MINISTRY OF BUSINESS, INNOVATION & EMPLOYMENT
HĪKINA WHAKATUTUKI

Please find enclosed Amendment 10, effective 5 November 2020, 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 9) was in June 2019.

Section	**Previous amendment**	**November 2020 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
References	Remove pages 13–16	Replace with new pages 13–16
E2/AS1	Remove pages 49/50, 53/54, 59–62, 85/86 91–96, 147/148, 163/164 and 167/168	Replace with new pages 49/50, 53/54, 59–62, 85/86, 91–96, 147/148, 163/164 and 167/168

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

E2
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.

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.

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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 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 5 November 2020 and supersedes all previous versions of this document.

The previous version of this document (Amendment 9) will cease to have effect on 3 November 2021.

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	

E2: **Document History** *(continued)*			
	Date	**Alterations**	
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 until 3 November 2021	p. 5 Contents	p. 21 E2/VM1 1.0
Amendment 10	Effective 5 November 2020	pp. 13, 16 References pp. 49–50 E2/AS1 Figures 11 and 12 p. 54 E2/AS1 7.3.2.1 pp. 60–61 E2/AS1 8.1.6, 8.1.7, 8.1.6.1 p. 86 E2/AS1 Figure 52 p. 91 E2/AS1 8.5.6	p. 93 E2/AS1 8.5.10 p. 96 E2/AS1 Figure 64 p. 148 E2/AS1 9.7.1, 9.7.3 p. 164 E2/AS1 Figure 124 p. 167 E2/AS1 9.9.10.2
Note: Page numbers relate to the document at the time of Amendment and may not match page numbers in current document.			

References

For the purposes of New Zealand Building Code (NZBC) compliance, the Standards and documents referenced in these Verification Methods and Acceptable Solutions (primary reference documents) must be the editions, along with their specific amendments, listed below. Where these primary reference documents refer to other Standards or documents (secondary reference documents), which in turn may also refer to other Standards or documents, and so on (lower-order reference documents), then the version in effect at the date of publication of these Verification Methods and Acceptable Solutions must be used.

Amend 6 Feb 2014

Amend 4 May 2008

Amend 6 Feb 2014

		Where quoted
Standards New Zealand		
Amend 5 Aug 2011 AS/NZS 1734: 1997	Aluminium and aluminium alloys – Flat sheet, coiled sheet and plate	AS1 4.3.2, 8.3.4.3, 8.4.3.3, 9.6.3.3
Amends 2 and 5 AS/NZS 2269.0: 2008	Plywood – Structural	AS1 8.5.3, 9.3.6.1, 9.8.2
NZS 2295: 2006	Pliable, Permeable Building Membranes	AS1 8.1.5, Table 23
Amend 6 Feb 2014 AS/NZS 2728: 2013	Prefinished/prepainted sheet metal products for interior/exterior building applications – Performance requirements	AS1 4.2.1, 8.3.4.1, 8.3.4.2, 8.3.4.3, 8.4.3.1,8.4.3.3, 9.6.3.1, 9.6.3.3, Table 20
Amend 5 Aug 2011 AS/NZS 2904: 1995	Damp-proof courses and flashings	
Amend 6 Feb 2014 *Amend: 1*		AS1 4.3.10, 9.2.4
AS/NZS 2908: Part 2: 2000	Cellulose-cement products Flat sheet	AS1 9.3.6.2, 9.5.2, 9.7.2
NZS 3602: 2003	Timber and wood-based products for use in building	AS1 9.1.10, 9.4.2, 9.4.9, 9.7.3, 9.8.2, 10.2,Table 23
NZS 3604: 2011	Timber framed buildings	Definitions, VM1 1.1, 1.2, AS1 1.1, 1.3, 4.2.1, 7.2.1, 8.3.4.1, 8.4.3.1, 8.5.1, 9.1.3.1, 9.1.3.5, 9.2.1, 9.2.3, 9.2.7.1, 9.2.9, 9.3.2, 9.6.3.1, Table 1, Table 2, Table 4, Table 5, Table 6, Table 18, Table 18A, Table 20 and Table 24
Amend 5 Aug 2011		AS2 Figure 5.11 a) and b)
NZS 3617: 1979	Specification for profiles of weatherboards, fascia boards, and flooring	AS1 9.4.1.1
AS/NZS 4020: 2005	Testing of products for use in contact with drinking water	AS1 8.1.1

Amend 10 Nov 2020

Amend 4 May 2008

Amend 5 Aug 2011

		Where quoted
Amend 5 Aug 2011		
	NZS 4206: 1992 Concrete interlocking roofing tiles	AS1 8.2.1, 8.2.3
Amend 5 Aug 2011	NZS 4211: 2008 Specification for performance of windows	VM1 1.2, AS1 9.1.10
Amend 8 Nov 2018	*Amend: 1*	
	NZS 4217 Pressed metal tile roofs	AS1 8.3.3
	Part 1: 1980 Specification for roofing tiles and their accessories	
	Part 2: 1980 Code of practice for preparation of the structure and the laying and fixing of metal roofing tiles	
Amend 5 Aug 2011	SNZ HB 4236: 2002 Masonry veneer wall cladding	Definitions, AS1 Table 3
	NZS 4251: Solid plastering	
Amend 5 Aug 2011	Part 1: 2007 Cement plasters for walls, ceilings and soffits	AS1 9.3.2, 9.3.4.1, 9.3.4.2, 9.3.6.1, 9.3.6.2
	AS/NZS 4256 Plastic roof and wall cladding materials	AS1 4.3.1
	Part 2: 1994 Unplasticized polyvinyl chloride (uPVC) building sheets	
Amend 5 Aug 2011	AS/NZS 4284: 2008 Testing of Building Facades	VM1 1.1, 1.4, 1.4.2, 1.4.3, 1.4.4
	NZS 4298: 1998 Materials and workmanship for earth buildings	AS2 5.1.8, 9.7.2, Figure 4.1, Figure 9.2 a), b), c) and d)
	Amend: 1	
	NZS 4299: 1998 Earth buildings not requiring specific design	AS2 1.0, 1.1
	Amend: 1	
	NZS 4431: 1989 Code of practice for earth fill for residential development	AS2 Figure 4.1
Amend 4 May 2008	*Amend: 1*	
	AS/NZS 4534: 2006 Zinc and zinc/aluminium-alloy coatings on steel wire	AS1 9.1.8.5
Amend 5 Aug 2011	AS/NZS 4680: 2006 Hot-dip galvanized (zinc) coatings on fabricated ferrous articles	AS1 9.9.4.1, Table 20
Amend 5 Aug 2011	AS/NZS 4858: 2004 Wet area membranes	AS1 9.7.7.1, 9.9.4.4, 9.9.10.1

			Where quoted
	Standards Australia		
	AS 1366	Rigid cellular plastics sheets for thermal insulation	
	Part 3: 1992	Rigid cellular polystyrene – Moulded (RC/PS-M)	AS1 9.9.3.1
	Part 4: 1989	Rigid cellular polystyrene – Extruded (RC/PS-E)	AS1 9.9.3.1
Amend 5 Aug 2011 Amend 6 Feb 2014	AS 1397: 2011	Continuous hot-dip metallic coated steel sheet and strip – Coatings of zinc and zinc alloyed with aluminium and magnesium *Amend: 1*	AS1 4.3.4, Table 20 (Amend 6 Feb 2014)
	AS 1566: 1997	Copper and copper alloys – Rolled flat products	AS1 4.3.6
	AS 1804: 1976	Soft lead sheet and strip	AS1 4.3.7
	AS 2049: 2002	Roof tiles	AS1 8.2.1
	AS 2050: 2002	Installation of roof tiles	AS1 8.2.3
	AS 3566	Self-drilling screws for the building and construction industries	
Amend 5 Aug 2011	Part 2: 2002	Corrosion resistance	AS1 8.4.8, 8.4.9, 9.6.6, Table 20
Amend 5 Aug 2011	AS 3730	Guide to the properties of paints for buildings	AS1 9.3.7, 9.4.9, 9.5.6, 9.7.3.1, 9.7.4, 9.8.9, 9.9.3, 9.9.6.3
Amend 5 Aug 2011	Part 6: 2006	Solvent-borne – Exterior – Full gloss enamel	
	Part 7: 2006	Latex – Exterior – Flat	
	Part 8: 2006	Latex – Exterior – Low-gloss	
Amend 2 Jul 2005	Part 9: 2006	Latex – Exterior – Semi-gloss	
	Part 10: 2006	Latex – Exterior – Gloss	
	AS 4046	Methods of testing roof tiles	
Amend 5 Aug 2011	Part 9: 2002	Determination of dynamic weather resistance	VM1 2.1, AS1 8.2.3
	British Standards Institution		
	BS 6538: 1987	Air permeance of paper and board	AS1 Table 23
	Part 3: 1987	Method for determination of air permeance using the Garley apparatus	
Amend 5 Aug 2011	BS EN 988: 1997	Zinc and zinc alloys. Specification for rolled flat products for building	AS1 4.3.8

			Where quoted
	American Society for Testing and Materials		
Amend 5 Aug 2011	ASTM C1549: 2009	Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer	AS1 2.4
Amend 5 Aug 2011	ASTM D1667: 2005	Standard Test Specification for Flexible Cellular Materials – Vinyl Chloride Polymers and Copolymers (Closed-Cell Foam)	AS1 9.1.10.7
Amend 5 Aug 2011	ASTM D2240: 2005	Standard Test Method for Rubber Property	AS1 9.1.10.7
Amend 5 Aug 2011	ASTM D6134: 2007	Standard Specification for Vulcanised Rubber Sheets Used in Waterproofing Systems	AS1 4.3.9, 8.5.4
Amend 5 Aug 2011	ASTM E96: 2005	Standard Test Methods for Water Vapour Transmission of Materials	AS1 Table 23
	ASTM E104: 2002	Standard Practice for Maintaining Constant Relative Humidity by Means of Aqueous Solutions	AS1 10.3.2
Amend 5 Aug 2011	ASTM E2098: 2000	Standard Test Method for Determining Tensile Breaking Strength of Glass Fibre Reinforcing Mesh for Use in Class PB Exterior Insulation and Finish Systems (EIFS), after Exposure to a Sodium Hydroxide Solution	AS1 9.9.3.2
	ASTM E2134: 2001	Standard Test Method for Evaluating the Tensile-Adhesion Performance of an Exterior Insulation and Finish System (EIFS)	AS1 9.9.6
Amend 5 Aug 2011	ASTM G154: 2006	Standard Practice for Operating Fluorescent Light Apparatus for UV Exposure of Nonmetallic Materials	AS1 9.1.10.7
Amend 5 Aug 2011	ASTM G155: 2005	Standard Practice for Operating Xenon Arc Light Apparatus for UV Exposure of Nonmetallic Materials	AS1 9.1.10.7
	Building Research Association of New Zealand		
Amend 5 Aug 2011	BRANZ Bulletin 330: 1995	Thin flooring materials – 2 Preparation and laying. Appendix 1	AS1 10.3.2
Amend 2 Jul 2005	BRANZ EM 4: 2005	Evaluation method for jointing systems for flush finished fibre cement sheet	AS1 9.7.4
Amend 2 Jul 2005	BRANZ EM 5: 2005	Evaluation method for adhesives and seam tapes for butyl and EPDM rubber membranes	AS1 8.5.4
Amend 5 Aug 2011	BRANZ EM 6: 2010	Evaluation method for window and door support mechanisms or bars	AS1 9.1.10.5
	BRANZ Bulletin 411: 2001	Recommended timber cladding profiles	AS1 9.4.1.1

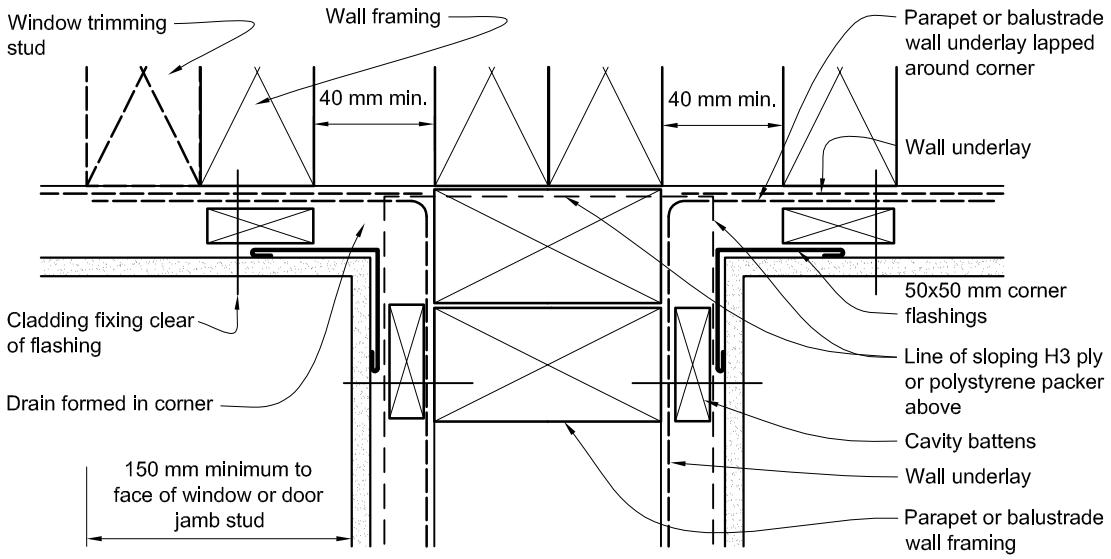
Amend 10 Nov 2020

Amend 10 Nov 2020

Errata 2 Dec 2011

Figure 11: Parapet/enclosed balustrade-to-wall junctions – plan section
Paragraphs 6.4.1, 7.4.2 and 9.9.10.2, Figures 10, 12, 117, 129 and 130

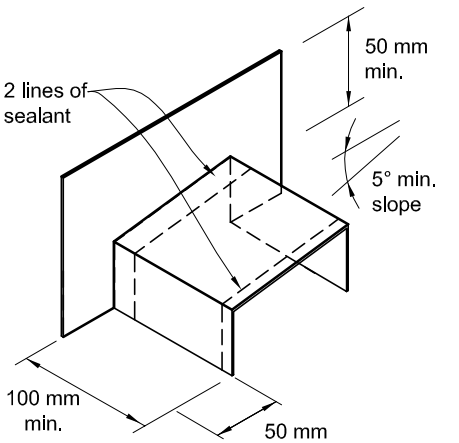
NOTE: (1) Refer Figure 12 for *saddle flashing* and *capping* to wall junction.
(2) Plan section is through balustrade or *parapet framing*, below *capping* packer.



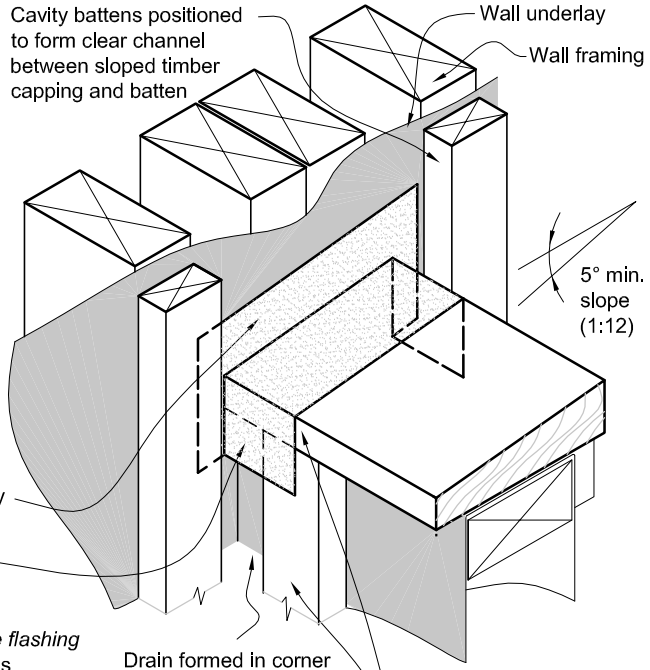
Amend 5 Aug 2011

Amend 10
Nov 2020

Figure 12: General junction of parapet and enclosed balustrade to wall
Paragraphs 6.4.1, 7.4.2, and 9.9.10.2, Figures 10, 11, 117, 129 and 130

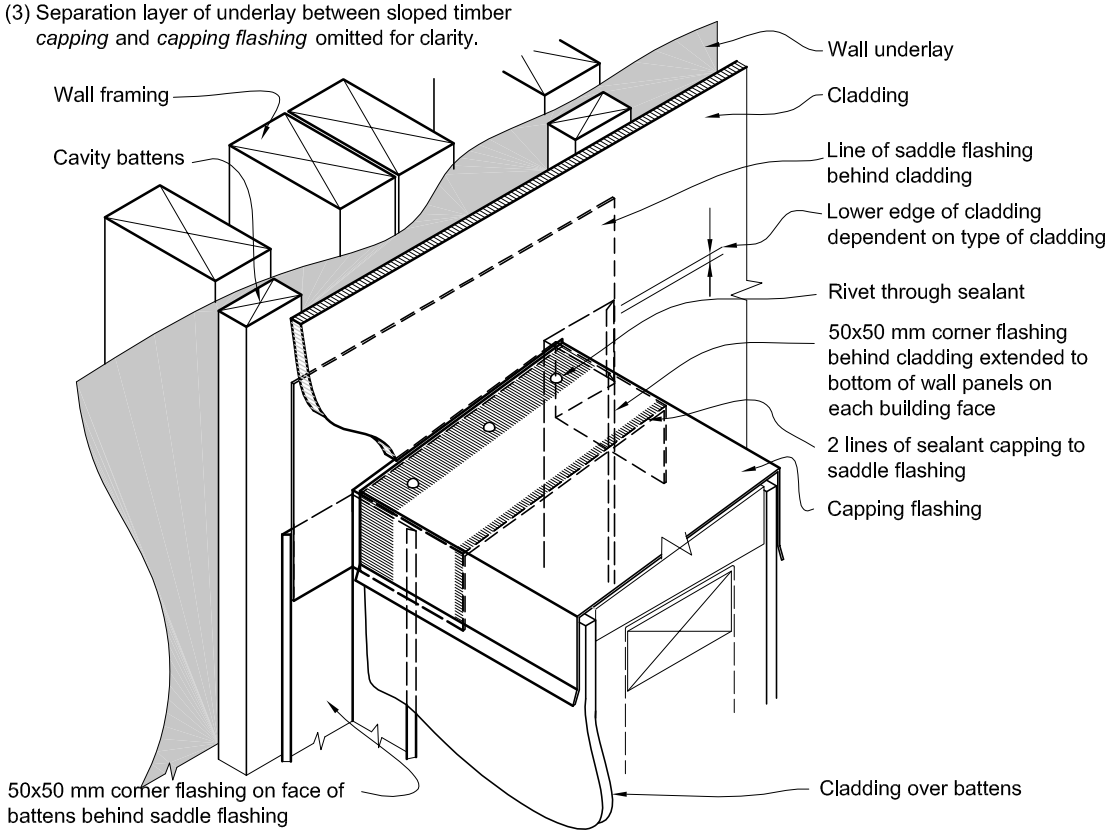


(a) SADDLE FLASHING



NOTE:
(1) The junction is weatherproofed by the *saddle flashing* which is positioned at the front of the cavity as shown in (c).
(2) The *flexible flashing tape* over the sloped *capping* packer is intended to drain only moisture from within the *drained cavity* above, and to direct it into the adjacent continuous cavity.
Refer Figure 11 for plan section.
(3) Separation layer of underlay between sloped timber *capping* and *capping flashing* omitted for clarity.

(b) STAGE 1 FLEXIBLE FLASHING INSTALLATION



(c) STAGE 2 SADDLE FLASHING INSTALLATION

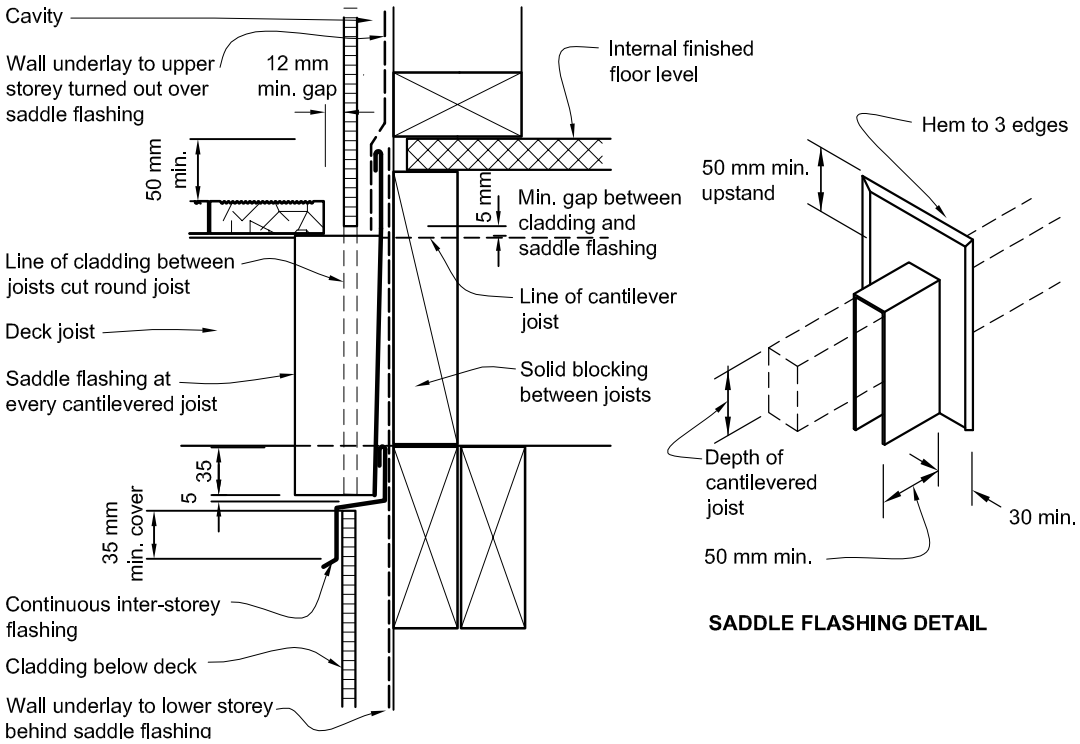
Amend 2
Jul 2005

Amend 5
Aug 2011

Figure 16: Junction with wall for cantilevered timber deck
Paragraphs 7.1, 7.2.1.1, 7.3.1 and Figure 14

Amend 2 Jul 2005

NOTE:
(1) *Building wrap* at back of *cavity* shall be taped around joist penetrations.
(2) The back of the *saddle flashing* shall be positioned behind the cladding.
(3) Saddle flashing terminates over inter-storey *flashing*.



Amend 2 Jul 2005

Amend 5 Aug 2011

7.3 Level thresholds

Where provision for level access is required, this shall be provided as shown in Figure 17A and Figure 17B.

7.3.1 Enclosed decks

Where provision for level access is required for an *enclosed deck*, this shall be provided in Figure 17A. The underlying *membrane deck* surface shall be made *weathertight* as described in Paragraph 8.5.

7.3.1.1 Removable surfaces

Amend 5 Aug 2011

Raised removable surfaces of tiles, pavers or timber shall be provided over the underlying *weathertight enclosed deck* surface for cleaning and maintenance, as shown in Figure 17A. A minimum gap of 12 mm shall be provided against the *wall* or balustrade *cladding*.

7.3.1.2 Timber removable surface

Amend 5 Aug 2011

Timber decking shall be over *framing* supported off the *deck membrane* as shown in Figure 17A, with spacing in accordance with B2/AS1.

No fixings shall penetrate the underlying *deck membrane*.

COMMENT:

Amend 5 Aug 2011

Tiled boards or structural pavers sitting on proprietary supports can be adjusted according to level changes in the underlying *deck* surface.

The pavers or tiled boards are spaced to allow free drainage and the ability to lift the top surface off when necessary.

Amend 5 Aug 2011

The timber option allows access by fixing the timber decking with stainless steel screws, so they may be removed when necessary.

7.3.2 Ground floor level access

Where provision for level access is required, this may be provided as shown in Figure 17B, with exterior paving or decking that complies with the *access route* requirements of D1/AS1.

COMMENT:

The specific features of a *building* and its site can have a significant effect on the options available for providing level access at doors. These features include the provision of shelter, prevailing winds and ground levels. Where level access is required, it is highly recommended that the services of a designer experienced in this field be obtained.

7.3.2.1 Concrete slab

Where provision for level access is required from a concrete floor slab to exterior paving, this shall be as shown in Figure 17B with:

a) A channel, together with drainage provisions, across the door opening, with: Amend 5 Aug 2011
   i) width and depth dimensions to provide capacity that meets the requirements of NZBC Clause E1,
   ii) a minimum width of 200 mm and minimum depth of 150 mm, Amend 10 Nov 2020
   iii) a maximum length of 3700 mm, and Amend 5 Aug 2011
   iv) 1:200 minimum fall along length of channel towards a drainage outlet, Amend 2 Jul 2005
   v) the channel discharging to the surface water drainage system via a sump installed in accordance with the requirements of NZBC Clause E1, Amend 10 Nov 2020
b) Grating, in accordance with Tables 21 and 22, over the channel, that: Amend 5 Aug 2011
   i) is supported independently of the door frame,
   ii) is removable to allow access for cleaning,
   iii) is specifically designed to accommodate imposed loads,
   iv) has gaps sized to prevent the wheels of wheel chairs or mobility aids entering or being trapped, and
   v) has a continuous gap of 12 mm minimum from door frame and *wall cladding*, and

COMMENT:

The grating support must be specifically detailed to suit the condition of the *building* and site.

c) Exterior paving that:
   i) has a minimum fall of 1:40 away from the channel for a minimum distance of 1 m, Amend 5 Aug 2011
   ii) together with the surrounding paving and ground levels, meets the drainage requirements of NZBC Clause E1. Amend 10 Nov 2020

7.3.2.2 Timber floor

Where provision for level access is required from a timber floor structure to the exterior, this may be provided as shown in Figure 17B, with clearances in accordance with Paragraph 9.1.3. Amend 5 Aug 2011

8.0 Roof Claddings

8.1 General

8.1.1 Weathertightness

Roof claddings shall meet the requirements of NZBC E2.2, and be specified and *constructed* in accordance with the provisions of Paragraph 8.1.2 to Paragraph 8.5.

COMMENT:
For *roofs* used to collect water for human consumption, refer AS/NZS 4020.

Amend 5 Aug 2011

8.1.2 Limitations

The following *roof cladding systems* are covered in this Acceptable Solution:

a) *Masonry tiles*	Paragraph 8.2
b) Pressed metal tiles	Paragraph 8.3
c) Profiled metal *roof claddings*	Paragraph 8.4
d) *Membrane* roofing	Paragraph 8.5.

Other *roof claddings* are beyond the scope of this Acceptable Solution.

8.1.3 Maintenance

Maintenance of *claddings* shall be carried out as necessary to achieve the expected *durability* of the materials – refer to Paragraph 2.5.

Amend 5 Aug 2011

Amend 5 Aug 2011

COMMENT:
A deterioration in the appearance of the coating of the metal does not necessarily relate to a deterioration in the *weathertightness* of the roof *cladding*.

Care should be taken to avoid post-installation damage to the *cladding* when accessing the roof. Additional support is required around roof-mounted units such as air-conditioners to avoid roof distortion.

8.1.3.1 Projecting eaves

Soffits and verges of all projecting *eaves* shall be closed in. Refer to Paragraph 5.3 for details.

Amend 5 Aug 2011

Amend 5 Aug 2011

8.1.4 Fixings

Fixings shall be as specified in Paragraph 8.2 to Paragraph 8.5.

Materials for fixing *roof claddings* and *flashings*, where necessary, shall be selected from Tables 20, 21 and 22 to minimise corrosion.

Amend 5 Aug 2011

COMMENT:
The use of stainless steel fixings is not recommended by steel manufacturers for use with coated steel in severe marine and industrial environments, as they are considered to cause deterioration.

Amend 5 Aug 2011

8.1.5 Roof underlays

Roof underlays shall be to Table 23 and NZS 2295, and be either:

- R1 heavy weight kraft, or
- R2 self supporting kraft.

Amend 2 Jul 2005

Underlays shall be:

- Layed with minimum numbers of laps
- Lapped at all side and end laps by minimum 150 mm
- Run horizontally for *roof* pitches below 10°
- Run horizontally or vertically for *roof* pitches above 10°
- Have *anti-ponding boards* at lower edges of masonry tiles, refer Figure 25(b) and Paragraph 8.2.5.

8.1.5.1 Underlay support

Prevent sagging of *roof underlay* by either:

- For R1 *underlays*, fully support with a corrosion resistant material
- For R2 self supporting *underlays*, laid to maximum 1.2 metre span between adjacent supports

Amend 5 Aug 2011

COMMENT:
Solvent in freshly LOSP-treated timber can affect bitumen in *underlays*. Any solvent should be allowed to evaporate before the *roof underlay* is installed.

Amend 5 Aug 2011

8.1.6 Gutters general

Gutters, downpipes and spreaders, including *eaves* gutters/spoutings are required for the drainage of *roof* water, and shall:

a) Be to the minimum dimensions shown in this Acceptable Solution, or calculated to provide capacity that meets the requirements of NZBC Clause E1, whichever is the greater

Amend 10 Nov 2020

b) If a gutter depth is reduced to allow entry of a *valley gutter*, the reduced depth must be used to calculate the capacity of the gutter

c) For internal, *valley*, and *hidden gutters*, have no fixings in gutter bottoms or sides, and be continuously supported on H1.2 minimum treated timber gutter boards or H3 ply which is separated from metal by *roof underlay* strip.

Eaves gutters/spoutings shall:

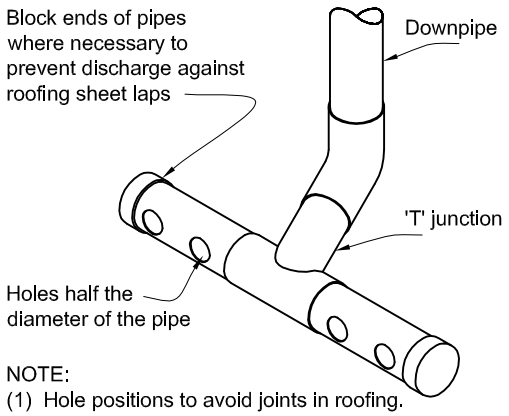
d) Be to any of the materials outlined for *flashings* in Paragraph 4.1 except 4.3.9, 4.3.10 and 4.3.11

e) Have a minimum cross sectional area of 2500 mm^2

f) Be designed to overflow water to the outside.

Amend 5 Aug 2011

Figure 20: **Spreader for roof discharge**
Paragraph 8.1.6



Amend 5 Aug 2011

Downpipes shall:

g) Be formed from any of the materials outlined for flashings in Paragraph 4.1 except 4.3.9, 4.3.10 and 4.3.11

h) Upper *roofs* shall drain via downpipes directly to ground level where possible, or

i) Where discharging to a lower *roof*, be fitted with a spreader as detailed in Figure 20

j) Have a maximum catchment area of 25 m^2 if discharging on to a lower *roof* area.

Spreaders shall:

k) Be to any of the materials outlined for *flashings* in Paragraph 4.1 except 4.3.9, 4.3.10 and 4.3.11

l) Be to Figure 20 and not be used on masonry tile roofs unless a *roof underlay* is installed

m) Discharge directed away from roofing laps and clear of *roof* penetrations.

Amend 5 Aug 2011

COMMENT:

Design calculations for a specific *roof* may allow larger catchment areas per spreader to be used.

The alternative to a spreader is to direct an upper level downpipe into a rainwater head.

The ends of spreaders should be blocked off where a sideways flow of water is against laps in *roof claddings*.

Amend 5 Aug 2011

8.1.6.1 Internal gutters

Internal gutters shall:

a) Be formed with continuous butyl or *EPDM* strip complying with Paragraph 4.3.9, with no cross-joints in the gutter, or aluminium, copper, stainless steel, or zinc sheet to Paragraph 4.3, with joints that are welded

b) Where butyl or *EPDM*, be minimum 1.5 mm *membrane* thickness, or 1.0 mm thickness for gutters less than 1 metre wide

c) Have a minimum slope of 1:100

d) Have capacity that meets the requirements of NZBC Clause E1 and have a freeboard depth of at least 30 mm, but in no case have any dimension less than those shown in Figure 52.

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COMMENT:

The minimum dimensions shown in Figure 52 provide sufficient working space to ensure the gutter is able to be accessed, constructed and maintained without undue risk of failure, for *buildings* within the scope and construction methodologies of this Acceptable Solution. In some *buildings*, specific design may be able to show that smaller dimensions do not prevent adequate access, construction and maintenance of the gutter; however such gutters are outside the scope of this Acceptable Solution. The requirements of NZBC Clause E1 ensure the gutter has sufficient flow capacity to handle the runoff from the particular *roof* catchment area. Flow capacity will govern the sizing of internal gutters when the *roof* area and/or rainfall intensity require a gutter of more than the minimum dimensions.

Acceptable Solutions E1/AS1 and E1/AS2 provide means of calculating the capacity of internal gutters. If E1/AS1 is used, a freeboard depth of 30 mm must be added. If E1/AS2 is used, the calculation method already includes a freeboard depth of 30 mm.

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For *roofs* other than *membrane roofs*:

e) Discharge into a rainwater head as shown in Figure 63 (a) and (b), or

f) Discharge to an internal outlet to Figure 64 (b) or (c) with overflows provided by either:

   i) a second outlet to a rainwater head, or
   ii) an overflow as shown in Figure 63(c), and positioned below the level of any potential overflow into the *building*.

For internal gutters and *membrane roofing*, refer to Paragraph 8.5.

8.1.6.2 Valley gutters and hidden gutters

Valley gutters and *hidden gutters* shall be constructed as shown in Figures 50 and 51 for the applicable *roof cladding* (except for *membrane roofing*) and:

a) Not change direction in plan

b) Have a minimum underlap to *roof cladding* as specified in Figures 27, 37, 50, and 51 for the relevant *roof cladding*

c) Be formed from any of the materials outlined for *flashings* in Paragraph 4.3 except 4.3.10 and 4.3.11

d) Be fixed at upper ends only, and be secured with a purpose-made clip system for the remaining length to enable expansion/ contraction along the length of the gutter

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e) Discharge into an internal gutter or *eaves* gutter/spouting.

In addition:

f) Have minimum slopes of 8° for *hidden gutters*, and to Table 8 for *valley gutters*

g) *Hidden gutters* receive no discharge from downpipes or spreaders

h) Spreaders not discharge directly into a *valley gutter*

i) *Valley gutters* be minimum 250 mm wide where receiving run off from spreaders.

Table 8: Maximum catchment areas for valley gutters
Paragraphs 8.1.6.2, 8.4.16.2, 9.7.7.1, 9.9.4.4, 9.9.10.1, Figures 27, 37 and 51

Gutter width	Maximum catchment area	Minimum roof pitch
250 mm	25 m^2	8°
160 mm to 249 mm	16 m^2	12.5°

NOTE: Catchment areas are limited to:

(1) Gutters in accordance with Paragraph 8.1.6.2.

(2) Rainfall intensity with average recurrence interval (ARI) no greater than 200 mm per hour.

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COMMENT:

Gutters for lower-pitched *roofs*, or for catchment areas other than those shown in Table 8, require *specific design*. Additional information may be found in the New Zealand Metal Roof and Wall Cladding Code of Practice.

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8.1.7 Roof penetrations

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Roof penetrations shall be made *weathertight* in accordance with Paragraph 8.2 to Paragraph 8.5.

Where *roof* penetrations are required for large openings such as *roof* lights and *chimneys*, this Acceptable Solution is limited to the following requirements:

a) The edge of roofing penetrations over 200 mm wide shall be supported in either direction with additional *framing* as shown in Figure 21, and

b) For the catchment area of the *roof* above the penetration as shown in Figure 22, the *roof* length shall be limited to:
   i) for profiled metal roofing, Table 17
   ii) for other *roof claddings*, the areas shown in Table 9.

COMMENT:

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Flashings for *roof* penetrations not included in this Acceptable Solution require *specific design*.

For pipe penetrations, refer to details for the *roof cladding* material used.

Table 9: Maximum catchment areas above penetrations
Paragraph 8.1.7 and Figure 22

Penetration width	Maximum roof length above penetrations in metres
800 to 1200 mm	4 m
600 to 800 mm	6 m
400 to 600 mm	8 m
0 to 400 mm	10 m

NOTE: Refer to Table 17 for profiled metal roofing.

Figure 21: Penetration support
Paragraphs 8.1.7 and 8.4.17

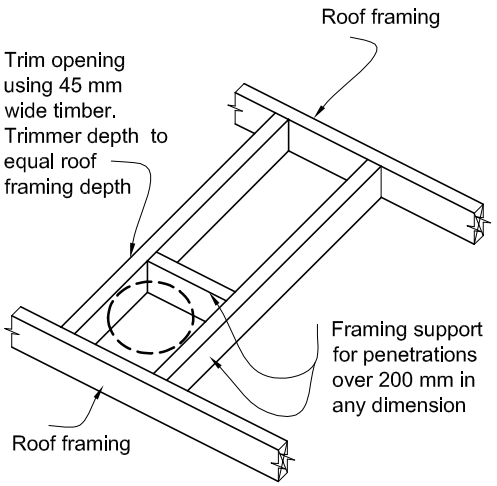

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Figure 22: Catchment area for penetrations
Paragraphs 8.1.6, 8.1.7, Tables 9 and 17

NOTE:
(1) Profiled metal roofing - refer Table 17 for maximum roof lengths above penetrations.
(2) Other roof cladding - refer Table 9 for maximum roof lengths above penetrations.

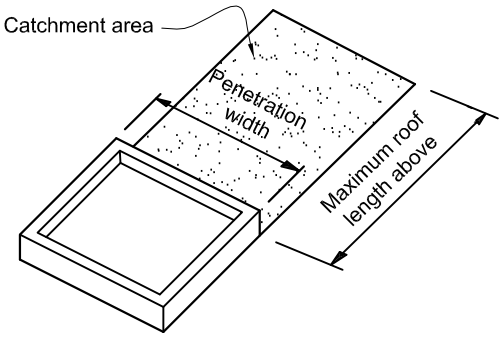

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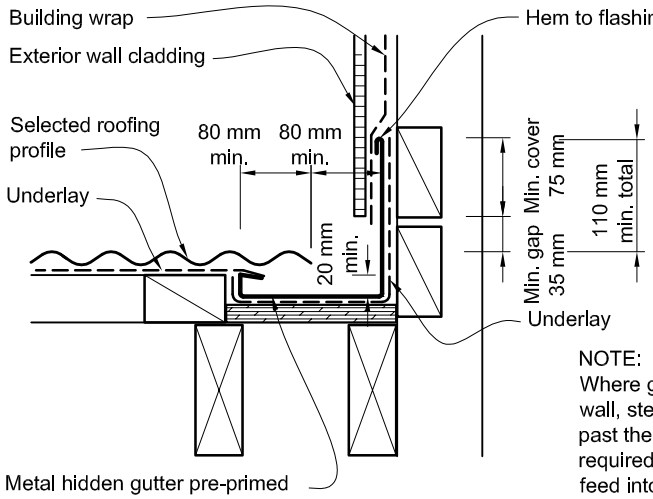
Figure 50: Parallel hidden gutter for profiled metal
Paragraphs 4.3, 4.5, 8.1.6.2 and 8.4.16



NOTE:
Where gutter finishes within the length of the wall, step lower part of gutter out to 10 mm past the *cladding* line, while maintaining required clearances, to allow the gutter to feed into the lower *eaves* gutter.

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Figure 51: Valley gutters for profiled metal
Paragraphs 4.3, 4.5, 8.1.6.2 and 8.4.16

NOTE: (1) Refer to Table 8 for maximum roof catchment areas for *valley gutters*.
(2) Minimum width of *valley gutter* may reduce to 160 mm, providing roof catchment area is in accordance with Table 8. In this case, cover of roof cladding over gutter shall be reduced to 60 mm to provide a clearance gap of 40 mm.

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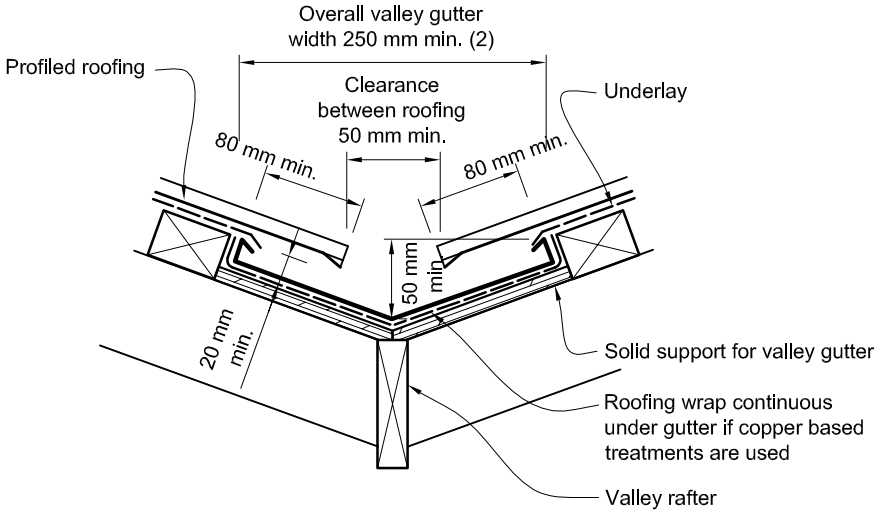

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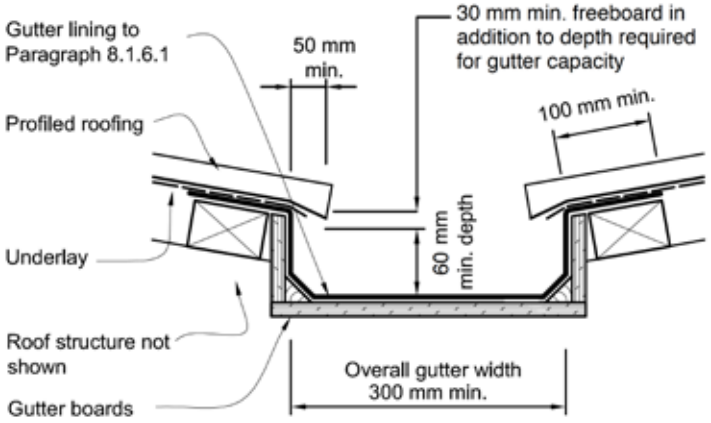
Figure 52: Internal gutter for profiled metal
Paragraphs 4.3, 4.5, 8.1.6.1 and 8.4.16



NOTES:
(1) Butyl rubber gutter lining to comply with Paragraph 4.3.9. Butyl cross joins in gutter are not permitted.
(2) Internal gutter shall be sized to meet the requirements of NZBC Clause E1 for the particular *roof* catchment area, but in no case have dimensions less than those shown in this figure.
(3) 1:100 minimum gutter fall.
(4) For gutter drainage refer Paragraph 8.1.6.1.

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8.4.17 Roof penetrations

The maximum length of profiled *roof cladding* above penetrations shall be as shown in Table 17.

The edge of roofing penetrations over 200 mm wide shall be supported in either direction with additional *framing* as shown in Figure 21.

Roof penetrations shall be flashed as follows:

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a) Pipe penetrations up to 85 mm shall be flashed using an *EPDM* boot *flashing* as shown in Figure 53,

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b) Pipe penetrations up to 500 mm shall be flashed using a soaker *flashing* and *EPDM* boot *flashing* as shown in Figure 54,

c) Rectangular penetrations up to 1200 mm wide shall be flashed using a soaker type *flashing* as shown in Figure 55.

COMMENT:
Penetrations on lower pitched *roofs*, larger penetrations, or needing specialised complex *flashings* will require *specific design* to suit the particular circumstances.

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The New Zealand Metal Roof and Wall Cladding Code of Practice should be consulted for guidance.

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Table 17: Catchment areas for profiled metal
Paragraphs 8.1.7, 8.4.17, Table 9, Figure 22

Penetration width	Maximum roof length above penetration in metres		
	Corrugated	Trapezoidal	Trough profile
800 to 1200 mm	4 m	8 m	16 m
600 to 800 mm	6 m	12 m	18 m (refer Note)
400 to 600 mm	8 m	16 m	18 m (refer Note)
0 to 400 mm	12 m	18 m (refer Note)	18 m (refer Note)

NOTE: Limited to 18 m as per the limitations of this Acceptable Solution.

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ii) via a *scupper*, into a gutter, or rainwater head, as shown in Figure 63 (a), (b) and (d).

e) Gutters formed with continuous butyl or *EPDM* strip complying with Paragraph 4.3.9, with no cross-joints.

COMMENT:

In addition to this paragraph, *membrane roof* and *deck* drainage must comply with NZBC Clause E1, and Acceptable Solutions E1/AS1 and E1/AS2 are options for achieving such compliance.

Seams in gutters are particularly difficult to form at outlets through *enclosed balustrade walls*, and the risk of failure is high. Failure of a seam can result in damage to underlying *walls*.

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8.5.7 Control joints

All *control joints* in the substrate shall be accommodated in the *membrane roof* design.

The design of *control joints* for *membrane* roofing is subject to *specific design* and is outside the scope of this Acceptable Solution.

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Figure 56: Falls in membrane roofs and decks
Paragraph 8.5.6, Figures 61, 62, 63 and 64

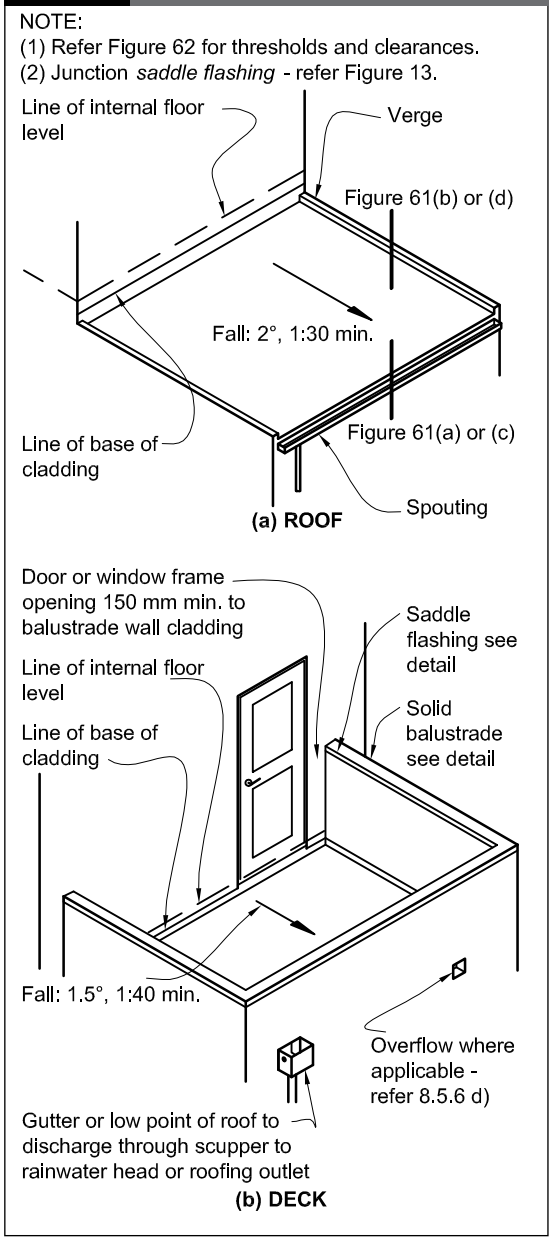

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Figure 57: External corner in upstand
Paragraph 8.5.8, Figures 59, 62, 63 and 64

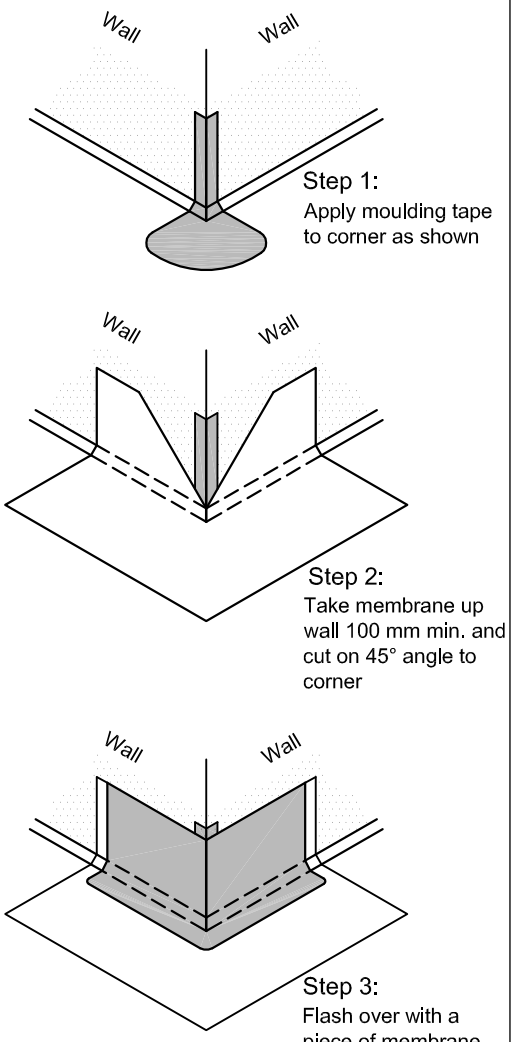

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Figure 58: Internal corner in upstand
Paragraph 8.5.8, Figures 62 and 64

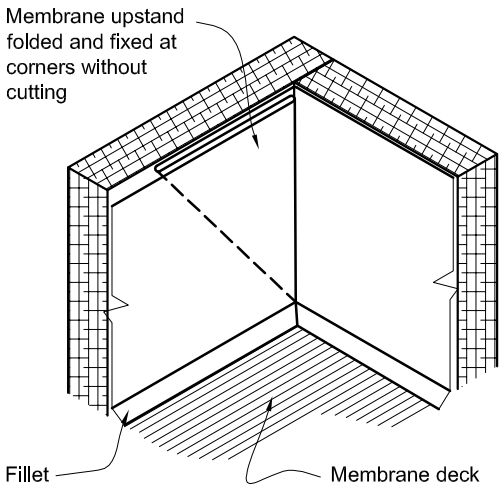

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Figure 59: Roofing penetration in membrane
Paragraphs 8.5.8 and 8.5.9

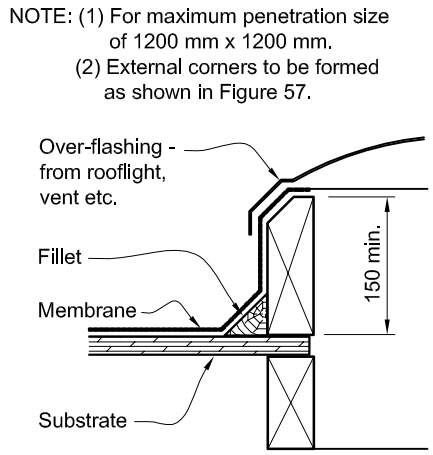

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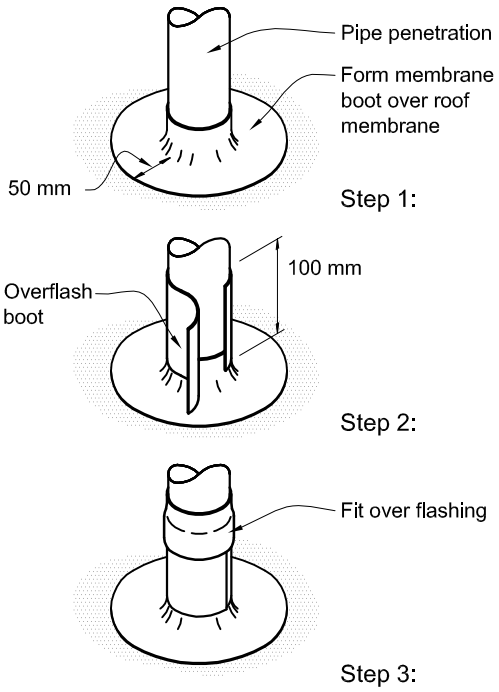
Figure 60: Pipe penetration in membrane
Paragraph 8.5.9



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8.5.8 Junctions

All junctions of *roof* or *deck* to *walls*, *parapets* and *enclosed balustrades* shall be made *weathertight* using the following appropriate details:

a) Figure 57: External corner in upstands,

b) Figure 58: Internal corner in upstands,

c) Figure 61: Verges and *eaves*,

d) Figure 62: Junctions of *decks* and *walls*, and

e) Drainage details to Paragraph 8.5.6.

8.5.8.1 Junctions with walls

Junctions of *membrane decks* or walls shall be formed as shown in Figure 62.

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The bottom of the wall *cladding* above the *deck* or *roof* surface shall be sealed prior to fixing.

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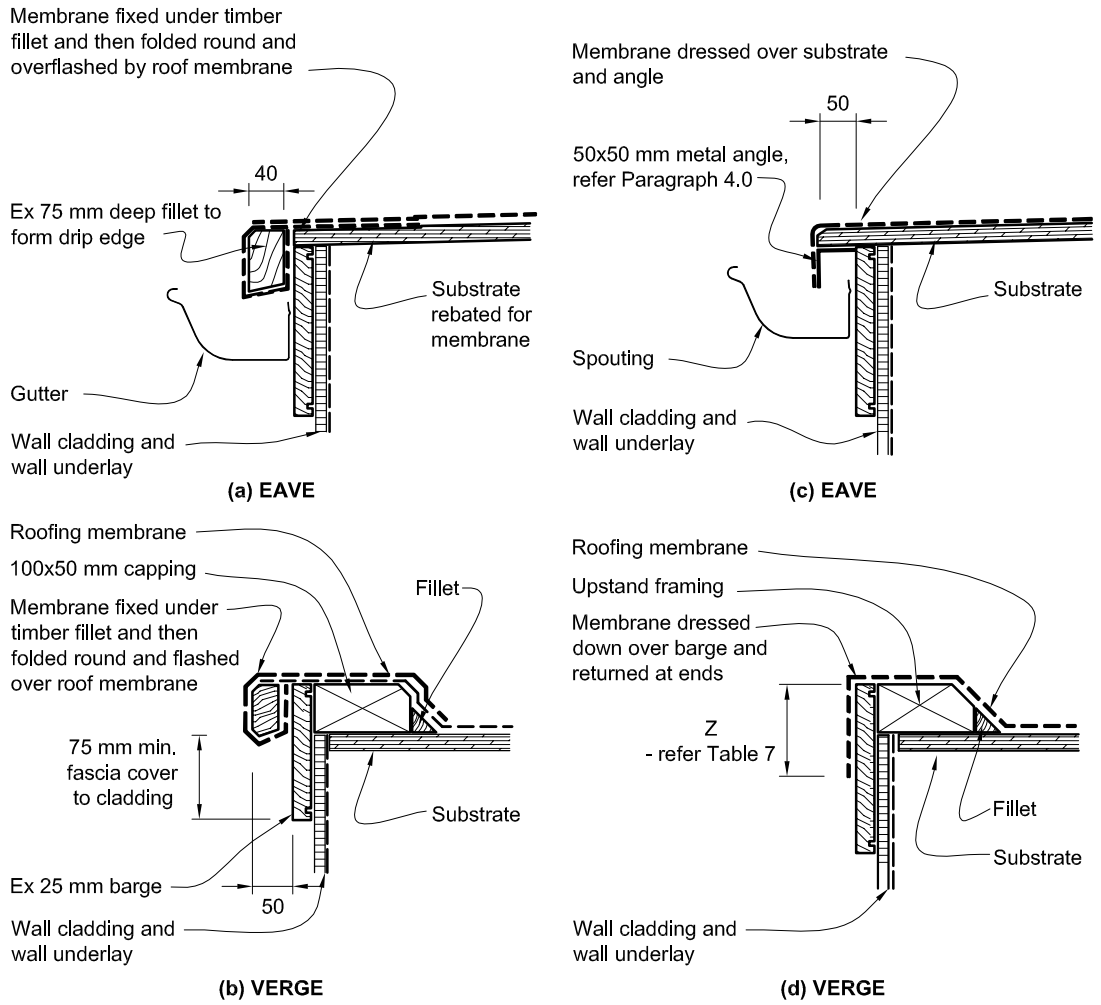
8.5.9 Penetrations

Penetrations through *membrane roofs* and *decks* shall be as shown in Figure 59 and Figure 60.

Figure 61: Verges in membrane
Paragraph 8.5.8, Figure 56



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8.5.9.1 Handrails

Fixing of posts for *handrails* into *membrane roofs* or *decks* is not covered by this Acceptable Solution.

COMMENT:

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Any fixing of posts into *membrane roofs* or *decks* will require *specific design.*

The fixing of posts into tiles over a *membrane* is particularly risky, and should be avoided.

8.5.10 Gutters

Deck gutters and internal outlets shall have dimensions to provide capacity that meets the requirements of NZBC Clause E1, and shall be constructed as shown in Figure 64.

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COMMENT:

Acceptable Solutions E1/AS1 and E1/AS2 provide means of calculating the capacity of internal gutters.

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Internal outlets should have a dome-type cover to reduce risk of blockage, except where this could constitute a pedestrian hazard.

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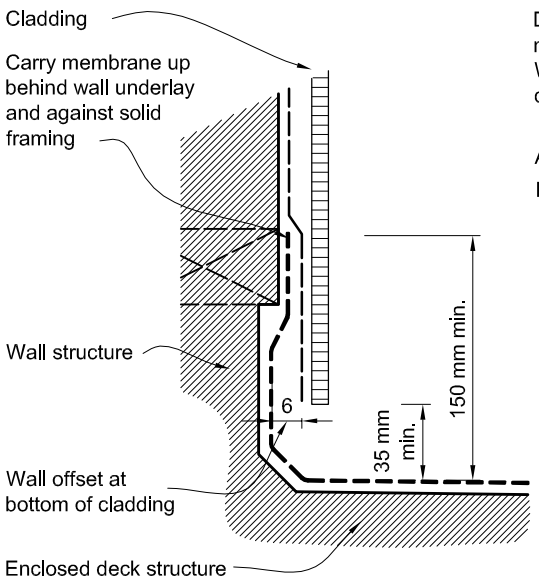
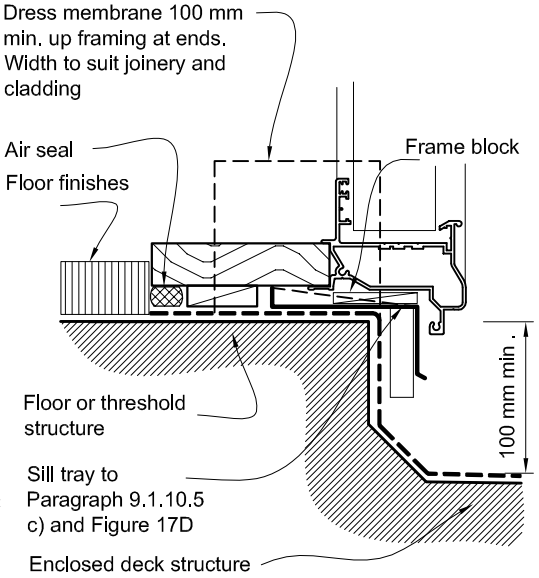
Figure 62: Junctions with walls for membrane
Paragraph 7.4.3, Figure 56

NOTE: (1) Internal corners to be formed as shown in Figure 58.
(2) Dimensions are shown to *membrane*. However, where there is an addirional material applied over the *membrane*, all dimensions shall apply to the highest level of the wearing surface.



(a) DIRECT FIX CLADDING



(b) DIRECT FIX THRESHOLD AT OPENING

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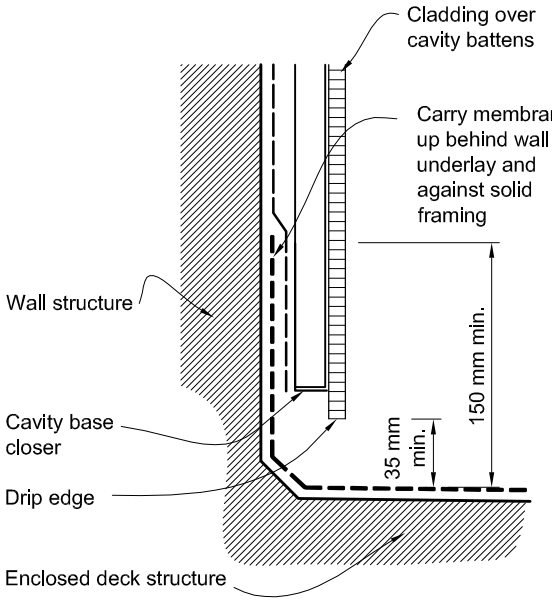
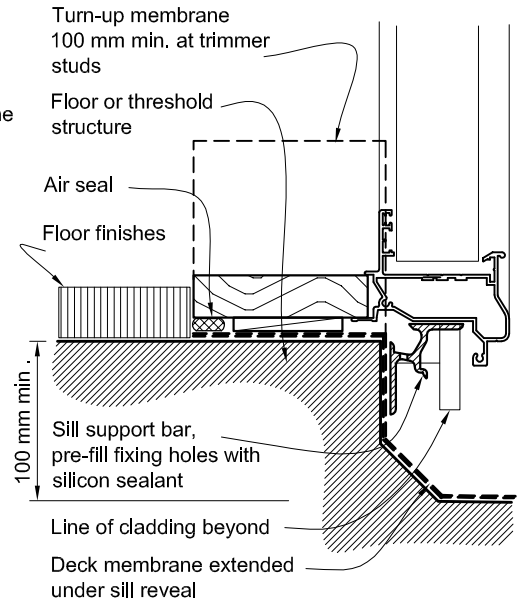


(c) CAVITY FIXED CLADDING



(d) CAVITY THRESHOLD AT OPENING

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Figure 63: Rainwater head and scupper opening in membrane
Paragraph 8.5.6, Figure 56

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NOTE: (1) Use preformed *scuppers* where provided by the membrane supplier .
(2) External corners of *scupper* opening to be formed as shown in Figure 57.

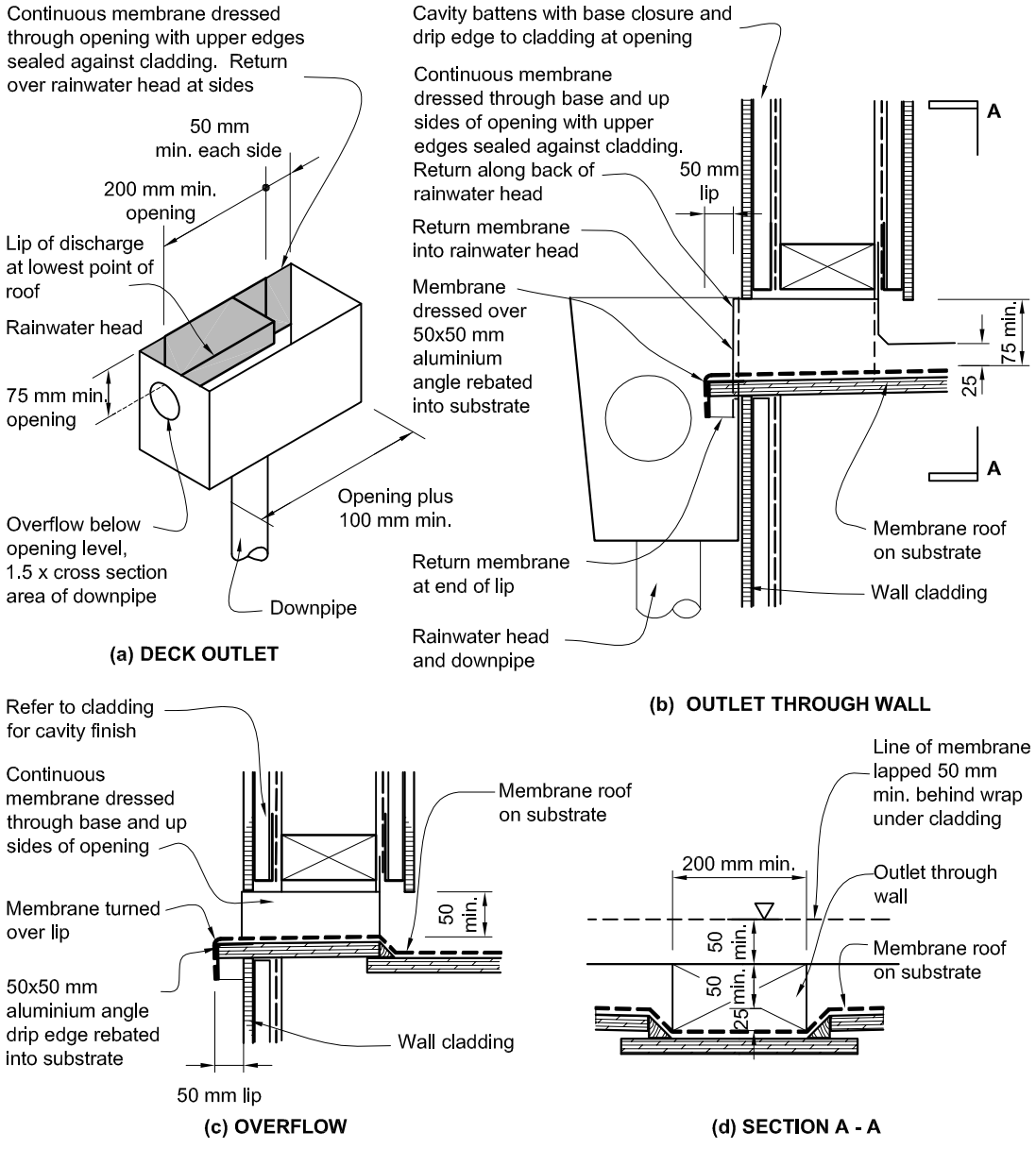

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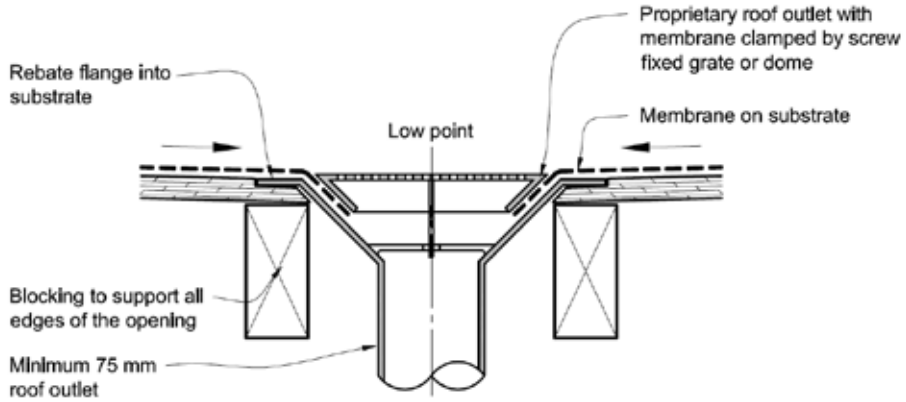
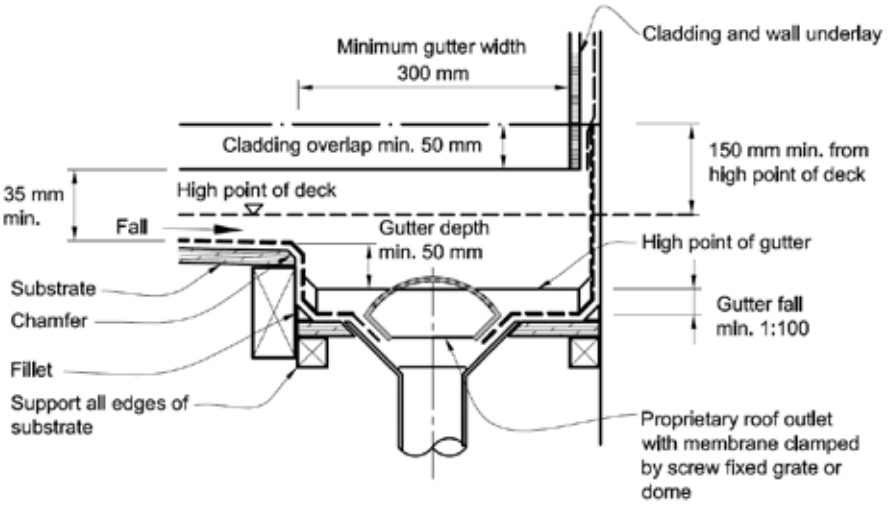
Figure 64: Gutters and outlets in membrane
Paragraphs 8.5.6 and 8.5.10



(a) TYPICAL ROOF OUTLET

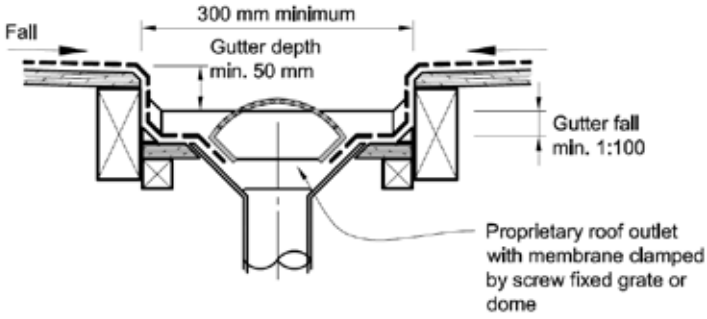


(b) EDGE GUTTER

NOTES:

1) Gutters shall be sized to meet the requirements of NZBC clause E1 for the particular catchment area, but in no case have dimensions less than those shown in this figure.

2) A freeboard allowance is not required in addition to the gutter capacity required to meet NZBC Clause E1 for gutters constructed to (b) or (c) of this figure, provided that the *membrane roof* or *deck* has at least 30 mm fall into the gutter channel, and all *membrane* perimeter details comply with Figures 61, 62, 63 and 64(b) of this Acceptable Solution.



(c) CENTRAL GUTTER

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Figure 101: Balustrade and parapet for vertical profiled metal
Paragraph 9.6.9.8

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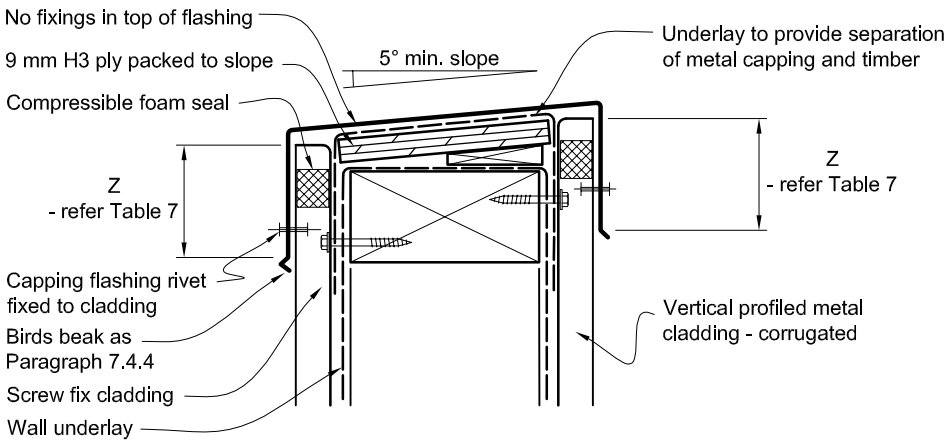

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Figure 102: Balustrade and parapet for horizontal profiled metal
Paragraph 9.6.9.8

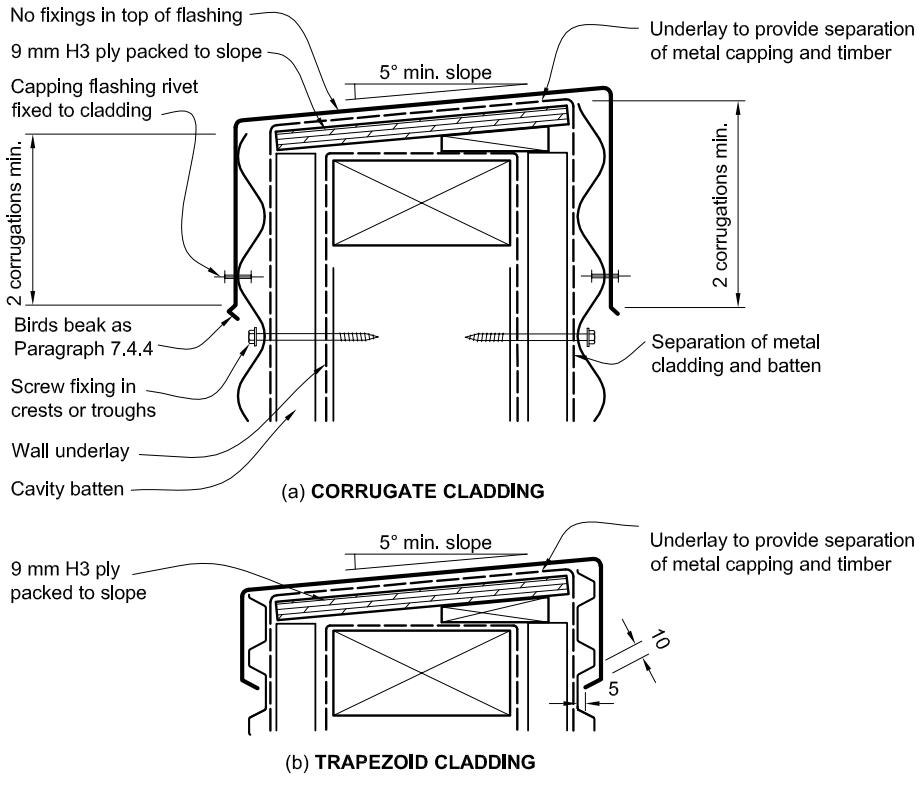

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Figure 103 deleted

9.7 Fibre Cement Sheet

Fibre cement sheet *claddings* shall be either *direct fixed* to *framing* over a *wall underlay* or fixed over a *drained cavity* based on the *risk score* for an *external wall*, calculated as per Paragraph 3.1 and Table 3.

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9.7.1 Limitations

This Acceptable Solution is limited to the following types of fibre cement sheet *cladding systems*:

a) *Flush-finished* systems over a drained cavity using sheets of 7.5 mm minimum thickness, with

   i) fibre cement sheets manufactured with a rebated edge for this purpose,
   ii) if necessary for part sheets, rebated on site using a purpose-made tool, and
   iii) have all edges sealed,
   iv) joints, comprising a bedding compound and reinforcing tape, that are finished in accordance with Paragraph 9.7.4, or

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b) Jointed systems in accordance with Paragraph 9.7.3 using sheets of 6 mm minimum thickness with:

   i) purpose-made jointers,
   ii) timber battens over joints.

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9.7.2 Material and installation – both systems

Fibre cement shall comply with AS/NZS 2908: Part 2.

9.7.2.1 Installation

Install sheets with:

a) Paint seals to all sheet edges and cut edges, including 100 mm across back face from each edge

b) A *wall underlay*, as specified in Table 23 and Paragraphs 9.1.5–9.1.7, installed behind fibre cement sheet *claddings*

c) Fixings as required in Table 24, installed through the *wall underlay* into the *wall framing*

d) All sheet joints located over solid *framing*.

COMMENT:

Refer to Paragraph 1.5 for qualification of installers.

Edge sealing can be improved by application of a second seal coating.

It is recommended that the applicator of the *flush-finished* jointing and coating be trained and approved by the supplier of the jointing and finish system.

9.7.3 Jointed systems

Jointed systems shall have:

a) Vertical joints with either:

   i) uPVC jointers – Figure 104A
   ii) timber battens – Figure 105.

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b) Internal corners:

   i) uPVC jointers – Figure 104B
   ii) timber battens – Figure 104B.

c) External corners

   i) timber battens – Figure 105.

d) Horizontal joints with either:

   i) 'Z' *flashings*, to Figure 107 for Direct fixed claddings
   ii) 'Z' *flashings* to Figure 108 for cavity fixed systems.

Flashings shall be either, uPVC, aluminium, stainless steel, or copper to Paragraph 4.3.

Timber battens shall comply with NZS 3602.

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9.9 EIFS

This paragraph covers polymer-modified cement-based plaster or polymer-based polystyrene-based plaster Exterior Insulation and Finish Systems *(EIFS)*.

EIFS cladding shall be fixed over a *drained cavity* as described in Paragraph 9.1.8.

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9.9.1 Limitations

This Acceptable Solution is limited to *EIFS cladding systems* that are:

a) Designed and tested as a total system, and

b) Not fixed:
   i) so as to form a horizontal surface,
   ii) as a replacement for roofing, or
   iii) in such a way as to allow water to pond.

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9.9.2 General

COMMENT:
Refer to Paragraph 1.5 for qualification of installers.

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9.9.3 Materials

EIFS cladding systems shall comprise the following parts:

a) A polystyrene sheet *cladding* material,

b) A polymer-modified cement-based plaster or a polymer-based plaster, reinforced with fibreglass mesh,

c) A polymer-modified cement or polymer-based finishing plaster, and a latex exterior paint system complying with any of Parts 7, 8, 9 or 10 of AS 3730,

d) A range of head, sill, jamb, corner and base mouldings suitable for exterior use, and

e) A flexible polymeric neutral cure sealant that:
   i) is approved by the *cladding system* supplier, and
   ii) complies with:
      a. Type F, Class 20LM or 25LM of ISO 11600, or
      b. low modulus Type II Class A of Federal Specification TT-S-00230C.

COMMENT:
This is the minimum standard, and extra elements deemed suitable by the system supplier should not be excluded on the basis of this Acceptable Solution.

9.9.3.1 Polystyrene sheet

Polystyrene sheet shall be a minimum of 40 mm thick and shall be either:

a) Expanded polystyrene (EPS) complying with AS 1366: Part 3, Class H or Class S, or

b) Extruded polystyrene (XPS) that complies with AS 1366: Part 4.

9.9.3.2 Fibreglass reinforcing mesh

Fibreglass reinforcing mesh shall be alkali-resistant fibreglass mesh, and shall:

a) Weigh no less than 150 grams per m^2,

b) Have an aperture size from 3 mm x 3 mm to 6 mm x 6 mm square, and

c) Comply with the requirements of EIMA 101.9 test No. 6.3 and ASTM E2098.

9.9.4 Installation

A *wall underlay*, as specified in Table 23 and Paragraphs 9.1.5–9.1.7, shall be fixed to the *framing*.

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9.9.4.1 Fixings

Polystyrene sheets shall be fixed through the *cavity battens*, and *wall underlay* into the *wall framing* with fixings as required in Table 24. Fixings shall:

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a) Be spaced as shown in Table 24,

b) Penetrate the *framing* by 30 mm minimum,

c) Comply with AS/NZS 4680, and

d) Be either:
   i) hot-dipped galvanized springhead nails with a 22 mm top, or
   ii) hot-dipped galvanized flat head nails used in conjunction with a 22 mm minimum diameter plastic washer.

9.9.4.2 Joints

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Joints to plain-edged sheets shall be butt jointed over solid timber backing.

Rebated or tongued boards may be jointed away from solid timber backing, providing the joint is self-supporting at both edges.

Corner joints shall be butted together and fully supported along the length of the joint.

9.9.4.3 Movement control joints

Control joints shall always be located over solid timber backing. *Control joints* shall be as shown in Figure 124, and shall be provided:

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a) On all walls over 20 metres long or over 7 metres high including gables,

> **COMMENT:**
> The system supplier may require *control joints* at closer spacings.

b) At abutments to different *cladding* types,

c) Where *cladding* covers different structural materials such as timber to concrete, and

d) Over a movement *control joint* in the underlying *framing*.

9.9.4.4 Fixing blocks

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H3.2 treated timber blocks shall be provided at appropriate locations for fixing all downpipe brackets, garden taps, and other outside fittings.

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The blocks shall be cut to suit the polystyrene thickness, and fixed to *framing* or *cavity battens*. Prior to applying the plaster basecoat, a patch shall be applied that:

a) Extends over the timber block face and overlaps the adjacent polystyrene by a minimum of 50 mm, and

b) Is suitable for the direct application of the base coat, and is either:
   (i) a butyl-based *flexible flashing tape* that complies with Parts 3.2 and 4 of ICBO Acceptance Criteria AC148, or
   (ii) a *waterproofing membrane* that complies with the requirements of AS/NZS 4858 Table 8, Parts (a) to (e), except that bleach and detergent immersion set out in Appendix A1 shall not be required.

The design of fixing blocks for connecting items carrying substantial loads such as stringers for *decks* are outside the scope of this Acceptable Solution. These will require *specific design*.

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Figure 124: Control joints for EIFS
Paragraph 9.9.4.3

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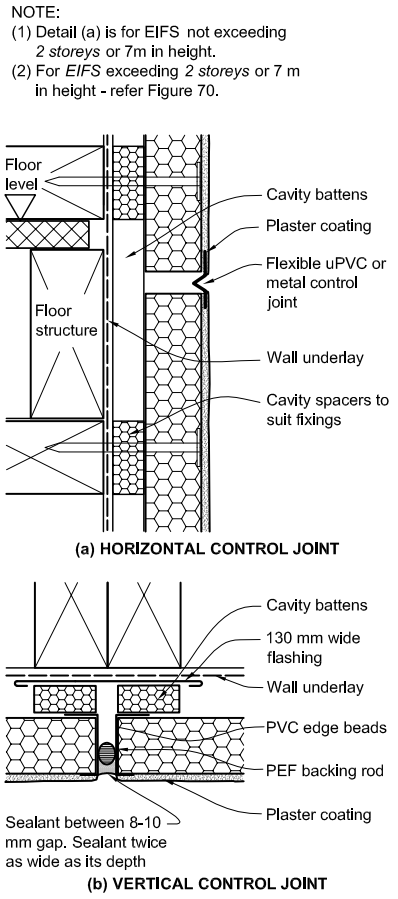

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9.9.9 Windows and doors

Windows and doors shall be installed in accordance with Paragraph 9.1.10, and shown in Figures 17C, 127 and 128.

Install uPVC three-way corner *flashings* at jamb/sill junctions as shown in Figure 127. Corner *flashings* shall be installed behind *EIFS* jamb and sill *flashings*, with flanges turned out over polystyrene backing sheets.

9.9.10 Parapets and enclosed balustrades

Parapets shall comply with Paragraph 6.0.

Enclosed balustrades shall comply with Paragraph 7.4.

9.9.10.1 Flush-finished balustrade top

Where the tops to *enclosed balustrades* are formed using *EIFS*, they shall have a minimum fall of 10° (1:6), and be wrapped as shown in Figure 129 and 130, with a liquid *waterproofing membrane* approved by the supplier. The *EIFS* system shall be fully protected by the coating, and shall comply with the requirements of AS/NZS 4858 Table 8, Parts (a) to (e), except that bleach and detergent immersion set out in Appendix A1 shall not be required.

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9.9.10.2 Metal cappings

Metal *cappings* shall comply with the requirements of Paragraph 6.4, and shall be as shown in Figure 130.

Where a *parapet* or an *enclosed balustrade* meets *EIFS* wall *cladding*, a *saddle flashing* shall be used, as shown in Figure 11 and Figure 12.

Amend 10 Nov 2020

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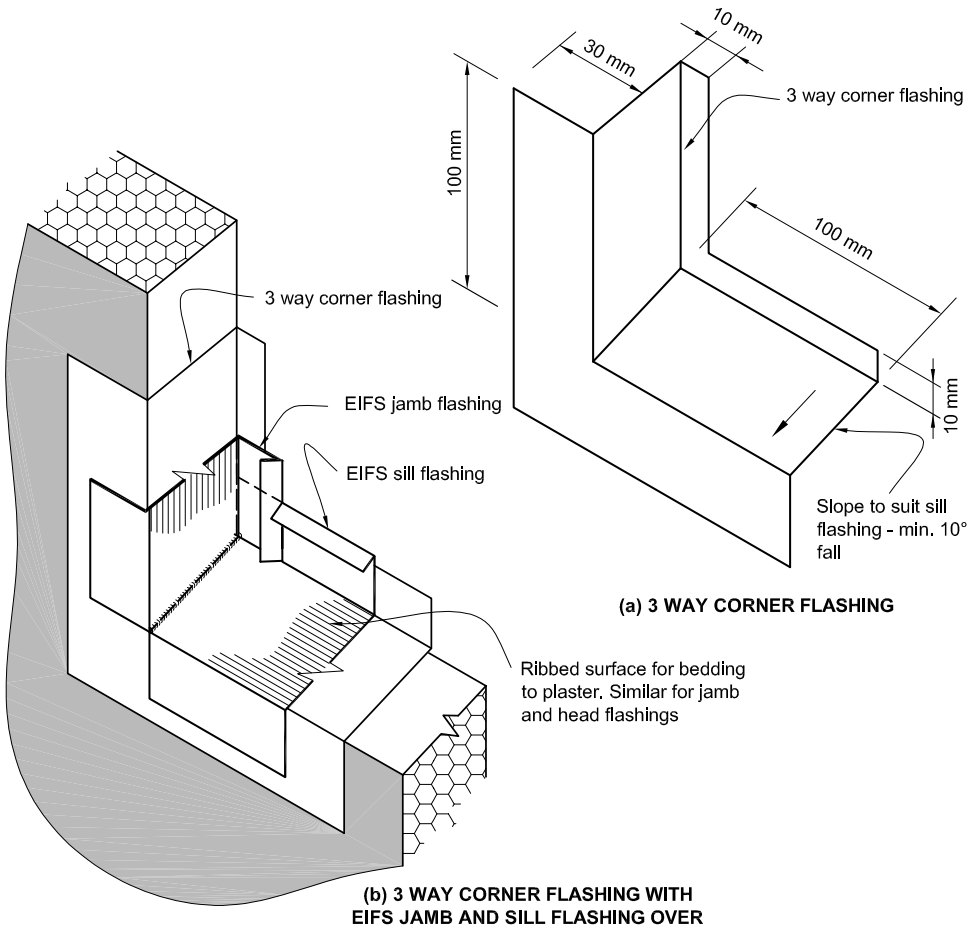
Figure 127: Window and door corner flashing for EIFS
Paragraph 9.9.9



Amend 5
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