MINISTRY OF BUSINESS, INNOVATION & EMPLOYMENT
HĪKINA WHAKATUTUKI

Please find enclosed Amendment 12, effective 27 June 2019 to the Acceptable Solutions and Verification Methods for Clause G12 Water Supplies of the New Zealand Building Code. The previous amendment to the G12 Acceptable Solutions and Verification Methods (Amendment 11) was in November 2018.

Section	**Previous amendment**	**June 2019 Amendment 12**
Title pages	Remove titla page and document status and history pages 1–2B	Replace with new titla page and document status and history pages 1–2B
References	Remove page 9/10	Replace with new page 9/10
G12/VM1	Remove page 15/16	Replace with new page 15/16
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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

Verification Methods and Acceptable Solutions are prepared by the Ministry of Business, Innovation and Employment in accordance with section 22 of the Building Act 2004. Verification Methods and Acceptable Solutions are for use in establishing compliance with the New Zealand Building Code.

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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

Document Status

The most recent version of this document (Amendment 12), as detailed in the Document History, is approved by the Chief Executive of the Ministry of Business, Innovation and Employment. It is effective from 27 June 2019 and supersedes all previous versions of this document.

The previous version of this document (Amendment 11) will cease to have effect on 31 October 2019.

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	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 until 31 March 2019	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
Amendment 11	Effective from 30 November 2018 until 31 October 2019	p. 10 References		
Amendment 12	Effective 27 June 2019	p. 10 References p. 15 G12/VM1 1.0.1	p. 20 G12/AS1 3.5.2 p. 51 G12/AS2 4.2.2	

Note: Page numbers relate to the document at the time of Amendment and may not match page numbers in current document.

2B

			Where quoted
	Standards Australia		
	AS 1308: 1987	Electric water heaters – Thermostats and thermal cut-outs *Amend: 1*	AS1 6.5.1
	AS 1357:	Water valves for use with unvented water heaters	
	Part 1: 2009	Protection valves *Amend: 1, 2*	AS1 Table 6
	Part 2: 2005	Control valves *Amend: 1, 2*	AS1 6.14.2 b), Table 6
Amend 7 Sep 2010	AS 2845:	Water supply – Mechanical backflow prevention devices	
	Part 3: 1993	Field testing and maintenance *Amend: 1*	AS1 3.6.1 b), 3.7.2
Amend 8 Oct 2011			
Amend 7 Sep 2010			
	Australian/New Zealand Standards		
	AS/NZS 1170:	Structural Design Actions	
	Part 0: 2002	General principles *Amend: 1, 2 and 4*	AS2 1.1.1
	Part 1: 2002	Permanent, imposed and other actions *Amend: 1, 2*	AS2 1.1.1
	Part 2: 2011	Wind Actions *Amend: 1, 2 and 3*	AS2 1.1.1
Amend 10 Jan 2017	Part 3: 2003	Snow and ice actions *Amend: 1*	AS2 1.1.1
	NZS 1170:		AS2 1.1.1
Amend 8 Oct 2011	Part 5: 2004	Earthquake design actions – New Zealand	
	AS/NZS 1477: 2006	PVC pipes and fittings for pressure applications *Amend: 1*	AS1 Table 1
	AS/NZS 2032: 2006	Installation of PVC pipe systems *Amend: 1*	AS1 7.4.1, 7.5.2
Amend 7 Sep 2010			
	AS/NZS 2642:	Polybutylene pipe systems	
	Part 1: 2007	Polybutylene (PB) pipe extrusion compounds	AS1 Table 1
Amend 8 Oct 2011	Part 2: 2008	Polybutylene (PB) pipe for hot and cold water applications	AS1 Table 1
Amend 8 Oct 2011	Part 3: 2008	Mechanical jointing fittings for use with polybutylene (PB) pipes for hot and cold water applications *Amend: 1*	AS1 Table 1

		Where quoted
Amend 9 Feb 2014	AS/NZS 2712: 2007 Solar and heat pump water heaters – Design and construction *Amend: 1, 2 and 3*	AS2 3.1.1, 3.6.1
Amend 10 Jan 2017		
Amend 10 Jan 2017 Amend 8 Oct 2011 Amend 10 Jan 2017	AS/NZS 2845: Part 1: 2010 Water supply – Backflow prevention devices Materials, design and performance requirements *Amend: 1*	AS1 3.6.2
Amend 9 Feb 2014	AS/NZS 60335.2.35: 2013 Household and similar electrical appliances. Safety – Part 2.35 Particular requirements for instantaneous water heaters	AS1 Table 5
Amends 7 & 10		
Amends 10 & 12	AS/NZS 3500: Plumbing and drainage	
	Part 1: 2018 Water services	VM1 1.0.1 a), AS1 3.5.2 Comment, VM1 1.0.1 b) AS2 1.1.1 c), 4.2.2 Comment, 5.0.1 (Amend 11 Nov 2018; Amend 12 Jun 2019)
Amends 9 & 11		
	Part 4: 2018 Heated water services *Amend: 1*	
Amends 9 & 11		
	AS/NZS 4020: 2005 Testing of products for use in contact with drinking water	AS1 2.1.2
	AS/NZS 4129: 2008 Fittings for polyethylene (PE) pipes for pressure applications *Amend: 1*	AS1 Table 1
Amend 10 Jan 2017		
Amend 7 Sep 2010	AS/NZS 4130: 2009 Polyethylene (PE) pipes for pressure applications *Amend: 1*	AS1 Table 1
	AS/NZS 4692: Part 2: 2005 Electric water heaters 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 *Amend: 1*	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	
	NZ Backflow testing standard 2011	AS1 3.6.1 b), 3.7.2
Amend 8 Oct 2011	Field testing of backflow prevention devices and verification of air gaps	

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:

Amend 6 Jun 2007
Amend 12 Jun 2019

a) AS/NZS 3500.1 Section 2, Section 3 and Appendix C: Sizing method for supply piping for dwellings (note that Appendix C is part of this Verification Method even though it is included in the standard as an "Informative" Appendix), and

Amend 6 Jun 2007

b) AS/NZS 3500.4.

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
Air gap (see **Note 1**)	✓	✓	✓	✓	✓	✓
Reduced pressure zone device	✓	✓	✓	✓	✓	✓
Double *check valve* assembly (see **Note 2**)			✓	✓	✓	✓
Pressure type vacuum breaker (see **Note 3**)		✓		✓		✓
Atmospheric vacuum breaker (see **Note 4**)		✓		✓		✓

Note:

1. *Air gaps* must not be installed in a *toxic environment*.
2. Double *check valves* can be installed in a medium and low hazard *toxic environment*.
3. Pressure type vacuum breakers are designed to vent at 7 kPa or less. However, they require a significantly higher pressure to reseat and must be installed only in systems which provide pressures sufficient to ensure full closing of the valve.
4. 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 Appendix G: Storage Tanks – Inflow and Overflow may be used to calculate the size of the overflow.

Amend 12
Jun 2019

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.

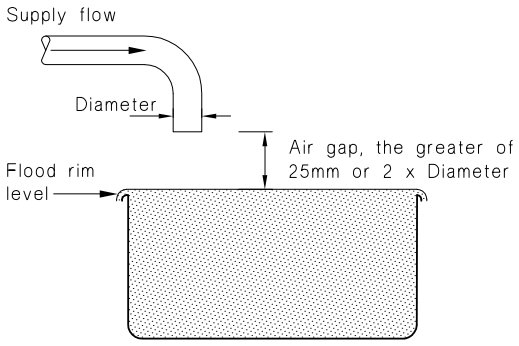
3.6 Backflow prevention devices

3.6.1 Location

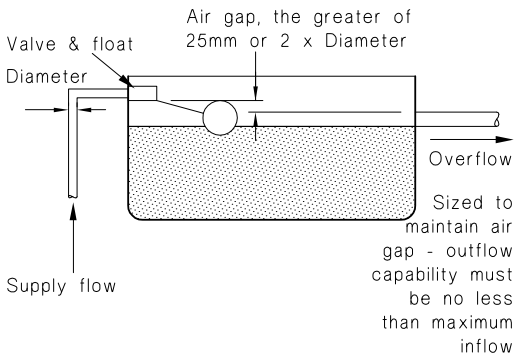
Backflow prevention devices and *air gaps* shall be located:

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

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

		Inclination angle (degrees)					
Direction (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 AS/NZS 3500.4 Appendix H: Estimation of Shading of Collectors

Amends 10 and 12

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

Figure 3: Support for penetration greater than 200 mm wide
Paragraph 5.2.2 a)

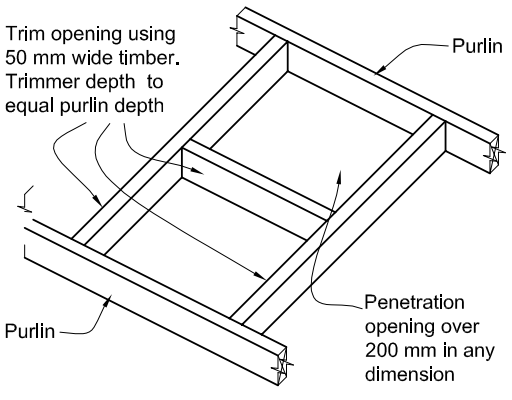


Figure 4: Catchment area for penetrations greater than 200 mm wide – see table 4
Paragraph 5.2.2 b)