15, or
 - (ii) 1.0 kPa as determined by AS/NZS 1170 or NZS 3604: 2011, Section 15, and
- h) either:
 - i) the solar collectors are installed parallel to the roof *cladding*, or
 - ii) where solar collectors are installed at a different pitch to the pitch of the roof:
 - the pitch of the solar collector is not greater than 45° to the horizontal, and
 - the *building* is in a *wind zone* where wind speeds do not exceed 44 m/s (H *wind zone* defined in NZS 3604: 1999), and
 - the solar collector faces in the same compass direction as the section of roof the solar collector is installed on.

COMMENT:

1. The limitations described in Paragraph 1.1.1 are necessary, because roofs are likely to have limited capacity to support additional loads.

1.1.2 When any of the requirements described in Paragraph 1.1.1 are not met, specific engineering design is required.

COMMENT:

Specific engineering design will require a structure assessment to be completed. This may result in either an assessment that the roof structure is sufficient to support the additional load or details of how to strengthen the roof structure to support the additional load.

Amend 8
Oct 2011

Amend 8
Oct 2011

Amend 10
Jan 2017

1.2 Exclusions

1.2.1 If the solar *water heater* includes connection to an application such as underfloor heating, a swimming pool or any similar application, this Acceptable Solution applies only to the solar *water heater* and its components and not to the application.

2.0 Materials

2.1 Material selection

2.1.1 All material used to install the solar *water heater* must:

- a) meet the *durability* requirements of NZBC Clause B2, and
- b) be suitable for their use, location and environment as shown in Table 1, and
- c) be compatible with adjoining materials as shown in Table 2, and
- d) be compatible with materials subject to run-off as shown in Table 3 (except as described in Paragraph 2.1.2).

2.1.2 Table 3 states that “butyl/EPDM” to “steel, galvanized unpainted” is “not permitted”; however, water flow from small areas of **EPDM** will not significantly affect the *durability* of the roofing. Therefore it is acceptable to use unpainted **EPDM** boots with unpainted galvanised steel roofing if:

- a) the boots are small (for 60 mm pipe diameter or smaller), and
- b) there are no more than 10 boots used for the solar *water heater* installation, and
- c) the boots contain no greater than 15% carbon black.

2.1.3 If the requirements described in Paragraph 2.1.2 are not met then either the **EPDM** boots or the galvanised roofing must be painted with a suitable protective coating.

2.1.4 Table 2 shows that galvanized fixings must be used rather than stainless steel when in contact with galvanized *cladding* and zinc-aluminium-magnesium (combinations) coated *cladding*. (This includes mounting brackets and straps.)

Amend 9
Feb 2014

4.2.2 Solar collectors must be inclined at an angle within +/- 20 degrees of the angle of latitude (from the horizontal) to satisfy the requirements of NZBC Clause H1.3.4(a).

COMMENT:

1. The ideal orientation of a solar collector is geographic north with an inclination angle from the horizontal the same as the angle of latitude for the location. Deviations from the ideal orientation will reduce the performance of the solar *water heater*.

Details of the impact of changes in orientation and inclination are provided in NZS 4614: 1986, and are shown in the following diagram.

FACTORS FOR INCLINATION AND SOLAR ORIENTATION

Direction (degrees)		Inclination angle (degrees)					
		0°	20°	40°	60°	80°	90°
West	270	0.85	0.85	0.8	0.72	0.6	0.53
	300	0.85	0.92	0.92	0.86	0.73	0.65
	330	0.85	0.98	0.99	0.93	0.8	0.71
North	0	0.85	0.97	1	0.94	0.8	0.7
	30	0.85	0.94	0.95	0.88	0.74	0.65
	60	0.85	0.88	0.86	0.77	0.65	0.57
East	90	0.85	0.8	0.73	0.64	0.52	0.46
Good orientation			Moderate orientation				Poor orientation

The relative performance of flat-plate collectors in different orientations is illustrated. It is clear that collectors should face within about 45° of north, and be fitted at an inclination angle between 20° and 50°.

If for some reason it were necessary to place the collectors facing the west at 60° inclination, then to avoid loss in performance, the collectors would have to be 1/0.72 (or 1.4) as large (i.e. increased by 40% in the collector area).

Where collectors other than flat-plate type (cylindrical shape for instance) are used, similar optimum requirements for orientation will apply (i.e. the axis of the cylinder should be inclined at 20° to 50°). The performance loss by using poorer orientation has not been as fully explored as for the flat-plate case.

Figure 12 from NZS 4614: 1986 is reproduced with the permission of Standards New Zealand under Licence 684.

2. Shading of solar collectors should be minimised to ensure maximum performance of the system.

Significant shading between 9:00 am and 3:00 pm will affect the performance of a solar *water heater*.

The solar altitude may be determined using a commercial "sun locator" or a simple solar altitude sight may be constructed using the diagrams given in Appendix I of AS/NZS 3500.4.

Amend 10
Jan 2017

5.0 Installation of Solar Water Heaters

5.0.1 Solar *water heaters* must be installed in accordance with the requirements of AS/NZS 3500 Part 4, unless modified by this Acceptable Solution.

Amend 10
Jan 2017

5.0.2 Water storage tanks that form part of a solar *water heater* must have drain pipes that:

- a) have an easily reached isolating valve, and terminate with a cap or plug to empty the vessel for maintenance, or
- b) terminate outside the *building* with a cap only.

5.0.3 Fixings used for the installation of a solar *water heater* must meet the requirements described in Paragraphs 2.1.1, 2.1.2, 2.1.3 and 2.1.4.

5.0.4 All metal swarf from drilling or cutting must be removed from the roof surface to prevent corrosion. Care must also be taken to avoid scratching of any roof *cladding* protective coating.

5.1 Wetback water heaters

5.1.1 Where water is heated by a wetback *water heater* and a solar collector, independent water pipe circuits must be installed for each heat source.

5.1.2 A wetback *water heater* must have an open-vent connected to the:

- a) *water tank*, or
- b) wetback *water heater* flow pipe (see G12/AS1 Figure 5).

COMMENT:

In Paragraph 5.1.2 (b) a heat-exchanger is required when the tank pressure is higher than the open-vented wetback circuit.

5.2 Weathertightness

5.2.1 Any penetrations made in the *building cladding* during the installation of a solar water heater must be flashed, or sealed using purpose-made sealing washers or boots to prevent leaks.

5.2.2 Where roof penetrations are required for large openings such as solar collectors installed in or below the roof:

- a) the edge of roofing penetrations over 200 mm wide must be supported in either direction with additional *framing* as shown in Figure 3, and
- b) for the catchment area of the roof above the penetration as shown in Figure 4, the roof length must be limited to the areas shown in Table 4.

5.2.3 Penetrations through masonry tile roofs must be as shown in Figure 5.

5.2.4 Pipe penetrations in pressed metal tile roofs must be flashed using *EPDM* or silicone rubber boot *flashings* as shown in Figure 6.

Table 4: Maximum catchment areas above penetrations greater than 200 mm wide
Paragraph 5.2.2 b)

Penetration width	Maximum roof length above penetration in metres			
	Profiled metal			
	Corrugated	Trapezoidal	Trough profile	Other roofs
800 to 1200 mm	4 m	8 m	16 m	4 m
600 to 800 mm	6 m	12 m	18 m	6 m
400 to 600 mm	8 m	16 m	18 m	8 m
200 to 400 mm	12 m	18 m	18 m	10 m

