

Please find enclosed Amendment 9, effective 27 June 2019, to Acceptable Solutions E2/AS1, E2/AS2 and E2/AS3 and Verification Method E2/VM1 for Clause E2 External Moisture of the New Zealand Building Code. The previous amendment to the E2 Acceptable Solutions and Verification Methods (Amendment 8) was in November 2018.

Section	Previous amendment	June 2019 Amendment 9
Title page	Remove title page and document status and history pages 1–2B	Replace with new title page and document status and history pages 1–2B
Contents	Remove page 5/6	Replace with new page 5/6
E2/VM1	Remove page 21/22	Replace with new pages 21/22



MINISTRY OF BUSINESS,
INNOVATION & EMPLOYMENT
HĪKINA WHAKATUTUKI

Verification Methods E2/VM1 and Acceptable Solutions E2/AS1, E2/AS2 and E2/AS3

For New Zealand Building Code Clause
E2 External Moisture



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.

A person who complies with a Verification Method or Acceptable Solution will be treated as having complied with the provisions of the Building Code to which the Verification Method or Acceptable Solution relates. However, using a Verification Method or Acceptable Solution is only one method of complying with the Building Code. There may be alternative ways to comply.

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.

Enquiries about the content of this document should be directed to:



**MINISTRY OF BUSINESS,
INNOVATION & EMPLOYMENT**
HĪKINA WHAKATUTUKI

Ministry of Business, Innovation and Employment
PO Box 1473, Wellington 6140
Telephone 0800 242 243
Email: info@building.govt.nz

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

New Zealand Government

© Ministry of Business, Innovation and Employment 2019

This document is protected by Crown copyright, unless indicated otherwise. The Ministry of Business, Innovation and Employment administers the copyright in this document. You may use and reproduce this document for your personal use or for the purposes of your business provided you reproduce the document accurately and not in an inappropriate or misleading context. You may not distribute this document to others or reproduce it for sale or profit.

The Ministry of Business, Innovation and Employment owns or has licences to use all images and trademarks in this document. You must not use or reproduce images and trademarks featured in this document for any purpose (except as part of an accurate reproduction of this document) unless you first obtain the written permission of the Ministry of Business, Innovation and Employment.

Document Status

The most recent version of this document (Amendment 9), 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 8) 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

E2: Document History			
	Date	Alterations	
First published	July 1992		
Second Edition	28 February 1998	Document revised – Second edition issued	
Third Edition	E2/VM1 effective from 1 July 2004	E2/AS1 effective from 1 February 2005	
Amendment 1 September 2004	E2/AS1 effective from 1 July 2005	p. 2 Document Status	
Reprinted incorporating Amendment 1		September 2004	
Amendment 2	Effective from 1 July 2005	p. 2 Document History, Document Status pp. 5-7, 9, 10 Contents pp. 13-16 References pp. 17-20 Definitions pp. 21-24 E2/VM1	pp. 25-43, 45-47, 49, 50, 55-57, 59-67, 69-89, 93-100, 102, 103, 105-107, 111-119, 121-125, 127-135, 138, 140-144, 146, 147, 149, 150, 153-155, 157, 163-169 E2/AS1 pp. 173, 174, 177, 178 Index
Erratum 1	Effective from 1 December 2005	p. 166 Table 23	
Amendment 3	21 June 2007	pp. 3 and 4, Building Code Clause E2	
Amendment 4	Effective from 1 May 2008 until 31 January 2012	p. 2 Document History, Document Status pp. 8 and 12 Contents pp. 13-14 References	pp. 171-180 E2/AS2 p. 181 Index
Amendment 5	1 August 2011	p. 2 Document History, Document Status pp. 5-12 Contents pp. 13-16A References pp. 17-20 Definitions pp. 21-24 E2/VM1	pp. 25-180 E2/AS1 pp. 183-184, 189-190 E2/AS2 p. 191 E2/AS3 pp. 193-204 Index
Errata 2	Effective from 24 December 2011 until 14 August 2014	p. 2 Document History, Document Status p. 9 Contents	pp. 29, 41, 43, 49, 55-57, 80, 81, 87, 91, 93, 94, 101, 106-108, 110-115, 117, 158, 160, 172, 176, 191 E2/AS1
Amendment 6	Effective from 14 February 2014 until 30 May 2017	p. 2A, Document History, Document Status p. 5, Contents pp. 13, 15, 16A References p. 17, Definitions	p. 23, E2/VM1 1.5.1, 1.5.2, 1.5.3 pp. 36, 68, 172, 175, 175 E2/AS1 4.3.4, 8.3.4.2, Tables 20, 21, 22
Amendment 7	Effective 1 January 2017 until 31 March 2019	p. 16A References	
Amendment 8	Effective from 30 November 2018 until 31 October 2019	p. 5 Contents p. 14 References	p. 21-23A E2/VM1 1.3, 1.3.1, 1.3.2, 1.3.2.1, 1.4.4.1, 1.4.5.1, 1.5, 1.6, 1.7
Amendment 9	Effective 27 June 2019	p. 5 Contents	
			p. 21 E2/VM1 1.0
Note: Page numbers relate to the document at the time of Amendment and may not match page numbers in current document.			

Contents

	Page			
		1.4	Specific design	26
		1.5	Qualifications	26
		2.0	General	26
		2.1	Weathertightness	26
		2.2	Materials	26
		2.3	Systems versus materials	26
		2.4	Cladding finish colours	26
		2.5	Maintenance – general	27
		2.5.1	Regular maintenance	27
		3.0	Weathertightness Risk Factors	27
		3.1	Establishing the risk	27
		3.1.1	Definitions of risk	27
		3.1.2	The risk score	27
		3.3	Wall claddings	28
		3.4	Examples using the risk matrix	32
		3.4.1	Example 1	32
		3.4.2	Example 2	33
		3.4.3	Example 3	34
		4.0	Flashings	35
		4.1	Materials for flashings	35
		4.2	Selection of flashing materials	35
		4.2.1	Environment	35
		4.2.2	Surrounding materials	36
		4.3	Acceptable flashing materials	36
		4.3.1	uPVC flashings	36
		4.3.2	Aluminium flashings	36
		4.3.3	Galvanized steel flashings	36
		4.3.4	Aluminium-zinc-magnesium (combinations) coated steel flashing to AS 1397	36
		4.3.5	Stainless steel flashings	37
		4.3.6	Copper flashings	37
		4.3.7	Lead sheet flashings	37
		4.3.8	Zinc sheet flashings	37
		4.3.9	Butyl rubber and EPDM flashings	37
		4.3.10	Bituminous flashings	37
		References		13
		Definitions		17
		Verification Method E2/VM1		21
		1.0 Cladding systems of buildings up to 10 m in height, including junctions with windows, doors and other penetrations		21
Amend 9 Jun 2019		1.1	General	21
		1.2	Scope	21
Amend 8 Nov 2018		1.3	Specimen details	21
		1.3.1	Class 1	22
		1.3.2	Class 2	22
		1.4	Test procedure	23
		1.4.1	Preconditioning	23
Amend 2 Jul 2005		1.4.2	Series 1 Static pressure water penetration	23
Amend 2 Jul 2005		1.4.3	Series 1 Cyclic pressure water penetration	23
		1.4.4	Series 2 'Water management testing'	23
Amend 5 Aug 2011		1.4.5	Series 3 'Wetwall test'	23
		1.5	Non-compliance	23
Amend 6 Feb 2014		1.6	Existing verification certificates as at 31 March 2019	23A
Amend 2 Jul 2005		1.7	Pro-forma for test details	23A
		2.0 Pitched roofing systems over a ventilated roof space of 15° pitch or more		23A
		3.0 Skillion roofs and commercial and industrial roofing		23A
		Appendix 1: Pro forma		23B
		Acceptable Solution E2/AS1		25
		1.0 Scope		25
Amend 5 Aug 2011		1.1	Construction included	25
		1.1.1	Attached garages	25
		1.2	Construction excluded	25
		1.2.1	Outbuildings	25
		1.2.2	Spread of flame	25
Amend 2 Jul 2005		1.2.3	Acoustics	25
		1.3	Provisions for snow	25

4.3.11 Flexible flashing tape	37	8.1.2 Limitations	59
4.4 Fixings	37	8.1.3 Maintenance	59
4.5 Flashing requirements	37	8.1.4 Fixings	59
4.5.1 Edge treatments for flashings	37	8.1.5 Roof underlays	59
4.5.2 Metal flashing joints	38	8.1.6 Gutters general	60
4.6 Flashing overlaps and upstands	39	8.1.7 Roof penetrations	61
4.6.1 Overlap with roof claddings	39	8.2 Masonry Tiles	63
5.0 Roof/Wall Junctions	42	8.2.1 Materials	63
5.1 Apron flashings	42	8.2.2 General	63
5.2 Gutters, barges and fascias	44	8.2.3 Installation	63
5.3 Soffits	44	8.2.4 Flashings and fixings	63
6.0 Parapets	45	8.2.5 Anti-ponding boards	63
6.1 Limitations	45	8.2.6 Details and flashings	63
6.2 General	45	8.2.7 Penetrations	66
6.3 Capping materials	45	8.3 Pressed Metal Tiles	68
6.4 Metal cappings	47	8.3.1 Limitations	68
6.4.1 Parapet-to-wall junctions	48	8.3.2 Installation	68
6.5 Membrane cappings	48	8.3.3 Tiles	68
6.6 Integral surface cappings	48	8.3.4 Metal substrate	68
7.0 Decks and Pergolas	51	8.3.5 Roof pitch	68
7.1 Thresholds for decks	51	8.3.6 Underlay	69
7.1.1 Slatted decks	51	8.3.7 Fixings	69
7.1.2 Enclosed decks	51	8.3.8 Flashings	69
7.2 Attachment to building structure	51	8.3.9 Gutters, ridges, barges and fascias	72
7.2.1 Slatted timber decks to walls	51	8.3.10 Roof penetrations	72
7.2.2 Pergolas	52	8.4 Profiled Metal Roof Cladding	73
7.3 Level threshold	54	8.4.1 Limitations	73
7.3.1 Enclosed decks	54	8.4.2 General	73
7.3.2 Ground floor level access	54	8.4.3 Materials	73
7.4 Enclosed balustrades	57	8.4.4 Profiles	74
7.4.1 Deck drainage	57	8.4.5 Roof pitch	74
7.4.2 Balustrade-to-wall junctions	57	8.4.6 Structure	74
7.4.3 Balustrade-to-deck floor junction	57	8.4.7 Underlay	76
7.4.4 Metal cappings	57	8.4.8 Fixings: corrugated and trapezoidal	76
7.4.5 Stanchions	58	8.4.9 Fixings: trough profile	78
8.0 Roof Claddings	59	8.4.10 Allowance for expansion	78
8.1 General	59	8.4.11 Flashing requirements	78
8.1.1 Weathertightness	59		

Amend 5
Aug 2011Amend 2
Jul 2005Amend 5
Aug 2011

Verification Method E2/VM1

Amend 9
Jun 2019

1.0 Cladding systems of buildings up to 10 m in height, including junctions with windows, doors and other penetrations

1.1 General

This Verification Method is for determining compliance with NZBC E2.3.2 of *cladding systems* and associated window and door junctions only, for *buildings* of importance Levels 1 or 2 as described in Table 1.1(a) of NZS 3604.

The tests in this Verification Method shall be undertaken in a test facility with IANZ or equivalent accreditation for testing the *weathertightness* of *claddings* to the procedures of AS/NZS 4284, and as used to establish the performance criteria detailed in Paragraph 1.4 Test Procedures.

COMMENT:

The *weathertightness* testing of AS/NZS 4284 is modified in this Verification Method for generic domestic-oriented *cladding* because the Standard was developed primarily for testing specific, non-absorptive facades and curtain wall systems on high-rise commercial *buildings*.

1.2 Scope

1.2.1 The scope of this Verification Method shall be restricted to *buildings* that:

- a) are in accordance with the scope of Paragraph 1.0 of E2/AS1, and within the *wind zones* covered by Section 5 of NZS 3604, and
- b) have *claddings* that include a drained and vented cavity of nominal 20 mm minimum depth with minimum ventilation opening of 1000 mm²/m at the foot, including any *claddings* that require a rigid *wall underlay* in accordance with Paragraph 9.1.7.2 of E2/AS1, and
- c) include window and door units that are manufactured to comply with the relevant requirements of NZS 4211, and

Amend 5
Aug 2011

- d) may include *buildings* based on (a), (b) and (c) above, but with specific engineering design frame elements of at least equivalent stiffness to the *framing* provisions defined in NZS 3604.

1.2.2 This Verification Method may also be used for individual *buildings* that comply with (a) to (d) above, and that are designed for a specific wind pressure up to a maximum ultimate limit state (ULS) of 2500 Pa.

COMMENT:

While the test specimens used for this Verification Method may include window and door units, it is only the junctions of these elements with other *cladding* elements that are assessed in the test.

1.3 Specimen details

The minimum size of the wall *cladding* specimen to be tested shall be 2.4 m x 2.4 m.

Any *cladding system* within an Extra High *wind zone* or subject to a specific design wind pressure up to ULS 2500 Pa that relies on this Verification Method shall have a rigid *underlay* installed in accordance with Paragraph 9.1.7 of E2/AS1. In either of these two circumstances, a rigid *underlay* is not necessary for the verification tests as a flexible *wall underlay* may suffice – unless the *cladding* to be tested specifically includes a rigid *underlay* as part of the *cladding system*, and its removal would compromise the structural fixings or support for the *cladding*.

COMMENT:

Testing a *cladding* with flexible *underlay*, but then verifying the *cladding* for use with rigid *underlay*, is allowed in order to make testing quicker and easier. It is expected that *cladding systems* with a cavity within the scope of E2/VM1 will perform better with a rigid *underlay* than with a flexible *underlay*, although this has not been proven.

For *cladding systems* intended to be available for use in multiple situations, including *cladding systems* for which a New Zealand supplier has commissioned the testing for the purposes of providing product assurance, Class 1 or Class 2 testing must be selected. Class 1 and Class 2 each include a mandatory

Amend 5
Aug 2011

Amend 8
Nov 2018

minimum set of details to be included in the specimen. If any of the mandatory details from Class 1 or Class 2 are omitted from the specimen, then E2/VM1 compliance to Class 1 or Class 2 cannot be claimed.

1.3.1 Class 1: *Cladding systems* where only vertical joints are required, and having no penetrations through the *cladding*.

Test specimens shall include vertical joints, internal and external corners of the external *wall* junctions, and footer and header termination systems.

1.3.2 Class 2: All *cladding systems* within the scope of this document that are not Class 1.

Testing is to include representative samples of penetrating *building elements* or joints to be used.

- a) Test specimens must include vertical and horizontal *control joints*, internal and external *wall* junctions, windows and/or doors, a *parapet* or *enclosed balustrade capping* with a *saddle flashing*, a 200 mm diameter pipe penetration, and footer and header termination systems.
- b) Test specimens may also include other details relevant to the use of the *cladding system* on the building, such as *scupper* penetrations, meter boxes, junctions with other *cladding systems* or *building elements*, and junctions where roof and *enclosed deck* terminations, *gutters*, or other features occur within walls (including within the sides of framed chimneys with *cladding*).

COMMENT:

Although only certain details are mandatory for inclusion within test specimens, the inclusion of other additional details could enable manufacturers, suppliers and specifiers who commission tests to demonstrate compliance for a wider range of situations than those which the mandatory details cover. Manufacturers, suppliers and specifiers should ensure that test specimens include all *cladding* details or junctions for which compliance with this Verification Method is intended to be demonstrated and claimed.

A 15 mm diameter round hole shall be formed in the internal *lining* below the window to simulate the effect of power points, light switches and other air leakage through the internal *lining*. Where a *cladding* specimen is larger than 2.4 m x 2.4 m, an additional 15 mm hole shall be added for each 7 m² of *cladding* area (or part thereof).

1.3.2.1 To allow the observation of any water penetration, one of the following options must be followed:

- a) For specimens that include a rigid *wall underlay*, adjacent to critical elements where visual access is required a proportion of the *underlay* shall be made using transparent material of sufficient structural capability and similar airtightness to the specified wall *lining* material, and able to resist the applied wind pressures. The proportion shall be at least 2%, but shall be small enough that it does not affect the ability of the specimen to represent the performance of the *underlay* within the *cladding system*; or
- b) For specimens that do not include a rigid *wall underlay*, adjacent to critical elements where visual access is required, the *wall underlay* shall be cut through and removed, or fastened back onto the *framing*, with a rigid transparent internal *lining* used to support the air pressure. It is required that between 2% and 100% of the area of the *wall underlay* (or equivalent) be so removed; or
- c) For specimens that include a flexible or a rigid *underlay*, small video cameras and/or borescopes shall be installed within the cavity to provide a clear view of all critical elements where visual access is required. Borescopes and cameras must be positioned clear of all junctions, and must be installed in a manner that does not affect the airtightness of the air barrier (rigid *underlay* or internal wall *lining*) or affect the path of any moisture that enters the cavity.

Amend 5
Aug 2011

Amend 8
Nov 2018

Amend 8
Nov 2018

Amend 8
Nov 2018

Amend 8
Nov 2018

Amend 5
Aug 2011

Amend 8
Nov 2018