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Department of
Building and Housing
Te Tari Kaupapa Whare

Dear Customer

Please find enclosed Errata 2, effective 24 December 2011, to the Compliance Document for Clause E2 External Moisture of the New Zealand Building Code.

Section	**Old E2**	**December 2011 Errata to E2**
Title page	Remove title page and document history	Replace with new title page and document history
Contents	Remove page 9/10	Replace with new page 9/10
E2/AS1	Remove pages 29/30, 41-44, 49/50, 55-58, 79-82, 87/88, 91-94, 101/102, 105-118, 157-160, 171/172, 175/176, 191/192	Replace with new pages 29/30, 41-44, 49/50, 55-58, 79-82, 87/88, 91-94, 101/102, 105-118, 157-160, 171/172, 175/176, 191/192

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Compliance Document for New Zealand Building Code Clause E2 External Moisture

Prepared by the Department of Building and Housing

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New Zealand Government

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

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 Compliance Document.

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	24 December 2011	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

Document Status

The most recent version of this document, as detailed in the Document History, is approved by the Chief Executive of the Department of Building and Housing.

E2 External Moisture Document Amendment 5 Errata 2 supersedes all previous versions from 1 February 2012, except for special provisions outlined in E2/VM1 Paragraph 1.5. E2 External Moisture Document Amendment 4 may also be used until 31 January 2012, except for special provisions outlined in E2/VM1 Paragraph 1.5 Amendment 5.

People using this Compliance Document should check for amendments on a regular basis. The Department of Building and Housing may amend any part of any Compliance Document at any time. Up-to-date versions of Compliance Documents are available from www.dbh.govt.nz

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Tables

Figures

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Table 1: Definitions of risk levels
Paragraph 3.1.1, Figure 1

Risk Factor	Score(5)	Risk severity	Comments
A: Wind zone	**0**	**Low risk**	Low *wind zone* as described by NZS 3604
	0	**Medium risk**	Medium *wind zone* as described by NZS 3604
	1	**High risk**	High *wind zone* as described by NZS 3604
	2	**Very high risk**	Very High *wind zone* as described by NZS 3604
	2	**Extra high risk**	Extra High *wind zone* as described in NZS 3604 (4)
B: Number of storeys	**0**	**Low risk**	One *storey*
	1	**Medium risk**	Two *storeys* in part
	2	**High risk**	Two *storeys*
	4	**Very high risk**	More than two *storeys*
C: Roof/wall junctions	**0**	**Low risk**	Roof-to-wall intersection fully protected (e.g. hip and gable roof with *eaves*)
	1	**Medium risk**	Roof-to-wall intersection partly exposed (e.g. hip and gable roof with no *eaves*)
	3	**High risk**	Roof-to-wall intersection fully exposed (e.g. *parapets, enclosed balustrades* or *eaves* at greater than 90° to vertical with soffit *lining*)
	5	**Very high risk**	Roof elements finishing within the boundaries formed by the exterior walls (e.g. lower ends of aprons, *chimneys, dormers* etc)
D: Eaves width (1)(2)	**0**	**Low risk**	Greater than 600 mm for single storey
	1	**Medium risk**	451–600 mm for single storey, or over 600 mm for two storey
	2	**High risk**	101–450 mm for single storey, or 451–600 mm for two storey, or greater than 600 mm above two storey
	5	**Very high risk**	0–100 mm for single storey, or 0–450 mm for two storey, or less than 600 mm above two storey
E: Envelope complexity	**0**	**Low risk**	Simple rectangular, L, T or boomerang shape, with single *cladding* type
	1	**Medium risk**	Moderately complex, angular or curved shapes (e.g. Y or arrowhead) with no more than two *cladding* types
	3	**High risk**	Complex, angular or curved shapes (e.g. Y or arrowhead) with multiple *cladding* types
	6	**Very high risk**	As for High risk, but with junctions not covered in C or F of this table (e.g. box windows, pergolas, multi-storey re-entrant shapes etc)
F: Decks(3)	**0**	**Low risk**	None, timber slat *deck* or porch at ground floor level
	2	**Medium risk**	Fully covered in plan by *roof*, or timber slat *deck* attached at first or second floor level
	4	**High risk**	*Enclosed deck* exposed in plan or cantilevered at first floor level
	6	**Very high risk**	*Enclosed deck* exposed in plan or cantilevered at second floor level or above

NOTES:

(1) *Eaves* width measured horizontally from external face of *wall cladding* to outer edge of overhang, including fascias and external gutters/spoutings.

(2) Balustrades and *parapets* count as 0 mm *eaves*.

(3) The term *deck* includes balconies, as described in the Definitions.

(4) *Buildings* in Extra High *wind zones* require rigid *underlays* and *drained cavities,* refer to Table 3.

(5) Refer also to Table 2.

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Table 2: Building envelope risk scores
Paragraph 3.1.2, Figure 1

Risk factor	Risk severity: LOW	score	MEDIUM	score	HIGH	score	VERY HIGH (1)	score	Subtotals for each risk factor
Wind zone (per NZS 3604)(1)	0		0		1		2		
Number of storeys	0		1		2		4		
Roof/wall intersection design	0		1		3		5		
Eaves width	0		1		2		5		
Envelope complexity	0		1		3		6		
Deck design	0		2		4		6		
							Total risk score for use in Table 3:		

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(Enter the appropriate risk severity score for each risk factor in the score columns. Transfer these figures across to the right-hand column. Finally, add up the figures in the right-hand column to get the total risk score.)

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NOTE: (1) For *buildings* in Extra High *wind zones*, refer to Tables 1 and 3 for rigid *underlay* and *drained cavity* requirements.

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Table 7: continued **Metal flashings – general dimensions**
Paragraphs 4.6, 4.6.1.1, 4.6.1.2, 4.6.1.3, 4.6.1.4, 4.6.1.5, 4.6.1.6, 4.6.1.7, 5.1, 6.4, 6.5, 7.4.4, 8.3.8, 9.1.3, 9.1.10.2, 9.1.10.4 and 9.4.5.3

Membrane roofs and decks	Lap under *cladding* above	**115 min.**				Figures 18, 62a, c, 64b
Type	**Description**	**All (1)**	**Situation 1 (2) minimum mm**	**Situation 2 (3) minimum mm**	**Situation 3 (3a) minimum mm**	**Figure reference (as example)**
Windows	Window flange clearance for *direct fixed claddings* and ply or fibre cement on cavities	5 mm				Eg. Figure 81
	Cover to window/ door jamb flange	10 mm(7) min.				Eg. Figure 81c
	Cover to window/ door sill flange	8 mm(7) min.				Eg. Figure 81c
Sills	Sill *flashing* slope (6)	Flat(6)				Eg. Figures 72a, 81b
Heads	Head *flashing* slope	15° min.				Eg. Figure 81a
	Lap under *cladding* above	35 mm min.			60 mm	Eg. Figure 81a
	Anti-capillary gap to *cladding*	5 mm				Eg. Figure 81a
	Total upstand	**40** mm min.				
Corners	Corner *flashings* (1)	50 mm x 50 mm minimum			75 x 75 mm	Eg. Figure 79
Inter-storey junctions	Junction *flashing*: slope	15° min.				Figure 70
	Lap over *cladding* below (1)	35 mm min.(8)			60 mm	
	Lap under *cladding* above	35 mm min.			60 mm	
	Clearance under *cladding*	5 mm min.				
	Total upstand	**40** mm min.				

NOTES: (1) Unless otherwise dimensioned in details.
(2) **Situation 1:** Low, Medium, High *wind zones*, where roof pitch ≥10° (X or Z values)
(3) **Situation 2:** All roof pitches in Very High *wind zones*,
Low, Medium and High *wind zones* where roof pitch ≤10°. (X or Z values)
(3a) **Situation 3:** For all *roof* pitches in Extra High *wind zone*.
(4) Excluding any *soft edge* or turn-down to roofing.
(5) For *buildings* other than housing, slope shall be as per F4/AS1.
(6) For *direct fixed* window/doors, unless shown. Sill *flashing* must extend past the condensation channel. Ensure sill *flashings* are not installed with backwards slope.
(7) Excluding *drip edge*.
(8) Excluding *drip edge*.

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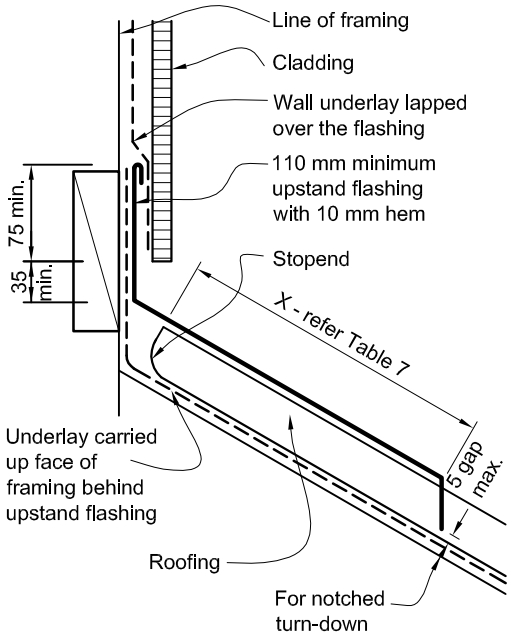
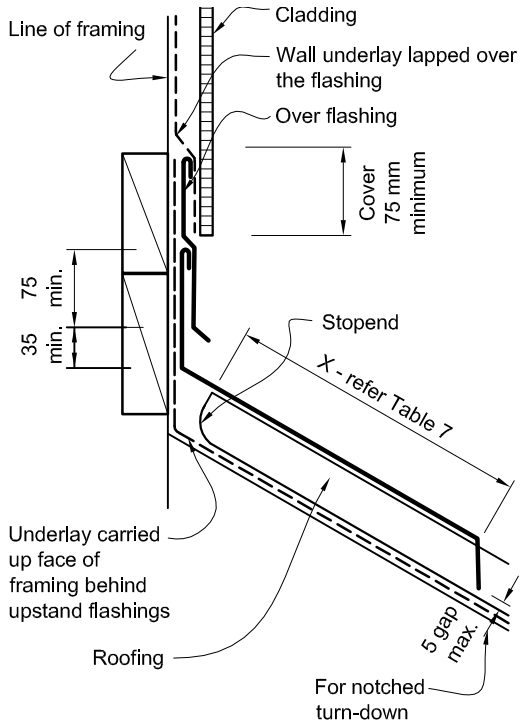
Figure 7: Basic apron flashing
Paragraphs 4.6.1.1, 4.6.1.4, 5.1, 8.3.8 and Table 7

NOTE: *Stopends* to profiled metal - refer Figure 49



(a) ONE PART FLASHING



(b) TWO PART FLASHING (OPTIONAL)

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4.6.1.5 Barges

Refer to Figure 47 for example of use.

a) There shall be a minimum effective overlap to the barge board, excluding the *drip edge* to the *flashing*, in accordance with Table 7.

b) The apron cover over the *roof cladding* shall be as for Paragraph 4.6.1.1.

4.6.1.6 Window and door heads

Amend 5 Aug 2011

Refer to Figures 71 and 81 for example of use.

a) Slopes and covers of *flashings* at window and door heads shall comply with Table 7. Amend 5 Aug 2011

b) Overlap cover of *cladding* to the *flashing* upstand and clearance from the bottom of the *cladding* to top of head *flashing* slope shall be in accordance with Table 7.

c) Details for door heads shall be based on those applying to windows.

4.6.1.7 Inter-storey junctions

Amend 5 Aug 2011

Refer to Paragraph 9.1.9.4 and Figure 70.

a) Minimum slopes and covers of *flashings* shall be in accordance with Table 7.

b) Overlap cover of the *cladding* to the *flashing* upstand, and clearance from the bottom of the *cladding* to the top of the slope of the head *flashing,* shall be in accordance with Table 7.

5.0 Roof/Wall Junctions

5.1 Apron flashings

Refer Paragraph 4.3 for acceptable *apron flashing* materials. Amend 5 Aug 2011

All roof-to-wall junctions shall be made *weathertight* by using an *apron flashing* as outlined in Paragraph 4.6.1.1, and shown in Figure 7, that:

a) Provides a minimum lap under the *wall cladding* of 75 mm in accordance with Table 7, except that:

i) pressed metal tiles shall have a *flashing* fitted to achieve the minimum required overlap of *wall cladding*, as shown in Figure 35, Amend 2 Jul 2005 Amend 2 Jul 2005

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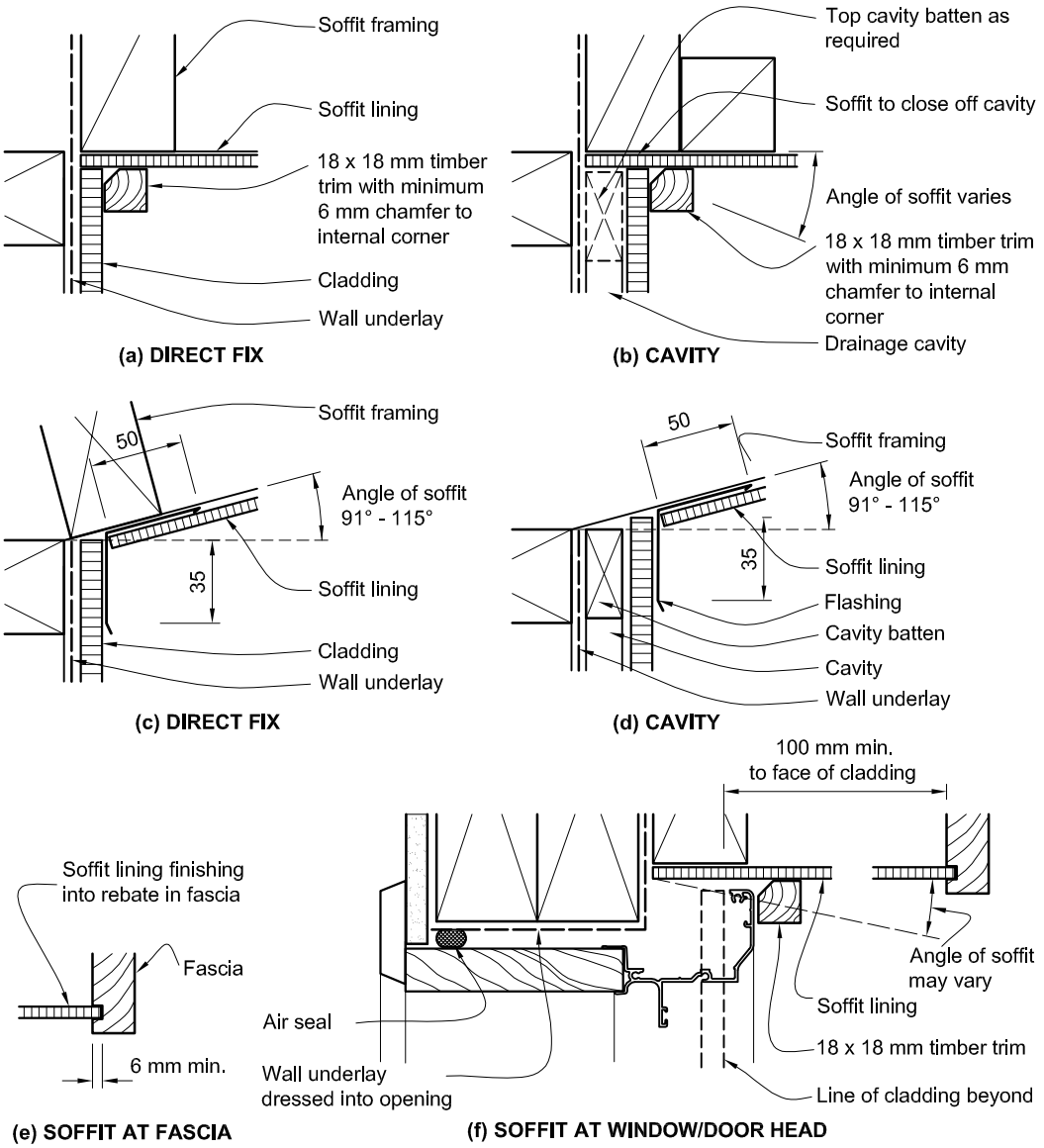
Figure 8A: Soffit/wall junction
Paragraphs 5.3, 8.1.3.1, 8.4.6, 9.7.5, 9.8.6



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Amend 2 Jul 2005

Amend 5 Aug 2011

b) For profiled metal, incorporates *stopends* at the upper end of the *roof cladding* as per Paragraph 8.4.13,

c) Provides a minimum clearance from the wall *cladding* to the roofing in accordance with Table 7, and

d) Extends over the roofing by a minimum cover in accordance with Paragraph 4.6.1.1 and Table 7, depending on the:
   i) *wind zone* and,
   ii) pitch of the *roof*.

Amend 2 Jul 2005

COMMENT:
40 mm is the maximum upturn achievable with pressed metal tiles, meaning that a *flashing* is required.

Amend 2 Jul 2005

Details for specific *wall cladding systems* are given in Paragraph 9.0.

Where the roof finishes within the length of an adjacent *wall*, a *kick-out* or *stopend* as detailed in Figure 8B shall be provided to direct water out from the *wall cladding* onto the *roof cladding* and gutter.

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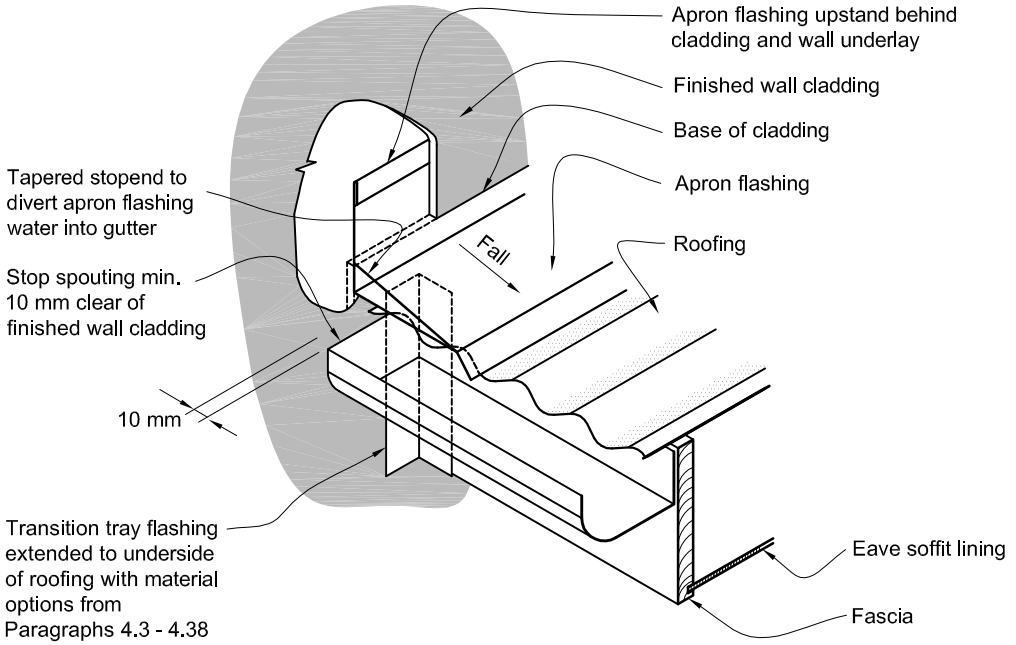
Figure 8B: Gutter/wall junction
Paragraphs 5.1 and 5.2

NOTE: (1) The upstand at the lower edge of the *apron flashing* may be preformed to a larger size and then trimmed on site to suit.
(2) The transition *flashing* bridges gap at the end of the fascia to protect the soffit *framing*.
(3) *Wall underlay* omitted for clarity.



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5.2 Gutters, barges and fascias

Amend 5 Aug 2011

Where *eaves* gutters/spoutings, barges or fascias terminate against *claddings*, these shall be installed after the wall *cladding*, and after any protective finishes have been applied.

Eaves gutters/spouting, barges and fascias shall terminate so as to leave a gap of 10 mm from the finished *wall cladding* as shown in Figure 8B.

Amend 5 Aug 2011

COMMENT:

Amend 5 Aug 2011

It is important to ensure the *wall cladding* behind *eaves* gutters/spoutings, barges and fascias is protected by the surface coating to prevent moisture penetration through the unsealed *cladding*.

5.3 Soffits

Eaves shall be enclosed by installing soffit *linings direct fixed* to *framing* and comprising minimum 4.5 mm fibre cement sheet, or 7 mm H3 plywood, with joints, fixings and finishes as shown in Paragraphs 9.7 and 9.8. Soffit *linings* shall be finished to fascias, barges and *wall claddings* as outlined in Figure 8A generally, or Figure 114 for *flush finished* fibre cement. *Wall underlays* shall not be required behind soffit *linings*.

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Figure 11: Parapet/enclosed balustrade-to-wall junctions – plan section
Paragraphs 6.4.1, 7.4.2, 7.4.4.1 and 7.4.4.2, Figures 10, 12, 117, 129 and 130

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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.

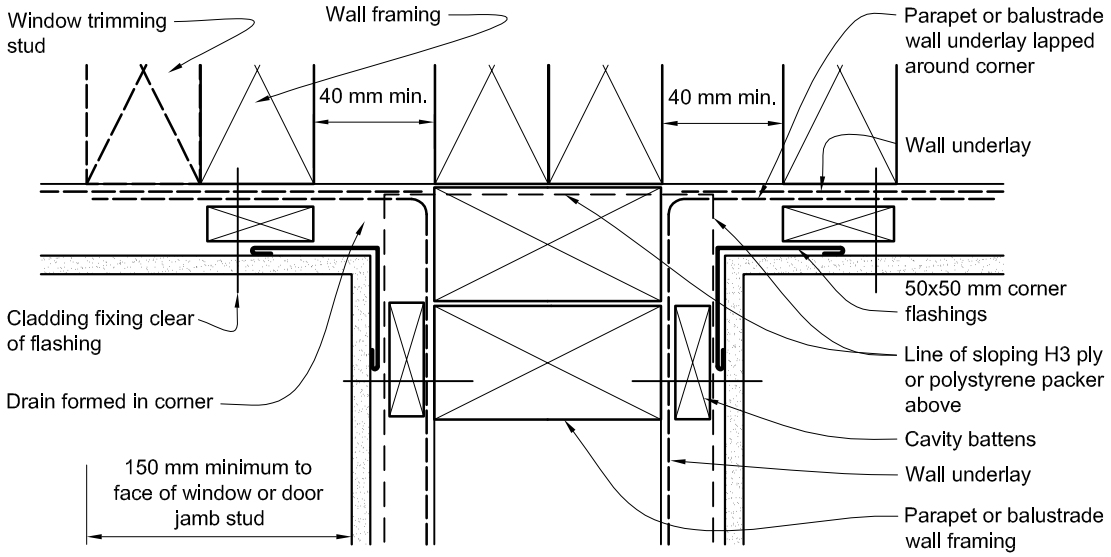

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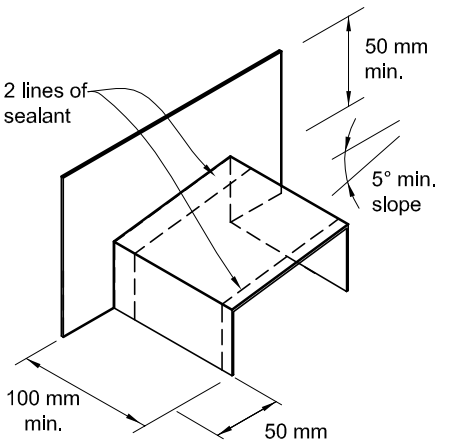
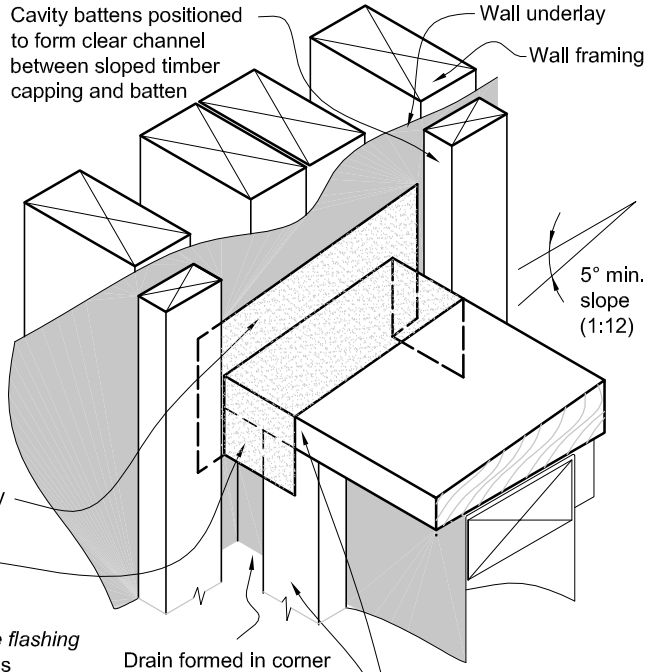
Figure 12: General junction of parapet and enclosed balustrade to wall
Paragraphs 6.4.1, 7.4.2, 7.4.4.1, 7.4.4.2 and 9.9.10.1, Figures 10, 12, 117, 129 and 130

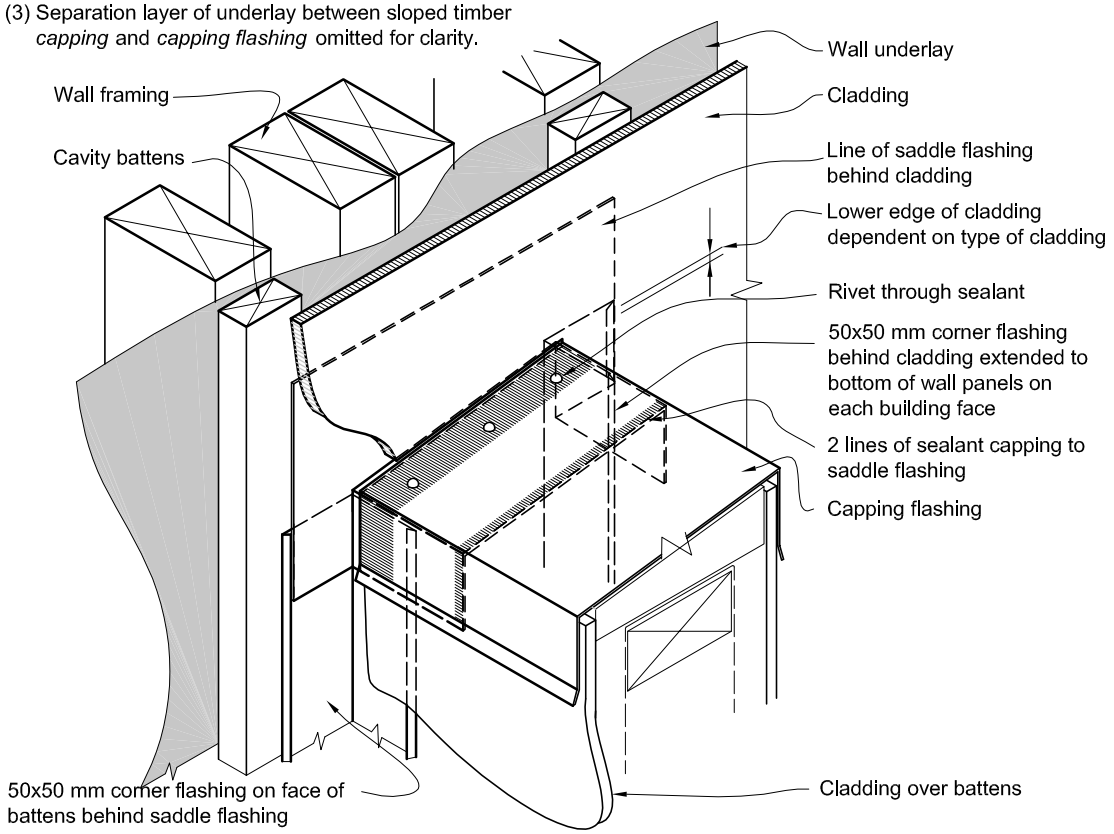


(a) SADDLE FLASHING



(b) STAGE 1 FLEXIBLE FLASHING INSTALLATION

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.



(c) STAGE 2 SADDLE FLASHING INSTALLATION

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Figure 17A: Level thresholds for enclosed decks
Paragraphs 7.3, 8.5.1 and Figure 17B

NOTE:
(1) For use for framed, above ground *enclosed decks* with *membrane* surfaces.
(2) Care must be taken to ensure that no fixings or sharp edges penetrate the *weathertight membrane* deck surface.
(3) Refer also to Paragraph 8.5.

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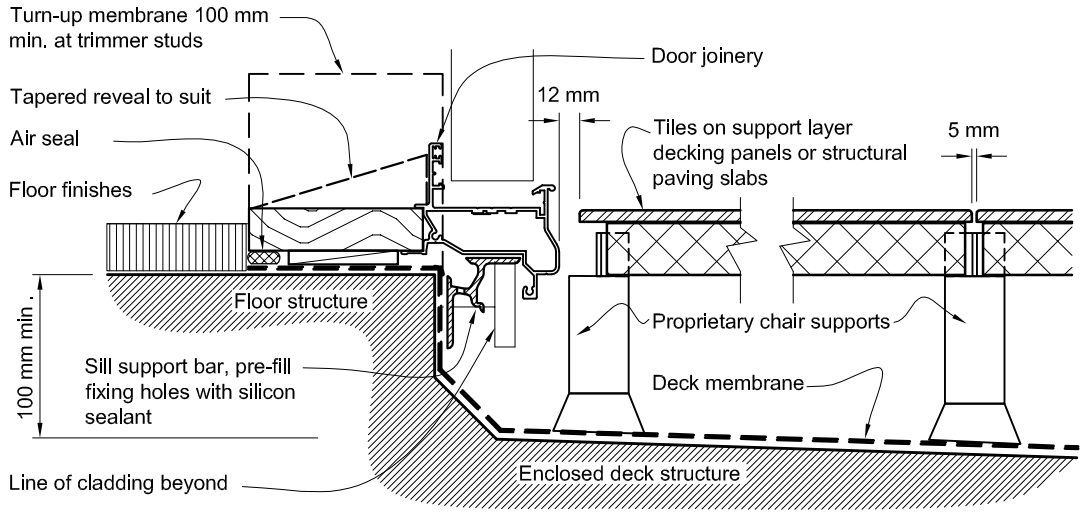

(a) TILE/PAVING

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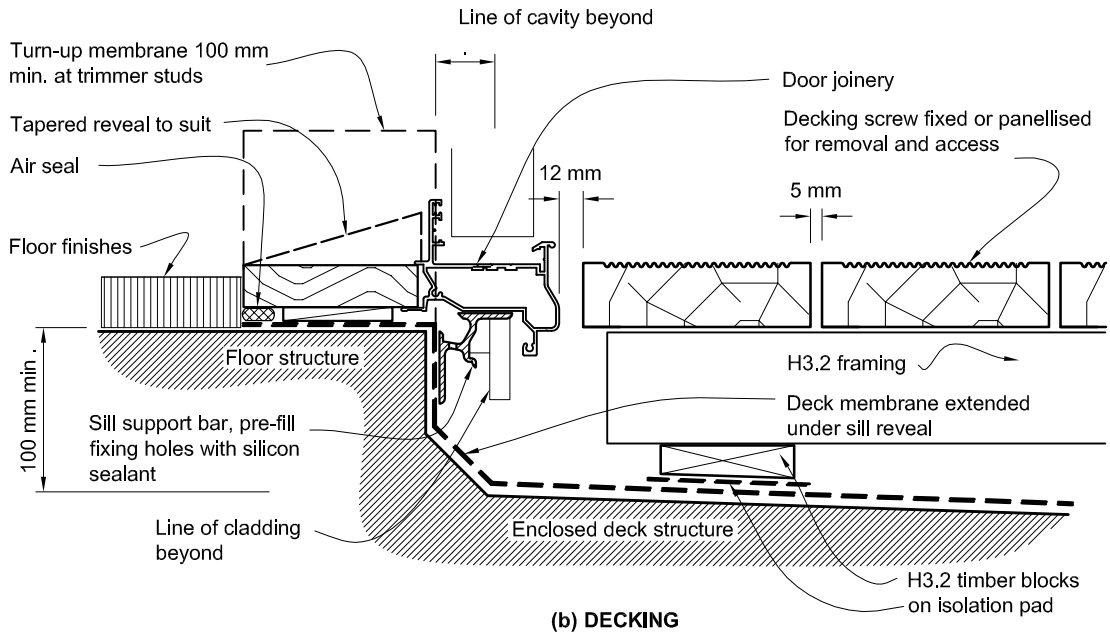

(b) DECKING

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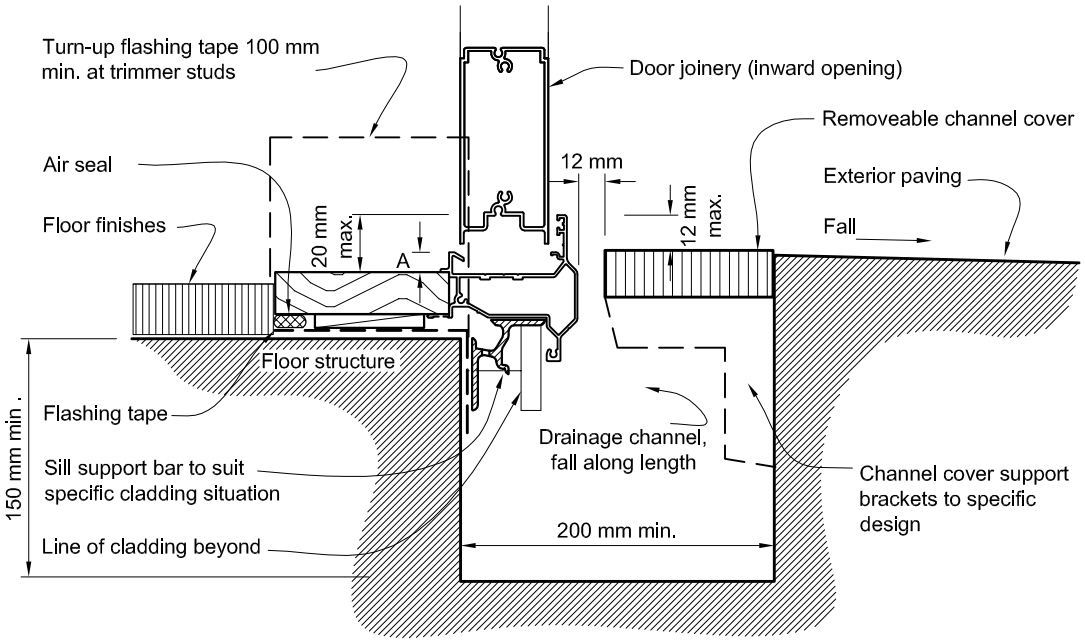
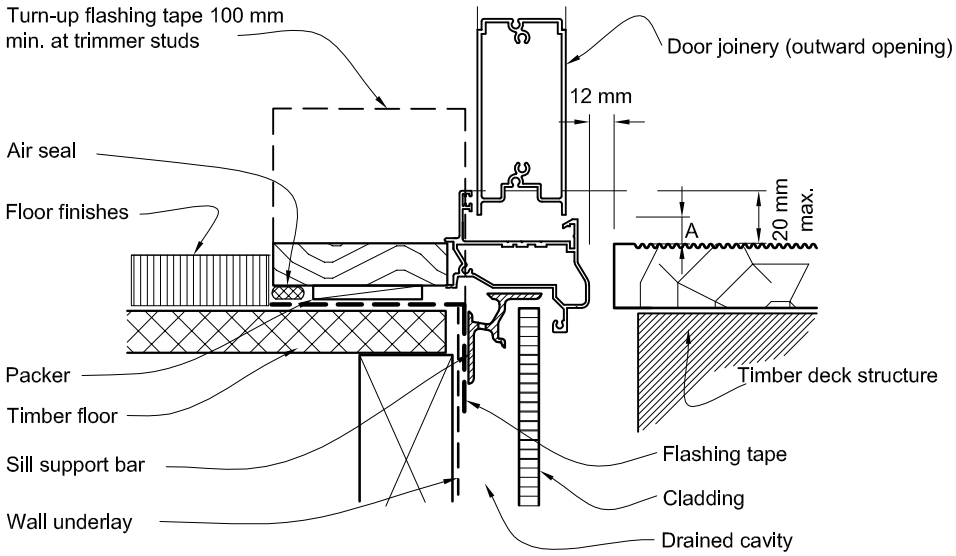
Figure 17B: Level thresholds for ground level
Paragraph 7.3 and Figure 17A

NOTE:
(1) Detail (a) is suitable for use with concrete floor slabs - refer Paragraph 7.3.2.1 for requirements.
(2) Detail (b) is suitable for use with timber floors. It may also be adapted for timber *decks* on upper *storeys* as per Paragraph 7.1.1 b), or for *enclosed decks*, with removable panels or decking as shown in Figure 17A.
(3) Both details may be adapted for inward or outward opening doors.
(4) Exposure to wind-driven rain must be specifcally taken into account when using these details, and shelter to doors and joinery provided where local conditions warrant.



(a) CONCRETE SLAB



(b) TIMBER FLOOR

NOTE: 'A' to be the minimum dimension to maintain clearance from the bottom of the door to finished floor or deck, to manufacturer's requirements, and to keep sill upstand height to less than 20 mm

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7.4 Enclosed balustrades

Enclosed balustrades require a *drained cavity* for *claddings*, except for vertical corrugated steel, as outlined in Table 3, and shall be detailed as required for *parapets* described in Paragraphs 6 and 9.1.8 and Figures 10, 11 and 12. Details for specific *cladding systems* are given in Paragraph 9.0. *Enclosed balustrade cappings* for *EIFS* and *flush finished* fibre cement may include flush finishes as outlined in Paragraphs 9.7.7 and 9.9.10.

Errata 2 Dec 2011

COMMENT:
Reports on leaky *buildings* show these junctions have been prone to leakage and care must be taken to detail and build them correctly.

Amend 5 Aug 2011

7.4.1 Deck drainage

For *decks* with *enclosed balustrades*, provision for drainage shall be in accordance with Paragraph 8.5.6 and Paragraph 8.5.10.

7.4.2 Balustrade-to-wall junctions

Enclosed balustrade-to-*wall* junctions shall be flashed to direct water clear of the outside face of the *cladding system* using a *saddle flashing* as shown in Figures 11 and 12.

Amend 5 Aug 2011

COMMENT:
Reports on leaky *buildings* show that these junctions are prone to leakage and care must be taken in detailing and in building them correctly.

7.4.3 Balustrade-to-deck floor junction

The junction of the *enclosed balustrade* with the floor of the *enclosed deck* shall be made *weathertight* as shown in Figure 18.

Junctions with *wall claddings* shall be as shown in Figure 62.

7.4.4 Metal cappings

Metal *cappings* to *enclosed balustrades* shall have dimensions as outlined in Table 7.

Metal *cappings* shall have the same requirements as outlined for *parapets* in Paragraph 6.4, with the exception of the:

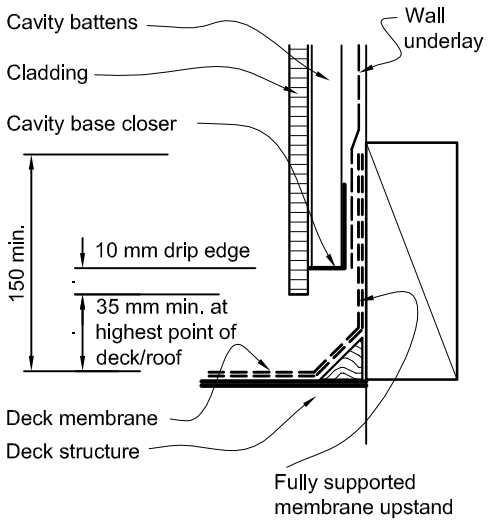
a) Slope to the top of the *capping*, for *buildings* other than housing to be as in F4/AS1,

b) *Drip edges* are required to both sides of the *capping*. The *drip edge* to the *deck* side of the *capping* shall be a *bird's beak* as shown in Figure 5.

Amend 5 Aug 2011

COMMENT:
A *bird's beak drip edge* will avoid danger of injury resulting from the sharp edge of a *kick-out*.

Figure 18: Enclosed balustrade – bottom of cladding
Paragraphs 7.4.3, 9.1.3, Figures 56, 62, 63 and 64



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7.4.5 Stanchions

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Stanchions for *handrails*, signs, television aerials or similar structures shall be side-fixed through the *cladding system* into *framing*, as shown in Figure 19. These fixings are not included for *stucco*, *EIFS* or profiled metal in this Acceptable Solution.

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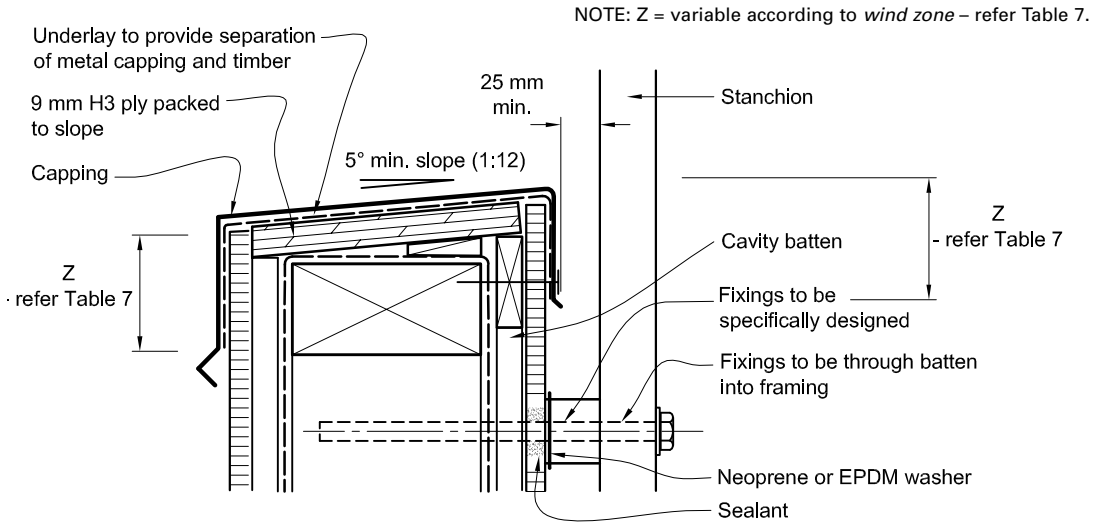
Fixing shall be to vertical surfaces only. The sealant shall be compatible with the washer.

Figure 19: Stanchion fixing
Paragraph 7.4.5



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b) When fixing *flashings* to other *flashings* or to roofing use:
   i) for galvanized steel, 4 mm diameter monel metal or stainless steel rivets, where compatible as per Table 21,
   ii) for aluminium-zinc coated steel, 4 mm diameter aluminium rivets,
   iii) for aluminium, 4 mm diameter aluminium rivets.

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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.

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c) *Flashing* joins, including *expansion joints* where required, shall be in accordance with Paragraph 4.5.2 and as shown in Figure 6.

d) Where end-laps are required in *flashings*, form these as shown in Figure 6 and, before joining the two parts, apply an 8 mm diameter bead of neutral cure sealant complying with:
   i) Type F, Class 20LM or 25LM of ISO 11600, or
   ii) low modulus Type II Class A of Federal Specification TT-S-00230C.

Figure 41: Soft edge flashing
Paragraphs 4.6, 8.4.12 and 8.4.11

NOTE: *Apron flashing* cover varies according to *wind zone* - refer Table 7.

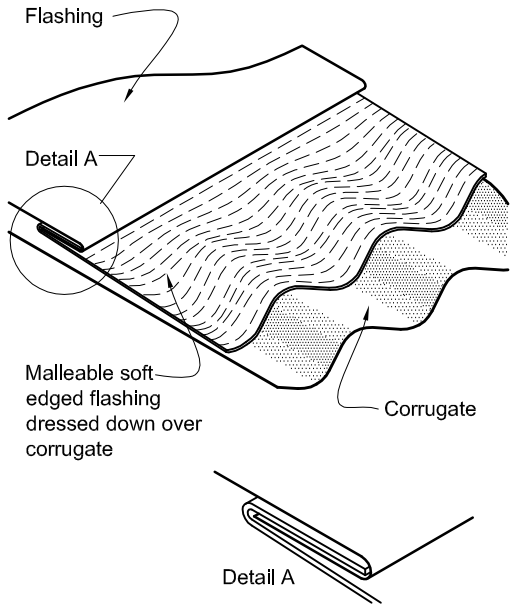

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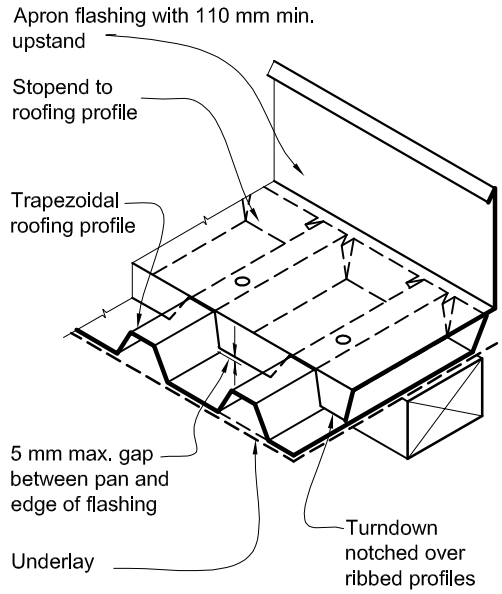
Figure 42: Trapezoidal notched flashing
Paragraphs 4.5, 8.4.11 and 8.4.12

NOTE: *Apron flashing* cover varies according to *wind zone* - refer Table 7.



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8.4.12 Flashing details

The *roof* shall be flashed using details shown below:

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a) Ridge to hip as shown in Figure 43,

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b) *Apron flashing* and change in pitch as shown in Figure 44,

c) *Eaves* and roof/wall ridge as shown in Figure 45,

d) *Eaves flashing* as in Figure 45(a) required for all roofs under 10° pitch and soffit widths less than 100 mm,

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e) Ridge and hip as shown in Figure 46,

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f) Barge *flashings* as shown in Figure 47,

g) *Apron flashing – parallel flashing* to profile as shown in Figure 48.

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COMMENT:

Reduced cover for barge and *apron flashings* may be applicable for specifically designed *roofs* in low *wind zones*.

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Refer to the New Zealand Metal Roof and Wall Cladding Code of Practice for additional guidance on ridge to hip *flashings*.

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Figure 43: Ridge to hip flashings
Paragraphs 8.4.11 and 8.4.12

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NOTE: *Flashing* cover varies according to *wind* zone - refer Table 7.
For other ridge to hip flashings refer to New Zealand Metal Roofing and Wall Cladding Code of Practice.

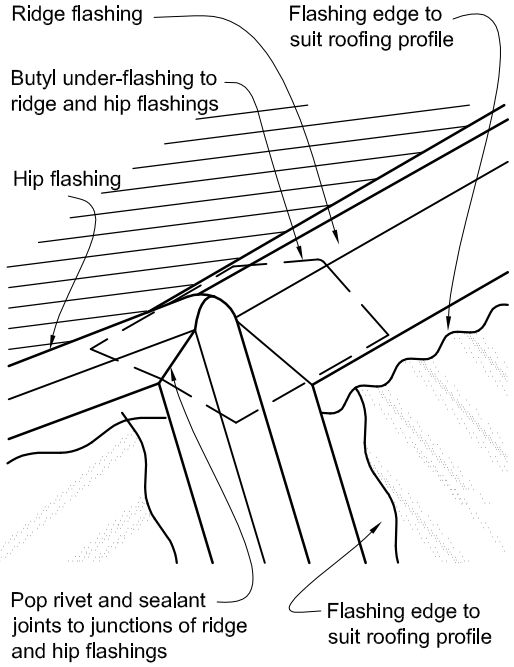

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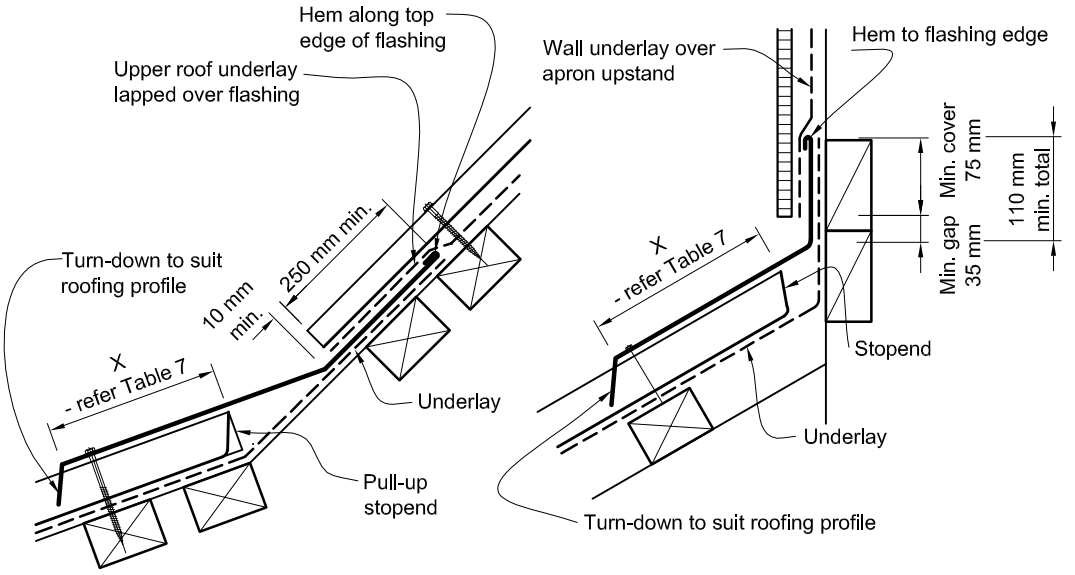
Figure 44: Apron flashing and change in pitch for profiled metal
Paragraphs 4.5, 8.4.11, 8.4.12, Table 7

NOTE: X = variable according to *wind zone* – refer Table 7.



(a) CHANGE IN PITCH

(b) APRON FLASHING

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Figure 45: **Eaves and roof/wall ridge for profiled metal**
Paragraphs 4.5, 8.4.11, 8.4.12, Table 7

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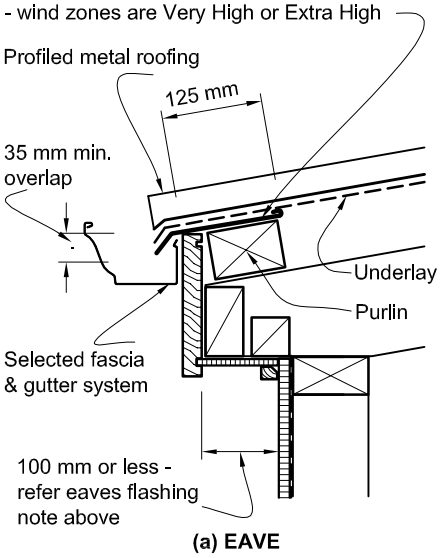
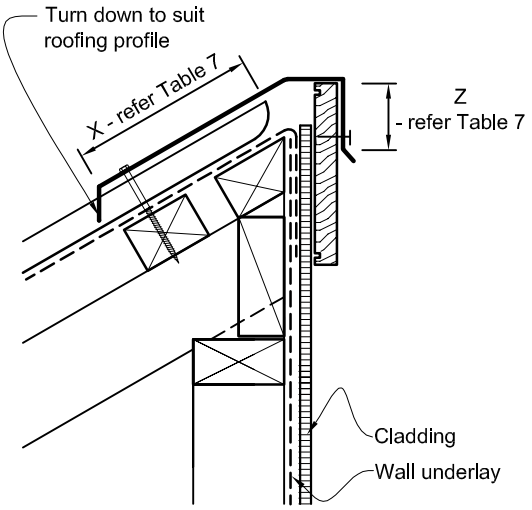
Eave flashing required where all of the following conditions are met:
- Roof slope less than or equal to 10°, and
- soffit width less than or equal to 100 mm, and
- wind zones are Very High or Extra High



(a) EAVE



(b) ROOF / WALL RIDGE

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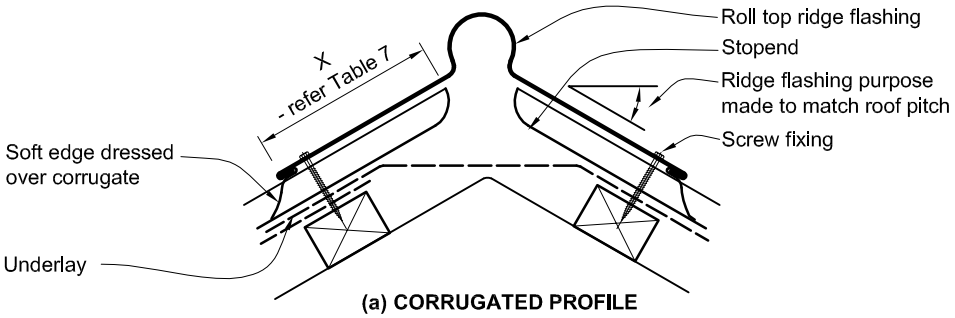
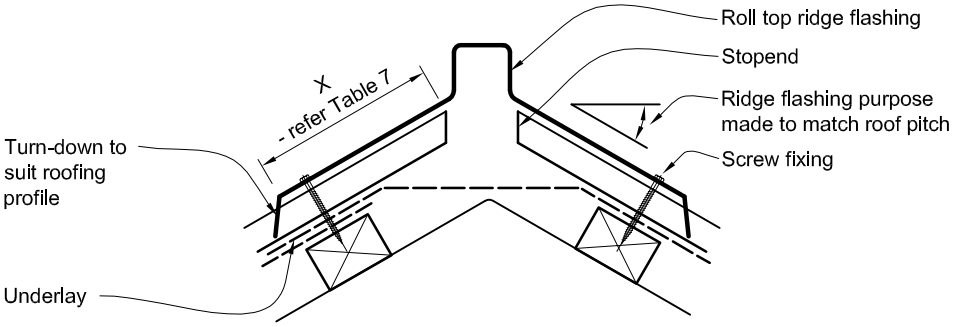
Figure 46: **Ridge and hip flashings for profiled metal**
Paragraphs 4.4, 4.5, 8.4.11, 8.4.12, Table 7



(a) CORRUGATED PROFILE



(b) TRAPEZOIDAL PROFILE

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Figure 47: Barge flashings for profiled metal
Paragraphs 8.4.11, 8.4.12, Table 7

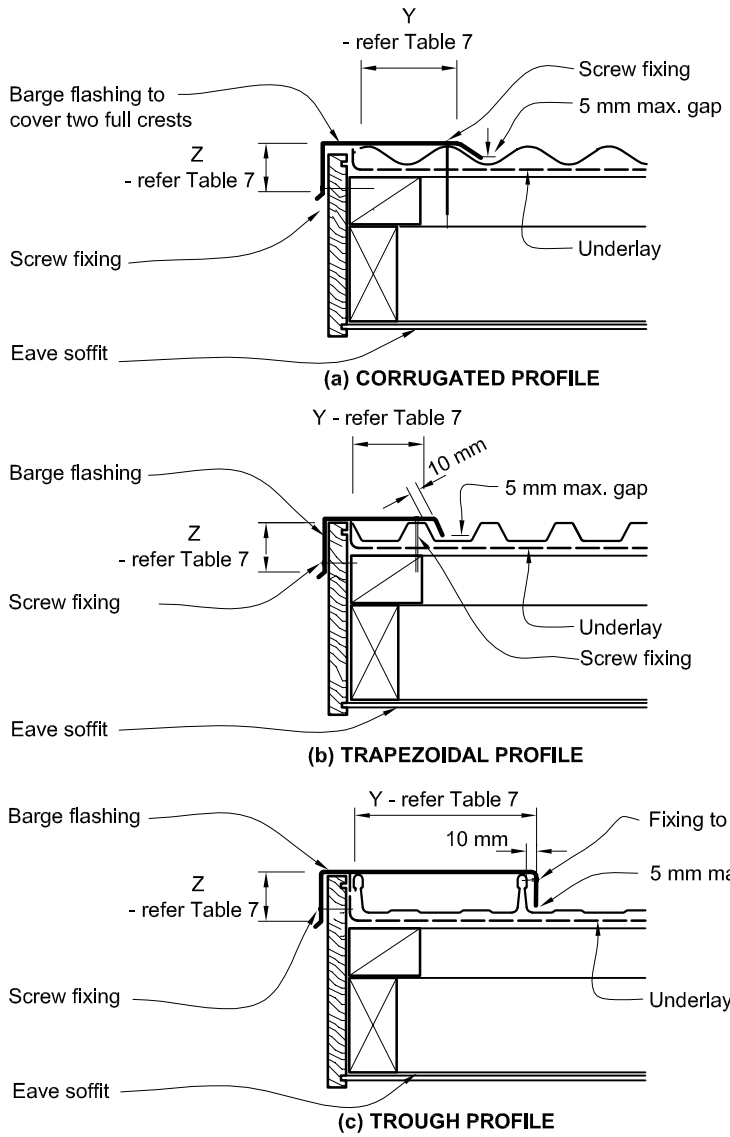

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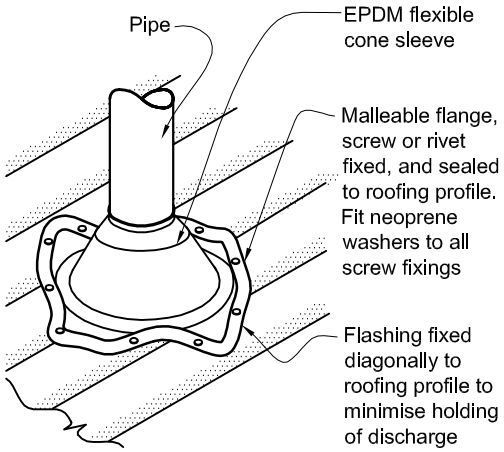
Figure 53: Flashing for small pipes
Paragraphs 8.3.10, 8.4.17, 9.6.8.5 and 9.6.9.6



NOTE:
(1) Max. roof pitch for this flashing 45°, minimum pitch 10° if base of flange covers one or more complete troughs.
(2) For pipes up to 85 mm diameter.

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Figure 54: Soaker flashing for pipe penetrations
Paragraph 8.4.17

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NOTE: (1) Suitable for pipes from 86 mm to 500 mm diameter.
(2) Suitable only for roof pitches of 10° or more.

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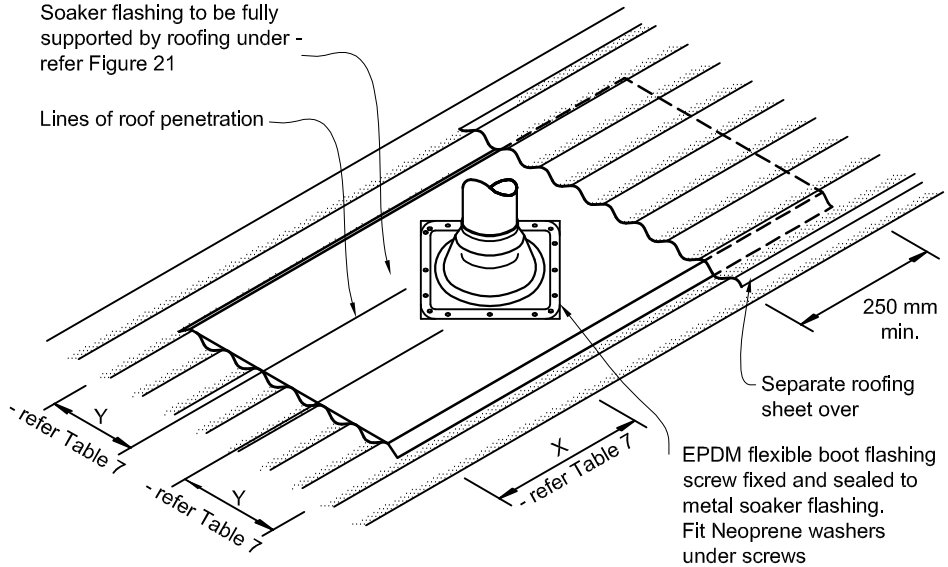

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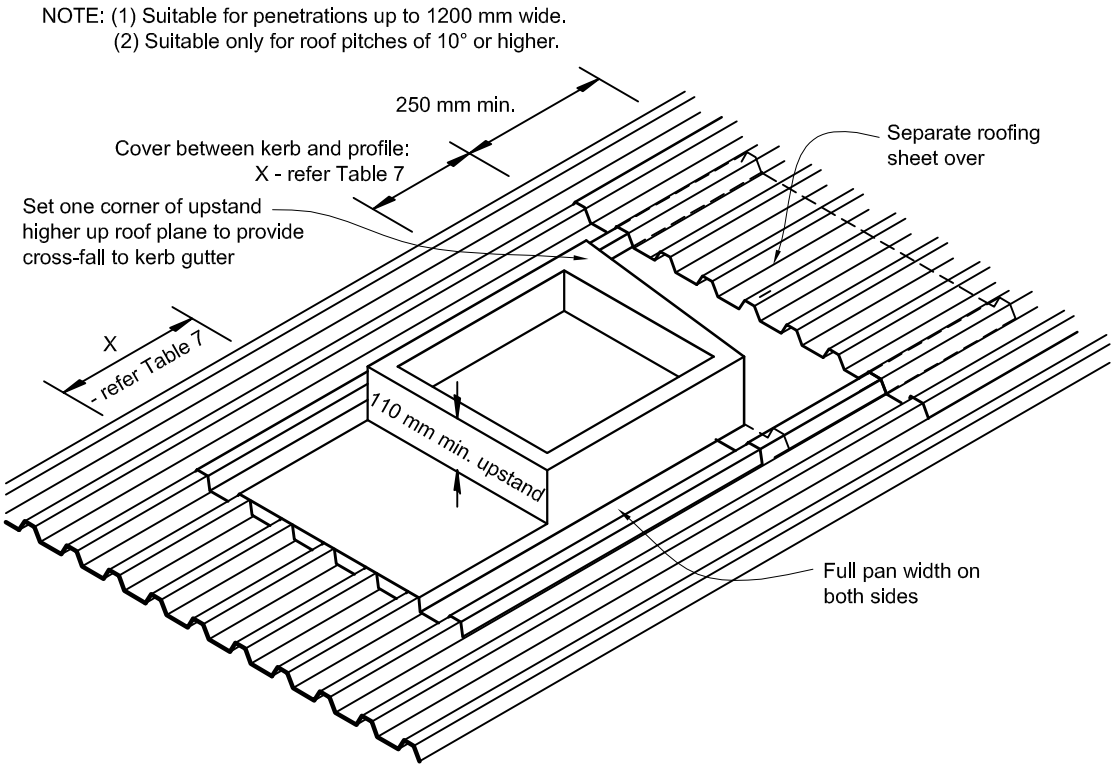
Figure 55: Soaker flashing for other penetrations
Paragraph 8.4.17, Table 17



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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:

Refer to E1/AS1 for specific drainage requirements outside the scope of this Acceptable Solution.

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

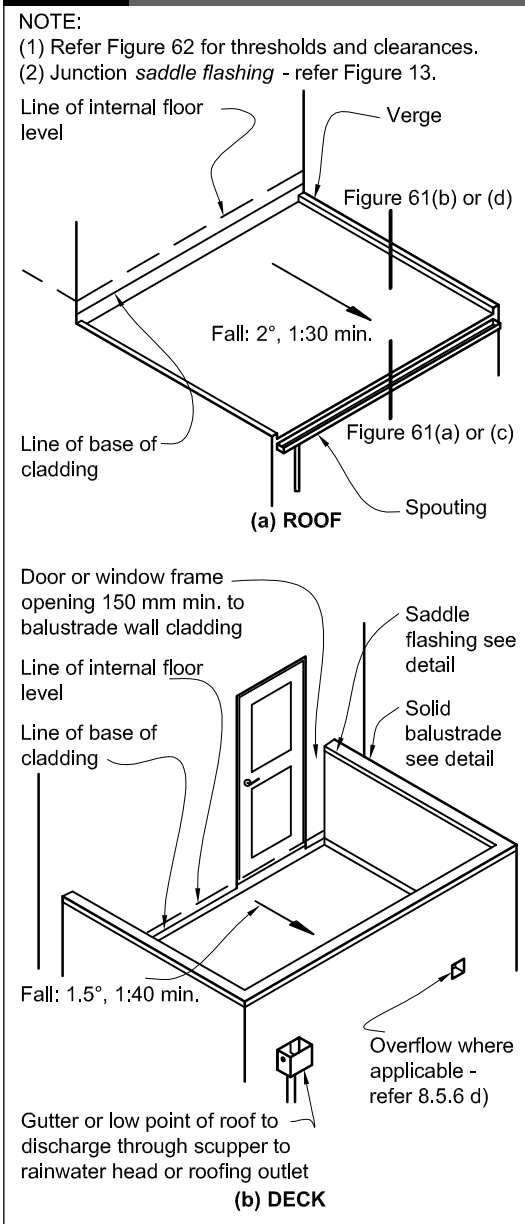

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Figure 57: External corner in upstand
Paragraph 8.5.8, Figures 59, 62, 63 and 64

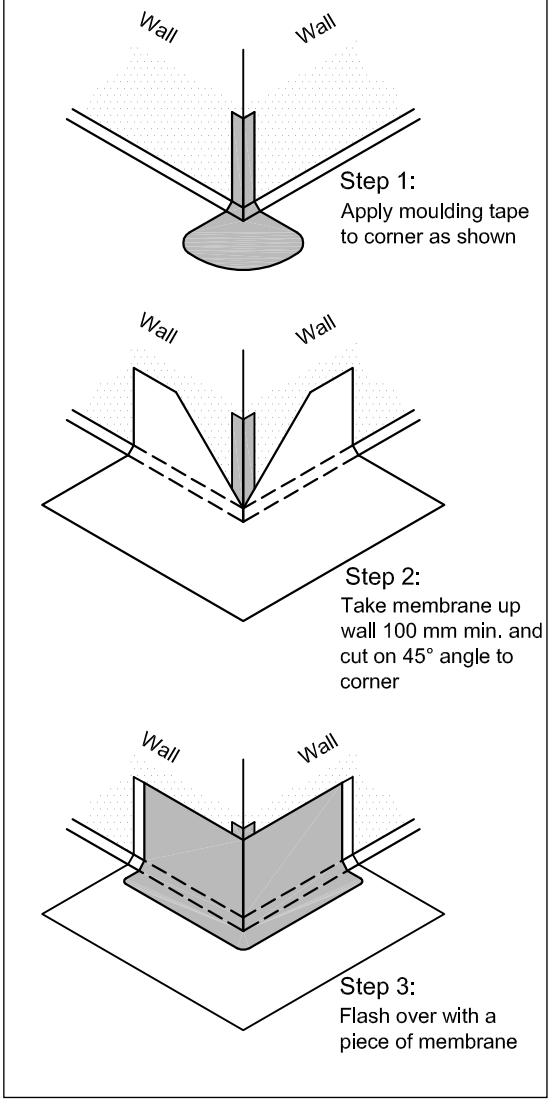

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Figure 58: Internal corner in upstand
Paragraph 8.5.8, Figures 62 and 64

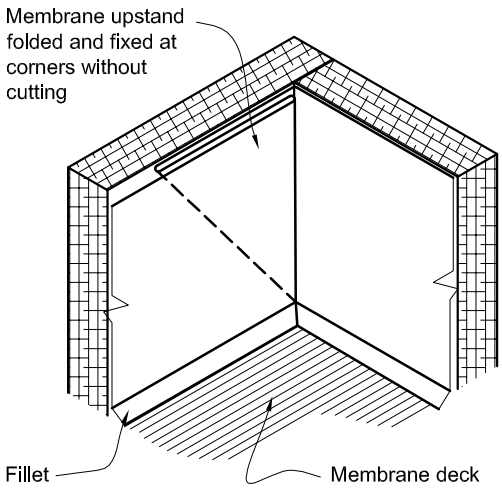

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Figure 59: Roofing penetration in membrane
Paragraphs 8.5.8 and 8.5.9

NOTE: (1) For maximum penetration size of 1200 mm x 1200 mm.
(2) External corners to be formed as shown in Figure 57.

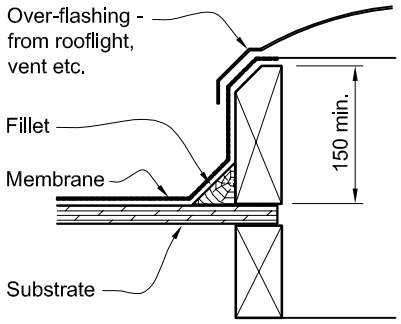

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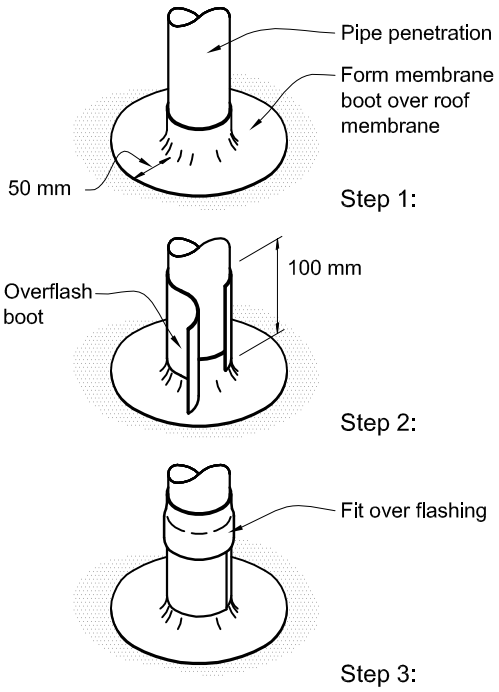
Figure 60: Pipe penetration in membrane
Paragraph 8.5.9



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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.

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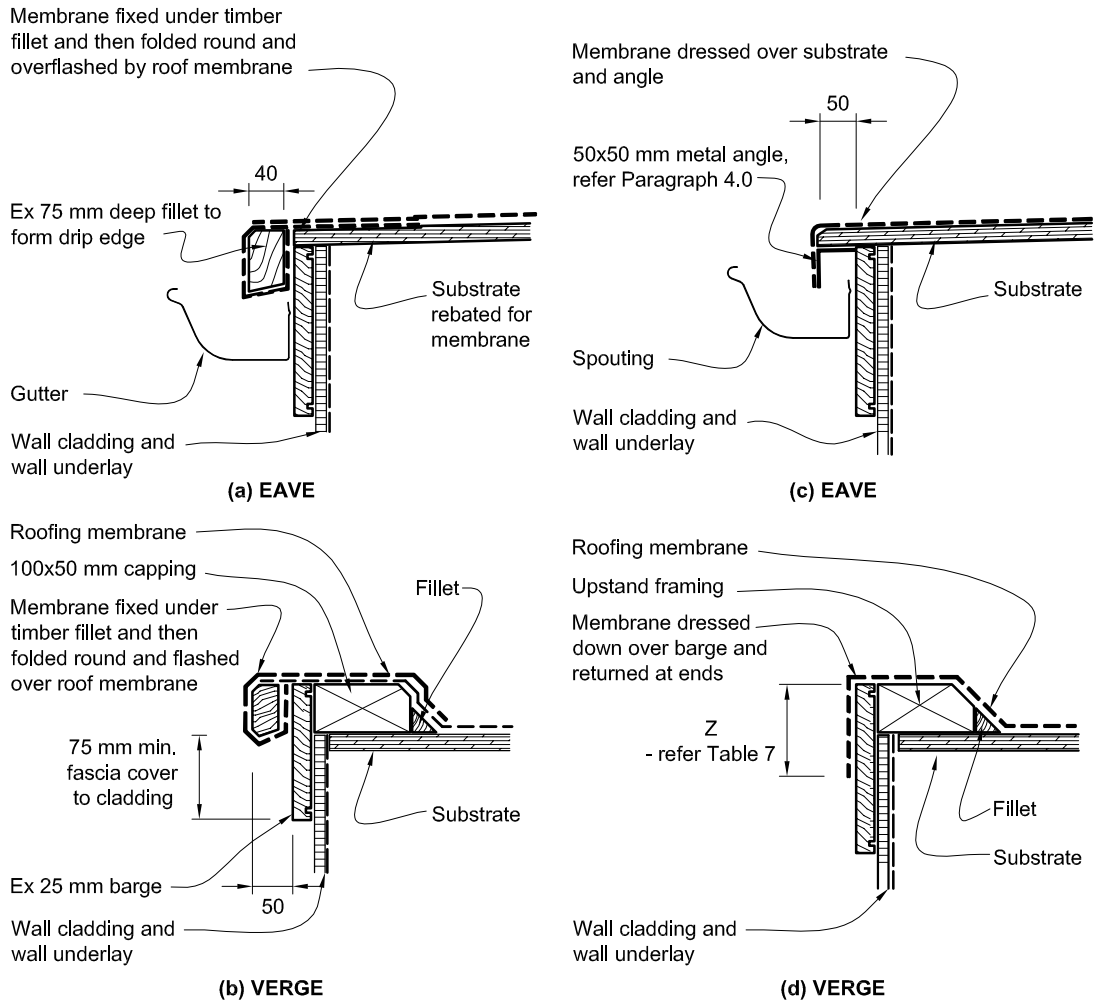
Figure 61: Verges in membrane
Paragraph 8.5.8, Figure 56



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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:
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.

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

8.5.10 Gutters

Deck gutters and internal outlets shall be *constructed* as shown in Figure 64.

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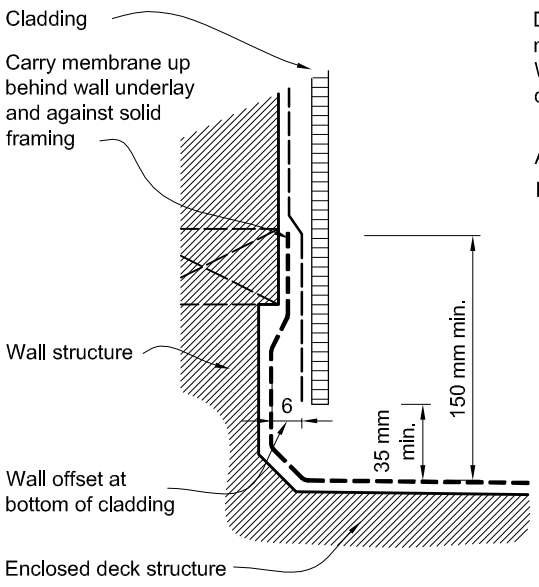
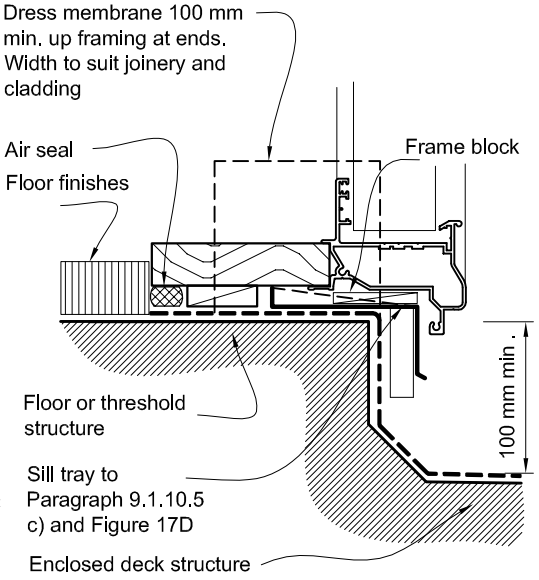
Figure 62: Junctions with walls for membrane
Paragraph 7.4.3, Figure 56

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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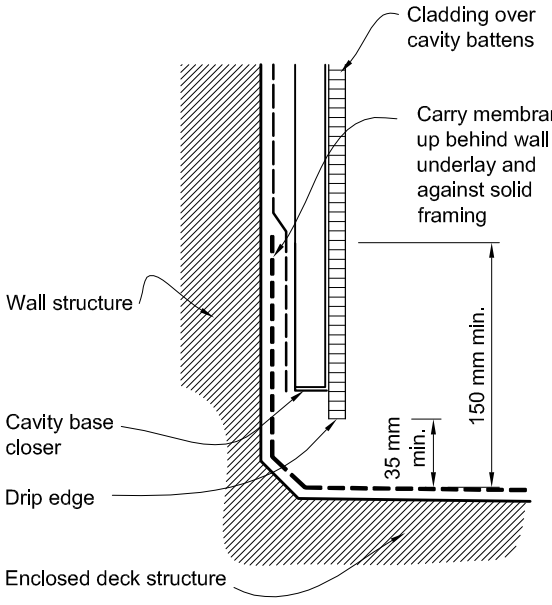
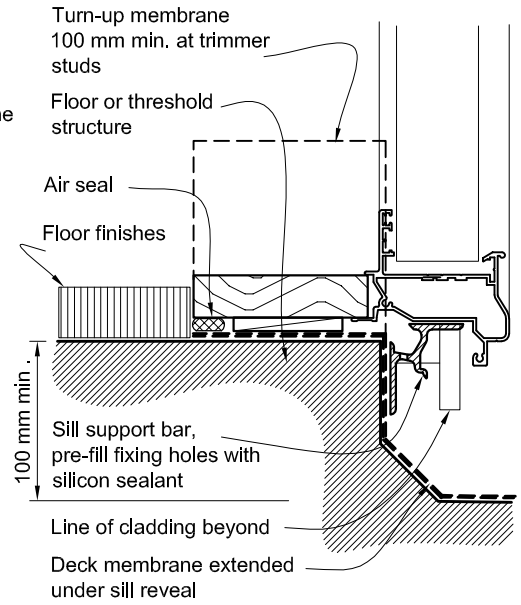


(c) CAVITY FIXED CLADDING



(d) CAVITY THRESHOLD AT OPENING

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9.1.8.3 Vermin-proofing

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Vermin-proofing shall be provided above window and door heads and at the base of the *drained cavity*. Figure 66 provides one example of an appropriate cavity closer.

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Aluminium, stainless steel or uPVC in accordance with Paragraph 4.1 shall be used where vermin-proofing material is not readily accessible or replaceable.

Vermin-proofing shall:

a) Provide holes or slots between 3 mm and 5 mm,

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b) Provide an area of opening of 1000 mm^2 per lineal metre of *wall*, and

c) Be positioned to allow a minimum *drip edge* to the *wall cladding* of:
   i) 10 mm at the base of *walls*, and
   ii) 15 mm above window and door head *flashings*.

COMMENT:

It is important the openings in vermin-proofing are kept clear and unobstructed in order to maintain draining and venting of the cavity. The closure shown is only one option for vermin-proofing. Provided openings are as specified, other dimensions can vary, so allowing the use of other shapes such as channels and right-angles.

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9.1.8.4 Cavity battens and jamb battens

Cavity battens shall:

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a) Be nominal 20 mm (between limits of 18 mm and 25 mm in thickness),

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b) Be a minimum 45 mm wide,

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c) Be fixed, by the *cladding* fixings, through the *wall underlay* into the *framing*,

d) If timber, comply with B2/AS1,

e) If polystyrene, comply with Paragraph 9.9.3.1, and be protected from any incompatible vapours from timber treatment.

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Cavity battens and/or cavity spacers that meet E2/VM1 Class 1 testing and B2/AS1, permit air circulation are allowed. The Class 1 test must include a horizontal *cladding* joint supported on a cavity spacer batten of a proposed type.

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Jamb battens shall:

f) be nominal 20 mm (between limits of 18 mm and 25 mm in thickness), minimum 45 mm wide, and of timber complying with B2/AS1. Refer to Figure 72A.

COMMENT:

The solvents from freshly LOSP-treated timber may melt polystyrene, so these should not be used together.

Solid horizontal cavity spacers risk obstruction of air flow in cavities and risk bridging moisture across the cavity.

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Battens will be fixed by the *cladding* fixings, which will penetrate the *wall framing*. Battens will therefore need only temporary fixing until the *cladding* is fixed. Polystyrene battens may be temporarily adhered to the *wall underlay*.

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9.1.8.5 Wall framing behind cavities

Dwangs shall be at a maximum of 1350 mm centres generally and maximum 480 mm centres for *direct-fixed* vertical weatherboard profiles, and vertical metal corrugated and symmetrical *trapezoidal claddings*.

Where *stud* spacings are greater than 450 mm, and flexible *wall underlays* only are used, an intermediate means of restraining the flexible *wall underlay* and insulation from bulging into the *drained cavity* shall be installed. Acceptable means of achieving this are by using:

a) 75 mm galvanized mesh or wire galvanized in accordance with AS/NZS 4534,

b) Polypropylene tape or galvanized wire at 300 mm centres fixed horizontally and drawn taut, or

c) Vertical cavity battens at 300 mm centres maximum.

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9.1.9 Penetrations

9.1.9.1 Penetrations through cavities

Window penetrations through cavities shall meet the requirements of Paragraph 9.2 to Paragraph 9.9.

9.1.9.2 Other cavity penetrations

Where penetrations of the *wall cladding* are wider than the *cavity batten* spacing, allowance shall be made for air flow between adjacent cavities by leaving a minimum gap of 10 mm between the bottom of the vertical *cavity batten* and the *flashing* to the opening.

9.1.9.3 Pipes and service penetrations

Pipes and service penetrations shall be made *weathertight* by using methods shown in Figures 68 and 69. *Flashing* tape complying with Paragraph 4.3.11, and sealant complying with:

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a) Type F, Class 20LM or 25LM of ISO 11600, or

b) low modulus Type II Class A of Federal Specification TT-S-00230C.

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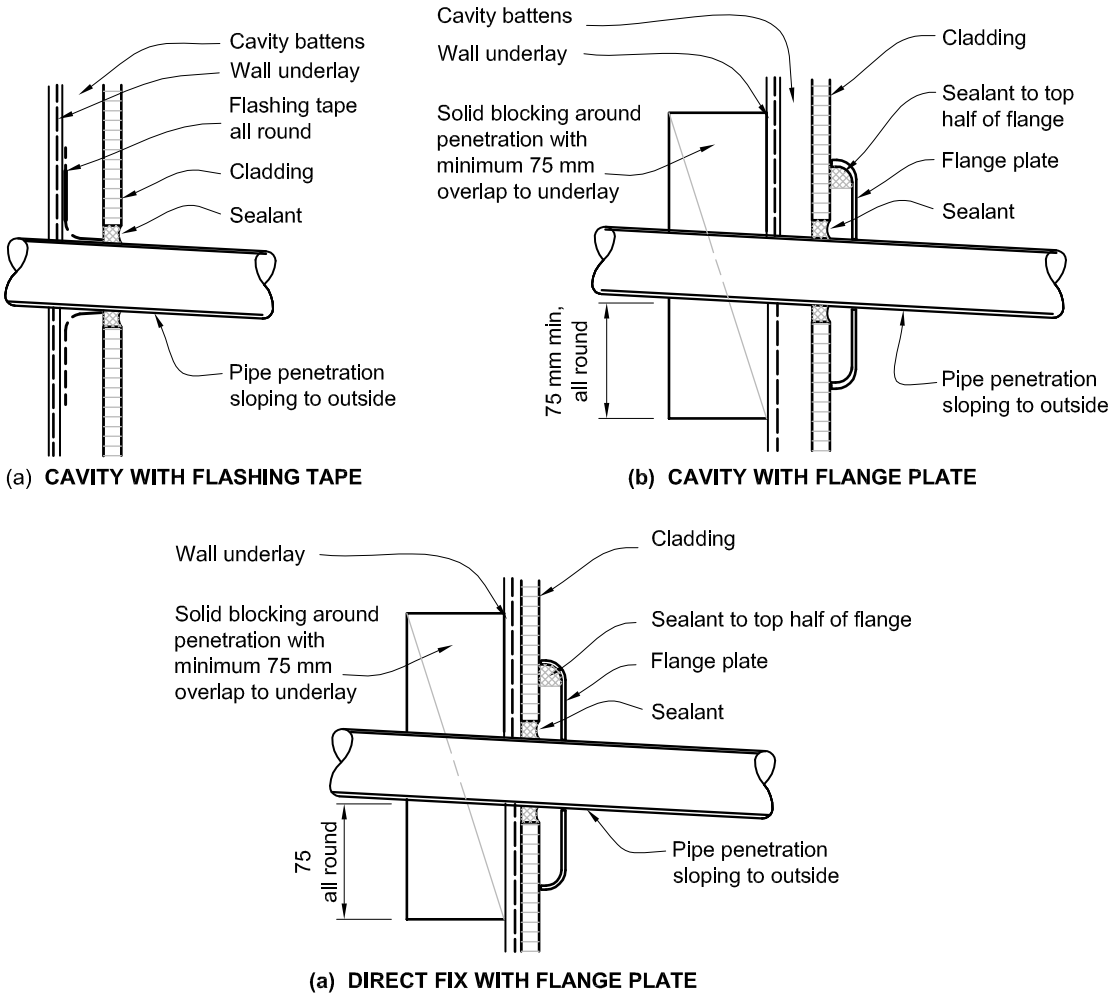
Figure 68: General pipe penetration
Paragraph 9.1.9.3, Figure 126



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COMMENT:
Where possible, pipe penetrations, meterboxes and similar penetrations should be located in sheltered areas of the *building*, such as a porch, or be installed behind a weatherproof glazed panel.

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9.1.10.4 Head flashings

Head *flashings* shall be in accordance with Paragraph 4.6.1.6 and Table 7, unless specifically shown otherwise, and shall:

a) Direct water to the outside of the *wall cladding*, and

b) Finish to the window head with clearance dimensions shown in Figure 71

c) For *direct fixed claddings*, have 50 mm bead of sealant installed between *cladding* and each end of the head *flashing*

d) For *wall claddings* on cavity *walls*:

i) incorporate 10 mm turn-ups as *stop-ends*, terminating at the inside face of the *cladding* so they do not pass through the *cladding*, and

ii) permit ventilation of the *drained cavities* above, by the installation of cavity base closers as shown in Figure 66.

e) For Very High and Extra High *wind zones*, have sealant installed between underside of head *flashing* and top edge of window head flange – refer Figure 71 (c) .

COMMENT:

Stopends are useful to prevent water moving past the ends of head *flashings*. However, additional problems of weatherproofing occur where the *stopend* penetrates the *cladding*.

9.1.10.5 Window and door sills

a) *Direct fixed claddings* shall have

i) sill tray *flashings* as shown in Paragraphs 9.2 to 9.9 for each *cladding* type. The sill *flashing* shall extend back past the condensation channel of the window. Ensure flat sill trays do not slope backwards. The 5 mm gap between the window facing and sill tray must not be sealed.

ii) *direct fixed* door sills, installed as for windows, and as shown in Figure 17D.

b) *Claddings* over a *drained cavity* shall have:

iii) window sills as shown in Paragraphs 9.2 to 9.9, without sill *flashings*

iv) door sills as shown in Figure 17C.

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v) Sill support bars and mechanisms for all doors, and for windows with a trim opening wider than 600 mm. Support bars and mechanisms shall comply with BRANZ Evaluation Method EM6, E2/VM1 and B2/AS1. Support bars and mechanisms must be installed prior to installation of the window or door.

COMMENT

Support bars and mechanisms are rated for their capacity to support the total weight of a joinery unit when installed at given offsets from the frame depending on *cladding* type. Designers select the an appropriate complying support mechanism for the joinery weight. Manufacturers provide build-in instructions for support bars and mechanisms.

c) Mitred aluminium window and door sills, for both *cavity* and *direct fixed*, shall have a corner soaker fitted to the back of the sill/jamb joint and installed at point of manufacture. The soaker will be designed to act as a secondary device to prevent water ingress to the *building* in support of the primary mitre seals. Soaker materials shall be either uPVC, aluminium, polypropylene, high impact styrene or other semi rigid moulded polymeric material.

Sill support bars and mechanisms must be designed to not impede the possible drainage of water from surfaces of sill *flashing* tape, and permit an air passage (of at least 1000 mm^2/m sill width) from the *drained cavity* to the window/door trim cavity.

9.1.10.6 Window and door jambs

Jamb *flashings* shall be installed as shown in Paragraphs 9.2 to 9.9.

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Where required, jamb *flashings* shall overlap sill *flashings*, and direct moisture to the outside face of the *cladding system*.

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9.1.10.7 Closed cell foam tape

Compressible foam tape shown behind window facings and *cladding* joints shall be closed cell PVC foam, with:

a) Hardness 55-60 to ASTM D2240 Scale OO,

b) Grade VE-43 to ASTM D1667,

c) Compression set of 20% maximum to ASTM D1667, and

d) UV weathering in UV Weatherometer for 1500 light hours to ASTM G154 or ASTM G155 with no visible deterioration in appearance.

9.1.10.8 Attachments for windows and doors

Install windows and doors using pairs of minimum 75 x 3.15 galvanised jolt head nails or 8 gauge x 65 mm stainless steel screws, through reveals into surrounding *framing* at:

a) Maximum 450 mm centres along sills, jambs and heads, and

b) Maximum 150 mm from reveal ends.

Install packers between reveals and *framing* at all fixing points, except between head reveals and lintels.

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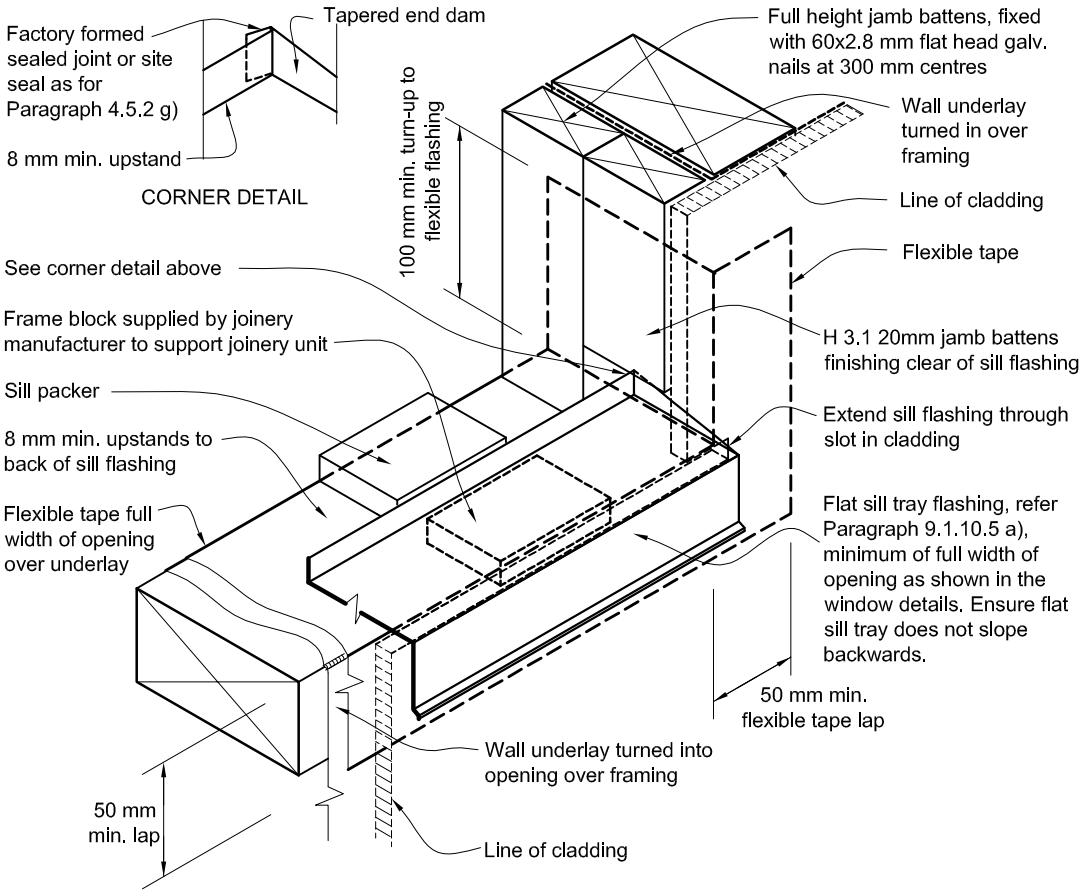
Figure 72A: **General window and door opening for direct fixed**
Paragraphs 9.1.5, 9.1.10.2, Figures 81, 82, 83, 84, 90, 95 and 115

NOTE:
(1) Detailed *cladding* omitted for clarity, refer to specific *claddings*.
(2) Sill *flashing* shall extend back past the condensation channel of the window.
(3) Head to be treated similarly with continuous *building underlay* and *flexible tape* at corners.
(4) Refer individual *cladding* details for jamb *flashings* and sill tray return requirements



Errata 2 Dec 2011

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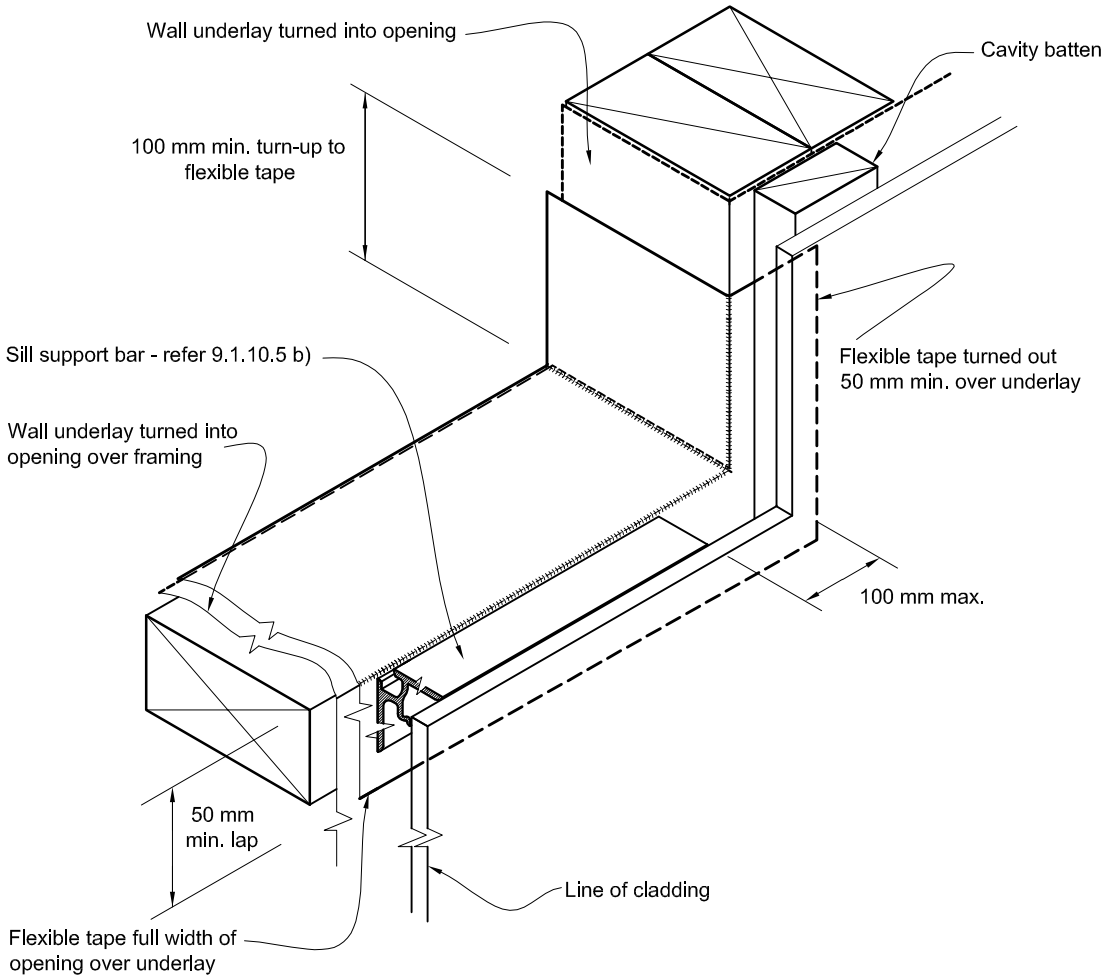
Figure 72B: **General window and door opening with drainage cavity**
Paragraphs 9.1.5, 9.1.9.3, 9.1.10.2, Figures 73C, 76, 85, 86, 91, 99, 116 and 128

NOTE:
(1) Detailed *cladding* omitted for clarity, refer to specific *claddings*.
(2) Head to be treated similarly with continuous *wall underlay* and *flexible tape* at corners.
(3) Refer individual cladding details for jamb flashings.



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9.2 Masonry Veneer

9.2.1 Limitations

This Acceptable Solution is limited to *masonry veneer cladding* attached to timber *wall framing* outlined in NZS 3604. *Masonry veneer* is either:

a) Clay brick, or

b) Concrete brick or block.

COMMENT:

Natural stone bricks or blocks may be suitable. However, they are not part of this Acceptable Solution. Refer to the manufacturer's recommendations for *specific design* information.

Refer to Paragraph 1.5 for qualification of installers.

9.2.2 General

1) The materials and workmanship of *masonry veneer* shall be in accordance with SNZ HB 4236 and have a maximum mass of veneer of 220 kg/m^2 and minimum veneer thickness of 70 mm

2) Masonry units shall be laid-up in running bond

3) Mortar, materials (cement, sand and admixtures) shall comply with NZS 4210

(4) Mortar joints less than 24 hours old shall not be subject to vibration, such as would result from the nailing of interior *linings*

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9.2.3 Installation

Masonry veneer construction shall be as shown in Figure 73B, and have:

a) A maximum height of veneer above adjacent *finished ground level* of 7 m.

b) A maximum height of veneer of 4.0 m, measured from the top of the concrete masonry *wall*, foundation *wall* or slab edge foundation. In the case of a veneer faced concrete block *wall* or foundation *wall* height is measured from the top of that *wall*.

c) A maximum height of veneer of 5.5 m on a gable end *wall*.

d) A minimum *wall* or panel width of 230 mm.

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Note: The bracing demand for framing supporting *masonry veneer* is determined from values listed in NZS 3604.

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COMMENT:

Refer to Paragraph 1.5 for qualification of installers

9.2.4 Flashings

1) Sill and head *flashings* shall be as described in Paragraph 4.3 and be either:

   a) 1.5 mm butyl rubber– refer to Paragraph 4.3.9

   b) 2 ply asphaltic pliable *waterproofing membrane* – refer to Paragraph 4.3.10

   c) Pliable polyethylene minimum 0.5 mm thick complying with DPC/DPM Table 23.

2) Jamb *flashings* shall be:

   d) 2 ply asphaltic pliable *waterproofing membrane* complying with AS/NZS 2904

   e) Pliable polyethylene minimum 0.5 mm thick complying with DPC/DPM Table 23.

COMMENT:

For further information refer to ASTM C1330 for backing rod material performance.

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Figure 73A: Vertical control joint
Paragraph 9.2.8

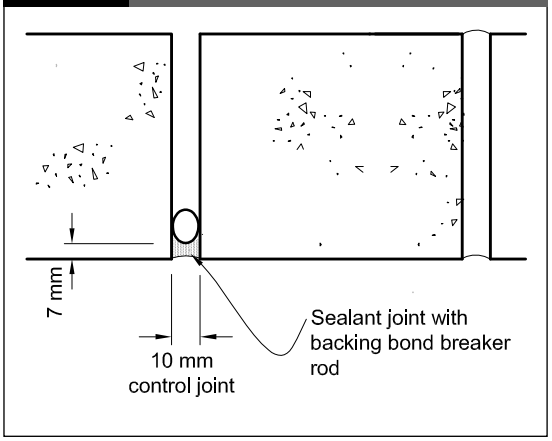

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Figure 73B: Masonry veneer height limitations
Paragraph 9.2.3

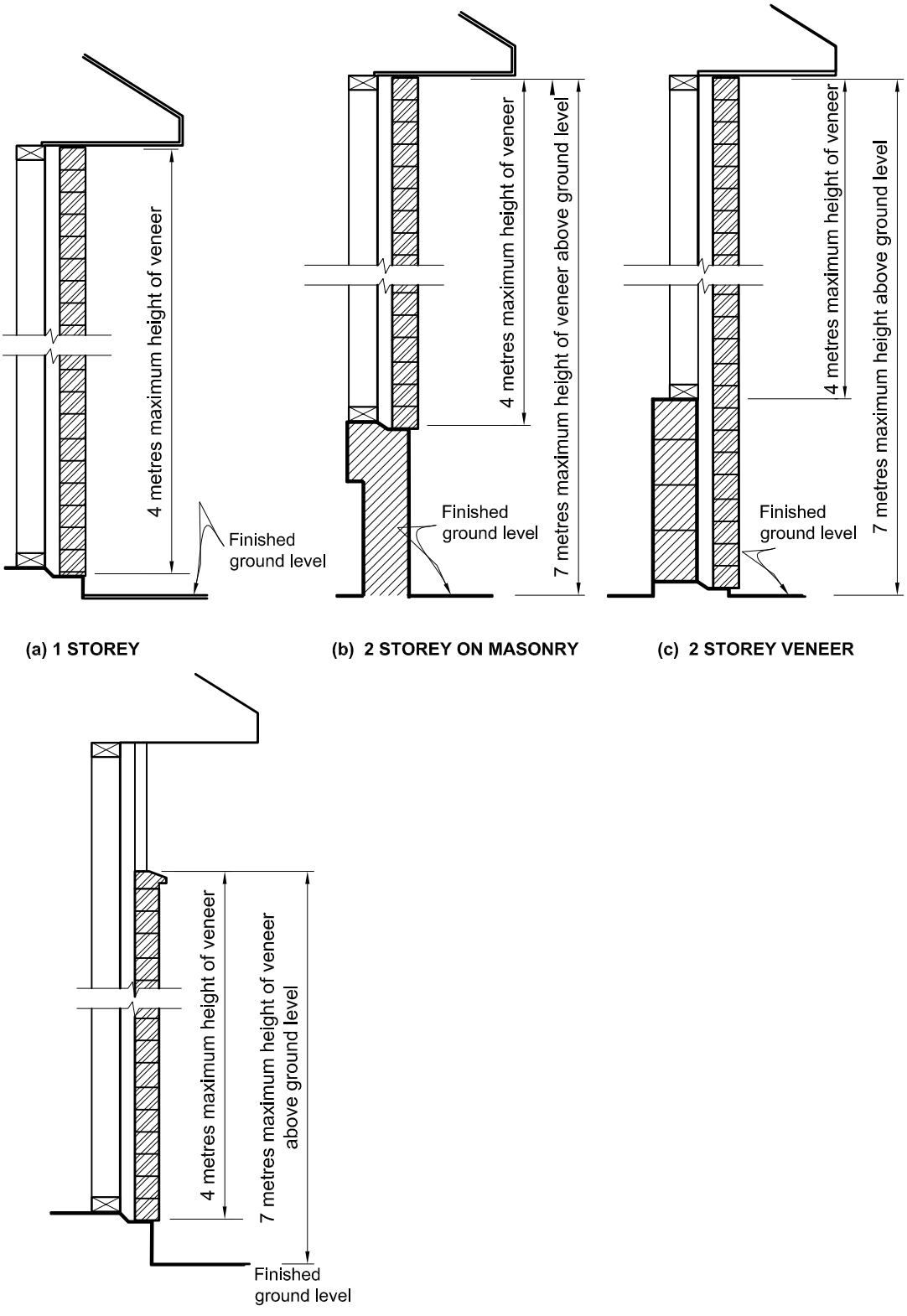

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Figure 73C: Masonry veneer window and door installation
Paragraphs 9.2.4, 9.2.6 and 9.2.9

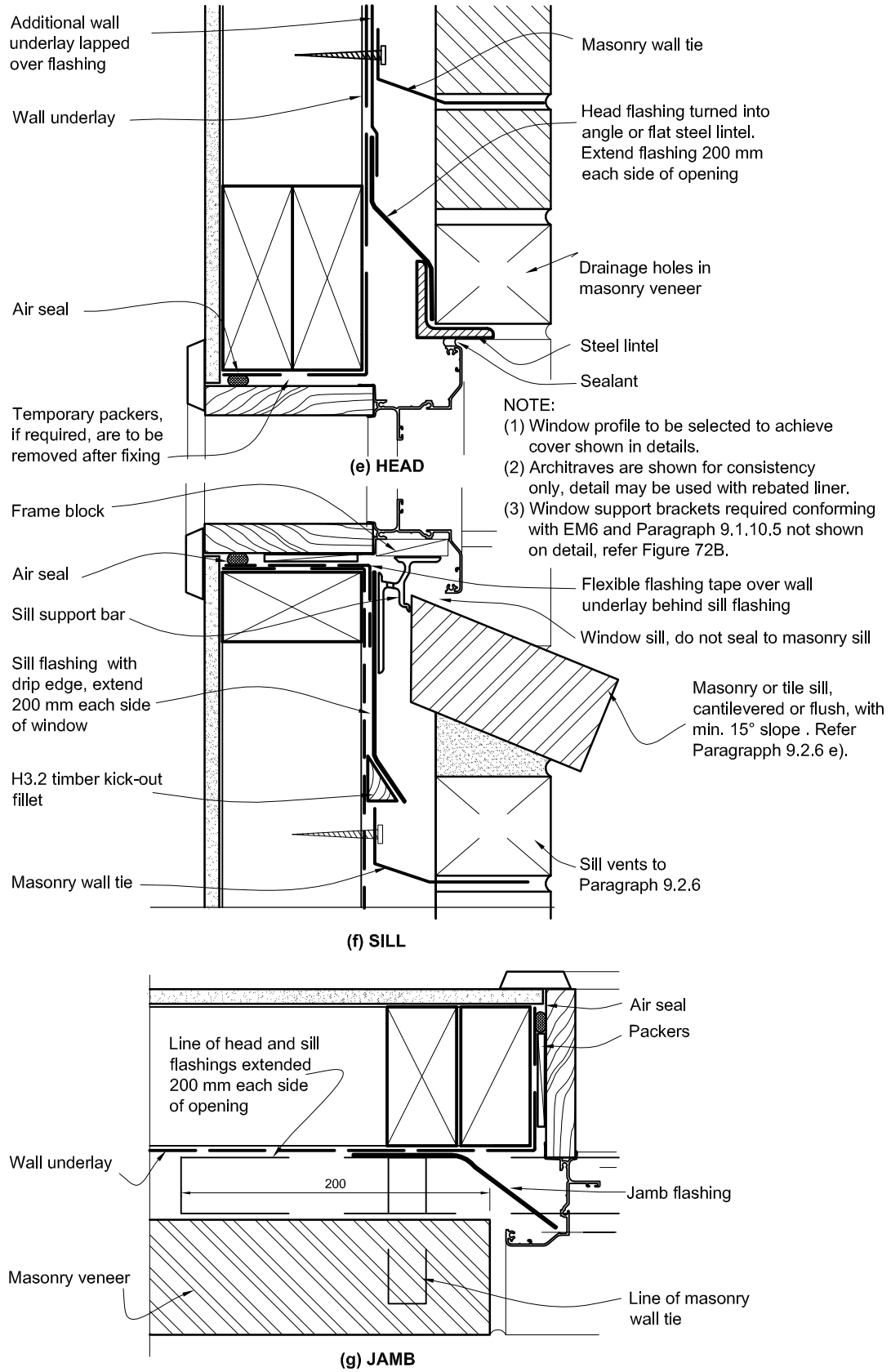

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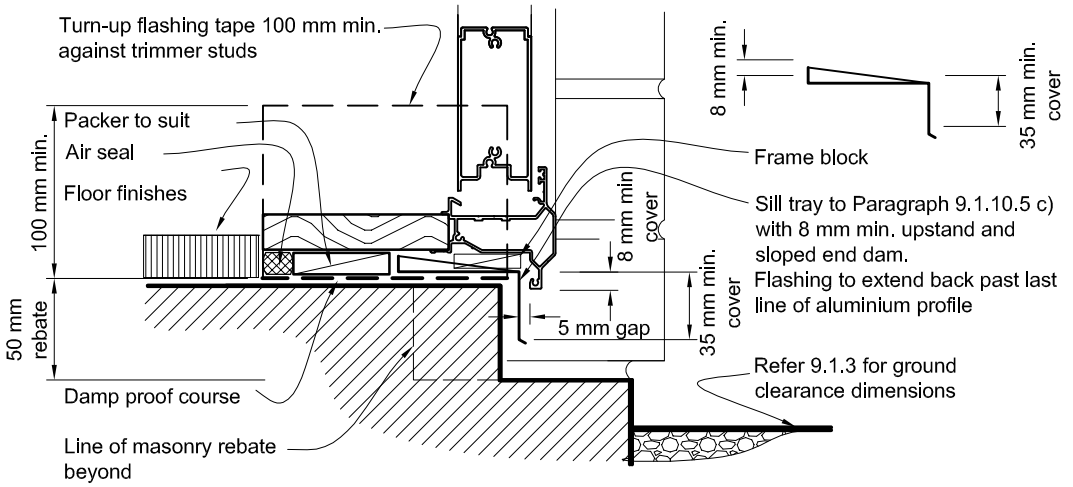
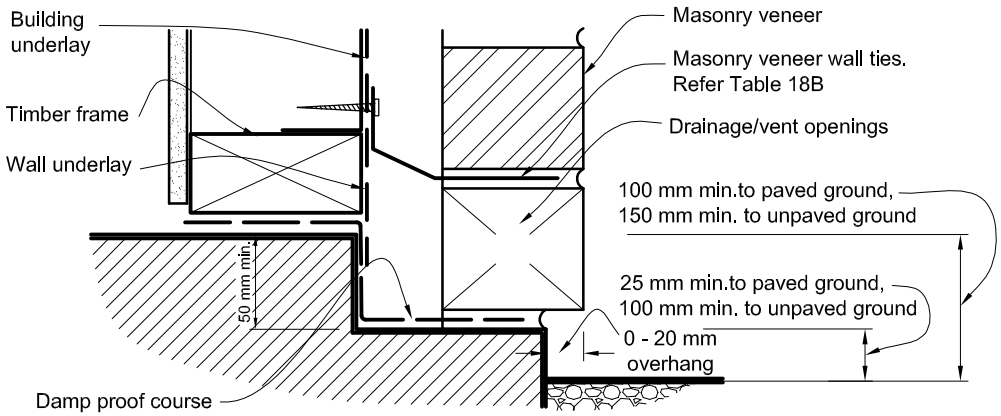
Figure 73D: Masonry veneer details
Paragraph 9.2.5



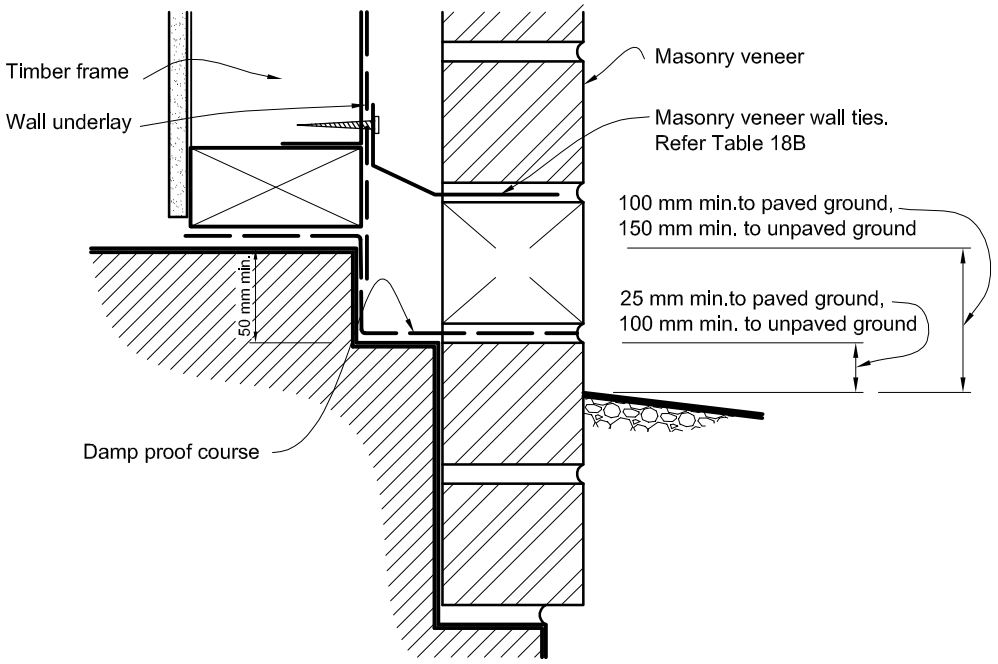
(h) MASONRY VENEER - DOOR SILL

Errata 2 Dec 2011



(i) MASONRY VENEER - FLOOR REBATE DETAIL

Errata 2 Dec 2011



(j) MASONRY VENEER - MASONRY BELOW GROUND

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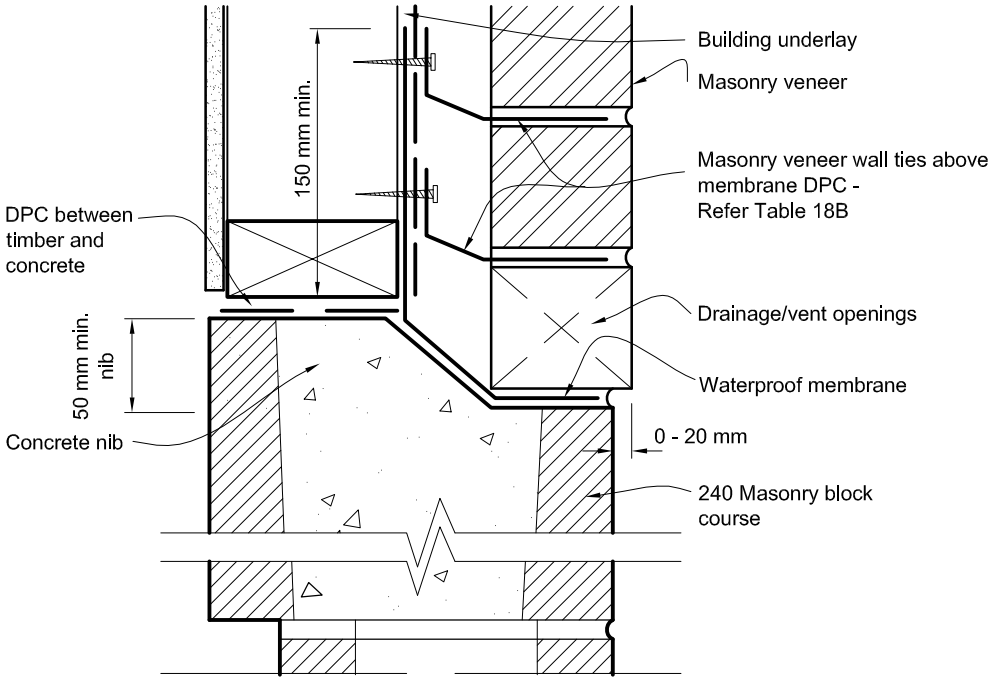
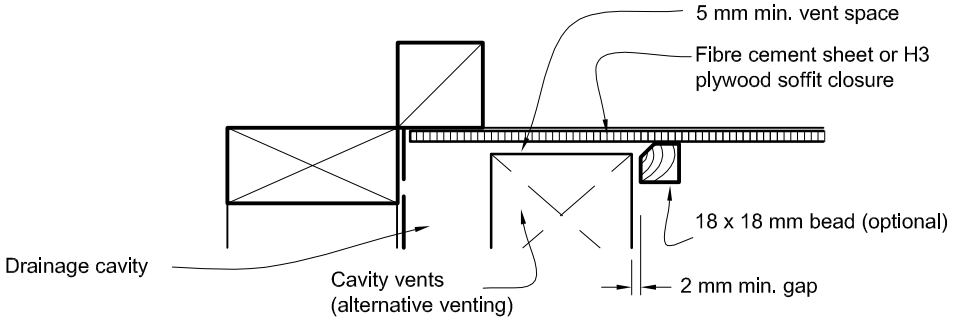
Figure 73E: Masonry veneer details
Paragraphs 9.2.5 and 9.2.6



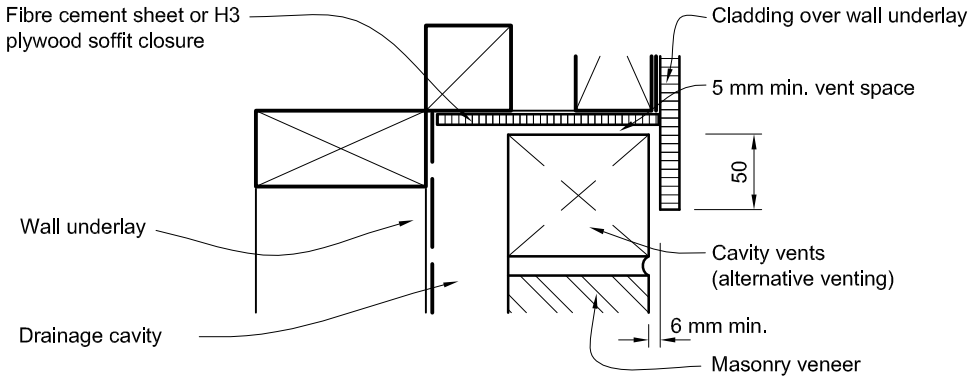
(k) MASONRY VENEER - ABOVE GROUND SUPPORT

Errata 2 Dec 2011



(l) MASONRY VENEER - SOFFIT DETAIL

Errata 2 Dec 2011



(m) MASONRY VENEER - CANTILEVER UPPER FLOOR

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9.2.5 Foundation support and damp proofing

1) *Masonry veneer* shall be supported by one, or a combination of the following:

   a) Concrete of masonry foundation *wall*
   b) Thickened slab edge footing
   c) Concrete or masonry lower storey *wall*.

2) The level of the concrete slab above ground shall comply with Figure 65.

3) The top of a foundation wall or concrete slab shall be stepped down, so that the surface supporting the veneer is 50 mm or more below the surface supporting the timber *framing*.

4) Provide a *damp-proof course* to the stepped rebates supporting *masonry veneer* adjacent to all habitable spaces and garages attached to habitable spaces. This includes stepped rebates in foundations, or on top of concrete or concrete masonry *walls* supporting veneers. Damp-proofing material shall be as outlined in Table 23 and be either:

   a) For rebates lower than ground floor level:
      i) two coats of bituminous liquid, or
      ii) 1.0 mm butyl rubber or bituminous sheet, or
      iii) 0.25 mm polythene or polyethylene *damp-proof membrane*.

   b) For rebates above ground floor level:
      i) 1.0 mm butyl rubber or bituminous sheet, or
      ii) 0.25 mm polythene or polyethylene *damp-proof membrane*.

5) Lap joints in *flashings* minimum of 150 mm.

6) Dimension rebates to accommodate the required cavity width in Paragraph 9.2.6 and the thickness of the veneer so that the veneer is supported within the tolerances outlined in Figures 73D and E.

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9.2.6 Cavities

Paragraphs 9.1.8.2(a), 9.1.8.5, and 9.1.9.3 shall apply to *masonry veneer* cavities.

a) The clear width of cavity between the *masonry veneer* and the exterior face of the *wall underlay* or bracing attaching to timber *framing* shall not be less than 40 mm or more than 75 mm wide measured at any part of the cavity.

COMMENT:
It is important to maintain the minimum cavity width of 40 mm after allowing for construction tolerances and thicknesses of *wall underlays* and sheet bracing.

b) Pipes and services shall not be placed in the cavity other than passing directly through the cavity to the exterior.

c) The cavity shall be drained and vented to outside at the bottom of wall panels, and above openings by open perpends that:

   i) are a minimum of 75 mm in height, by the width of the vertical mortar joint
   ii) at centres not exceeding 800 mm (where drainage/weep holes are less than 75 mm high, decrease spacing to give a ventilation area of 1000 mm^2/m wall length)
   iii) are fitted with vermin proofing where gaps greater than 13 mm exist.

d) The cavity shall be ventilated to the outside at the top of *walls* by either similar vents as at the bottom, or a continuous 5 mm minimum gap between the top course and soffit board, with a cover bead to outside that maintains a minimum 2 mm gap to masonry – refer to Figure 73E(l).

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e) The cavity shall be vented under openings exceeding 2.4 metres wide through gaps in perpends positioned at 1/3 points along the opening except at opening ends. Where these vent openings are used, protect from water entry using cantilevered sill bricks, as shown in Figure 73C (f).

f) The cavity shall be sealed off from the floor and *roof* space.

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Table 18A: Specification of maximum tie spacings for type B (4) veneer ties
Paragraph 9.2.7

Seismic zone Refer NZS 3604	Masonry veneer Less than 180 kg/m²			Masonry veneer 180 – 220 kg/m²			Masonry veneer more than 220 kg/m²
	Tie type (4)(5)	Maximum spacings (1) Horizontal	Vertical	Tie type (4)(5)	Maximum spacings (1) Horizontal	Vertical	
1	EL	600	400	EM	600	400	SED (2)
2 (6)	EM	600	400	EH (3)	600	400	SED (2)
3	EH (3)	600	400	EH (3)	600	400	SED (2)
4	SED (2)	SED (2)	SED (2)				

NOTES

(1) Maximum masonry tie spacings of 600 mm horizontally and 400 mm vertically

(2) Spacing of ties to be determined by specific engineering design

(3) EM may be used if the horizontal spacings do not exceed 400 mm and the vertical spacings do not exceed 300 mm

(4) Type B and Prefix E indicate masonry ties manufactured to AS/NZS 2699.1

(5) L (Light), M (Medium), H (High) indicate strength capability of ties in AS/NZS 2699.1

(6) Use seismic zone 2 (minimum) for Christchurch region comprising Christchurch City, Waimakariri District and Selwyn District.

COMMENT:
Variations in cavity width will require compensating adjustments to the length of masonry tie used.

9.2.7 Wall ties

Masonry veneer shall be attached to *wall framing* by *wall* ties. *Wall* ties and their spacings and embedment shall be in accordance with the requirements of NZS 4210 and Tables 18A, 18B and 18C. Screw fixings shall be minimum 12 gauge, 35 mm long hex washer face, galvanised or stainless steel to suit the ties required under Table 18C.

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Table 18B: Placement of wall ties
Paragraph 9.2.5 and 9.2.7

Location	Placement of masonry ties
Unsupported panel sides and edges of openings	Within 300 mm of panel side or edge.
Top of veneer panels and top of panels under openings	Within 300 mm or two courses (whichever is the smaller) of top of veneer
Bottom of veneer panel in masonry rebate sealed with liquid applied *damp-proof course*	Within 300 mm or two courses (whichever is the smaller) from bottom of veneer
Bottom of veneer panel supported on steel angle lintel	
Bottom of veneer panel in masonry rebate with *membrane damp-proof course*	In each of the first two courses

NOTES:

Ties are to be screw fixed (ie. non-impact method) using screws outlined in Table 24.

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9.2.7.1 Wall ties and screws shall be determined by the *durability* zone outlined in NZS 3604 and as outlined in Table 18C.

Table 18C: Corrosion protection to masonry wall ties
Paragraph 9.2.7

	316, 316L, or 304 stainless steel	470 g/m² galvanising on mild steel
Zone B	Yes	Yes
Zone C	Yes	Yes
Zones D and E	Yes	-

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9.2.8 Control joints

9.2.8.1 Clay bricks

Control joints in clay brick *masonry veneer* are not required, unless specified by the brick manufacturer.

9.2.8.2 Concrete bricks

Longitudinal shrinkage stresses in concrete *masonry veneer* shall be controlled by providing vertical *control joints* at not more than 6 m centres.

Vertical control joints shall be located:

(a) Within 600 mm of T joints

(b) Within 600 mm of L shaped corners or by restricting the spacing to the next *control joint* to 3.2 m maximum

(c) At changes in *wall* height, exceeding 600 mm

(d) At changes in *wall* thickness.

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Control joints shall be formed as shown in Figure 73A and comprise:

a) A backer rod of compressible foam, and

b) Sealant in compliance with:

i) Type F, Class 20LM or 25LM of ISO 11600, or

ii) low modulus Type II Class A of Federal Specification TT-S-00230C.

9.2.9 Openings in masonry veneer

Openings with *masonry veneer* above shall be spanned by steel angle lintels.

Openings in *masonry veneer* for meter boxes less than 500 mm wide may be installed without lintel bars or head *flashings* provided the meter box is sealed to *wall underlay* with flashing tape to Paragraph 4.3.11.

Separate steel meter boxes from direct contact with *masonry veneer* or mortar with flashing tape to Paragraph 4.3.11.

Lintels shall:

a) Be protected against corrosion as in Table 18D and to exposure zones outlined in NZS 3604.

b) Have a minimum seating into adjacent veneer of:

i) 100 mm for spans up to, and including 2 m,

ii) 200 mm for spans over 2 m.

c) Be sized in accordance with Table 18E.

Table 18D: Corrosion protection to lintels
Paragraph 9.2.9, Table 18E

	316 or 316L or 304(2) stainless steel or **600 g/m² galvanising on mild steel plus duplex coating(1)**	**600 g/m² galvanising on mild steel(1)** or **300 g/m² galvanising on mild steel plus Duplex coating(1)**
Zone B	Yes	Yes
Zone C	Yes	Yes
Zone D	Yes	

1) To AS/NZS 2699.3

2) 304 stainless steel will exhibit greater levels of surface rusting than 316 stainless steel, especially where not exposed to rain washing.

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Table 18E: Masonry veneer lintel sizes (minimum)
Paragraph 9.2.9

Span of lintel (m) up to:	Maximum thickness of masonry veneer (mm)					
	70			90		
	Maximum height of veneer supported (mm)					
	350	700	2000	350	700	2000
0.800	60 x 60 x 6 L	60 x 60 x 6 L	60 x 60 x 6 L	60 x 80 x 6 L	60 x 80 x 6 L	80 x 80 x 6 L
2.000	60 x 60 x 6 L	60 x 60 x 6 L	60 x 60 x 6 L	60 x 80 x 6 L	60 x 80 x 6 L	80 x 80 x 6 L
2.500	60 x 60 x 6 L	80 x 80 x 6 L	80 x 80 x 6 L	80 x 80 x 6 L	80 x 80 x 6 L	80 x 80 x 6 L
3.000	80 x 80 x 6 L	80 x 80 x 6 L	125 x 75 x 6 L	80 x 80 x 6 L	80 x 80 x 8 L	90 x 90 x 10 L
3.500	80 x 80 x 6 L	80 x 80 x 6 L	125 x 75 x 6 L	80 x 80 x 8 L	90 x 90 x 10 L	125 x 75 x 10 L
4.000	80 x 80 x 8 L	125 x 75 x 6 L	125 x 75 x 10 L	80 x 80 x 10 L	125 x 75 x 6 L	150 x 90 x 10 L
4.500	125 x 75 x 6 L	125 x 75 x 10 L	_	125 x 75 x 6 L	125 x 75 x 10 L	_
4.800	125 x 75 x 6 L	125 x 75 x 10 L	_	125 x 75 x 6 L	125 x 75 x 10 L	_

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9.2.10 Windows and doors

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The openings in *wall framing* for windows and doors shall have *flexible flashing tape* applied, in accordance with Paragraph 9.1.5.

Air seals shall be provided in accordance with Paragraph 9.1.6.

Window *flashings* shall be installed in accordance with Paragraph 9.2.4 and Figures 73C and 73D(h).

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9.2.11 Secondary cladding

Where a secondary *cladding* is used with the *masonry veneer*, and is *direct fixed* to *framing* above windows or at gable ends, this shall be fully sealed on:

a) The face of the *cladding*,

b) All edges of the *cladding*, and

c) A 75 mm minimum perimeter strip on the rear of the *cladding*.

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9.3 Stucco

9.3.1 Limitations

This Acceptable Solution is limited to the following types of *stucco cladding*:

a) Solid plaster *cladding* with a non-rigid backing and a *drained cavity*, and

b) Solid plaster *cladding* with a rigid backing and a *drained cavity*. Refer to Figure 74

9.3.2 Structure

The timber *framing* of *external walls* supporting *stucco wall claddings* shall comply with NZS 3604 and NZS 4251. The *cladding system* shall be attached to the *wall framing*.

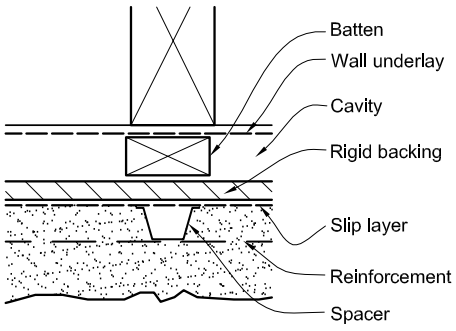
The *framing* for *buildings* using *stucco* exterior *cladding systems* shall be supported on a:

a) Concrete slab-on-ground, or

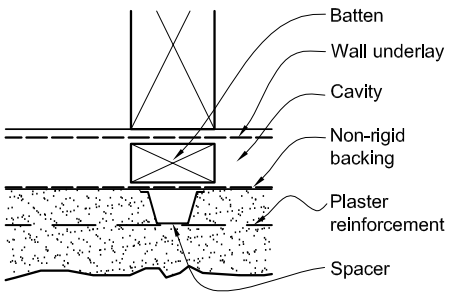
b) Continuous reinforced concrete foundation *wall*, or

c) Reinforced concrete masonry foundation *wall*.

Figure 74: Types of stucco cladding
Paragraphs 9.3.1 and 9.3.3



(a) RIGID BACKING



(b) NON-RIGID BACKING

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9.3.3 Stucco cladding system

All *stucco claddings* shall be used over a *drained cavity* as described in Paragraph 9.1.8, and shown in Figure 74.

9.3.3.1 All *stucco cladding* shall have *wall underlay* as specified in Table 23 and Paragraphs 9.1.5–9.1.7, and shall be:

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a) Fixed to the *framing* as specified in Table 23, and

b) Provided as an overlay to rigid backings to provide a slip layer that permits the independent movement of plaster and backing.

9.3.3.2 Have plaster backing installed as in Paragraphs 9.3.5 and 9.3.6.

9.3.3.3 Have metal lath reinforcements for *stucco* plaster attached through the plaster backing as described in Table 24.

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9.3.4 Installation

9.3.4.1 General

COMMENT:
Refer to Paragraph 1.5 for qualification of installers.

Amends 2 and 5

Activities that will cause impact or vibration during plaster application are not permitted until all plastering is completed and fully cured.

The materials, proportions, mixes, thickness, reinforcement materials and fixing, *control joints*, and application and curing of plaster shall comply with NZS 4251.

9.3.4.2 Movement control joints

Movement *control joints* shall be as required in NZS 4251.

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9.3.5 Non-rigid plaster backings

9.3.5.1 Installation of wall underlays

The *wall underlay* shall be in accordance with Table 23, and as described in Paragraphs 9.1.5–9.1.7.

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9.3.6 Rigid plaster backings

Rigid backings shall be made of either:

a) Plywood, or

b) Fibre cement sheet, and

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Have slip layers to Paragraph 9.3.3 b).

Backing sheets shall be no more than 3 mm out of plane at the time of plastering.

9.3.6.1 Plywood backing

Plywood shall be:

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a) Selected from Table 6 of NZS 4251,

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b) H3 treated as per AS/NZS 2269, and

c) Fixed as specified in Clause 4.2.4.4.2 of NZS 4251, except that nails shall:

i) be 2.8 mm in diameter, and

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ii) penetrate *framing* by 35 mm minimum.

9.3.6.2 Fibre cement sheet backing

Fibre cement shall:

a) Comply with AS/NZS 2908: Part 2,

b) Be a minimum of 4.5 mm thick,

c) Span no more than 600 mm centres between *cavity battens*, and

d) Be fixed as specified in Clause 4.2.4.5.2 of NZS 4251, except that nails shall:

i) be 2.8 mm in diameter, and

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ii) penetrate *framing* by 35 mm minimum.

COMMENT:

When the sheathing is used as bracing, the nailing patterns are subject to *specific design*, and the use of tested and rated systems.

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9.3.7 Finishes

All *stucco* surfaces shall be sealed by applying a minimum of a 2-coat latex exterior paint system complying with any of Parts 7, 8, 9 or 10 of AS 3730.

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COMMENT:

Stucco cladding systems cannot be assumed to be completely weatherproof.

It is necessary to ensure that corrosive salts are not carried into the plaster by moisture, causing corrosion of the reinforcing and fixings.

9.3.8 Bottom of stucco

The bottom of *stucco* wall *cladding* shall be in accordance with Paragraph 9.1.3, and as shown in Figure 75.

9.3.9 Parapets and enclosed balustrades

Parapets shall be in accordance with Paragraph 6.0.

Enclosed balustrades shall be in accordance with Paragraph 7.4.

Parapets and *enclosed balustrades* for *stucco cladding* shall be capped with metal, butyl or *EPDM membrane*, complying with the requirements of Paragraph 4.0.

9.3.10 Windows and doors

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Windows and doors shall comply with Paragraph 9.1.10, as shown in Figure 76.

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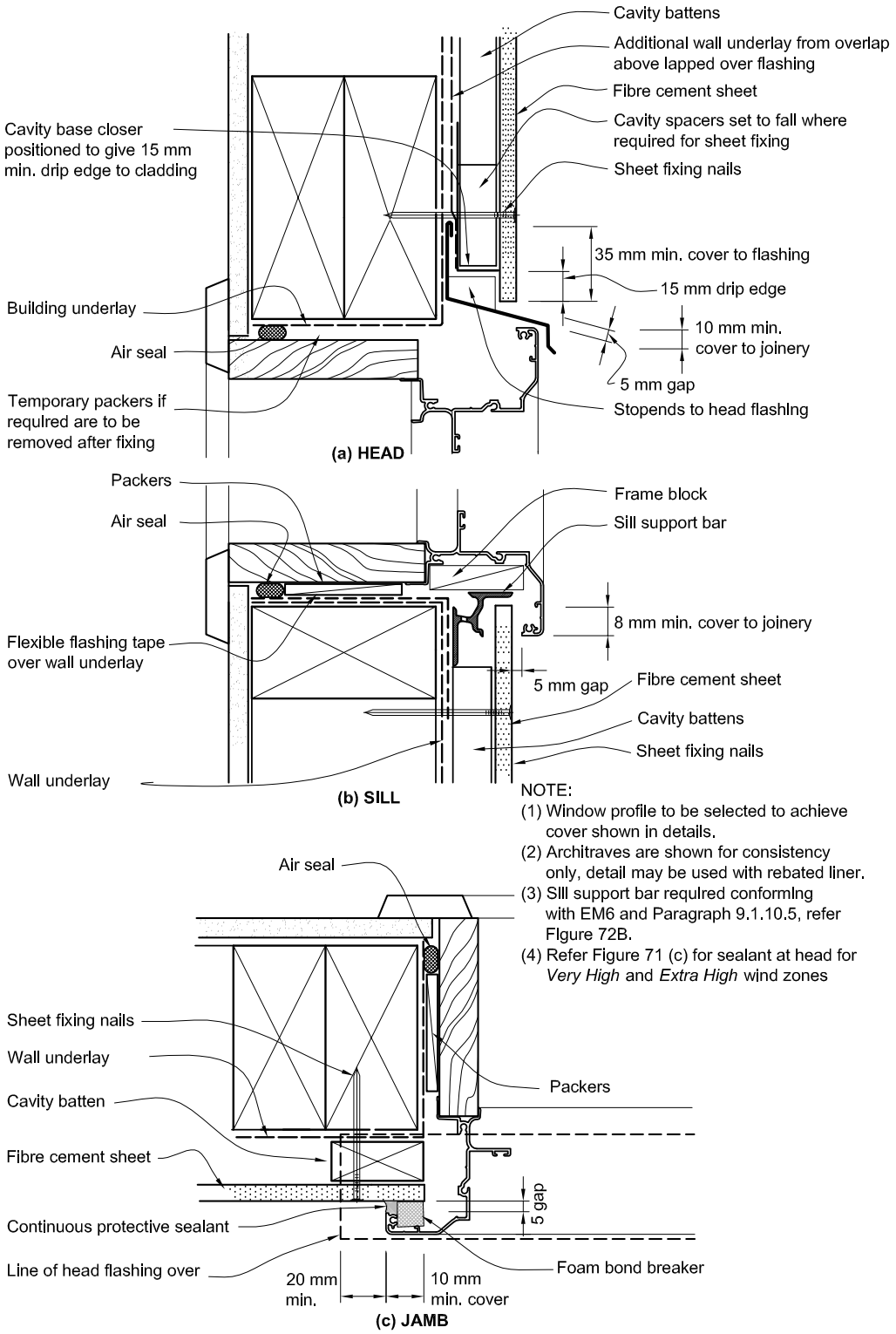
Figure 116: Windows and doors for fibre cement sheet and flush-finished fibre cement on cavity
Paragraph 9.7.6



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9.7.7.1 Flush-finished topped balustrades

Where the tops to *enclosed balustrades* are formed using *flush-finished* fibre cement, they shall have a minimum fall of 10° (1:6), and be wrapped as shown in Figure 117, with a *waterproofing membrane*, approved by the supplier of the jointing and finish system.

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The *membrane* 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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Figure 117: Enclosed balustrade to wall for fibre cement sheet
Paragraphs 6.6 and 9.7.7.1

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NOTE: (1) Refer Figure 11 and Figure 12 for details of *framing* and bridge over cavity.
(2) Flush finish fibre cement balustrades only permitted with cavity construction - refer 9.1.8.

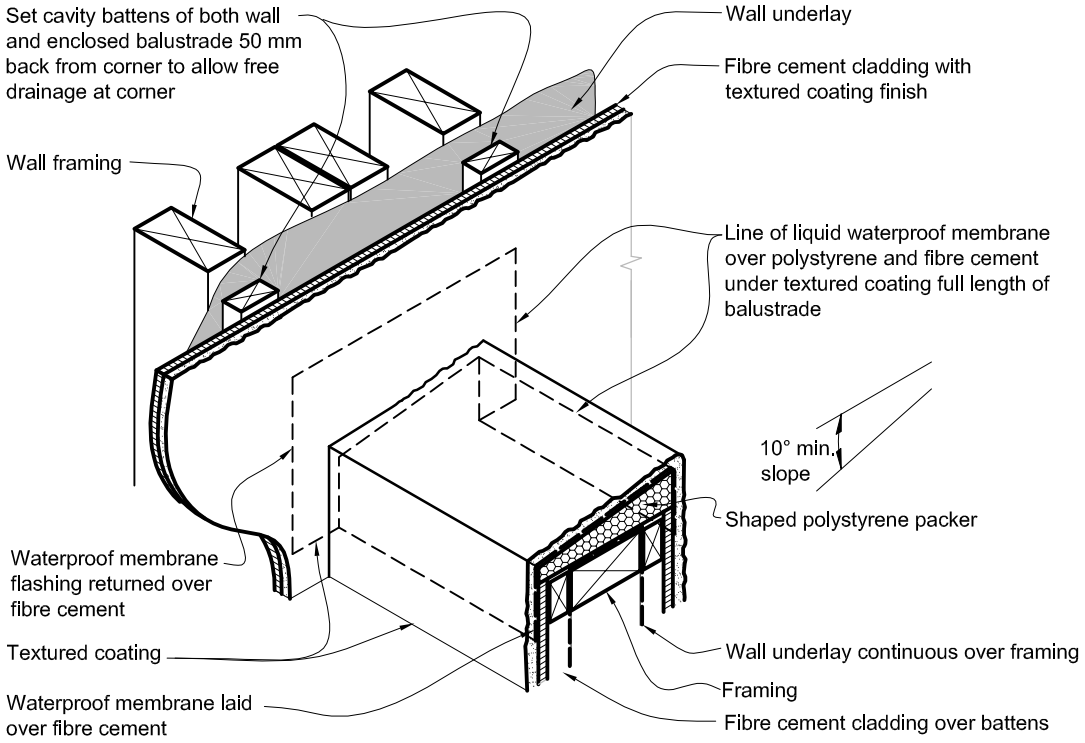

Figure 118 deleted

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9.7.8 Decorative attachments

Where decorative attachments are used, seal sheets prior to attachment of the decorative elements. The final weatherproofing system shall be applied over decorative elements and *wall cladding*. Horizontal decorative elements shall have top surfaces sloped to a minimum of 10° and drip mouldings to bottom edges.

Attachments shall not interfere with the functioning of critical joints such as *control joints*.

COMMENT:
Alternatively, a decorative moulding may be formed from the coating by using mesh and plaster.

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9.8 Plywood Sheet

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Plywood-sheet *claddings* shall be either *direct fixed* to *framing* over a *wall underlay* or fixed over a *drained cavity* as per Paragraph 9.1.8.

Based on the *risk score* for an *external wall*, calculated as per Paragraph 3.1, the sheet *cladding* may require the inclusion of a *drained cavity*.

9.8.1 Limitations

This Acceptable Solution covers plywood panel *claddings* with vertical battened joints and flashed horizontal joints.

Figure 118 deleted

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9.8.2 Materials

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Batten-jointed panels shall have weather-grooved timber battens as shown in Figure 119.

Plywood panels shall be:

a) Manufactured to AS/NZS 2269, grade CD,

b) A minimum of 5 ply,

c) A minimum of 12 mm in thickness, and

d) Treated as required by NZS 3602.

9.8.3 Installation

A *wall underlay*, as specified in Table 23, shall be installed behind plywood sheet *claddings*.

COMMENT:
Refer to Paragraph 1.5 for qualification of installers.

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9.8.3.1 Fixings

Plywood sheets shall be fixed through the *wall underlay* into the *wall framing* with fixings as required in Table 24.

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9.8.3.2 Joints

All joints shall:

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a) Be made only over supports, and

b) If horizontal, incorporate a 10 mm expansion gap, and be fitted with a *flashing*, as shown in Figure 121, or

c) If vertical, have battened joints – refer to Figure 119.

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Figure 119: Battened joints for plywood sheet
Paragraphs 9.8.2 and 9.8.3.2

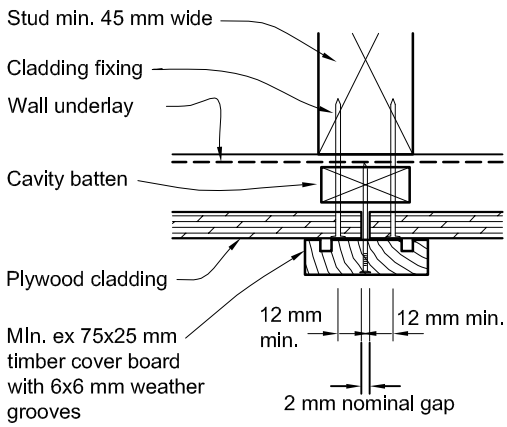

Figure 120 deleted

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10.0 Construction Moisture

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10.1 Moisture in materials

Moisture contained in the *building* structure at completion of *construction* shall not be permitted to damage the *building elements*.

Construction moisture includes the moisture contained in:

a) Timber products as a result of a treatment or manufacturing process,

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b) Green timber, and timber or other materials that have been exposed to the weather, and

c) Concrete, mortar or plaster that is not completely cured.

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10.2 Maximum acceptable moisture contents

The maximum moisture contents shall be:

a) For timber *framing* at the time of installing interior *linings*, the maximum acceptable moisture content shall be the lesser of:

   i) 20% for insulated buildings, 24% for non-insulated buildings, or

   ii) as specified in NZS 3602,

b) For timber weatherboards and exterior joinery, 20% at the time of painting,

c) For reconstituted wood products, 18% at all times, and

d) For concrete floors, sufficiently dry to give a relative humidity reading of less than 75% at the time of laying fixed floor coverings.

COMMENT:

Some manufacturers of timber or other wall or floor components may recommend lower moisture contents for their products.

It is advisable to use the manufacturer's moisture content requirements, if these are lower than those required by this paragraph.

10.3 Measuring moisture content

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10.3.1 Timber

Measurement shall be by the recommended procedure in the Scion (New Zealand Forest Research Institute) publication "Measurement of moisture content of Wood" using electrical resistance type moisture meters with insulated probes. Representative samplings of measurements shall be taken:

a) With meters calibrated to AS/NZS 1080.1 Appendix E

b) By inserting probes to at least 1/3 the depth of timber being measured, at a distance exceeding 200 mm from board ends

c) Using correction factors for timber species, temperature, and treatment type (outlined in Scion publication above).

COMMENT:

For convenience of site measurement, readings of moisture content can be compared against a 'control' *framing* sample of known acceptable moisture content. The comparative readings must be taken during the same test period, be of the same framing type, and using the same resistance moisture meter. This method of moisture testing may be appropriate for non-boron treated *framing*, or processed timber *framing*.

10.3.2 Concrete floors

Measurement shall be made in accordance with BRANZ Bulletin 330 Thin Flooring Materials using hygrometers calibrated to ASTM E 104 – 2002 Standard practice for maintaining constant relative humidity by means of aqueous solutions.

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Table 20: Material selection

This table shall be read in conjunction with Table 21 and Table 22 and Paragraph 4.0.
Refer relevant *cladding* and *flashings* paragraphs for material and coating specifications.
Paragraphs 2.2, 4.2.1, 4.3.3, 4.3.4, 4.3.8, 4.3.10, 8.2.3, 8.2.4, 8.3.4.2, 8.4.3.1, 8.4.3.2, 9.1.10.2, 9.6.3.1, 9.6.3.2, 9.6.6 and 9.8.5

Material	Exposure(1)(2)(4)(6) NOTE: Consider all walls as 'Sheltered' for steel based claddings(8)	Type	Acceptable Exposure Zones as per NZS 3604 – Section 4 (3)(4)(6) 15 years	50 years for hidden elements(2)(9)
CLADDINGS AND FLASHINGS				
Aluminium, zinc	Hidden(2)		B,C,D,E	B,C,D,E
	Exposed		B,C,D,E	
	Sheltered		B,C,D,E	
Copper, lead, or stainless steel	Hidden(2)		B,C,D,E	B,C,D, E
	Exposed		B,C,D,E	
	Sheltered		B,C,D,E	
Factory painted				
Aluminium-zinc coated or galvanised steel to AS/NZS 2728 (includes pre-painted tiles)	Hidden(9)	Type 4	B,C,D,E	B,C,D
	Hidden(9)	Type 6	B,C,D,E	B,C,D,E
	Exposed(8)	Type 4	B,C,D	
	Exposed(8)	Type 6	B,C,D,E	
	Sheltered	Type 4	B,C	
	Sheltered	Type 6	B,C,D	
Pressed metal tiles aluminium-zinc coated AZ150 to AS/NZS 2728 with post-form factory painting	Exposed	Type 6	B,C,D,E	
	Sheltered	Type 6	B,C,D	
Non-factory painted				
Aluminium-zinc coated steel AZ150 to AS 1397.	Hidden(9)		B,C,D,E	B,C,D
	Exposed(8)		B,C	
	Sheltered		B	
Galvanised steel Z450 to AS 1397	Hidden(9)		B,C,D	B,C
	Exposed(8)		B,C	
	Sheltered		B	
Non-metallic				
Bituminous material, or uPVC	Hidden		B,C,D,E	B,C,D,E
	Exposed (uPVC only)		B,C,D,E	
	Sheltered (uPVC only)		B,C,D,E	
Butyl rubber	Hidden		B,C,D,E	B,C,D,E
	Exposed		B,C,D,E	
	Sheltered		B,C,D,E	
FIXINGS(7)				
Aluminium, bronze, and stainless steel (Types 304 and 316)(10)	Hidden		B,C,D,E	B,C,D,E
	Exposed		B,C,D,E	
	Sheltered		B,C,D,E	
Nails – Hot-dip galvanised steel to AS/NZS 4680	Hidden(5)(9)		B,C,D	B,C
	Exposed		B,C,	
	Sheltered		B	
Screws – galvanised steel, painted or unpainted, to AS 3566: Part 2	Hidden(5)(9)	Class 3	B,C,D,E(3)(4)	B,C,D,E
	Exposed	Class 4	B,C,D	
	Sheltered	Class 4	B,C	

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Table 22: Compatibility of materials subject to run-off

This table shall be read in conjunction with Table 20 and Table 21.
Refer relevant *cladding* and *flashings* paragraphs for material and coating specifications.
Paragraphs 2.2, 4.2.2, 4.5.2, 8.2.4, 8.4.1 and 9.8.5

Material that water flows from \ Material that water flows onto	Aluminium, anodised or mill-finish	Aluminium, coated (1)	Butyl rubber & EPDM	CCA-treated timber (2)	Cedar	Cement plaster (uncoated)	Ceramic tiles (cement grout)	Clay bricks (cement mortar)	Concrete old (unpainted)	Concrete green (unpainted)	Copper/brass	Glass	Glazed roof tiles	Lead (including lead-edged) unpainted	Plastics	Stainless steel	Steel, galvanised coil-coated	Steel, galvanized (unpainted)	Zinc	Zinc/aluminium coated (1)	Zinc/aluminium, (unpainted)
Aluminium, anodised or mill-finish	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✘	✘	✓	✓
Aluminium, coated (1)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✘	✘	✓	✘
Butyl rubber & EDPM	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✘	✘	✓	✘
CCA-treated timber (2)	✘	✘	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✘	✘	✘	✘	✘
Cedar	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✘	✘	✓	✘
Cement plaster (uncoated)	✘	✘	✓	✓	✓	✓	✓	✓	✓	✓	✓	A	✓	✘	✓	✓	✓	✘	✘	✓	✘
Ceramic tiles (cement grout)	✘	✘	✓	✓	✓	✓	✓	✓	✓	✓	✓	A	✓	✓	✓	✓	✓	✘	✘	✓	✘
Clay bricks (cement mortar)	✘	✘	✓	✓	✓	✓	✓	✓	✓	✓	✓	A	✓	✓	✓	✓	✓	✘	✘	✓	✘
Concrete old (unpainted)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	A	✓	✓	✓	✓	✓	✓	✓	✓	✓
Concrete green (unpainted)	✘	✘	✓	✓	✓	✓	✓	✓	✓	✓	✓	A	✓	✘	✓	✓	✘	✘	✘	✘	✘
Copper/brass	✘	✘	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✘	✘	✘	✘	✘
Glass	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✘	✘	✓	✓
Glazed roof tiles	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✘	✘	✓	✓
Lead (including lead-edged) unpainted	✘	✘	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✘
Plastics	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✘	✘	✓	✓
Stainless steel	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✘	✘	✓	✓
Steel, galvanised coil-coated	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✘	✘	✓	✓
Steel, galvanized (unpainted)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Zinc	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Zinc/aluminium, coated (1)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✘	✘	✓	✓
Zinc/aluminium (unpainted)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✘	✘	✓	✓

LEGEND:
✓ Materials satisfactory with water run-off as indicated.
✘ Water run-off is not permitted as indicated.
A Etching or staining of glass may occur with run-off.

NOTES:

(1) Coated – includes factory-painted, coil-coated and powder-coated.

(2) Includes copper azole and copper quaternary salts.

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Table 23: Properties of roof underlays and wall underlays

Paragraphs 6.2, 8.1.5, 8.2.3, 8.3.6, 8.4.7, 9.1.3.4, 9.1.4, 9.1.7.1, 9.1.7.2, 9.1.8.2, 9.2.4, 9.2.5, 9.3.3, 9.3.5.1, 9.4.2, 9.4.3, 9.5.3, 9.6.8.1, 9.6.9.1, 9.6.9.2, 9.7.2.1, 9.8.3 and 9.9.4

Category	Application	Vapour resistance	Absorbency	Water resistance	pH of extract	Shrinkage	Mechanical
Roof (1) Underlay (Bitumen and fire-retardant paper-based products)(2)	All *roofs*	≤ 7 MN s/g ASTM E96 B.	NZS 2295: 2006 section 3				
Flexible Wall Underlay (Includes paper and synthetic underlays)	*Wall claddings* over a cavity(6) Flexible *underlays* over rigid *underlays* – refer Paragraph 9.1.7.2 *Direct fixed* absorbent *wall claddings*(4) (eg, timber, fibre cement etc)		NZS 2295: 2006 section 2 No minimum Absorbency requirement				
	Direct fixed non-absorbent *claddings*(3)		NZS 2295: 2006 section 2 Minimum Absorbency 100 g/m^2 tested to NZS 2295				
Rigid Wall Underlay (plywood(5) and fibre cement sheet)	*Wall claddings* over a cavity(6) *Direct fixed* absorbent *wall claddings* (eg, timber, fibre cement etc)	≤ 7 MN s/g ASTM E96 B.		≥ 20 mm NZS 2295			
	Direct fixed non-absorbent *claddings* (6)	≤ 7 MN s/g ASTM E96 B.	≥ 100 g/m^2 AS/NZS 4201: Part 6	≥ 20 mm AS/NZS 4201: part 4	≥ 6.0 and ≤ 9.0		
Air Barrier	Where no internal *linings*	≤ 7 MN s/g ASTM E96 B.	≥ 100 g/m^2 (7) NZS 2295	≥ 20 mm NZS 2295	≥ 6.0 and ≤ 9.0	≤ 0.5% NZS 2295	Edge tear strength NZS 2295 Air resistance BS 6538: Part 3: ≥ 0.1 MN s/m^3
DPC/DPM	All applications	≥ 90 MN s/g ASTM E96					

NOTE:

1) Metal *roofs* and *direct-fixed* metal *wall claddings* require paper-based *underlays*
2) Excluding synthetic *underlays*
3) Use paper based *underlays* where directly behind (in contact with) profiled metal *wall cladding*
4) Excludes profiled metal *wall cladding*
5) Plywood to be treated in accordance with NZS 3602
6) Bitumen based products shall not be used in direct contact with LOSP-treated plywood
7) Applies only to air barriers used with non-absorbent *claddings*.

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Acceptable Solution E2/AS3

1.0 Concrete and Concrete Masonry Buildings

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Concrete and concrete masonry construction with the scope of CCANZ CP 01, and that complies with CCANZ CP 01,will meet the performance criteria of *NZBC* E2.

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