NASH

NATIONAL ASSOCIATION OF STEEL FRAMED HOUSING INC.

NASH Building Envelope Solutions: 2019

Light Steel Framed Buildings

www.nashnz.org.nz

Notes:

NATIONAL ASSOCIATION OF STEEL-FRAMED HOUSING INC. (NASH)

NASH is an active industry association centred on light structural framing systems for residential and similar construction. We represent the interests of suppliers, practitioners and customers – all those involved in steel-framing systems.

NASH's key objectives are to:

- Support the long-term growth and sustainability of the steel framing industry.
- Maximise awareness of the steel-framing industry in the market place.
- Promote the advantages of steel-framing to the building industry and homeowners.

Committee

This NASH Standard was prepared by representatives of the following organisations:

- Framecad Solutions
- Frametek 2007 Ltd
- Heavy Engineering Research Association (HERA)
- Howick Ltd
- James Hardie
- LGSC Ltd
- National Association of Steel-Framed Housing Inc. (NASH)
- New Zealand Steel
- Redco Consulting Professional Engineers Ltd
- Scottsdale Construction System Ltd
- Winstone Wallboards Ltd

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This Standard has been prepared for use by practitioners with the appropriate skills, professional judgement, and qualifications to meet the performance criteria of the of the New Zealand Building Code clauses in which it is referenced. Where requirements from this Standard are used by practitioners on any particular project, the practitioners shall ensure that the design solutions meet the Standard.

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Foreword

This Standard is intended to be referenced as an Acceptable Solution to the New Zealand Building Code (NZBC) clause E2 *External moisture*. It sets out solutions for the exterior weathertight envelope for steel-frame buildings constructed in accordance with NASH Standard Part 2 which provides for low-rise buildings including houses and low-rise commercial buildings.

This 2019 edition of the NASH Standard is the first edition.

This Standard is part of NASH Standard suite including the following:
NASH Standard Part 1: Design criteria
NASH Standard Part 2: Non-specific light steel framed buildings
NASH Building envelope solutions

Contents

1.0 SCOPE

This Standard covers the weathertightness of the building envelope for buildings constructed with light gauge steel framing within the scope of NASH Standard Part 2.

1.1 Construction included

The scope of this Standard is limited to the materials, products and processes contained herein, and for buildings:

a) Up to 3 storeys with a height measured from lowest ground level adjacent to the building to the highest point of the roof (except for chimneys, aerials and the like) of 10 m or less;
b) Buildings with external walls that are vertical, and roofs that are 45º or less above the horizontal; and
c) Buildings with structural design in accordance with the NASH Standard Part 2 , or if they require specific engineering design input, the framing shall be of at least equivalent stiffness to the framing provisions of NASH Standard Part 2.

COMMENT :
Claddings also required to perform as bracing should comply with this Standard. Where a drained cavity is used, specific testing can be used to demonstrate that a cladding on cavity battens can provide the required bracing resistance.

1.1.1 Attached garages

Attached garages that are integral with the weathertightness envelope of the building are included within the scope of this Standard (see 9.1.3.4.).

1.1.2 Thermal breaks

Thermal breaks shall be applied to steel frame buildings constructed in accordance with this Standard. These may be full sheets or strips. The requirements are included in Section 11.

1.2 Construction excluded

1.2.1 Outbuildings

Outbuildings, such as stand-alone garages and other structures that are unlined, are outside the scope of this Standard.

COMMENT :
Details contained in this Standard can be used for outbuildings and unlined structures, but the requirements may be in excess of the minimum required by the Building Code.
This is particularly the case in regard to unlined and uninsulated buildings, where a drained cavity is unlikely to be necessary.
However, care should be taken, as some weathertight details depend on the presence of an internal lining to provide pressure equalisation behind the cladding.

1.2.2 Spread of flame

Buildings with drained cavities and are required to meet the spread-of-flame requirements specified in the NZBC clause C *Protection from fire*, are outside the scope of this Standard.

Cavities in such circumstances shall be specifically designed for both weathertightness and spread of flame.

COMMENT :
Options could include the provision of a fire rated wall behind the battens, or breaking the cavity at each floor and providing a cavity flashing and fire stop at each level.

1.2.3 Acoustics

Buildings with drained cavities and are required to meet the acoustic requirements specified in the NZBC Clause G6 *Airbourne and impact sound*, are outside the scope of this Acceptable Solution.

COMMENT :
Cavities in such circumstances should be specifically designed for both weathertightness and acoustic performance.

1.2.4 Bracing.

Claddings that are required to act as a bracing system are outside the scope of this Standard.

1.3 Interpretation

The word “shall” denotes mandatory requirements for compliance with this Standard. The word “should” denotes requirements that are practices that are recommendations only.

In this Standard, notes provide guidance only and do not provide mandatory requirements.

Where other documents, that are themselves referenced or cited in regulations, legislation, or provide a legal means of demonstrating compliance with legislation are referred to by this Standard, they shall be considered along with any modifications made in their statutory incorporation by reference or citing.

Steel framing members shown in the Figures in this document are generic only and the actual shape and size of these members may vary to that indicated.

Notes on a Figure are part of the normative part of that Figure’s requirements.

Notes shown under ‘COMMENT’, occurring throughout this document are for guidance purposes only and do not form part of this Standard.

Appendices may be either informative guidance or normative requirements as indicated.

Further guidance material on steel-framed housing is available from www.nashnz.org.nz.

1.4 Provisions for snow

Specific design for preventing the ingress of snow melt water is required when the open ground snow load, Sg, as defined in NASH Standard Part 2, exceeds 1.0 kPa, and the roof is constructed in a way that is likely to cause a build-up of snow.

COMMENT :
Hidden gutters, parapets and skylights are examples of features within a roof design that are likely to cause a build-up of snow.

1.5 Specific engineering design

Buildings, components or cladding details not included or shown in this Standard require specific engineering design (SED).

1.6 Licensed Building Practitioners

Work on the design or construction to the outside of a building to protect it from the weather is Restricted Building Work as defined by regulations made under the Building Act 2004.

The Building Act requires that Restricted Building Work is carried out or supervised by Licensed Building Practitioners who are licensed in the relevant class for that work (or certain registered professionals who may be treated as if they were licensed)

COMMENT :
An understanding of the proper methods of design and installation and the importance of the correct construction sequence is essential if an NZBC compliant building is to be achieved.
Further information on Restricted Building Work and on Licensed Building Practitioners is available on either of the Ministry’s websites www.lbp.govt.nz or www.business.govt.nz/lbp.
In limited circumstances, Restricted Building Work may be carried out by owner-builders.

2.0 GENERAL

2.1 Weathertightness

Cladding systems shall meet the requirements of NZBC E2.2 to E2.3.7, and the provisions of this Standard are a means of achieving this.

COMMENT :

Most manufacturers provide technical literature for their cladding materials and systems that include recommendations for design and installation. Manufacturers' recommendations may include information additional to that shown in this Standard.
However, some additional work, such as extra fixings that penetrate flashings, can lead to details that need to be considered in terms of specific design.
Additional or alternative details may be required that need supporting documentation or testing to demonstrate compliance in regard to weathertightness.

2.2 Materials

Materials used to construct the building envelope shall be:

a) In accordance with the durability requirements of NZBC B2;
b) Suitable for their end-use, location and environment as shown in Table 20, and
c) Compatible with adjoining materials as shown in Table 21 and Table 22.

Separation shall be provided between any timber treated with copper based preservatives (apart from LOSP treatment) and any steel building element.

2.3 Systems versus materials

All building products shall be considered as part of a system, even if the components of that system are provided from different sources.

Materials used to construct the building envelope shall be designed as a complete cladding system rather than as separate items.

COMMENT :

It is important that the compatibility and durability of the combination of materials is able to be demonstrated for any given application.

2.4 Thermal breaks

Thermal breaks shall meet the requirements of the NZBC clause E3 paragraph E3.3.1

Section 11 sets out the application for thermal breaks to meet the requirements of NZBC clause E3

COMMENT :

Correctly detailed and installed thermal breaks prevent the risk of moisture forming inside the cladding envelope and ghosting on internal walls and ceilings at framing members. The particular requirements relevant to steel frame construction of NZBC E3 are included in section 11.

2.5 Extra High wind zone requirements

A building site subjected to an ultimate limit state wind speeds up to 50-55 metres per second shall be classified as being in an Extra High wind zone. The wind force experienced on a particular site shall be calculated in accordance with NASH Standard Part 2, Section 5 or NZS 3604, Section 5, which will identify the corresponding wind zone.

Buildings in Extra High wind zones require special design detailing and construction attention and shall comply with the particulars as set out in Paragraph 4 Flashings, Paragraph 8 Roof Claddings and Paragraph 9 Wall Claddings.

In accordance with Table 3, any cladding on parapets, enclosed balustrades or in Extra High wind zones shall be installed over a drained cavity as per 9.1.8 and with a rigid underlay as per 9.1.7.2

Specific design of the external building envelope is required for wind speeds greater than 55 metres per second.

COMMENT:

The following is an indicative summary of where to find within this document those design details related to Extra High wind zones:

Extra High wind zone	Definitions, wind zone
Cladding system testing	E2/VM1
Wall claddings	
Risk matrix assessment	Tables 1 and 3
Wall claddings general	Paragraphs 9.1 and 9.1.4
Drained cavities	Paragraph 9.1.8
Rigid underlays	Paragraph 9.1.7.2
Barriers to airflow	Paragraph 9.1.4 (b)

Wall cladding flashings

Metal flashings	Table 7 and Situation 3; Paragraph 4.5.1.4
Edge treatments for flashings	Paragraph 4.4.1; Figures 2, 66
Interstorey and horizontal joints	65, 101, 110
Head flashings	Paragraph 9.1.10.4
General sealing of head flashings	Figure 66
Apron upstands	Figures 4, 21, 30, 32, 36, 37, 39, 43, 45
Head flashings	Figures 2, 4, 64, 66, 68D, 71, 80, 81, 86, 90, 107, 117

Roof claddings

Profiled Metal Roof Cladding	Tables 10, 11, 12, 13, 14, 15

Roof cladding flashings

Apron upstands	Figures 4, 21, 30, 32, 36, 37, 39, 43, 45
Masonry Tiles	Table 10; Figures 21, 25, 26
Eave Flashing	Paragraph 8.4.12; Figure 40(a)
Stopends	Paragraph 8.4.13b)
Metal flashings	Paragraphs 4.5.1.3, 4.5.1.4
Membrane flashings	Paragraph 4.5.1.5; Figures 14, 25, 57, 58; Table 7

The note “Flashings in Extra High wind zone shall meet Table 7” has been added to relevant Figures to draw attention to where particular Extra High wind zone requirements apply.

2.6 Cladding finish colours

Finish colours for flush-finished fibre cement sheet and EIFS shall have a reflectivity of 40% or more when measured in accordance with ASTM C1549.

COMMENT :

Dark colours cause claddings to reach higher temperatures, which results in more thermal expansion and a greater risk of cracking of joints in monolithic wall claddings. Risks of cracking are also associated with dark colours on painted timber wall claddings and trim. Expansion of metal roofing and flashings are affected by dark colours. Colour cards from some coating manufacturers may include reflectance values.

2.7 Maintenance – general

Maintenance shall be carried out as necessary to achieve the required durability of materials, components and junctions.

COMMENT :

A deterioration in the appearance of the surface of a cladding does not necessarily relate to a deterioration in the weathertightness of the cladding.

2.7.1 Regular maintenance

Regular maintenance of a building will include the following:

Washing exterior surfaces,

a) Inspecting surfaces and junctions, and repairing or replacing items when necessary, in order to preserve the weathertightness of the building.
b) Maintaining clearances between cladding and external ground or paving (see 9.1.3).
c) Maintaining minimum 35 mm clearances between roofing and membrane decking, and wall cladding above.
d) Maintaining finish coatings especially for porous cladding that is sealed such as stucco, EIFS and fibre cement claddings.

COMMENT :

Washing by rain removes most accumulated atmospheric contaminants, but sheltered areas, such as walls directly below eaves, are protected from the direct effects of rain and require regular manual washing. Some heavily textured surfaces will not be as effectively washed by rain as smoother surfaces, so will require more regular manual washing.

However, it is important that high pressure water is not directed at sensitive junctions such as window surrounds and other flashings. Great care should be taken to avoid water being driven past anti-capillary gaps and flashings into the wall cavities.

3.0 WEATHERTIGHTNESS RISK FACTORS

A risk assessment of the proposed design shall be carried out using a building envelope risk matrix. This allows the risks related to various features to be aggregated, resulting in a risk score for the design.

COMMENT :

Analysis of inspection reports from leaking buildings shows that a high incidence of leaks is associated with junctions within, and penetrations through, the building envelope. It also shows serious problems are more commonly associated with claddings that have limited capacity to drain and dry out any water that gets behind them, when a leak occurs. This Standard addresses these problems in the following two ways:

1. By providing details for common junctions and penetrations of the building envelope, and
2. By classifying buildings within the scope of this document into risk categories, and requiring different cladding solutions depending on the risk score.

Using the risk assessment, risk factors can be identified and changes may be made to a design to lower the risk score.

3.1 Establishing the risk

Figure 1 shows the process that shall be followed in order to assess the weathertightness risk.

3.1.1 Definitions of risk

Table 1 sets out the definitions of risk levels relating to the location and design features of the building that shall apply when establishing the weathertightness risk.

3.1.2 The risk score

Table 2 sets out the risk matrix that shall be used to define the risk score for a building within the scope of this Standard.

A risk score is calculated for each external face of the building.

Claddings shall be selected from Table 3 according to the risk scores.

The highest risk score may be used for all walls, and cladding shall be selected from Table 3 accordingly.

3.2 Wind Zone design speeds

The wind force experienced on a particular site shall be calculated in accordance with NASH Standard Part 2, Section 5 or NZS 3604, Section 5

The following wind zone maximum design speeds apply to this Standard:

- Low: 32 m/s;
- Medium: 37 m/s;
- High: 44 m/s;
- Very High: 50 m/s; and
- Extra High: 55 m/s.

For buildings in Extra High wind zones, rigid underlay and drained cavity requirements from 2.5 and Table 3 shall be applied.

3.3 Wall claddings

The following wall cladding systems are provided for in this Standard:

- Masonry veneer (see 9.2);
- Stucco (see 9.3);
- Timber weatherboards (see 9.4);
- Fibre cement weatherboards (see 9.5);
- Profiled metal wall claddings (see 9.6);
- Fibre cement sheet (see 9.7);
- Plywood sheet (see 9.8); and
- EIFS (see 9.9).

Other wall claddings are outside the scope of this Standard.

COMMENT:

Guidance and worked examples on how to apply a building risk matrix are provided by MBIE publications (refer to www.building.govt.nz and search the publication page for “External moisture – a guide to using the risk matrix”).

Figure 1: **How to assess risk**
Paragraph 3.1

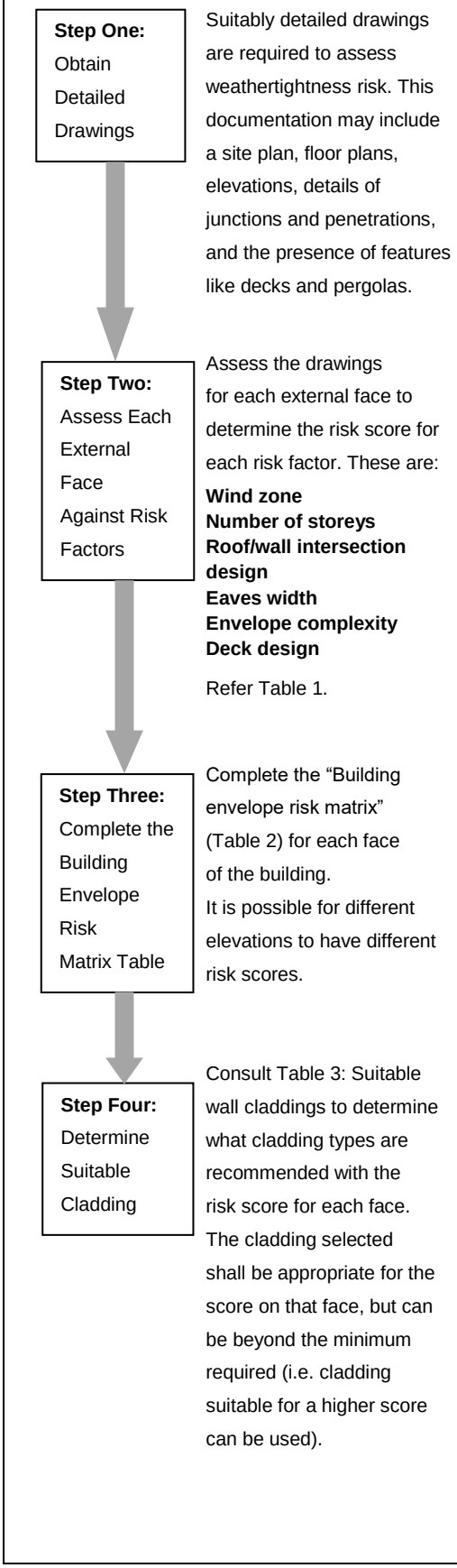


Table 1:	**Definitions of risk levels** Paragraph 3.1.1. Figure 1		
Risk Factor	**Score (5)**	**Risk severity**	**Comments**
A: Wind zone	**0**	**Low risk**	Low wind zone as described in section 3.2
	0	**Medium risk**	Medium wind zone as described in section 3.2
	1	**High risk**	High wind zone as described in section 3.2
	2	**Very high risk**	Very High wind zone as described in section 3.2
	2	**Extra high risk**	Extra High wind zone as described in section 3.2 (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**	Enclosed deck exposed at ground floor level, 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 section 12.

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

(5) Refer also to Table 2.

Table 2:	**Building envelope risk scores** Paragraph 3.1.2. Figure 1								
	Risk severity								
Risk Factor	**LOW**	**score**	**MEDIUM**	**score**	**HIGH**	**score**	**VERY HIGH(1)**	**score**	**Subtotal for each risk factor**
Wind zone	**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**		
(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.)							**Total risk score for use in Table 3:**		
NOTE: (1) For buildings in Extra High wind zones, refer to Tables 1 and 3 for rigid underlay and drained cavity requirements.									

Table 3:	**Suitable wall claddings** Paragraph 3.1.2, 7.4, 9.1.1, 9.1.7.2, 9.4.1.2, 9.4.1.3, 9.6, 9.6.1, Figure 1	
Risk Score from Table 2	**Suitable wall claddings(1)**	
	Direct fixed to framing	**Over nominal 20 mm drained cavity**
	Claddings on parapets, enclosed balustrades, and in Extra High wind zones shall be installed over drained cavities. (5) (6)	
0 – 6	a) Timber weatherboards – all types b) Fibre cement weatherboards c) Vertical profile metal – corrugated and symmetrical trapezoidal (3) d) Fibre cement sheet(4) (Jointed finish) e) Plywood sheet	a) Masonry veneer (2) b) Stucco c) Horizontal profiled metal(3) – corrugated and trapezoidal only d) Fibre cement sheet – flush finished e) EIFS
7 – 12	a) Bevel–back timber weatherboards b) Vertical timber board and batten c) Vertical profile metal – corrugated only (3)(6)	a) Masonry veneer (2) b) Stucco c) Horizontal profiled metal – corrugated and trapezoidal only d) Rusticated weatherboards e) Fibre cement weatherboards f) Fibre cement sheet – flush and jointed finish g) Plywood sheet h) EIFS
13 – 20	c) Vertical profile metal – corrugated only (3)(6)	a) Masonry veneer (2) b) Stucco c) Horizontal profiled metal – corrugated and trapezoidal only d) Rusticated weatherboards e) Fibre cement weatherboards f) Fibre cement sheet – flush and jointed finish g) Plywood sheet h) EIFS i) Bevel–back timber weatherboards
Over 20	a) Redesign the building to achieve a lower score, or b) Specific design – The design may need changing to reduce the risk – The building consent authority may require more comprehensive details and documentation providing evidence of weathertightness – The building consent authority, designer or owner may require more inspections – A third party audit of the design may be required	
NOTES:	(1) The wall claddings in this Table are limited to those covered in this Standard. (2) Traditional masonry veneer as per SNZ HB 4236, with minimum 40 mm cavity. (3) Refer Figure 33 for profiles. (4) Except stucco over a fibre cement backing. (5) Claddings in Extra High wind zones require rigid underlays and drained cavities – refer to Paragraph 2.5, 9.1.7.2 and 9.1.8 (6) Direct fix vertical corrugated sheet is included as cavity construction.	

4.0 FLASHINGS

Flashing material and designs for cladding systems shall comply with this section.

4.1 Materials for flashings

Acceptable materials for flashing junctions and penetrations shall be selected in accordance with 4.2 and have material properties for the given material type set out in 4.3.

4.1.1 Selection of flashing materials

The selection of flashing materials shall take into account the following factors:

a) The requirements of NZBC Clause B2 Durability;
b) The environment where the building is located;
c) The specific conditions of use; and
d) Consideration of the surrounding materials.

COMMENT:

Generally, the durability requirements for flashings specified in B2 are as follows:

a) 50 years, where flashings are:
   i) Completely hidden behind claddings such as masonry veneer, or
   ii) Not accessible,
b) 15 years, where flashings are:
   i) Exposed, partially exposed, or
   ii) Accessible.

Two part flashings allow replacement of the flashing without cladding alteration.

An example of a two part flashing is shown in Figure 4(b).

Further to Note 2 in Table 20, elements which are partially visible are not “hidden”. An example is where an apron flashing is concealed by another element that is moderately difficult to access and replace (such as the cladding to a high level wall), then the partially visible element has a minimum durability requirement of 15 years. However there may be advantages (in terms of future maintenance costs) in ensuring the partially visible element not only equals but exceeds the durability of the element that conceals it, or in ensuring the design allows for it to be easily removed and replaced without *cladding* alteration, such as a two part flashing shown in Figure 4(b).

4.1.2 Environment

Flashing materials shall be selected according to the relevant exposure conditions as given in Table 20.

4.1.3 Surrounding materials

Metals which are in contact in locations where they will become wet, or where water can flow over metals or certain plastics onto another metal, shall be selected in accordance with Table 21 and Table 22.

Uncoated metals shall not be used where carbon deposits or chemical contaminants may accumulate.

COMMENT :

Undesirable effects can occur when some materials are in contact with each other. Examples are corrosion of metals, stress cracking of plastics and staining of glass.

Carbon deposits such as soot will cause accelerated corrosion of damp uncoated metal.

4.2 Acceptable flashing materials

Tables 20, 21 and 22 shall be used to assess suitability of flashing materials for the required durability.

COMMENT :

Additional guidance on flashing materials can be found in the New Zealand Metal Roof and Wall Cladding Code of Practice.

4.2.1 uPVC flashings

uPVC flashings shall be a minimum of 0.75 mm thick.

uPVC flashings shall comply with the impact resistance, tensile strength, and colourfastness and impact resistance following ultraviolet light exposure requirements of AS/NZS 4256.2.

Where uPVC flashings are exposed to the weather, they shall also comply with Section 8 of AS/NZS 4256.2.

uPVC flashings shall have a finish colour with a reflectance of 40% or more, as outlined in 2.4.

COMMENT :

Manufacturers of uPVC flashings which have a proven performance in use may be able to show compliance with NZBC Clause B2 Durability as detailed in B2/VM1.

The uPVC requirements for impact resistance, tensile strength, and colourfastness and impact resistance in AS/NZS 4256.2 are given in clauses 9.2, 9.3, and 9.4 respectively.

4.2.2 Aluminium flashings

Aluminium flashings shall be a minimum thickness of 0.7 mm, and formed from 5000 series in accordance with AS/NZS 1734.

4.2.3 Galvanized steel flashings

Galvanized steel flashings shall comply with the following properties:

a) have a BMT of 0.55 mm minimum;
b) be grade G550, or G300 for rolled or crimped flashings; and
c) be selected for corrosion protection according to the intended exposure zone as given in Table 20.

4.2.4 Aluminium-zinc coated steel flashings

Aluminium-zinc coated steel flashings shall comply with the following:

a) have a BMT of 0.55 mm minimum;
b) be grade G550, or G300 for curved or crimped flashings; and
c) be selected for corrosion protection according to the intended exposure zone as shown in Table 20.

4.2.5 Stainless steel flashings

Stainless steel flashings shall comply with the following:

a) have a minimum thickness of 0.45 mm, and
b) be grade 304 or grade 316 stainless steel in accordance with ISO/TS 15510.

4.2.6 Lead sheet flashings

Lead sheet flashings shall comply with the following:

a) meet the performance requirements of AS 1804, and
b) have a minimum unit mass of 17 kg/m2.

4.2.7 Zinc sheet flashing

Zinc sheet flashings shall only be used in accordance with Tables 20, 21 and 22.

Zinc sheet flashings shall comply with the following:

a) have a minimum thickness of 0.7 mm, and
b) meet the performance requirements of BS EN 988.

4.2.8 Butyl rubber and EPDM flashings

Butyl rubber flashings shall only be used in accordance with Tables 20, 21 and 22.

Butyl rubber and EPDM flashings shall be a minimum thickness of 1.0 mm, and shall comply with the following parts of Table 1 in ASTM D6134:

a) Tensile strength,
b) Elongation,
c) Water absorption,
d) Water vapour permeance, and
e) Heat aging followed by:
   i) tensile strength; and
   ii) elongation.

4.2.9 Bituminous flashings

Bituminous flashings shall only be used in accordance with Table 20.

Flashings made from bitumen-impregnated material shall comply with the following:

a) meet the performance requirements of AS/NZS 2904, and
b) be used only in fully concealed applications.

4.2.10 Flexible flashing tape

Flexible flashing tape shall comply with Parts 3.2 and 4 of the ICBO Acceptance Criteria AC148.

Flexible flashing tape shall be compatible with the adjacent building wall underlay or roof underlay, and be used only in fully concealed applications.

4.3 Fixings

Fixings of metal flashings shall comply with Tables 20, 21 and 22.
Exposed flashings such as barge and ridge flashings are to be fixed along both edges.

COMMENT :
Fixings that penetrate flashings should be avoided where possible.

4.4 Flashing requirements

All flashings shall have expansion joints in accordance with 4.4.2 to provide for thermal expansion.

Flashings are required to shed or divert water at sensitive areas of the building cladding.
These include at:
a) The building periphery, except where gutters are present,
b) Changes of direction in cladding materials,

c) Intersections between cladding materials or with other buildings, and
d) Roof or wall penetrations, including windows, doors, movement joints and other penetrations.

4.4.1 Edge treatments for flashings

Flashings shall be to the dimensions shown throughout this Standard.

Exposed bottom edges of flashings shall be folded to a kick-out or a bird's beak or concealed grabber as shown in Figure 2.

For Low, Medium, High and Very High wind zones, see 3.2, flashing upstands shall have either:

a) A hem or hook to Figure 2, with upstand dimensions as per Table 7, or
b) No hooks or hems, and flashing upstand dimensions increased by 25 mm beyond those shown.

For Extra High wind zones, hooks or hems shall be used and flashing upstand dimensions increased as per Table 7 for situation 3.

COMMENT :
Refer to the New Zealand Metal Roof and Wall Cladding Code of Practice for further edge treatments.

4.4.2 Metal flashing joints

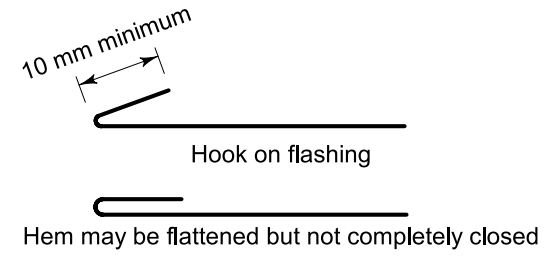
Where metal flashings are required to be joined, the method shall be as shown in Figure 3.

Joins of metal flashings shall have the following features:

a) Rivets used for joining and sealing laps spaced at a maximum of 50 mm centres and be:
   i) compatible with the flashing material as given in Table 21 and Table 22, and
   ii) sealed against moisture, or
   iii) of a sealing type or blind rivet.
b) Expansion joints be provided for joined flashings with a combined length exceeding:
   i) 12 metres for light coloured steel and stainless steel. 8 metres for dark coloured steel and
   ii) 8 metres for aluminium.
c) allowance be made for expansion where both ends of a flashing are constrained;
d) Where required expansion joints formed as given in Figure 3, with:
   i) minimum 200 mm laps, and
   ii) sliding clips at both sides of the lap.
e) When using uncoated galvanized steel, zinc or stainless steel flashings, joints be riveted or soldered as given in the New Zealand Metal Roof and Wall Cladding Code of Practice.
f) When using uncoated or coated lead flashings, maximum continuous lengths be 1300 mm for 17 kg or 1500 mm for 20kg lead. Where the pitch of the flashing is greater than 15° at the join, the lap at the join be a minimum of 100 mm.
g) Where the pitch of the flashing is 15° or less at the join, the lap at the join be a minimum of 200mm and the flashing underneath the lap have a hook at the edge.
h) Lap joins on other metal flashings be sealed using a neutral cure silicone sealant in conjunction with mechanical fasteners. The neutral cure silicone sealant will be one of the following:
   i) type F, Class 20LM or 25LM of ISO 11600; or
   ii) low modulus Type II Class A of Federal Specification TT-S-00230C.

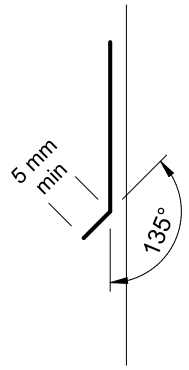
COMMENT :
Further information may be found in the New Zealand Metal Roof and Wall Cladding Code of Practice for joints in metal flashings.

Figure 2: **Typical metal flashing edge treatments**
Paragraphs 4.4.1, 4.4.2, 4.5, 6.4, 7.4.4, 9.0, 9.1, 9.5.7

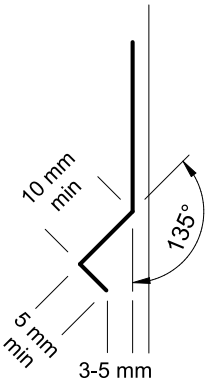


Hem may be flattened but not completely closed

NOTE: (1) For L, M, H, VH wind zones, hooks and hems may be omitted on flashing upstands on condition the upstand dimensions are increased by 25 mm.
(2) For EH wind zone hems and hooks are mandatory. Refer paragraph 4.5.1.
(3) Flashings in Extra High wind zone shall meet Table 7.

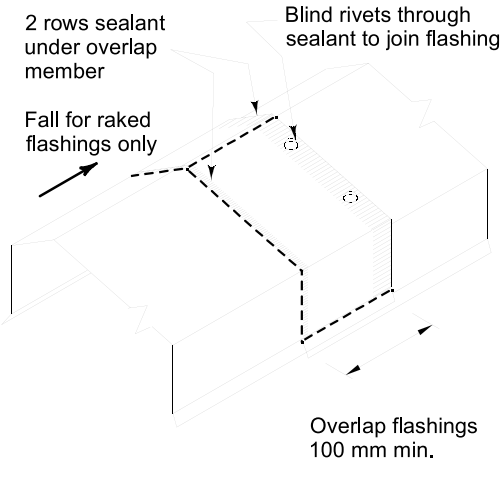


'Kick-out' at bottom edge of vertical flashing

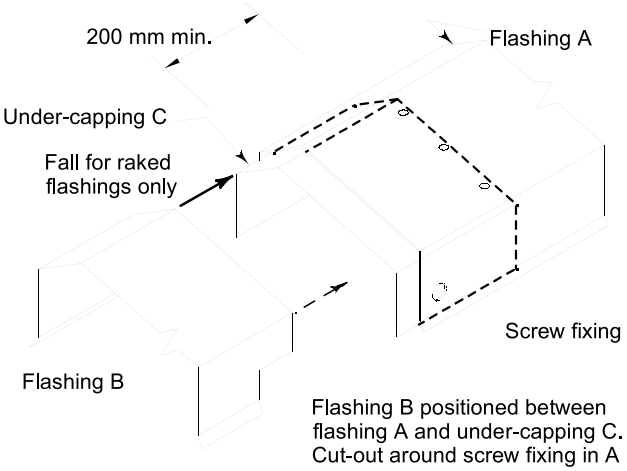


'Bird's beak' at bottom edge of vertical flashing

Figure 3: **Joints in metal flashings**
Paragraphs 4.4.2, 8.4.11.1, 9.5.7



(a) FLASHING SEALED JOINT



(b) FLASHING EXPANSION JOINT

4.5 Flashing overlaps and upstands

Overlaps and upstands to flashings shall be as given in 4.6 and Table 7, unless specifically shown otherwise (see 8.1 to 9.9 for requirements for specific claddings).

Flashing edges, with hooks, hems, kick-outs and bird's beaks shall be as required in 4.4.1 and Table 7.

Where a turn-down to the cover flashing for profiled metal claddings is required, the following shall apply:

a) A soft edge flashing for corrugated profiles;
b) A notched turn-down or soft edge flashing for trapezoidal profiles with rib height not exceeding 30 mm and/or rib centres not exceeding 200 mm;
c) A notched turn-down for trapezoidal profiles with rib height exceeding 30 mm or rib centres exceeding 200 mm, or a combination of a notched turn-down for trapezoidal profiles with rib height exceeding 30 mm and rib centres exceeding 200 mm; or
d) A notched turn-down for trough profiles.

Where a notched turn-down is used there shall be a gap between the edge of the flashing and the pan of the roof cladding.

The gap between the edge of the flashing and the pan of the roof cladding shall be a maximum of 5 mm.

4.5.1 Overlap with roof claddings

4.5.1.1. Apron flashing cover over metal roofing

Apron flashing covers over metal roofing shall be in accordance with the following:

a) Transverse flashing (see Figure 4 for an example). The apron shall have
   i) for notched turn-downs, a gap between the flashing and the pan of the roof cladding. The gap shall be a maximum of 5 mm; and
   ii) a minimum effective cover to roof cladding, excluding any soft edge or turn-down to the flashing, as shown in Table 7.
b) Parallel flashing (see Figure 43 for an example).The apron shall be in accordance with the following:
   i) be dimensioned to suit the roof cladding profile;
   ii) for profiled metal roof cladding, cover at least two crests, (turned-up edge to full crest height constitutes a crest); and
   iii) for profiled metal roof cladding, overhang flashing a minimum 10 mm clear of crest and maximum 5 mm clear of trough as shown in Figure 42.

4.5.1.2. Ridges and hips

Ridges and hips shall be in accordance with the following (see Figure 41 for examples):

a) For notched turn-downs of the flashing leave a gap between the flashing and the roof cladding. The gap shall be a maximum of 5 mm.
b) There shall be a minimum effective cover to roof cladding, excluding any soft edge or turn-down to the flashing, in accordance with Table 7.

4.5.1.3. Change in metal roof pitches

Where the roof pitch has changes, they shall be designed in accordance with the following (see Figure 39):

a) There shall be a minimum effective lap under roof cladding in accordance with Table 7, with a hem at upper edge.
b) The apron cover over the roof cladding shall be in accordance with Table 7.
c) Changes in a metal roofing pitch in an Extra High wind zone are not permitted.

4.5.1.4. Roof-to wall or deck-to-wall junctions – metal flashing

Roof or deck to wall junctions shall be accordance with the following (see Figure 4 for examples).

a) There shall be a total minimum upstand height of 110 mm, in accordance with Table 7, comprising of the following:
   i) minimum overlap cover of cladding to the flashing upstand of 75 mm, and
   ii) minimum clearance from bottom of the wall cladding to roof cladding or finished deck material of 35 mm.

b) Flashing upstands in an Extra High wind zone – refer to Table 7 Situation 3 and to Paragraph 4.4.1.

4.5.1.5. Membrane flashings

Refer to Table 7 and to Figures 14, 25, 57, 58 and 59 for butyl rubber or EPDM membrane flashing details.

a) There shall be a minimum upstand height of 150 mm in the membrane, including a minimum:

i) overlap cover of cladding to the flashing upstand of 75 mm, and

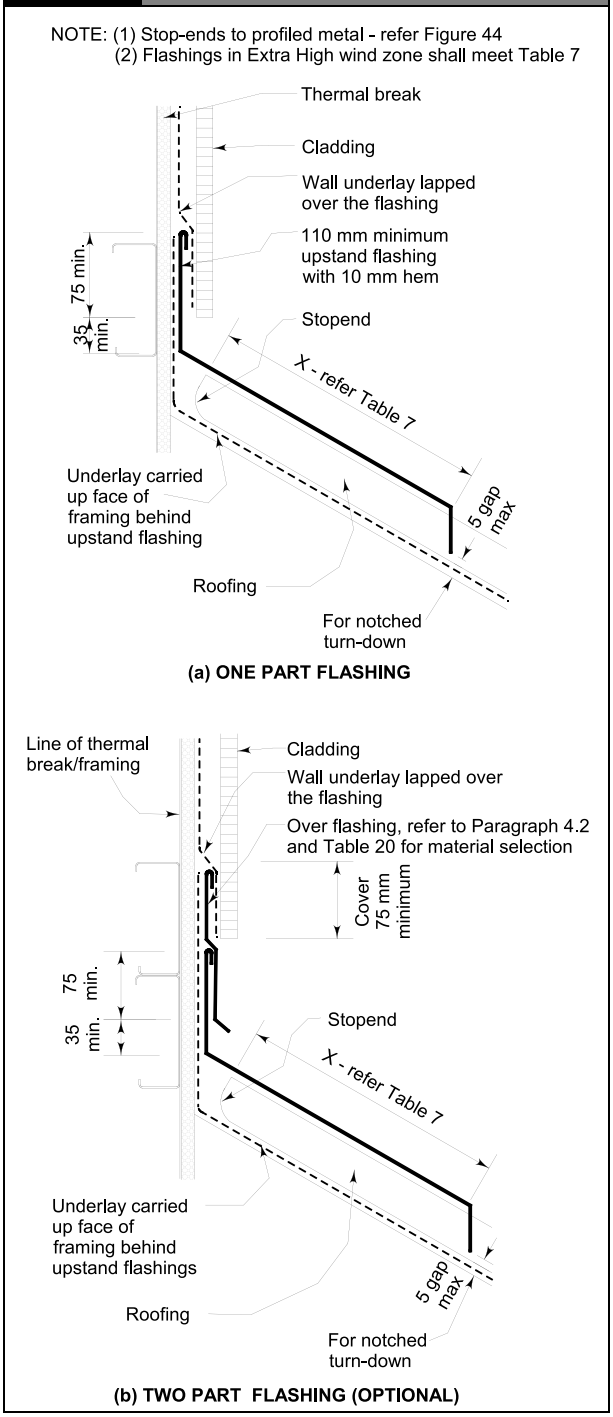
ii) unless shown otherwise 35 mm minimum clearance from bottom of the wall cladding to the deck membrane

Table 7:	**Metal flashings – general dimensions** Paragraphs 4.4.1, 4.5.1.5 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					
Type	**Description**	**All (1)**	**Situation 1 (2) Minimum mm**	**Situation 2 (3) Minimum mm**	**Situation 3 (3a) Minimum mm**	**Figure Reference (as example)**
Aprons: general	Transverse flashing over roofing		130 (4)	200 (4)	200 mm	Figures 4 ,39, 49 and 50. (X Value)
	Parallel flashing over roofing		Two crests, finish in next trough – Refer 4.6.1b			Figures 42, 48, 49 (Y values)
Ridges/ Hips	Transverse flashing Over roofing		Refer **Aprons: general**			Figures 38, 40b, 41
Changes in roof pitches	Upper lap under Roofing	250 mm min			Not permitted under this Standard	Figure 39
	Transverse flashing Over roofing		Refer **Aprons: general**			
Barges	Overlap to barge board		50 (8)	70 (8)	90 mm	Figure 42 (Z values)
Cappings	Overlaps to cladding		50 (8)	70 (8)	90 mm	Figure 7 (Z values)
	Slope to top: parapet and balustrade – metal capping	5° min				Figures 7, 8, 9, 119
	Slope to balustrade – flush-finished EIFS And fibre cement(5)	10° min				Figures 108, 118, 119
Roof to Wall (metal flashing)	Overlaps to roofing		Refer **Aprons: general**			
	Lap under cladding above		75 mm min	75 mm min	90 mm	Figures 4, 21, 25, 30, 32, 39, 43, 45
	Clearance below cladding		35 mm min	35 mm min	35 mm min	
	Total upstand		110 mm min	110 mm min	125 mm min	
Membrane roofs and decks (10)	Lap under cladding above Clearance below cladding	75 mm min 35 mm min				Figures 14, 25, 57, 58, 59
	Total upstand		110 mm min	110 mm min	125 mm min	

Table 7:	**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					
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 76
	Cover to window/ door sill flange	10 mm(7) min				Eg. Figure 76c
	Cover to window/ door sill flange	8 mm(7) min				Eg. Figure 76c
Sills	Sill flashing slope (6)	Flat(6)				Eg. Figures 67a, 76b
Heads	Head flashing slope	15° min				Eg. Figure 76a
	Lap under cladding above		35 mm min	35 mm min	60 mm	Eg. Figure 76a
	Anti-capillary gap to cladding	5mm				Eg. Figure 76a
	Total upstand		**40 mm min**	**40 mm min**	**65 mm min**	
Corners	Corner flashings(1)		50 mm x 50 mm minimum	50 mm x 50 mm minimum	75 x 75 mm	Eg. Figure 74
Inter- storey junctions	Junction flashing: slope	15° min				Figure 65
	Lap over cladding below (1)		35 mm(8) min	35 mm(8) min	60 mm	
	Lap under cladding above		35 mm min	35 mm min	60 mm	
	Clearance under cladding	5 mm min				
	Total upstand		**40 mm min**	**40 mm min**	**65 mm min**	

Notes:
(1) Unless otherwise dimensioned in details.
(2) **Situation 1**: Low, Medium, High wind zones, where roof pitch is 10° and above (X or Z values)
(3) **Situation 2**: (a) All roof pitches in Very High wind zones, (X or Z values)
(b) Low, Medium and High wind zones where roof pitch is below 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 should extend past the condensation channel. Ensure sill flashings are not installed with backwards slope.
(7) Excluding drip edge.
(8) Excluding drip edge.
(9) Edge treatments of flashings, refer to Paragraph 4.4.1.
(10) Membrane roof and deck flashings, refer to Paragraph 4.5.1.5.

Figure 4: **Basic apron flashing**
Paragraphs 4.5.1.1, 4.5.1.4, 5.1, 8.3.8 and Table 7



4.5.1.6. Barges

Barges shall be in accordance with the following (see Figure 42 for examples):

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 in accordance with 4.5.1.1.

4.5.1.7. Window and door heads

Window and door heads shall be in accordance with the following (see Figures 66 and 76 for examples):

a) Slopes and covers of flashings at window and door heads shall comply with Table 7.
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.

4.5.1.8. Inter-storey junctions

Inter-storey junctions shall be in accordance with the following (see 9.1.9.4 and Figure 65 for examples):

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 AND WALL JUNCTIONS

Roof and wall junctions shall comply with this section.

5.1 Apron flashings

Apron flashings shall be in accordance with the following:

a) apron flashing materials be in accordance with 4.2.

b) all roof-to-wall junctions made weathertight by using an apron flashing as given in 4.5.1.1, and shown in Figure 4 that provides the following:

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

      1) pressed metal tiles shall have a flashing fitted to achieve the minimum required overlap of wall cladding, as shown in Figure 30.

      2) profiled metal, incorporates stop-ends at the upper end of the roof cladding as per 8.4.13

   ii) a minimum clearance from the wall cladding to the roofing in accordance with Table 7; and

   iii) extends over the roofing by the minimum cover given in 4.6.1.1 and Table 7 when considering the wind zone and pitch of the roof.

COMMENT :

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

Requirements for specific wall cladding systems are given in Section 9.0.

Where the roof finishes within the length of an adjacent wall, a kick-out or stopend as detailed in Figure 5B shall be provided to direct water out from the wall cladding onto the roof cladding and gutter.

5.2 Gutters, barges and fascias

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 5B.

COMMENT :

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 given in 9.7 and 9.8.

Separation shall be provided between any H3 plywood treated with copper based preservatives (apart from LOSP treatment) and any steel building element.

Soffit linings shall be finished to fascias, barges and wall claddings as shown in Figure 5A, or Figure 105 for flush finished fibre cement. Wall underlays shall not be required behind soffit linings.

Figure 5A: **Soffit/wall junctions**
Paragraphs 5.3, 8.1.3.1, 8.4.6, 9.6.5, 9.7.6

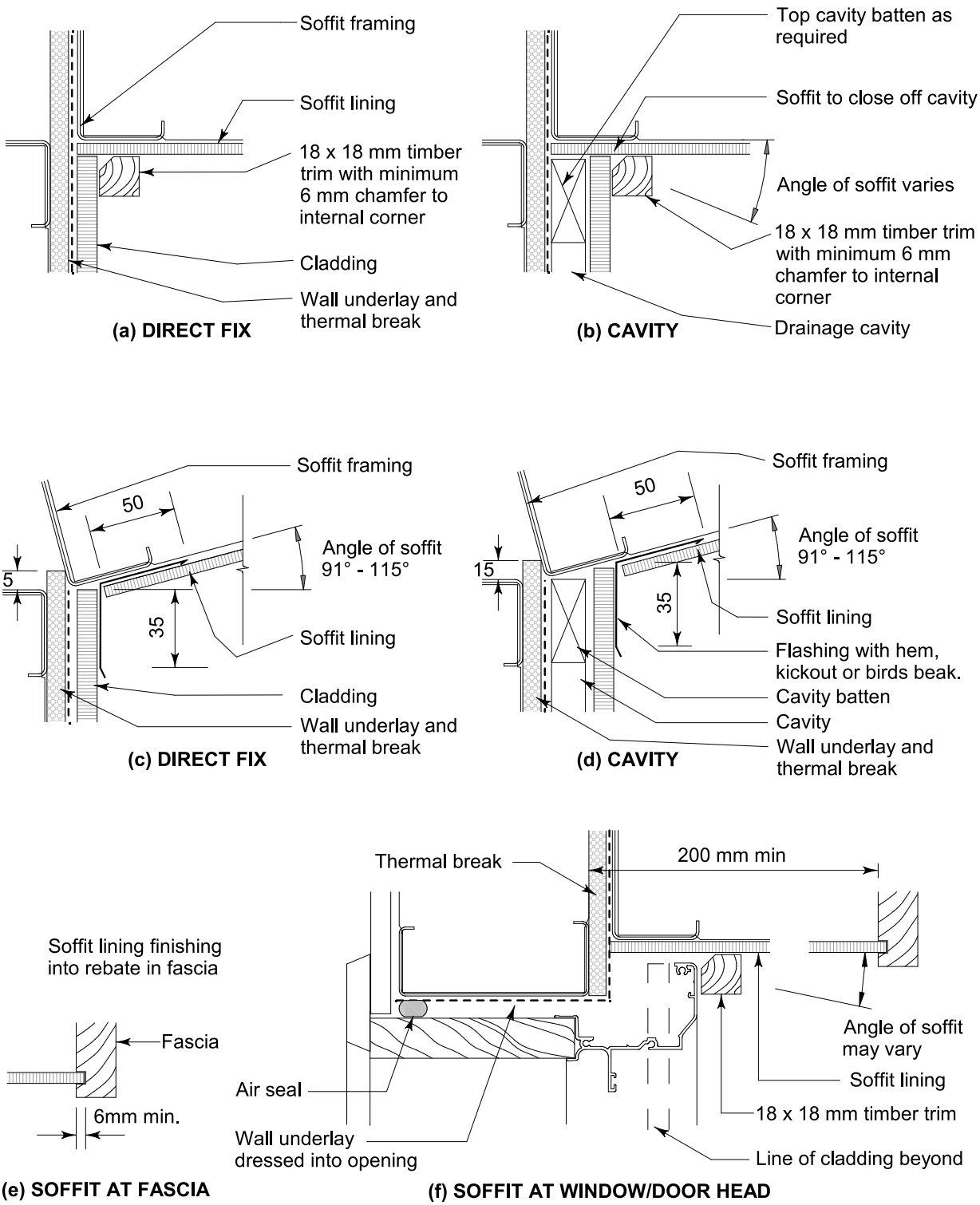
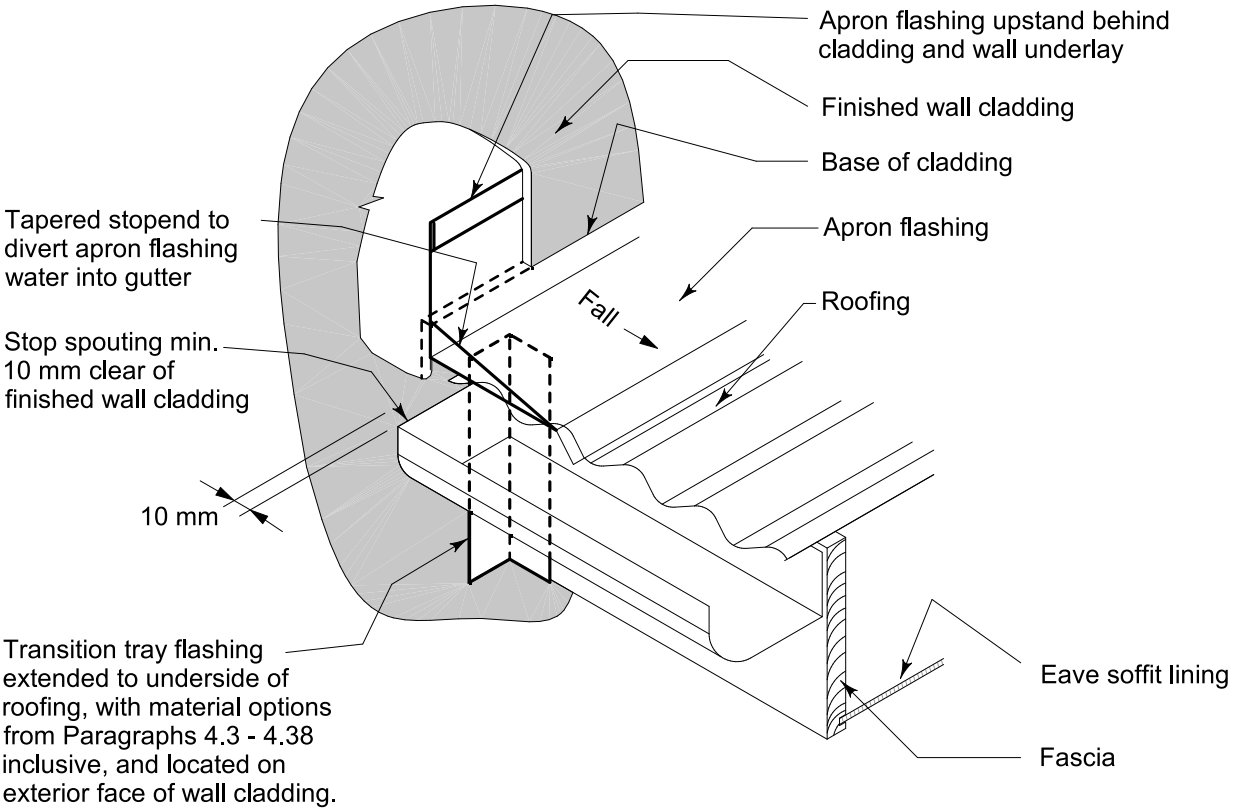


Figure 5B: **Gutter/wall junction**
Paragraphs 5.1 and 5.2

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.



6.0 PARAPETS

Parapets shall require a drained cavity for claddings except for vertical corrugated steel as outlined in Table 3 (see also 7.4 Enclosed balustrades).

COMMENT :
Vertical corrugated profiled metal is considered to have drainage capabilities the equivalent of drained cavities.

6.1 Limitations

This Standard does not include parapet cappings that use stucco, EIFS and flush finished fibre cement materials.

6.2 Parapet construction

Parapets shall be constructed as shown in Figure 7.
Parapets shall comply with the following requirements:

a) Steel for framing and timber cavity battens comply with the NZBC Clause B2;
b) Sloped packers under cappings be polystyrene or timber treated to B2/AS1, or be a minimum of 9 mm H3 plywood on packers, and
c) Framing shall be fully enclosed with wall underlay or roof underlay, in accordance with Table 23 for the specific cladding.
d) claddings shall be installed over a cavity in accordance with Paragraph 9.1.8.
e) thermal breaks are not required where the parapet framing is separated from the building envelope by a thermal break.

Details for specific wall cladding systems are given in 9.0.

Specific requirements for enclosed balustrades are given in 7.4.

6.3 Capping materials

Parapets shall be capped with metal, butyl or EPDM membrane.
Cappings shall comply with the requirements of 4.0.

6.4 Metal cappings

Metal cappings installed over parapets and enclosed balustrades shall be as outlined in 6.0 and 7.4.

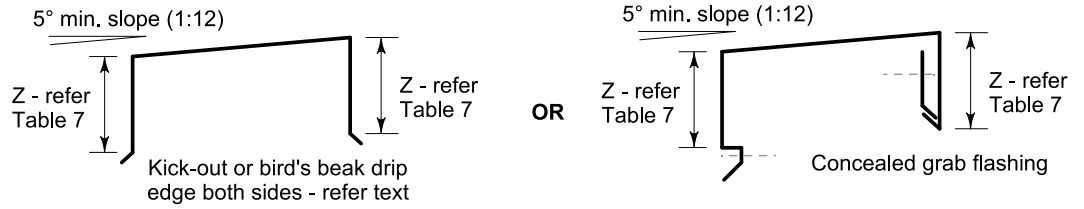
Metal cappings installed over parapets and enclosed balustrades shall comply with the following requirements:

a) tops of cappings be free of any penetrations;
b) slope of top be a minimum of 5° (1:12);
c) cover at the sides of the capping be in accordance with Table 7;
d) all cappings have drip edges (The details shown in Figure 2 are acceptable minimum drip edges for parapets);
e) cappings be separated from underlying framing by roof underlay as shown in Figure 7;
f) lengths of capping be joined as shown in Figure 6 (b) or Figure 6 (d);
g) external corners of cappings be as shown in Figure 6 (e);
h) expansion joints be provided for joined cappings with a combined length exceeding:
    i) 12 metres for light coloured steel and stainless steel, 8 metres for dark coloured steel and
    ii) 8 metres for aluminium;
i) Where both ends of a capping are constrained, allowance be made for expansion, and
j) Where required under h) above expansion joints shall be formed as shown in Figure 6 (g), and with:
    i) minimum 200 mm laps
    ii) sliding clips at both sides of the lap.

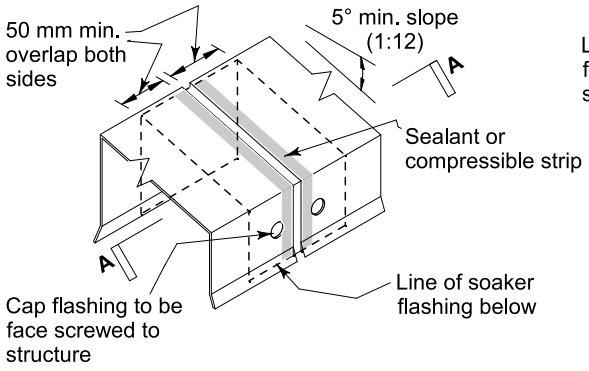
Any textured coating application, except for the finished coat, over flush-finished cladding shall be completed prior to the installation of metal cappings.

Figure 6: **General capping joints for parapets and enclosed balustrades**
Paragraphs 6.3, 6.4, 7.4.4, 9.7.7, and 9.9.10.2.

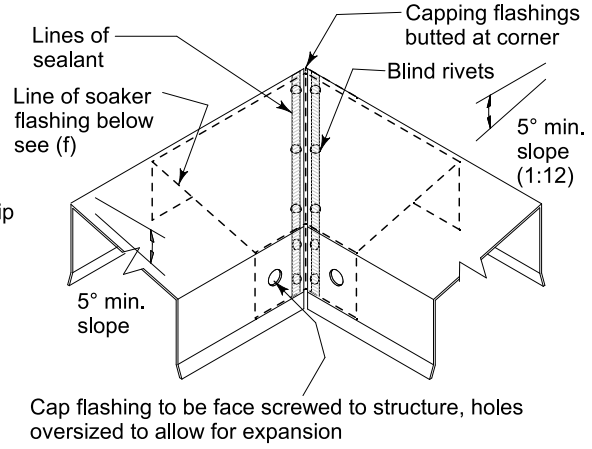
NOTE: Capping joints and fixings - refer Paragraph 4.5.2



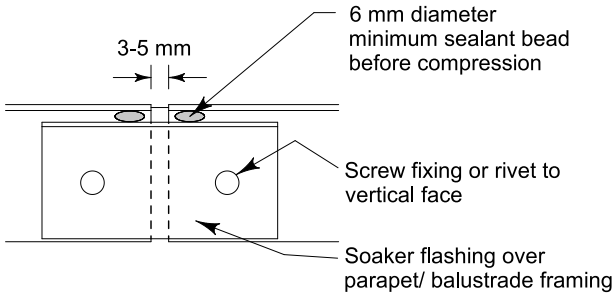
(a) PARAPET FLASHING



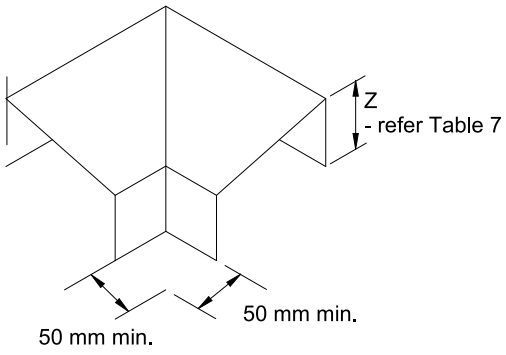
(b) PARAPET FLASHING SOAKER JOINT



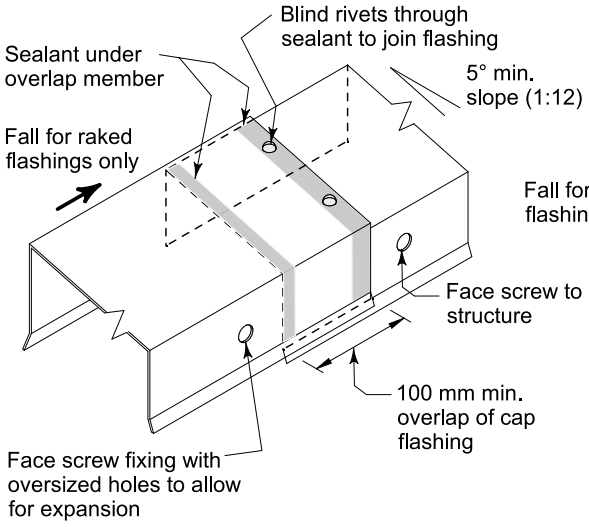
(e) CAPPING FLASHING AT EXTERNAL CORNER OF PARAPET



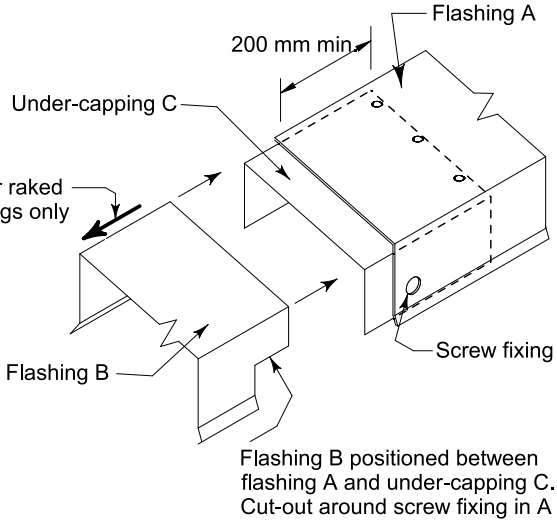
(c) SECTION A - A THROUGH SOAKER FLASHING



(f) PREFORMED CORNER SOAKER

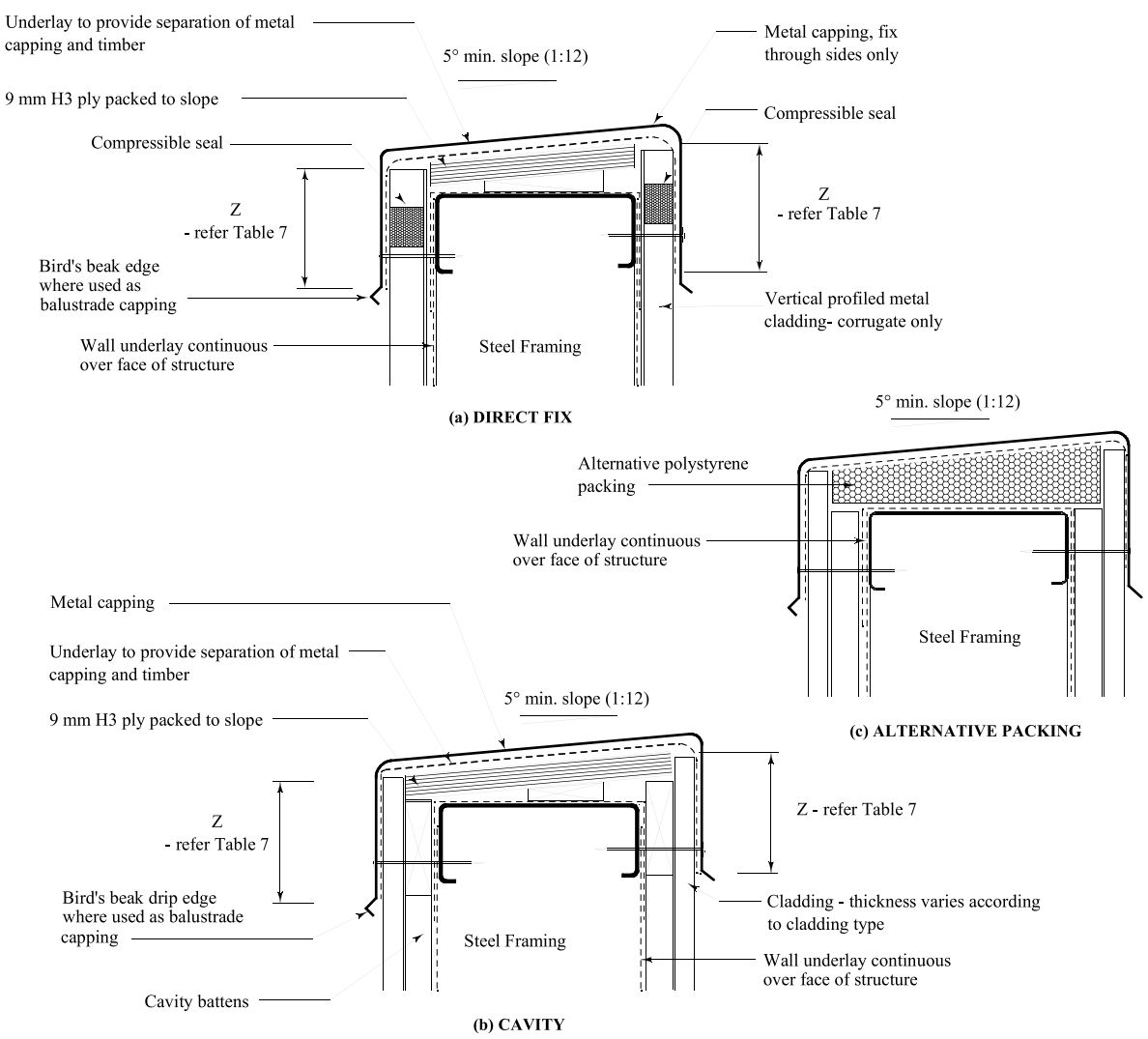


(d) PARAPET FLASHING OVERLAP JOINT



(g) PARAPET FLASHING EXPANSION JOINT

Figure 7: **General construction of parapet and enclosed balustrade**
Paragraphs 6.0, 6.2, 6.4, 7.4, 9.7.7, Figures 9, 10, 108, 118 and 119



6.4.1 Parapet-to-wall junctions

Junctions of parapets to walls shall be flashed to direct water clear of the outside face of the cladding system, using a saddle flashing as shown in Figure 8 and Figure 9.

Parapets that are continuous and in-plane with adjacent wall surfaces are outside the scope of this Standard. An offset in the wall line between parapet and adjacent wall is required as in Figures 8 and 9.

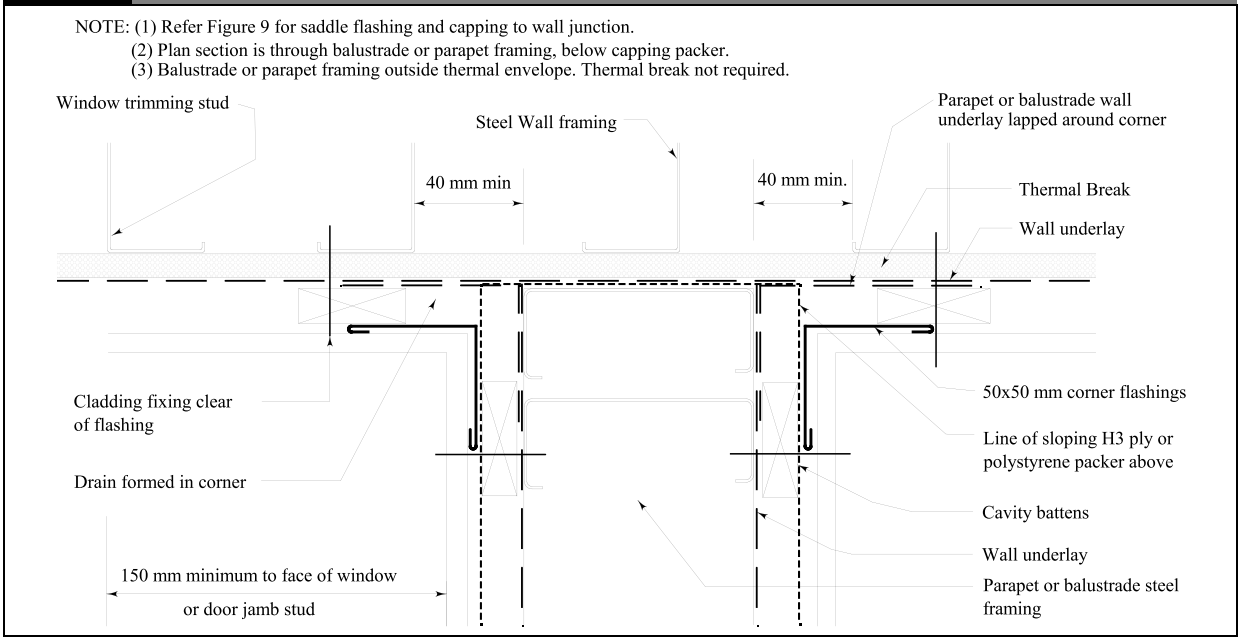
COMMENT :
Reports on leaky buildings show these junctions have been prone to leakage and care should be taken to detail and build them correctly.
In-plane junctions require specific design of flashing arrangements.

6.5 Membrane cappings

Butyl rubber and EPDM cappings shall be in accordance with 4.3.9, and shall comply with the following requirements:

a) Tops of membrane cappings be free of any penetrations, and have a minimum slope of 10° (1:6),
b) Sides of membrane cappings overlap the wall claddings as outlined in Table 7, and
c) Joints be in accordance with 8.5.5.2.

Figure 8: **Parapet/enclosed balustrade-to-wall junction – plan section**
Paragraphs 6.4.1, 7.4.2 and 7.4.4, Figures 7, 9, 108, 118 and 119



6.6 Integral surface cappings

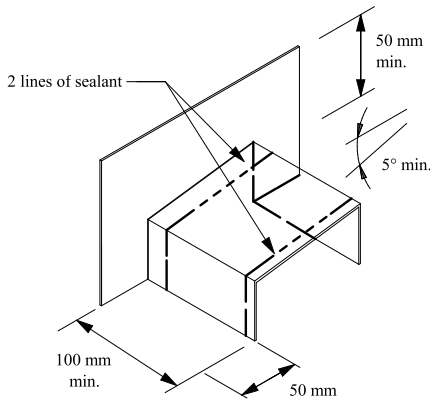
Cappings formed by using EIFS or flush-finished fibre cement materials shall not be used for parapets, (but may be used for enclosed balustrades as described in 7.4).

Parapets and enclosed balustrades for stucco cladding shall be in accordance with 9.3.9

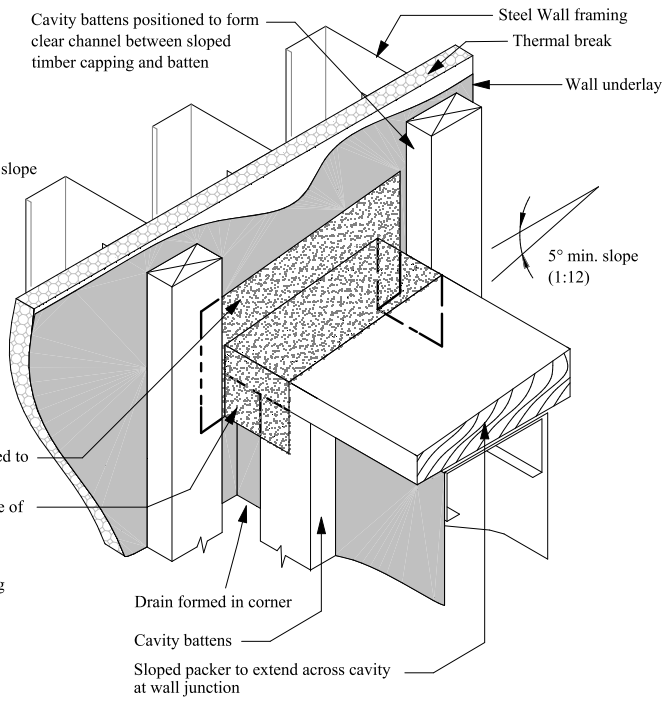
COMMENT :
The tops to parapets are considered to be more risky locations than the tops to enclosed balustrades, as they are less accessible for inspection and regular maintenance.

Figure 9:

General junction of parapet and enclosed balustrade to wall
Paragraphs 6.4.1, 7.4.2, 7.4.4 and 9.8.10.1, Figures 7, 8, 108, 118 and 119

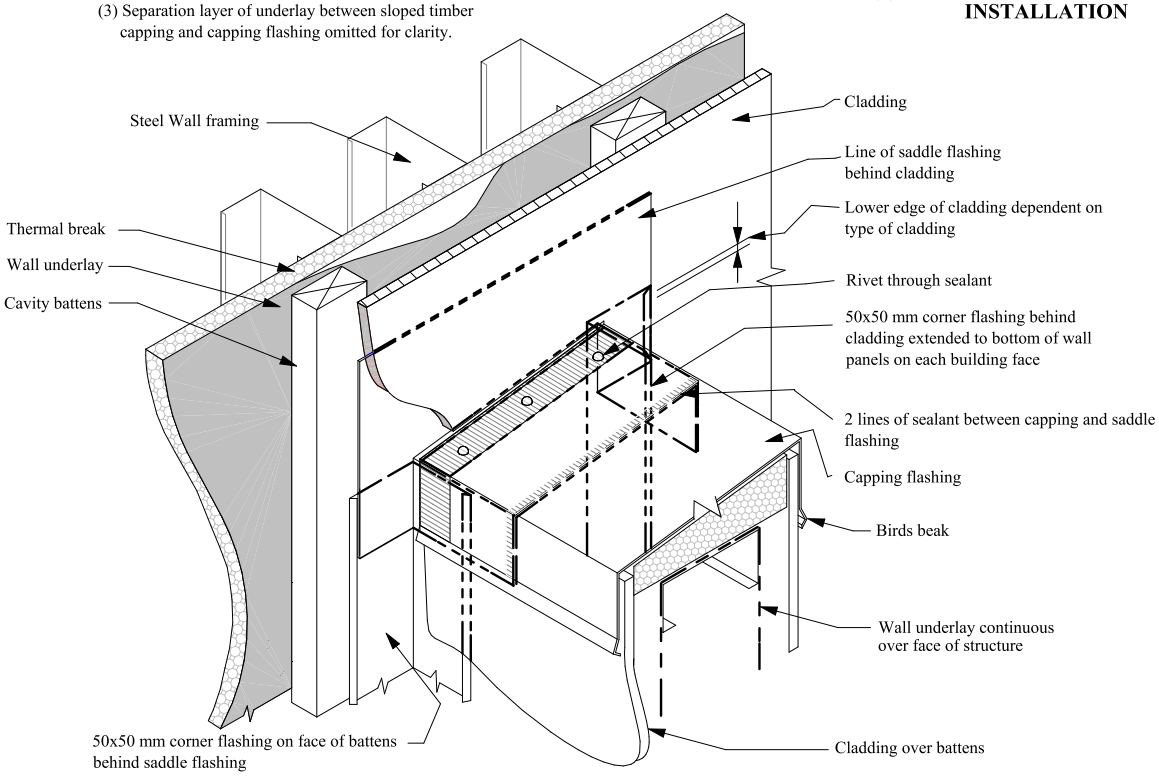


(a) SADDLE FLASHING



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 8 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

7.0 DECKS AND PERGOLAS

Timber and steel used to construct decks, enclosed balustrades, and other attachments such as pergolas shall comply with NZBC B2.

7.1 Thresholds for decks

The opening threshold level may be at or above floor level.

The vertical separation between the threshold level and the upper surface of the deck shall be as shown in Figure 10.

7.1.1 Slatted decks

The level of the upper surface of the slatted deck shall be in accordance with the following:

a) a minimum of 50 mm below the threshold level for cantilevered decks as shown in Figure 10(b) and Figure 12; or
b) at the same level as the threshold for non-cantilevered decks that are formed as shown in Figure 10(c).

For slatted decks, a minimum gap of 12 mm shall be provided between the exterior wall and the adjacent decking slat.

7.1.2 Enclosed decks

This Standard is limited to enclosed decks with a maximum area of 40 m^2.

For enclosed decks, the vertical separation between the opening threshold level and the upper surface of the finished deck surface shall be a minimum of 100 mm.

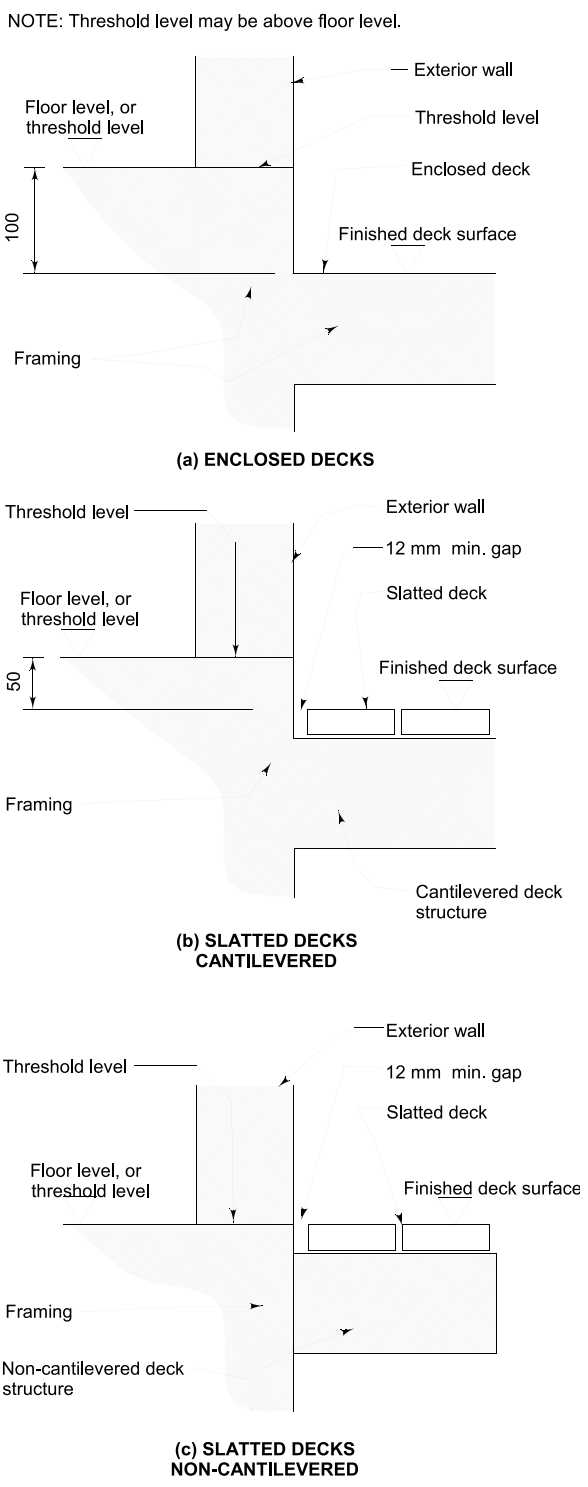
7.2 Attachment to building structure

7.2.1 Slatted decks to walls

Junctions of slatted decks with walls shall be made weathertight as shown in Figure 11 and Figure 12. Fixings for stringers shall be in accordance with NZS 3604.

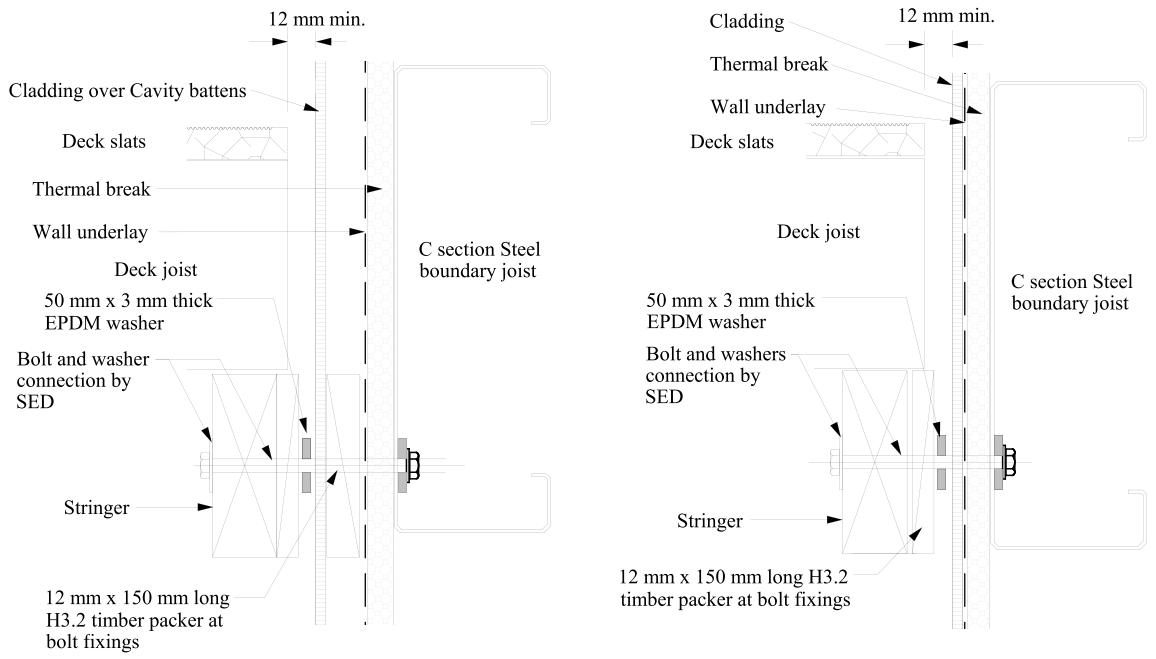
Wall claddings that rely on surface coatings to reduce water absorption shall be sealed on outer faces and edges prior to fixing the stringers.

Figure 10: **Threshold separation**
Paragraphs 7.1, 7.3, 8.5.6, Figures 11, 12, 13A, 51, 57 and 59



COMMENT :
Separating decks from buildings reduces the risk of water penetration into the framing.

Figure 11: **Junction with wall for non-cantilevered timber deck**
Paragraphs 7.1.1, 7.2.2 Figures 10



NOTE:
(1) Not suitable for stucco, EIFS or profiled metal.
(2) The top of the deck slats may be level with the interior threshold.
(3) The same stringer to wall junction applies when joist hangers are used.
(4) Bolt and washer connections by SED.

7.2.1.1. Cantilevered decks

Cantilevered decks shall have the junction with the exterior wall made weathertight as shown in Figure 12.

Cladding shall be sealed to the saddle flashing with silicon sealant complying with:

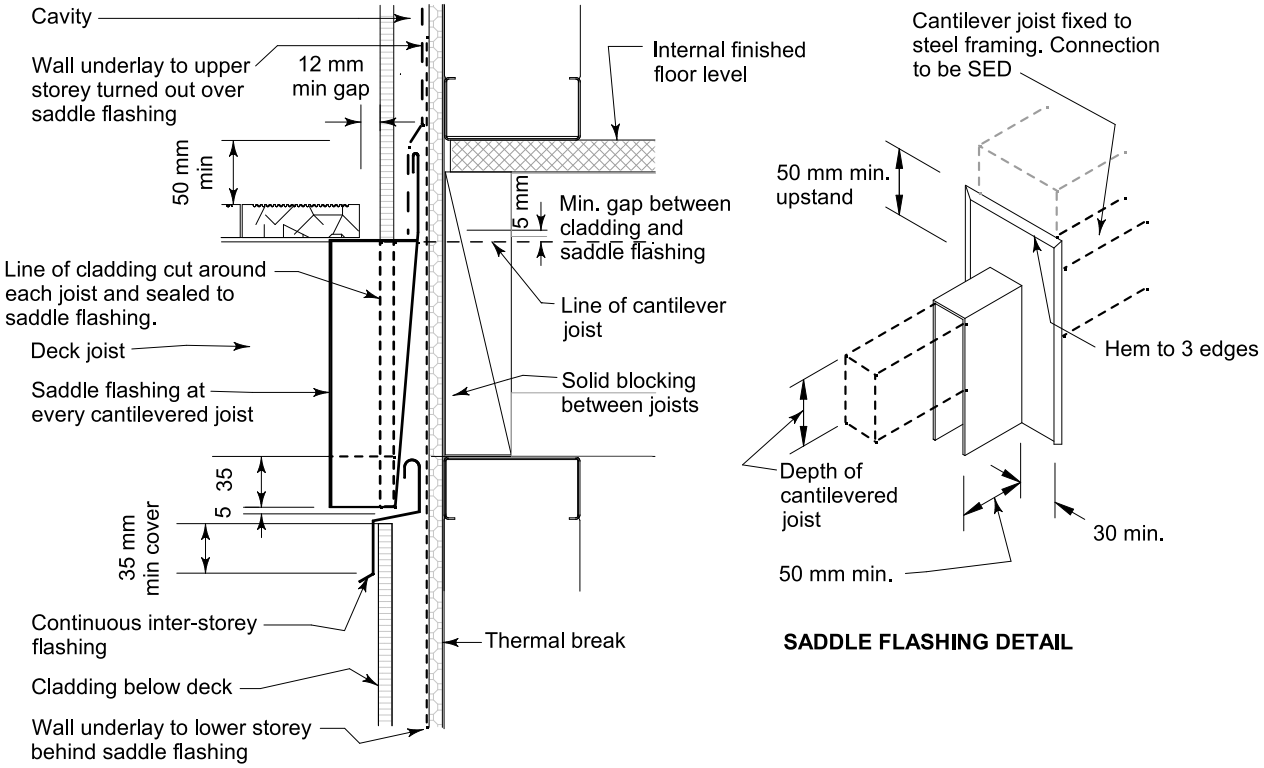
a) Type F, Class 20LM or 25LM of ISO 11600, or
b) low modulus Type II Class A of Federal Specification TT-S-00230C.

7.2.2 Pergolas

Connections of other structures, such as pergolas, shall have the junction with the exterior wall made weathertight by using the deck framing connections given in Figure 11.

Figure 12:	**Junction with wall for cantilevered timber deck** Paragraphs 7.1, 7.2.1.1, 7.3.1 Figures 10

NOTE:
(1) Wall underlay at back of cavity shall be taped around joist penetrations.
(2) The back of the saddle flashing shall be positioned behind the cladding, between the upper storey and lower storey layers of wall underlay.
(3) Saddle flashing terminates over inter-storey flashing.
(4) Cantilevered joist to framing structure connection by SED.



7.3 Level thresholds

Where provision for level access is required, this shall be provided as shown in Figure 13A and Figure 13B.

7.3.1 Enclosed decks

Where provision for level access is required for an enclosed deck, this shall be provided in accordance with Figure 13A.

The underlying membrane deck surface shall be made weathertight as given in 8.5.

7.3.1.1. Removable surfaces

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 13A.

A minimum gap of 12 mm shall be provided against the wall or balustrade cladding.

7.3.1.2. Timber removable surface

Timber decking shall be over framing supported off the deck membrane as shown in Figure 13A.

No fixings shall penetrate the underlying deck membrane.

COMMENT :
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.
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 shall be provided as shown in Figure 13B, 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 given in Figure 13B and includes one or more of the following:

a) A channel, together with drainage provisions across the door opening, with:
   i) the width to suit capacity in accordance with E1/AS1;
   ii) a minimum depth of 150 mm;
   iii) a maximum length of 3700 mm; and
   iv) a 1:200 minimum fall along length of channel towards a drainage outlet.
b) Grating over a channel, in accordance with Table 21, Table 22, and the following:
   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.
c) Exterior paving that is in accordance with the following:
   i) has a minimum fall of 1:40 away from the channel for a minimum distance of 1 m,
   ii) together with the surrounding paving and ground levels, complies with drainage requirements of E1/AS1.

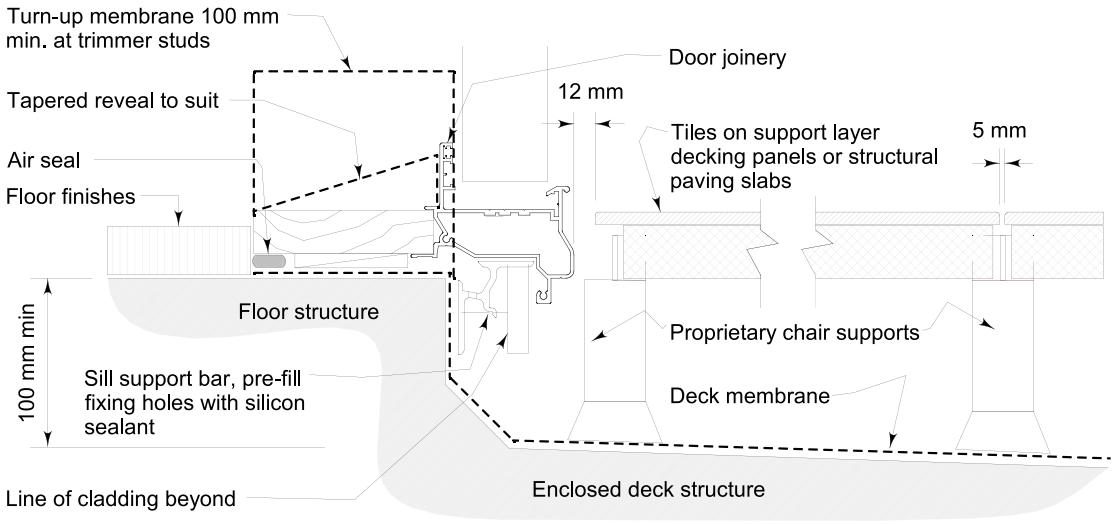
COMMENT :
The grating support should be specifically detailed to suit the condition of the building and site.

7.3.2.2. Framed floor

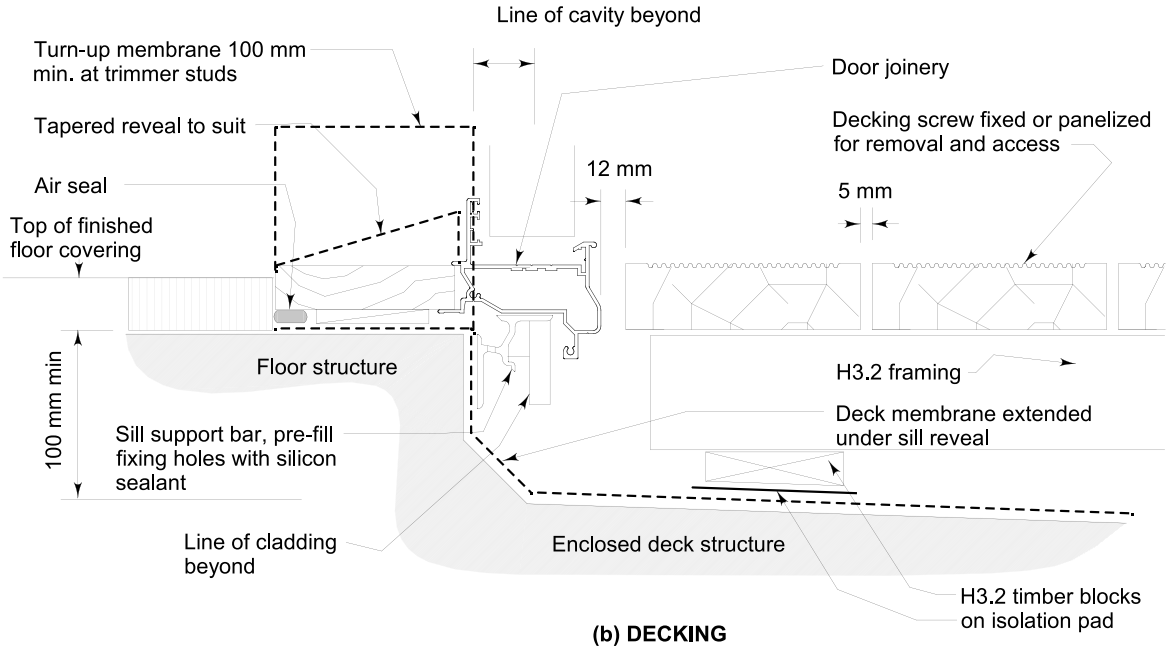
Where provision for level access is required from a framed floor structure to the exterior, this shall be provided as shown in Figure 13B, with clearances in accordance with 9.1.3.

Figure 13A: **Level for enclosed decks**
Paragraphs 7.3, 8.5.1 and Figures 13B

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.
(4) Sill support bar and fixings selected for secure connection to floor structure.



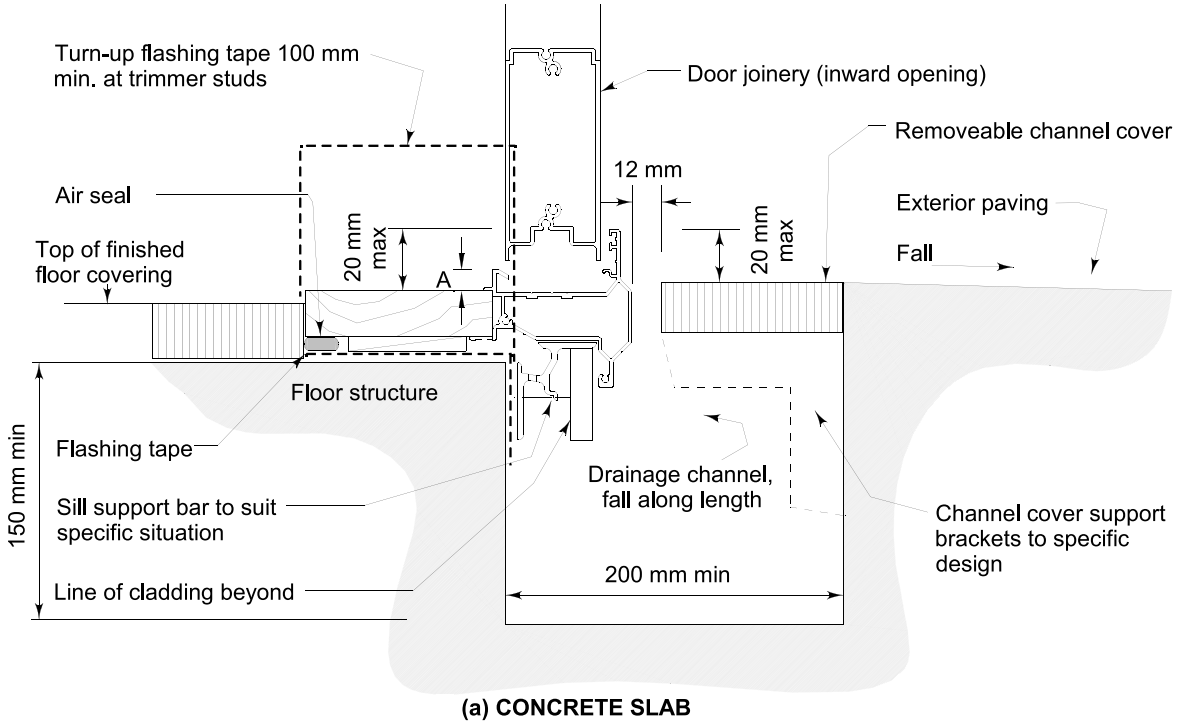
(a) TILE/PAVING



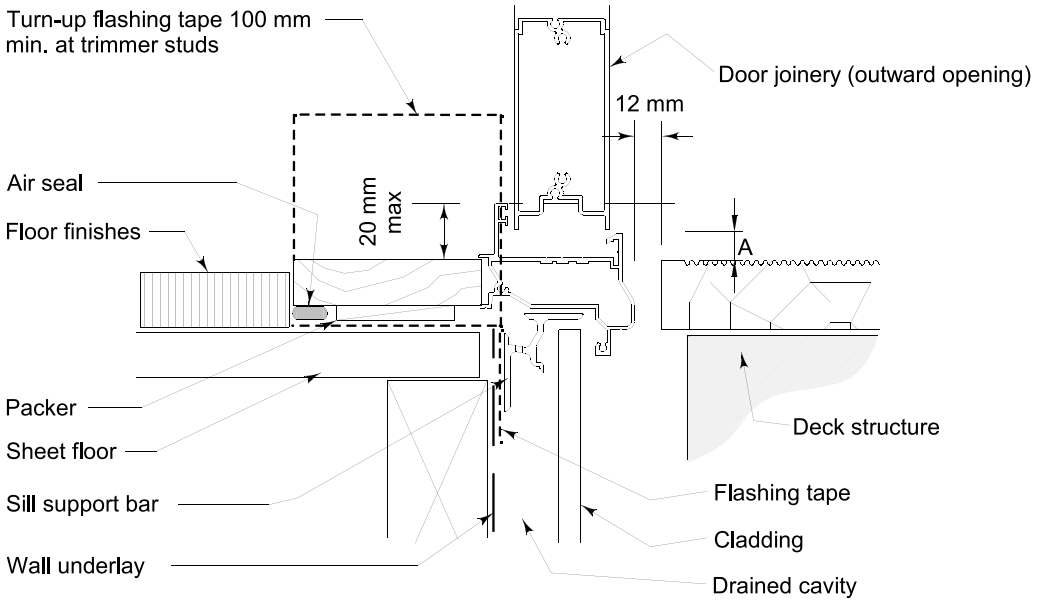
(b) DECKING

Figure 13B: **Level thresholds for ground level**
Paragraphs 7.3 and Figures 13A

NOTES:
(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 framed 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 13A.
(3) Both details may be adapted for inward or outward opening doors.
(4) Exposure to wind-driven rain must be specifically taken into account when using these details, and shelter to doors and joinery provided where local conditions warrant.
(5) In detail (A) 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.
(6) Sill support bar and fixings selected for secure fixing to floor structure.



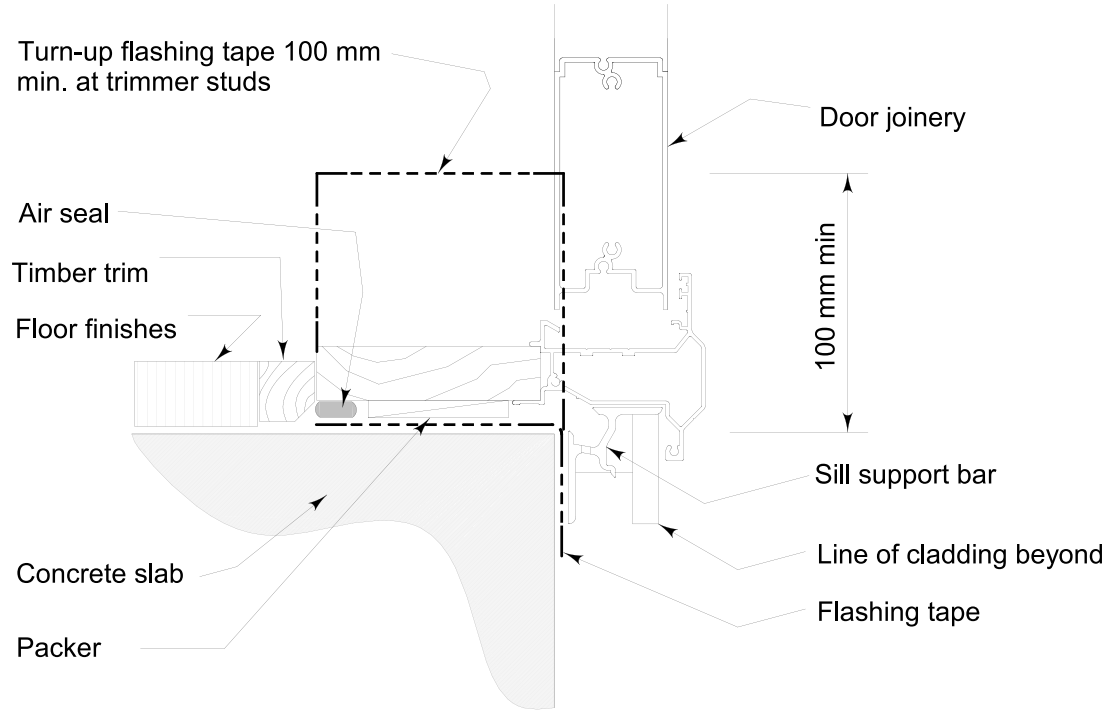
(a) CONCRETE SLAB



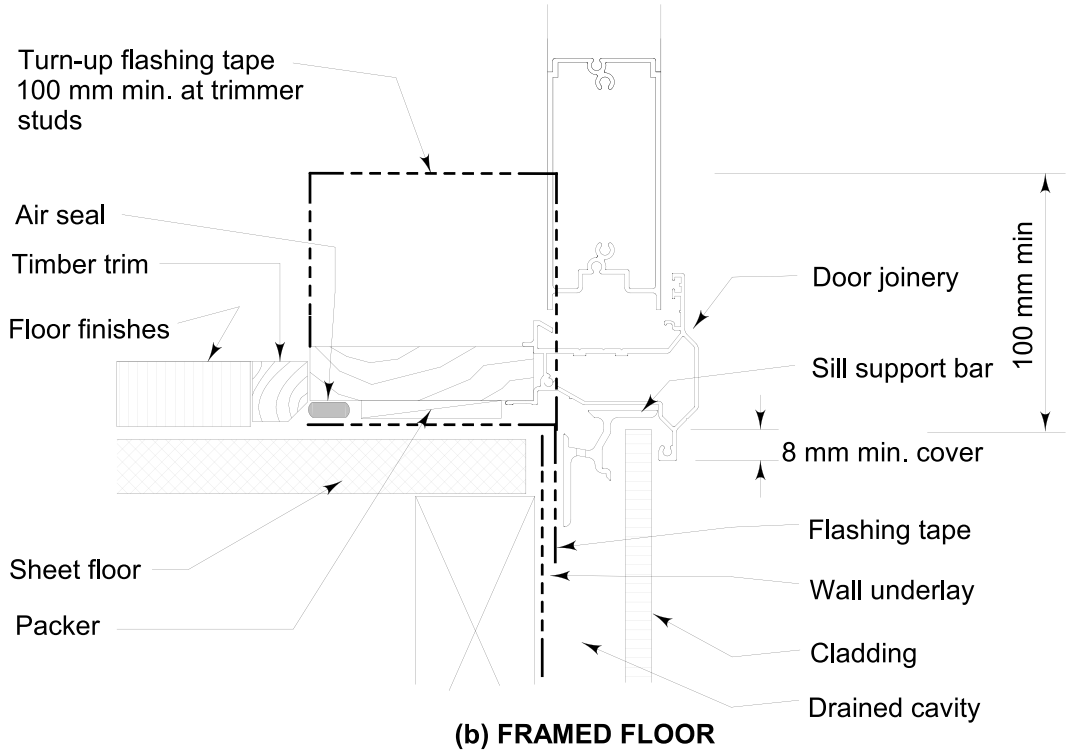
(b) FRAMED FLOOR

Figure 13C: **Door sills for cavity construction**
Paragraphs 9.1 Figures 68C, 80, 81, 86, 94, 107 and 117

NOTE:
Sill support bar and fixings selected for secure fixing to floor structure.



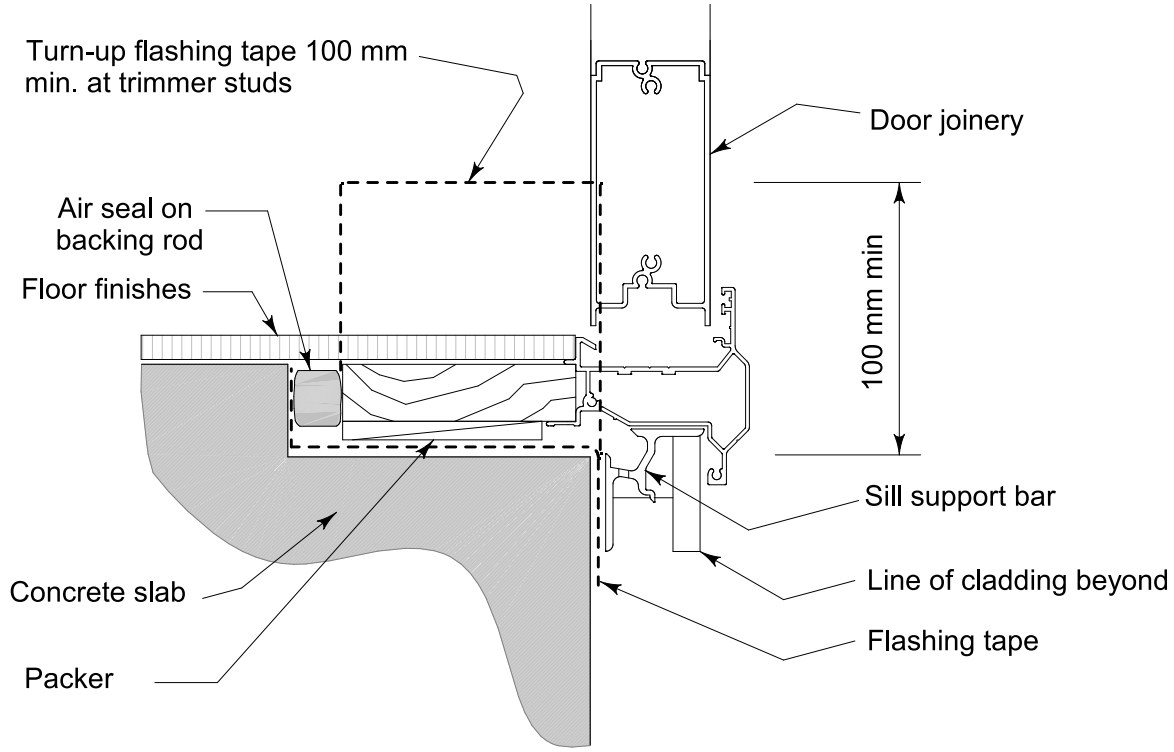
(a) CONCRETE SLAB



(b) FRAMED FLOOR

Figure 13C: (continued)

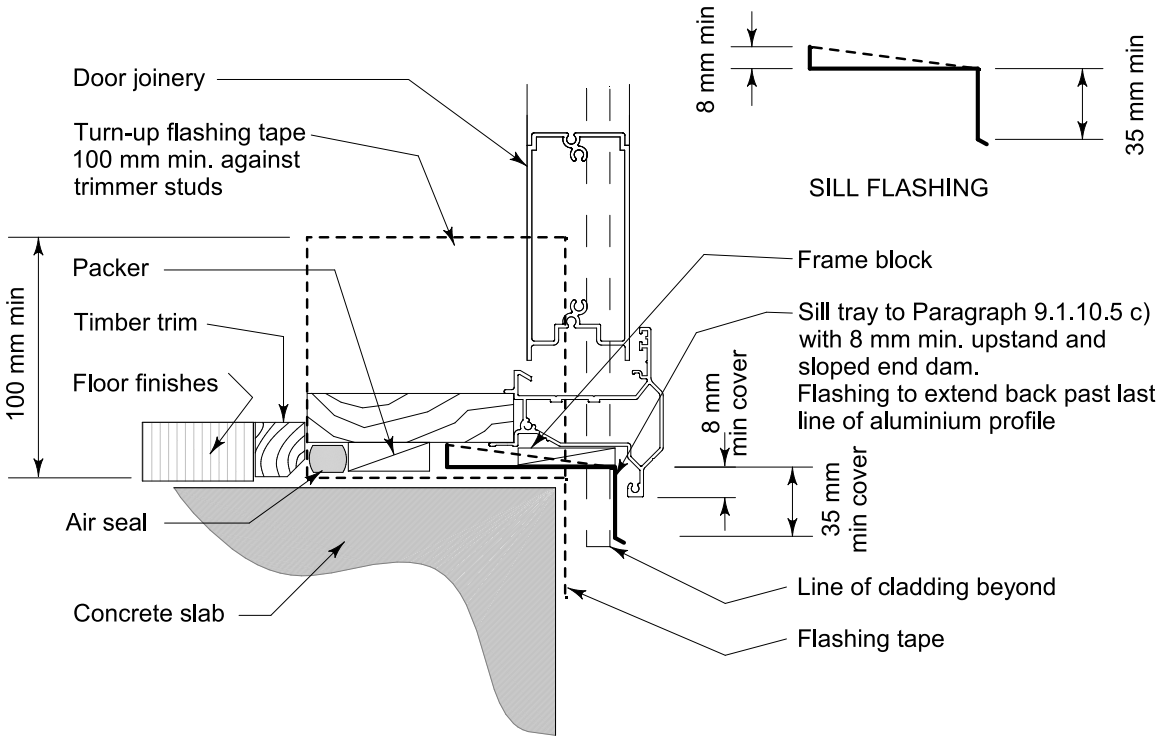
Rebated door sills for cavity construction
Paragraphs 9.1 Figures 68C, 80, 81, 86, 94, 107 and 117.



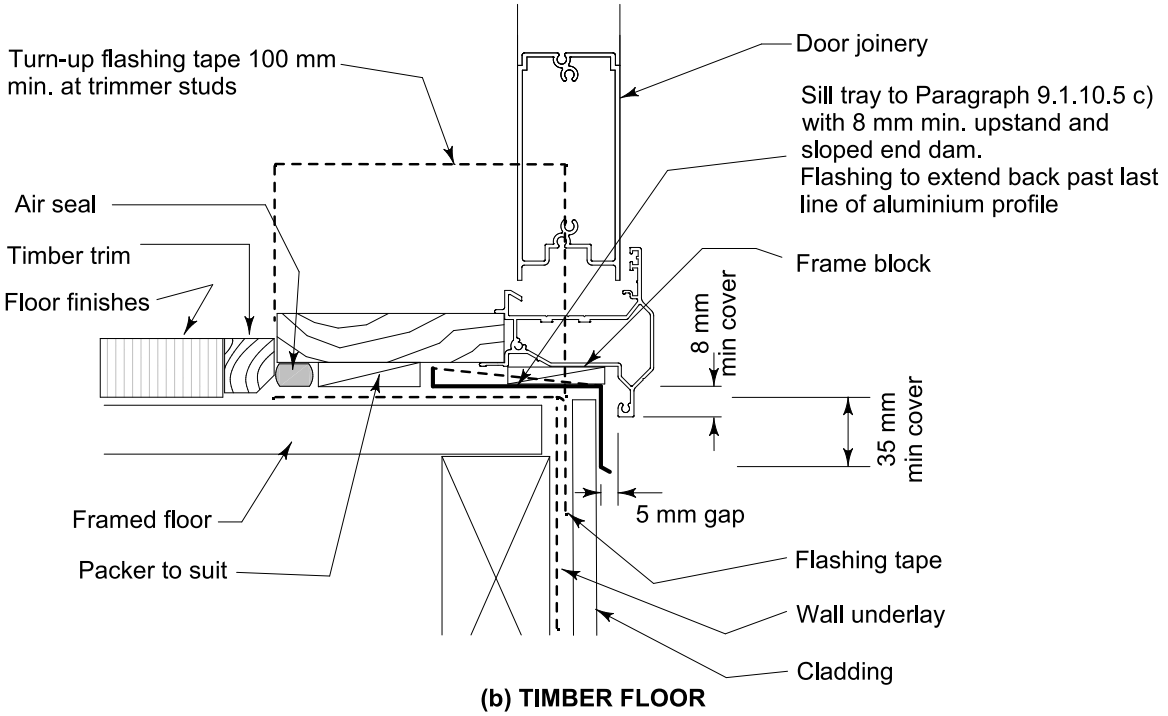
(c) CONCRETE SLAB FLUSH FLOOR

NOTES:
(1) Sill timber H3.1
(2) Aluminium frame with factory fitted corner soaker
(3) Flashing tape to Figure 68D
(4) Threshold level measured from bottom of sill rebate
(5) Sill support bar as per Paragraph 9.1.10.5 c

Figure 13D: **Door sills for direct fix**
Paragraphs 9.1 Figures 76, 77, 78, 79, 85, 90 and 106

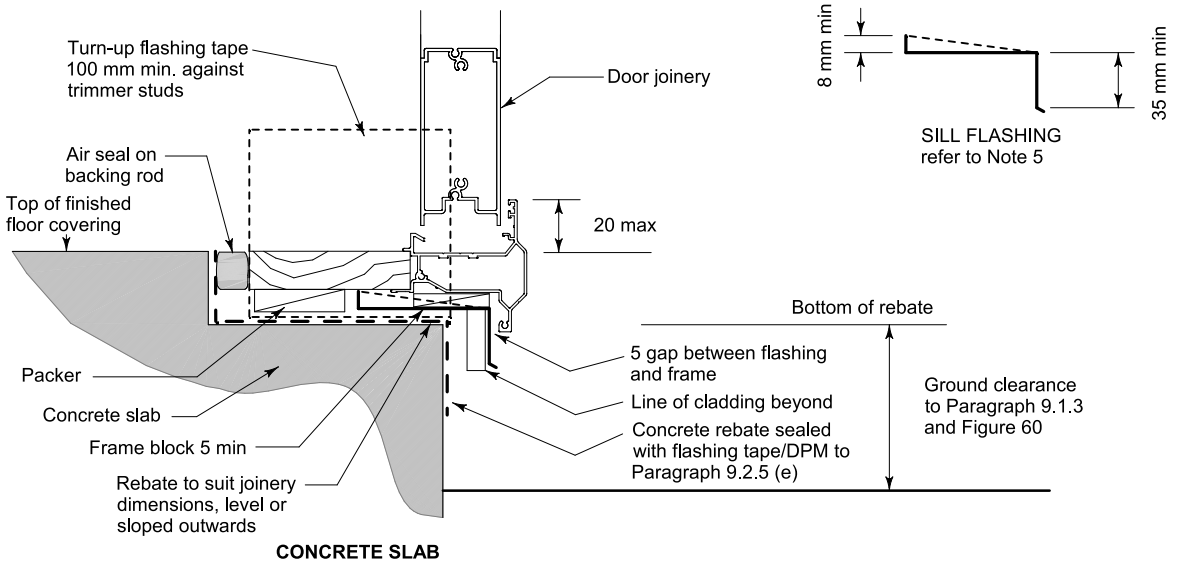


(a) CONCRETE SLAB



(b) TIMBER FLOOR

Figure 13E: **Rebate door sills for direct fix**
Paragraphs 9.1 Figures 76, 77, 78, 79, 85, 90 and 106



NOTES:
(1) Sill timber H3.1
(2) Aluminium frame with factory fitted corner soaker
(3) Flashing tape to Figure 68D
(4) Threshold level measured from bottom of sill rebate
(5) When joinery is installed according to this Figure and notes the sill tray may be left out
Refer to Figure 13F for sill tray installation details

7.4 Enclosed balustrades

Enclosed balustrades shall require a drained cavity for claddings, except for vertical corrugated steel, as given in Table 3, and be detailed as required for parapets described in Section 6, 9.1.8, and Figure 7,Figure 8, and Figure 9.

Details for specific cladding systems are given in Section 9.0.

Enclosed balustrade cappings for EIFS and flush finished fibre cement shall include flush finishes as given in 9.7.7 and 9.9.10.

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

7.4.1 Deck drainage

For decks with enclosed balustrades, provision for drainage shall be in accordance with 8.5.6 and 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 Figure 8 and Figure 9.

COMMENT :
Reports on leaky buildings show that these junctions are prone to leakage and care should 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 given in Figure 14.

Junctions with wall claddings shall be as given in Figure 57.

7.4.4 Metal cappings

Metal cappings to enclosed balustrades shall have dimensions as given in Table 7.
Metal cappings shall have the same requirements as given for parapets in 6.4, with the exception of the following:

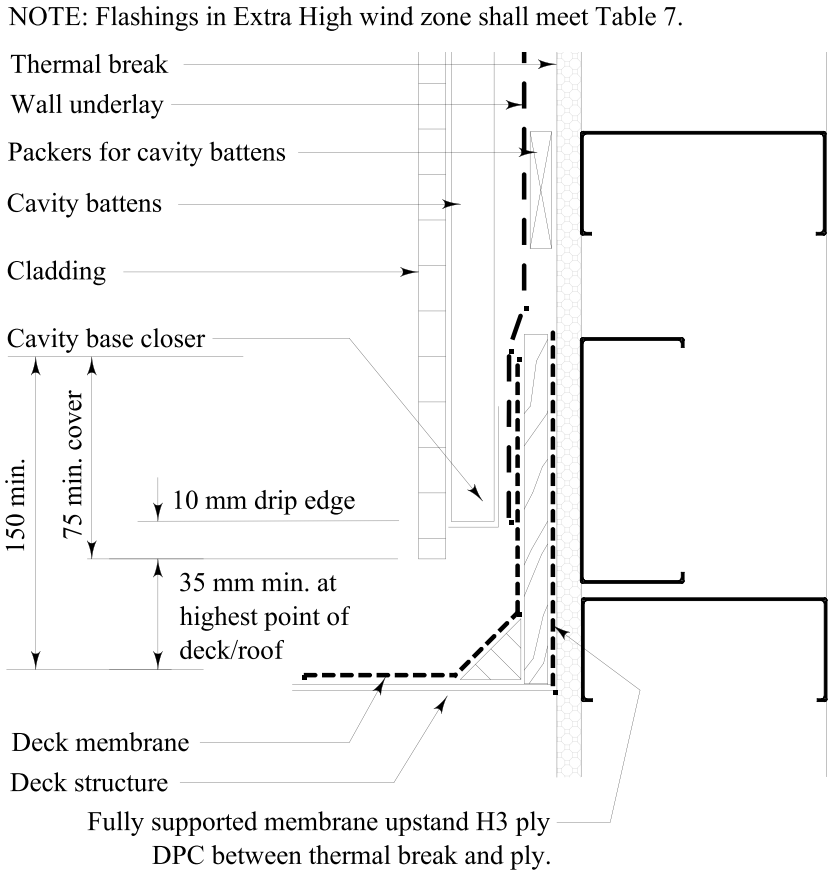
a) Slope to the top of the capping, for buildings other than housing, to be as given in F4/AS1; and
b) Drip edges be required for both sides of the capping. The drip edge to the deck side of the capping shall be a bird's beak as shown in Figure 2.

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

7.4.5 Stanchions

Stanchions are not covered by this Standard.

Figure 14: **Enclosed balustrade – bottom of cladding**
Paragraphs 7.4.3, 9.1.3, Figures 51, 57, 58 and 59



8.0 ROOF CLADDING

Roof cladding shall be in accordance with this section.

8.1 General weathertightness

Roof claddings shall meet the requirements of NZBC E2.3.1 and E2.3.2, and be specified and constructed in accordance with the provisions of 8.1.2 to 8.5.

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

8.1.1 Materials

The following roof cladding systems are covered in this Standard:

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

Other roof claddings are outside the scope of this Standard.

Roof cladding materials shall comply with Table 20.

8.1.2 Thermal Breaks

Roof framing shall have thermal breaks that comply with Section 11.

COMMENT:
Truss roofs, including gable end framing where used, require a thermal break between the trusses and framing and the wall framing. Rafter type construction requires the thermal break to be installed on top of the roof framing.

8.1.3 Maintenance

Maintenance of claddings shall be carried out as required by the manufactures warrantee to achieve the expected durability of the materials (see 2.7).

COMMENT :
A deterioration in the appearance of the coating of the metal does not necessarily relate to a deterioration in the weathertightness or durability 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 (see 5.3).

8.1.4 Fixings

Fixings shall be as specified in 8.2 to 8.5.

Materials for fixing roof claddings and flashings shall be selected from Table 20, Table 21, and Table 22.

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.

8.1.5 Roof underlays

Roof underlays shall be in accordance with Table 23, and NZS 2295:2016 and be either:

- R1 heavy weight kraft;
- R2 self supporting kraft;

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° and;
- Run horizontally or vertically for roof pitches 10° and above; and
- Have anti-ponding boards at lower edges of masonry tiles (see Figure 20(b) and 8.2.5).

8.1.5.1. Underlay support

Prevent sagging of roof underlay by:

a) For R1 underlays, fully supported with a corrosion resistant material, or
b) For R2 self supporting underlays, laid to maximum 1.2 metre span between adjacent supports where the roof pitch is 10° and above, and
c) whenever the roof pitch is below 10° ensure that R2 self supporting underlays are fully supported with the addition of a corrosion resistant material.

8.1.6 Gutters requirements

Where gutters, downpipes and spreaders, including eaves gutters or spoutings, are required for the drainage of roof water, they shall be in accordance with the following:

a) Be to the minimum dimensions shown in this Standard or calculated to meet the NZBC clause E1 surface water, whichever is the greater.

b) If a gutter depth is reduced to allow entry of a valley gutter, the reduced depth 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.

d) Eaves gutters or spoutings be in accordance with the following:
   i) Be materials given for flashings in 4.1 except 4.2.9 and 4.2.10;
   ii) Have a minimum cross-sectional area of 2500 mm^2; and
   iii) Be designed to overflow water to the outside of the building.

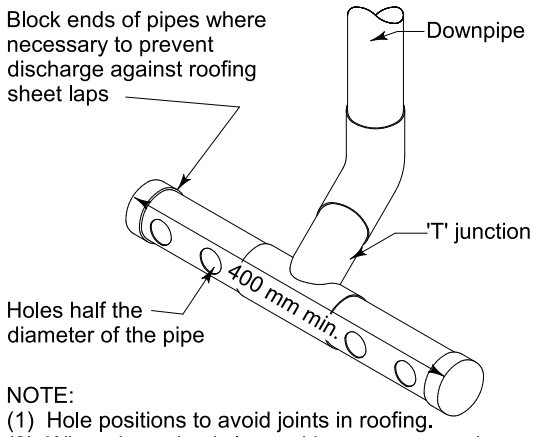
e) Downpipes shall be in accordance with the following requirements:
   i) Be formed from any of the materials given for flashings in 4.1 except 4.2.9 and 4.2.10;
   ii) Be used to drain upper roofs directly to ground level where possible;
   iii) Be fitted with a spreader, as detailed in Figure 15, where discharging to a lower roof if upper roof is not drained directly to ground level; and
   iv) Have a maximum catchment area of 25 m^2 if discharging on to a lower roof area.

f) Spreaders shall be in accordance with the following:
   i) Be constructed from any of the materials outlined for flashings in 4.1 except 4.2.9, and 4.2.10;
   ii) Be used as given in Figure 15 and not be used on masonry tile roofs unless a roof underlay is installed; and
   iii) Discharge over several spans with a minimum length of 400mm and be clear of roof penetrations by 300mm.
   iv) DP size must be less than 100mm.

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.

Figure 15: **Spreader for roof discharge**
Paragraph 8.1.6



NOTE:
(1) Hole positions to avoid joints in roofing.
(2) When downpipe is located in corner, spreader to be L-shaped.

8.1.6.1. Internal gutters

Internal gutters shall be in accordance with the following:

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

b) Butyl or EPDM be a minimum of 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) Be constructed to at least the minimum dimensions given in Figure 47, or the capacity calculated to E1/AS1 plus an additional freeboard depth of 20 mm minimum.

For roofs other than membrane roofs designed with internal gutters, the following shall apply:

a) Discharge will be into a rainwater head as given in Figure 58(a) and Figure 58(b);

b) Discharge to an internal outlet as given in Figure 59(b) or Figure 59(c) with overflows provided by either:
   i) a second outlet to a rainwater head, or
   ii) an overflow as given in Figure 58(c), and positioned below the level of any potential overflow into the building.

For internal gutters and membrane roofing, see 8.5.

8.1.6.2. Valley gutters and hidden gutters

Valley gutters and hidden gutters shall be constructed as given in Figure 45 and Figure 46 for the applicable roof cladding (except for membrane roofing) and in accordance with the following:

i. Not change direction in plan;
ii. Have a minimum underlap to roof cladding as given in Figure 22, Figure 32, Figure 45, and Figure 46 for the relevant roof cladding;
iii. Be formed from any of the materials given for flashings in 4.2, except 4.2.10. When roof is painted or coated the valley must also be painted;
iv. 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;
v. Discharge into an internal gutter or eaves gutter or spouting;
vi. Have minimum slopes of 8° for hidden gutters, and be as given in Table 8 for valley gutters;
vii. Receive no direct or indirect discharge into the hidden gutters from downpipes or spreaders;
viii. Have no spreaders discharging directly into a valley gutter; and
ix. Have valley gutters a minimum of 250 mm wide where receiving run off from spreaders.
x. Where secret gutters are used or where flashings are unseen they must have a durability of 50 years.

Table 8: **Maximum catchment areas for valley gutters**
Paragraph 8.1.6.2, 8.4.16.2, Figures 22, 32 and 46

Gutter width	Maximum catchment area	Minimum roof pitch
250 mm	25 m²	8°
160 mm to 249 mm	16 m²	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 200mm per hour.

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.

8.1.7 Roof penetrations

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

Where roof penetrations are required for large openings such as roof lights and chimneys, this 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 given in Figure 16; and
b) For the catchment area of the roof above the penetration as given in Figure 17, the roof length shall be limited to:
   i) the lengths given in Table 17 for profiled metal roofing; and
   ii) the lengths given in Table 9 for other roof claddings.

COMMENT :
Flashings for roof penetrations not included in this Standard 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 17

Penetration width	Maximum roof length above penetration 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 16: Penetration support
Paragraphs 8.1.7 and 8.4.17

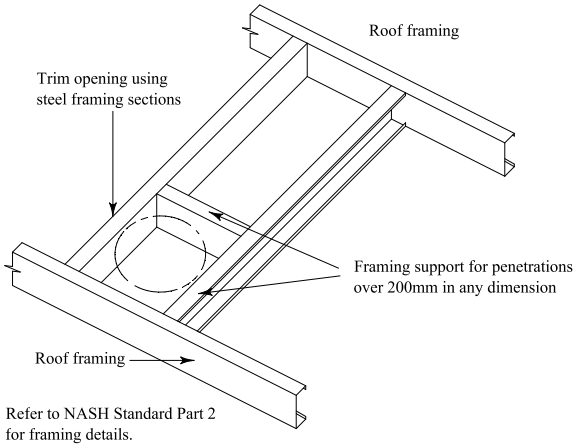
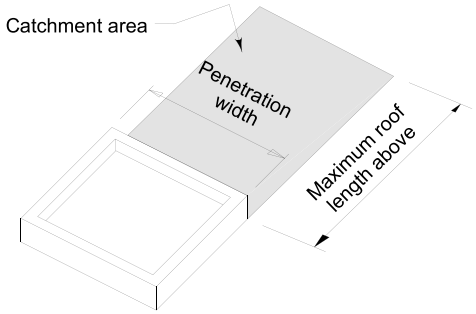


Figure 17: Catchment area for penetrations
Paragraphs 8.1.6, 8.1.7, Tables 9 and 17

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.



8.2 Masonry tiles

8.2.1 Materials

Concrete tiles shall meet the requirements of NZS 4206 or AS 2049.

Clay tiles shall meet the requirements of AS 2049.

8.2.1.1. Tile profiles

Tiles shall be considered one of three types as follows:

a) Type I – Double profile tiles having two distinct watercourses with a minimum watercourse depth of 18 mm,
b) Type II – Single profile tiles having one watercourse depth of a minimum of 25 mm, or
c) Type III – Tiles not fitting the Type I or Type II categories, and includes flat tiles and those resembling slates, shakes and shingles.

8.2.2 General

Masonry tile roof cladding shall be installed by suitably qualified practitioners (see 1.6).

8.2.3 Installation

Masonry tile roof cladding shall be installed in accordance with NZS 4206 or AS 2050 on to a minimum of H1.2 treated timber battens or Z275 steel battens, except using the minimum pitch as specified in Table 10.

Where required in AS 2050 and Table 10, underlay shall comply with 8.1.5.

Fixing and fixing patterns shall be in accordance with NZS 4206, with the exception that screws penetrate a minimum of 3 threads into steel framing and nails penetrate a minimum of 35 mm into timber battens.

The minimum pitches and roof underlay shall be as given in Table 10 and Table 23.

Grade 304 or Grade 316 stainless steel fixings shall be used for corrosion zones D and E.

Grade 304 or Grade 316 stainless steel fixings or hot dip galvanised fixings at 450 g/m^2 shall be used for Zone B and Zone C.

Corrosion zones shall be as given in Table 20.

COMMENT :
Rafter length, tile profile and wind zone all affect the allowable minimum pitch of a tile roof. Rafters longer than in Table 10 may require the addition of underlay.
Manufacturers may have specific profiles that are suitable for pitches lower than those shown in Table 10, but these are outside the scope of this Solution.

Table 10: **Maximum pitches for masonry tiles**
Paragraph 8.2.3, Figure 20

Tile Material	Profile type	With underlay (1) (2)	Without underlay (1) (2)
Concrete tiles (to rafter length 4.5 m)	Type I	15°	20°
	Type II	20°	–
	Type III	25°	–
Clay tiles (to rafter length 4.5 m)	Type I	20°	25°
	Type II	20°	–
	Type III	25°	–

NOTE: (1) Increase pitch by 1° per additional 0.5 metres of rafter length over 4.5 m.
(2) Roof underlay is required for any roof receiving discharge from a spreader, or for roofs in wind zone Very High or Extra High.

Where masonry tiles have been shown to comply with the dynamic weathertightness test requirements of AS 4046.9, a lower pitch may be used providing it is not less than 15°.

8.2.4 Flashings and fixings

Materials for flashings, gutters and fixings shall be in accordance with Section 4, and:

a) Be selected from Table 20 to minimise corrosion, and
b) Be compatible with mortar and bedding in accordance with Table 21 and Table 22.

8.2.5 Anti-ponding boards

Masonry tile roofs with underlays shall have anti-ponding boards installed as given in Figure 20.

Where anti-ponding boards are used, these shall be set to a minimum fall of 5° (1:12), and be Z275 folded steel, or solid timber treated to a minimum of H1.2 for solid timber, or be fibre cement sheet with a minimum thickness of 4.5mm and sealed to minimise moisture absorption. Ensure separation between treated timber and steel framing in accordance with 2.2

8.2.6 Details and flashings

Hips, ridges, valleys and barges shall be made weathertight by using flashings and seals as given in Figure 18 to Figure 23.

8.2.7 Penetrations

Penetrations shall be flashed as given in Figure 24 to Figure 26.

Holes in tiles for pipe penetrations shall be machine-cut to minimise the size of the hole.

Figure 18: **Metal tile ridge**
Paragraph 8.2.6

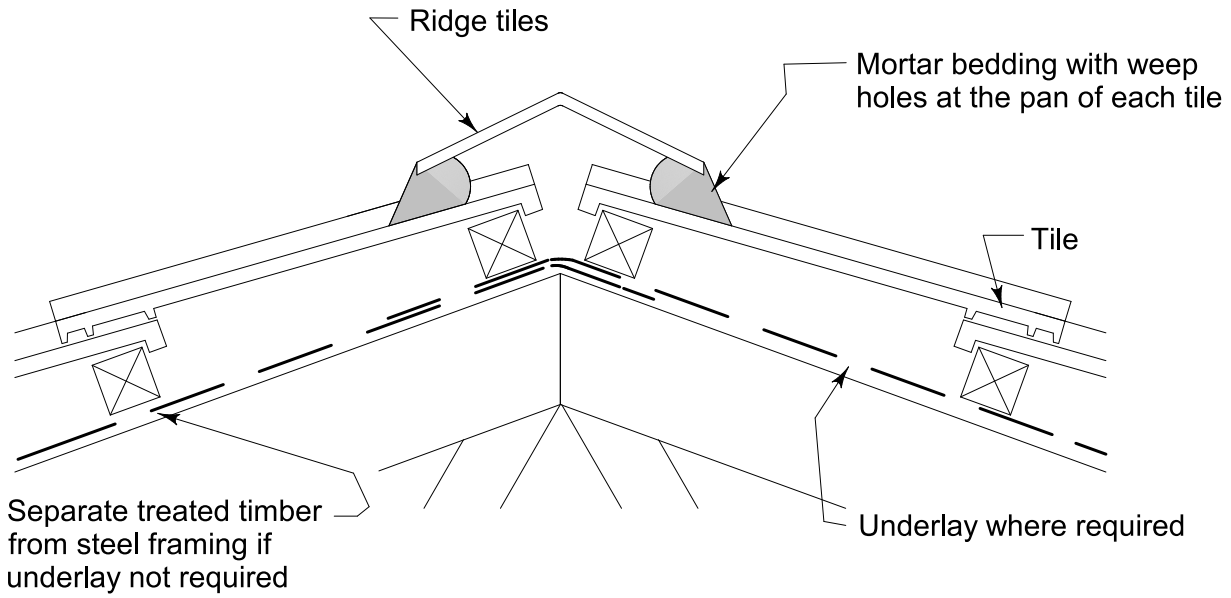


Figure 19: **Barge for masonry tile**
Paragraph 8.2.6

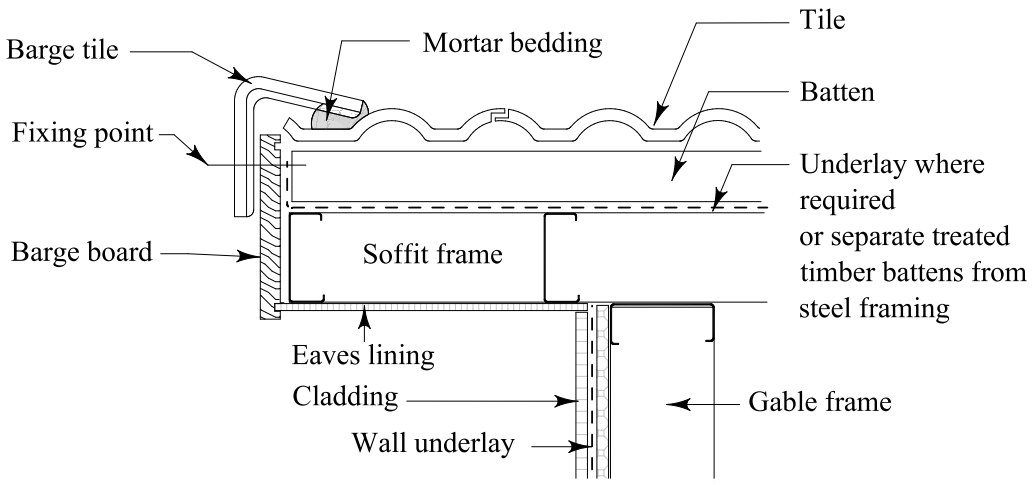
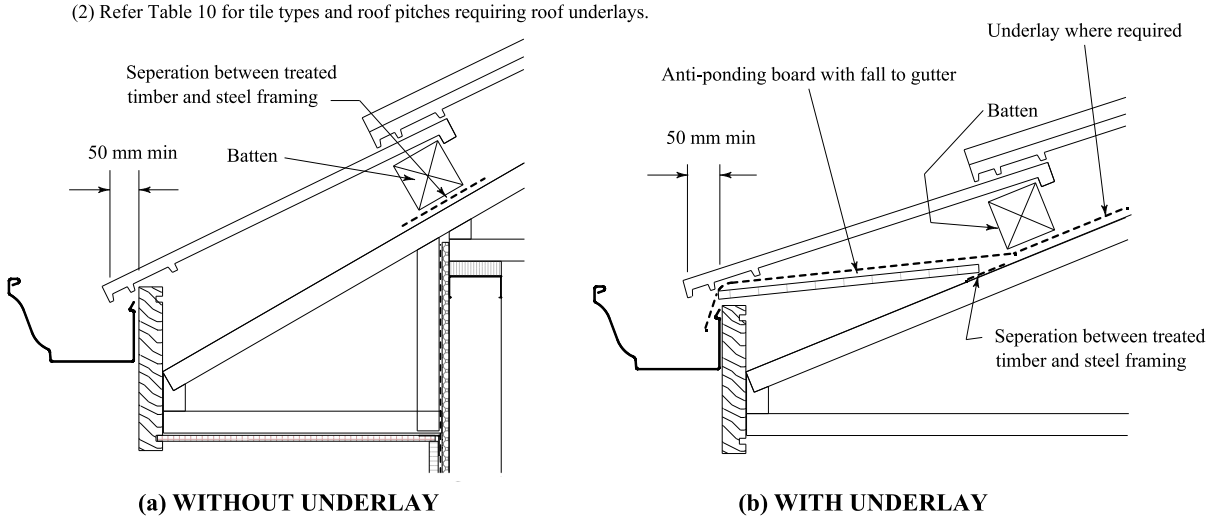


Figure 20: Timber fascia eaves for masonry tile
Paragraphs 8.1.5 and 8.2.5

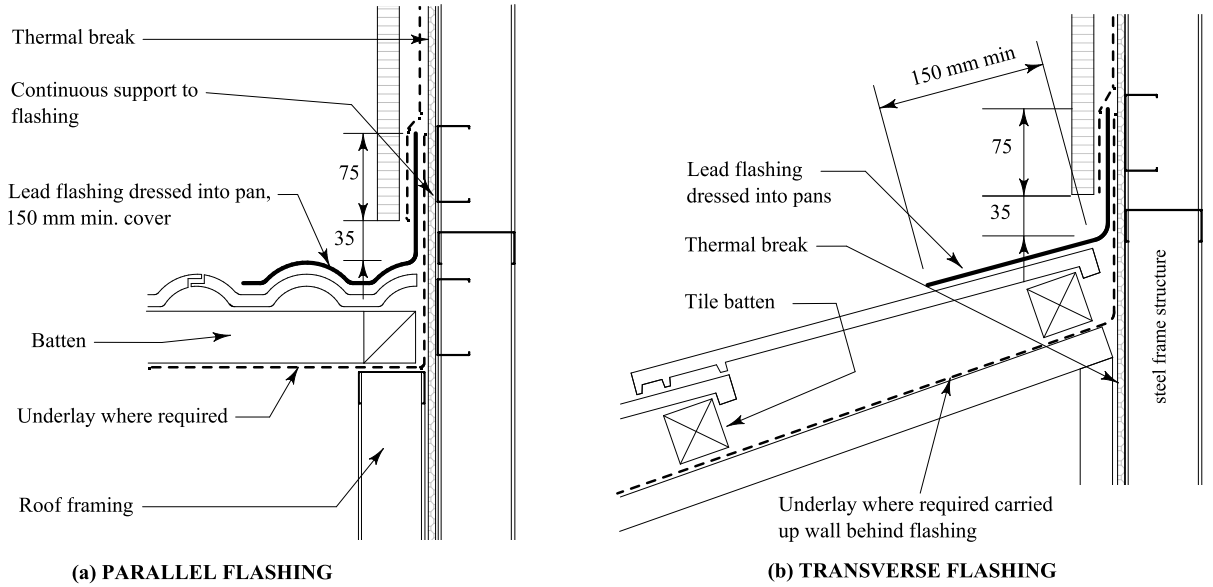
NOTE: (1) Anti-ponding boards required for tile roofs with underlays.
(2) Refer Table 10 for tile types and roof pitches requiring roof underlays.



(a) WITHOUT UNDERLAY **(b) WITH UNDERLAY**

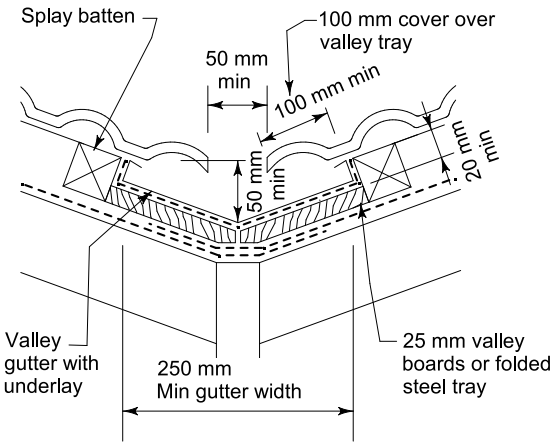
Figure 21: Apron details for masonry tile
Paragraph 8.2.6

NOTE: Flashings in Extra High wind zone shall meet Table 7.



(a) PARALLEL FLASHING **(b) TRANSVERSE FLASHING**

Figure 22: Valley for masonry tile
Paragraphs 8.2.6, and 8.1.6.2



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 tiles over gutter shall be reduced to 60 mm to provide a clearance between tiles of 40 mm.

Figure 23: Roof/wall ridge for masonry tile
Paragraphs 8.2.6

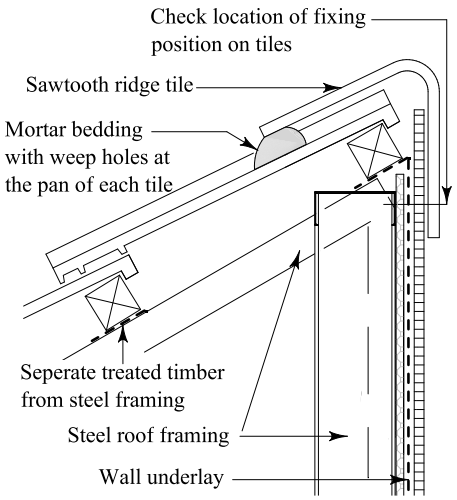


Figure 24: Pipe penetration for masonry tile
Paragraph 8.2.7

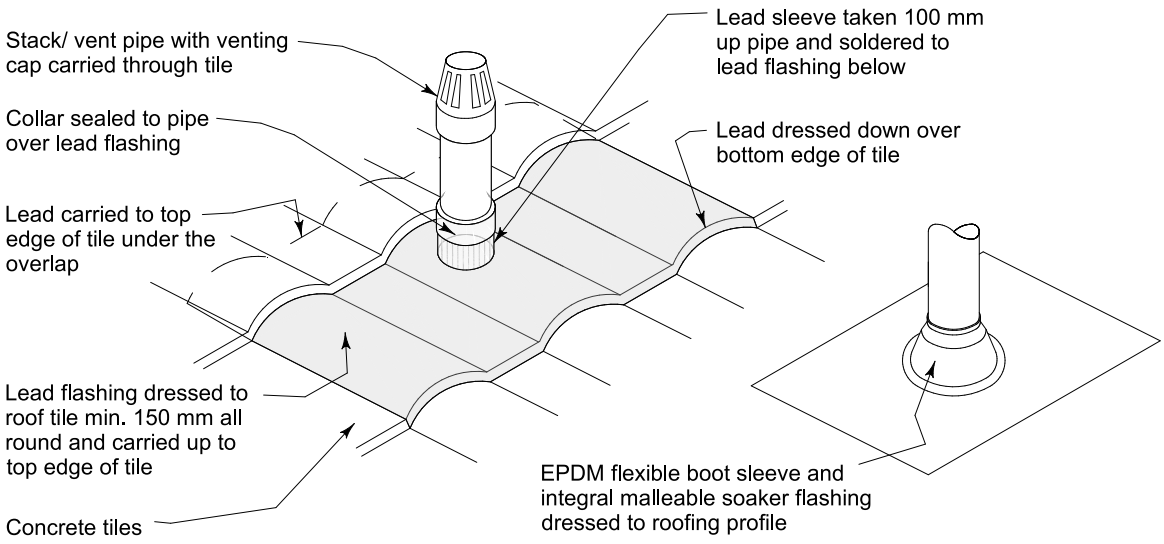
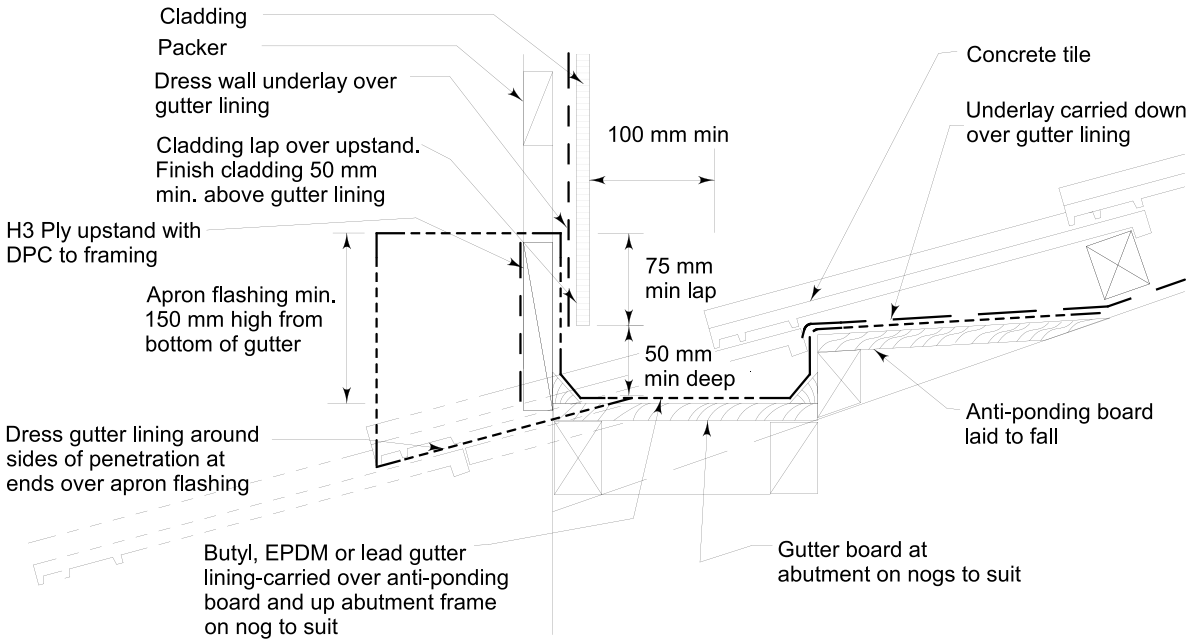
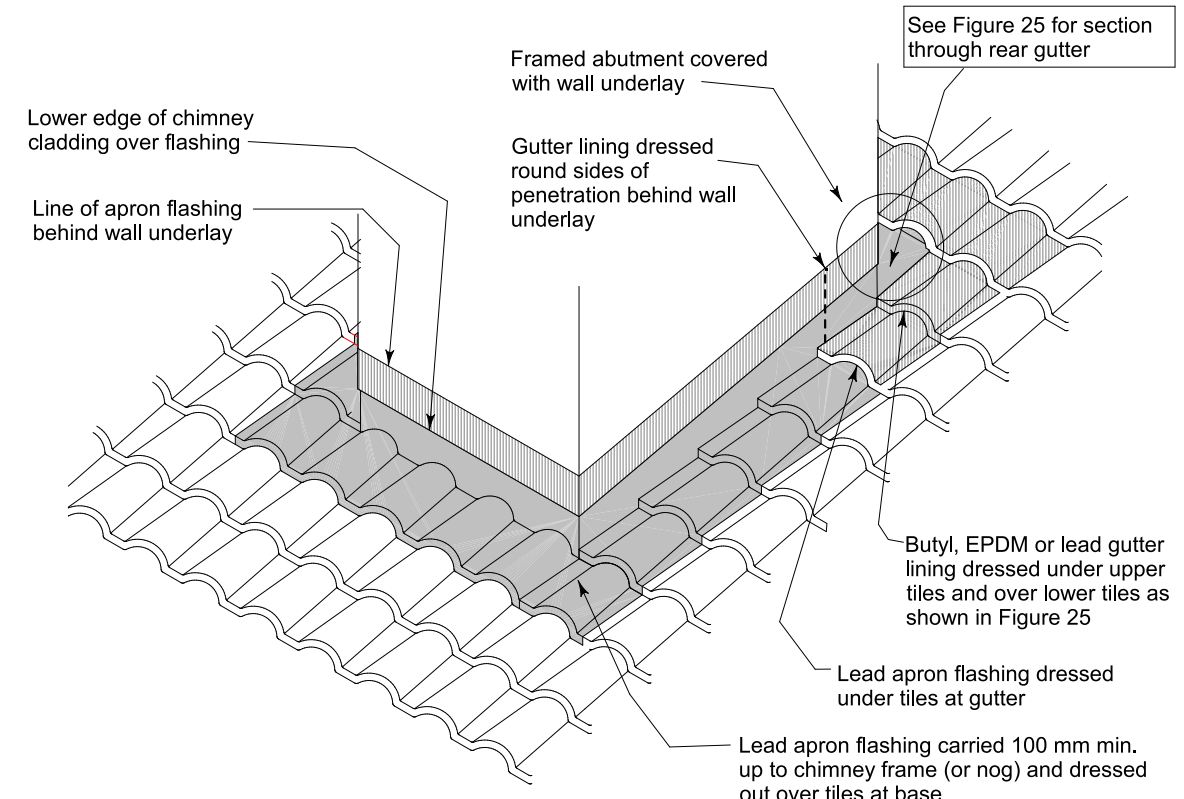


Figure 25: **Abutment at framed penetration for masonry tile**
Paragraph 8.2.7, Table 9 and Figure 26



Note: Seperate any lead flashing from steel framing with DPC.

Figure 26: **Flashing to framed penetration for masonry tile**
Paragraph 8.2.7, Table 9 and Figure 25



Note: Separate any lead flashing from steel framing with DPC.

8.3 Pressed metal tiles

8.3.1 Limitations

This Standard is limited to pressed metal tile roofs.

COMMENT :
Additional guidance on pressed metal tiles can be found in the New Zealand Metal Roof and Wall Cladding Code of Practice.

8.3.2 Installation

Pressed metal tile roof cladding shall be installed in accordance with NZS 4217 on to a minimum of H1.2 treated timber battens or Z275 steel battens (see 1.5).

8.3.3 Tiles and accessories

Tiles and their accessories shall meet the requirements of NZS 4217.

8.3.4 Metal substrate

8.3.4.1. Steel

Steel for the manufacture of pressed metal tile and flashing systems shall be in accordance with the following:

a) have a base metal thickness of 0.39 mm minimum;
b) be Grade G300 or Grade G250; and
c) be selected for corrosion protection according to the intended exposure zone as shown in Table 20.

COMMENT :
Paint coatings may include factory-applied finishes complying with AS/NZS 2728, or factory-painted or bonded resin and chip finishes of minimum 15 year durability.

8.3.4.2. Aluminium

Aluminium pressed metal tiles and flashing systems shall comply with AS/NZS 1734.

Aluminium pressed metal tiles and flashing systems shall be in accordance with the following:

a) have a minimum base metal thickness (BMT) of 0.7 mm;
b) be a minimum 5000 series; and
c) have a factory applied finish complying with AS/NZS 2728 if pre-painted.

8.3.5 Roof pitch

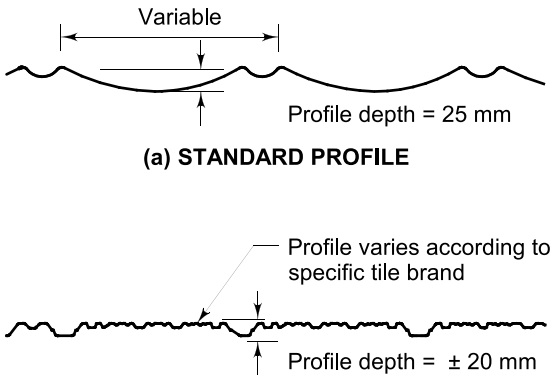
Types of standard profile, and shake or shingle profile metal roof tiles are shown in Figure 27.

The minimum roof pitches for metal tiles where rafter length does not exceed 12 m shall be limited to:

a) 12° (1:4.75) for standard profiles; and
b) 15° (1:3.75) for shingle or shake profiles.

Where rafter length exceeds 12 m the minimum pitch shall be increased by 1° per additional 0.5 m.

Figure 27: **Metal tile profiles**
Paragraphs 8.3.5



COMMENT :
Panels are available in a wide range of profiles.
Where manufacturers have more stringent requirements, these should be followed to optimize performance and to avoid invalidating guarantees.

8.3.6 Underlay

All metal tile roofing shall have a roof underlay installed.
Roof underlay shall be to Table 23 (see also 8.1.5).

8.3.7 Fixings

Pressed metal tiles shall be fixed as given in Figure 28.
Pressed metal tiles shall be fixed in accordance with the following:

a) 10g wafer head screws for steel battens or 50 x 2.8 mm hot-dipped galvanized painted flat-head annular-grooved nails for timber battens shall be used.

b) For fixings through the top of the tiles, neoprene washers containing no more than 15% by weight carbon black content be used.

c) Four fixings be used per sheet in the following areas:

   i) the turn-down of the tiles for the body of the roof, and

   ii) the top of the profile slope for sheets at the eaves, avoiding the weather channel of the tiles.

Screws shall be Class 4 for corrosion zones D and E.

Screws shall be Class 3 for corrosion zones B and C use Class 3.

Corrosion zones shall be as given in Table 20.

8.3.8 Flashings

The roof shall be flashed at all boundaries, except at the discharge to a gutter, using the details given in Figure 29 to Figure 32.

Metal flashings shall comply with 8.3.4. and Table 7.

COMMENT :
Metal tile manufacturers supply pre-folded or formed accessories and recommendations for their installation.

Figure 28: **Metal tile fixing**
Paragraph 8.3.7

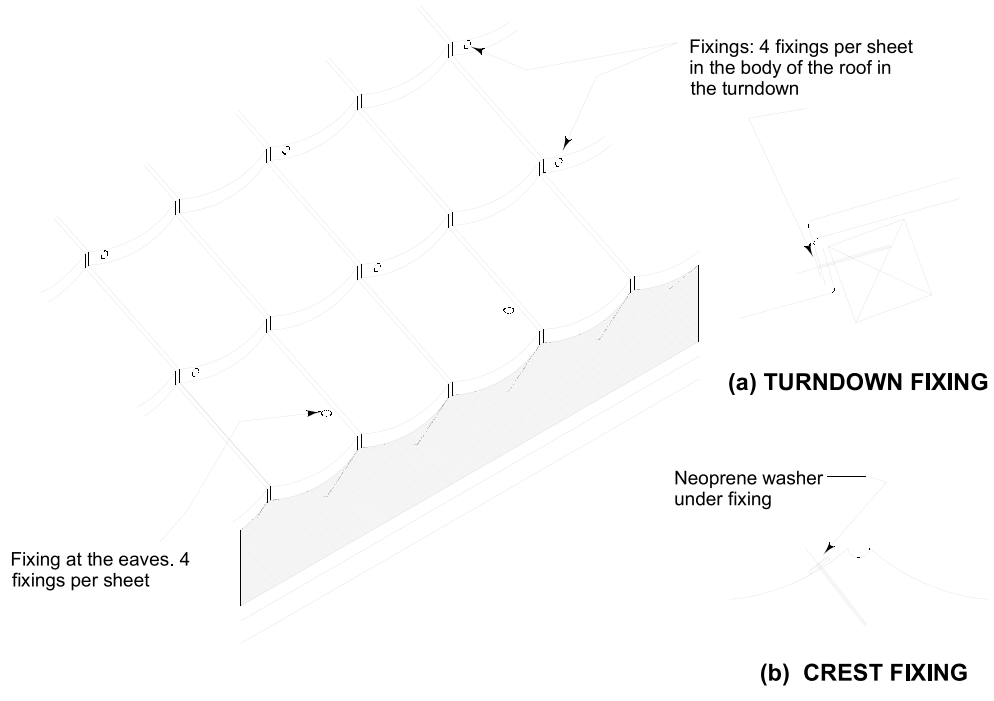
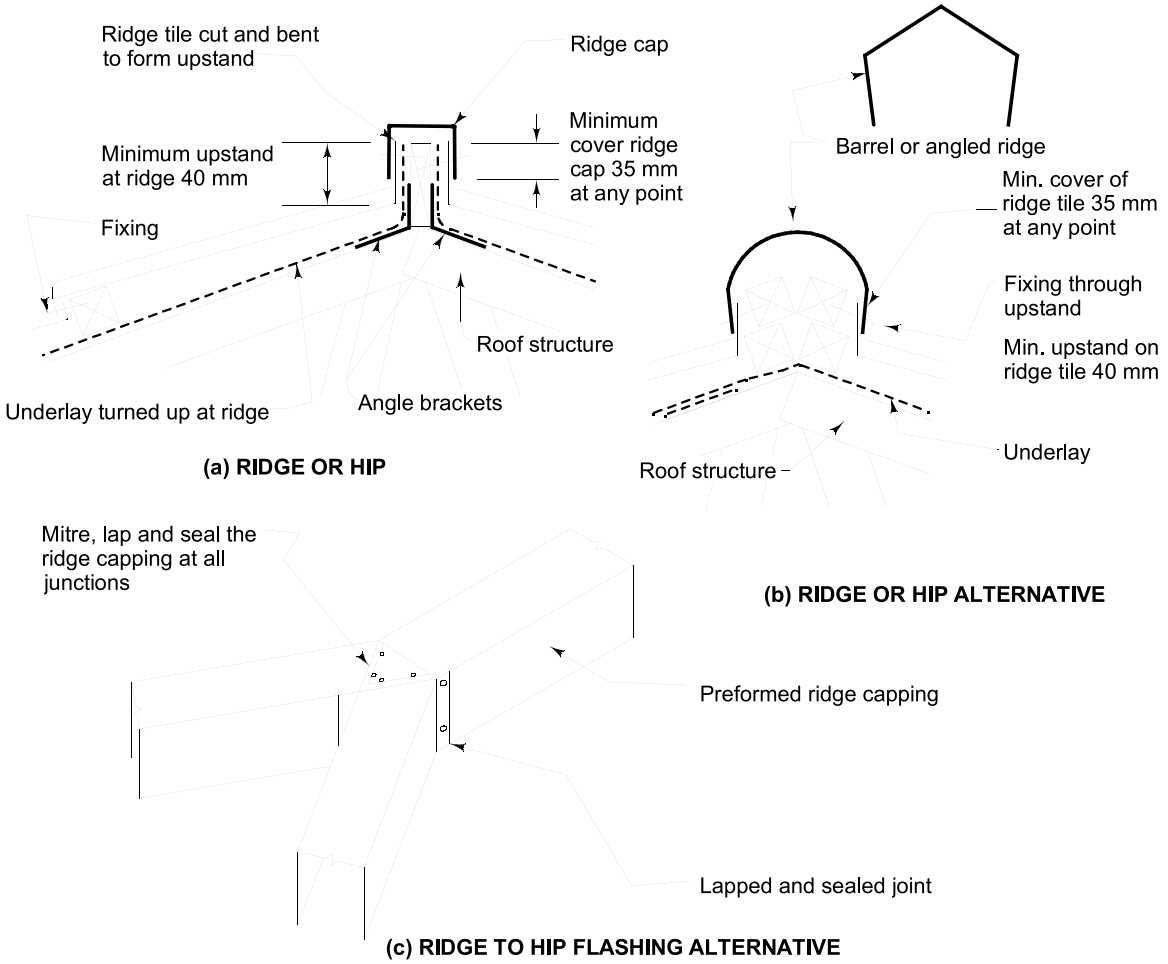


Figure 29: **Ridge or hip metal tile**
Paragraph 8.3.3 and 8.3.8



NOTE: For alternative ridge profiles, ridge to hip capping must be preformed to suit profile.

Figure 30: **Apron flashing for metal tile**
Paragraph 8.3.3 and 8.3.8

NOTE: Flashings in Extra High wind zone shall meet Table 7.

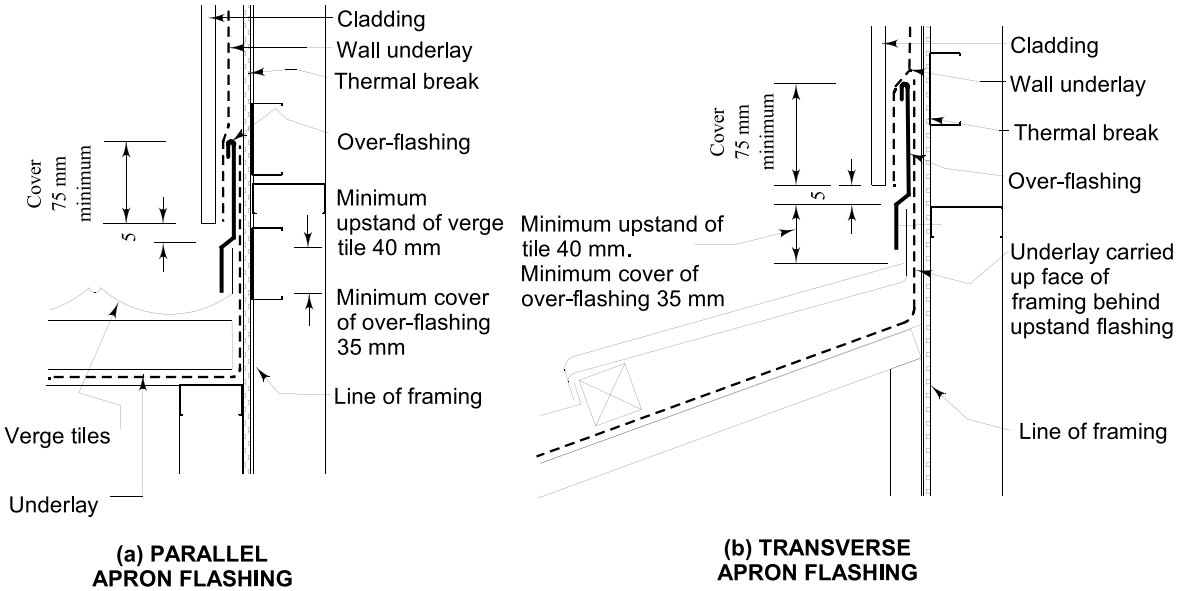


Figure 31: Eaves and barge for metal tile
Paragraph 8.3.3 and 8.3.8

NOTE: If alternative barge flashing profiles are used, these profiles must achieve equivalent covers.

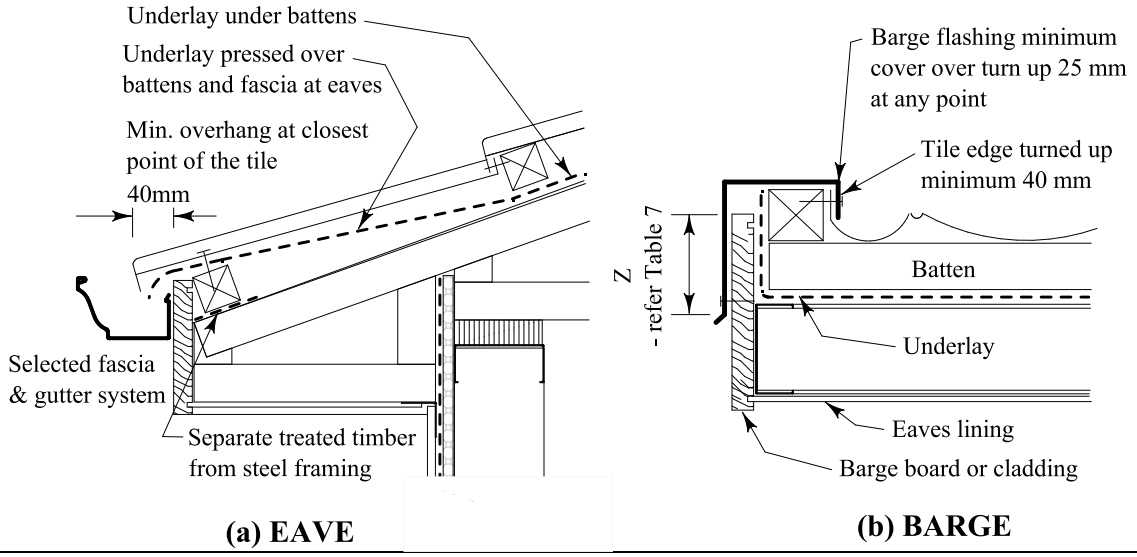
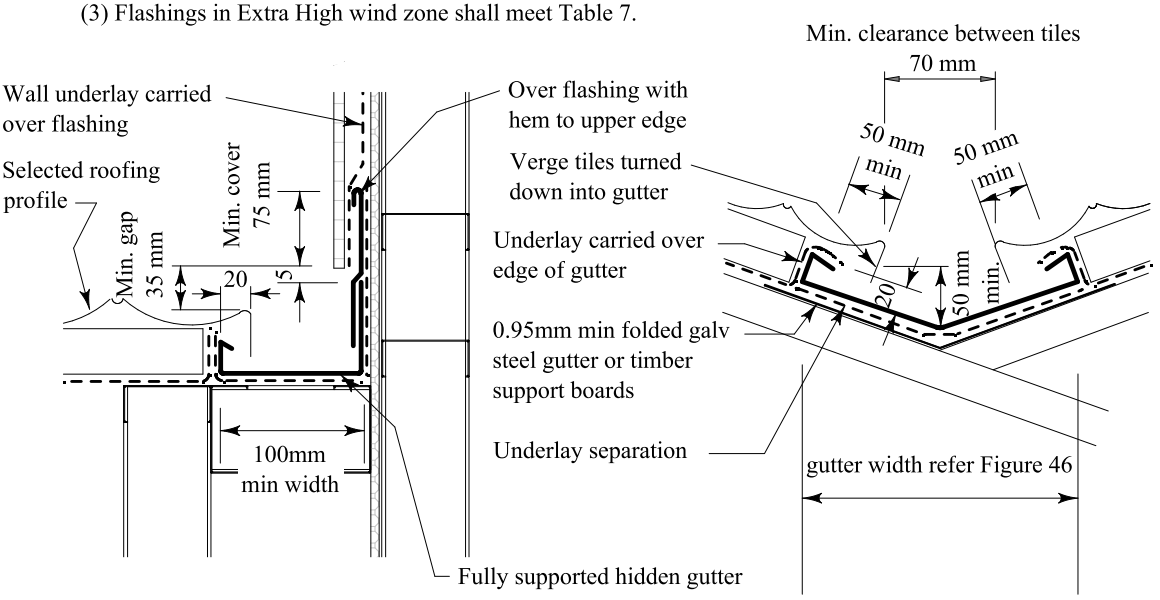


Figure 32: Hidden and valley gutter flashing for metal tile
Paragraphs 8.1.6.2, 8.3.3, 8.3.8 Figure 46

NOTE: (1) Refer to Table 8 for maximum 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, minimum dimensions as shown, shall apply.
(3) Flashings in Extra High wind zone shall meet Table 7.



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.

8.3.9 Gutters, ridges, barges and fascias

Gutters, ridges, barges, and fascias shall be as given in Figure 29 to Figure 32 (see also 5.2 for the termination of roofs against wall claddings).

8.3.10 Roof penetrations

Pipe penetrations shall be flashed using EPDM flashings similar to that shown for masonry tiles (see Figure 24).

COMMENT :
Use purpose-made preformed rooflights and ventilators supplied by the manufacturer of the tiles where available.

8.4 Profiled metal roof cladding

8.4.1 Limitations

This Solution is limited to the following types of profiled metal roof cladding:

a) Is a profile given in 8.4.4;
b) valley gutters that do not change direction in plan;
c) is not curved; and
d) has sheets no more than 18 metres long.

COMMENT :
If curved profiled metal sheet is used, the radius of the curve may affect durability. Specific design is required, and manufacturers and the New Zealand Metal Roof and Wall Cladding Code of Practice should be consulted for recommendations.

8.4.2 General

COMMENT :
Refer to Paragraph 1.5 for qualification of installers.

8.4.3 Materials

8.4.3.1. Choice of metal

Metal roof cladding and flashings shall be selected according to the exposure conditions given in Table 20 as defined in NZS 3604 and AS/NZS 2728.

8.4.3.2. Steel

Materials for profiled steel roof cladding shall be in accordance with the following:

a) have a minimum BMT of 0.4 mm;
b) be grade G550 or G300 for rolled, crimped, or trough profile roofing; and
c) be selected for corrosion protection according to the intended exposure zone as shown in Table 20.

8.4.3.3. Aluminium

Materials for profiled aluminium roofing shall comply with AS/NZS 1734, and be in accordance with the following:

a) have a minimum BMT of 0.7 mm;
b) be a 5000 series; and
c) have a factory applied finish complying with AS/NZS 2728 if pre-painted.

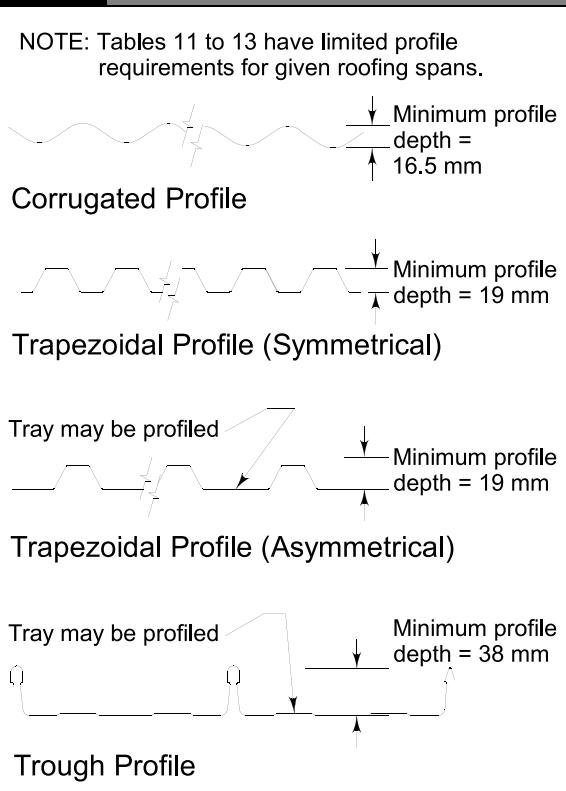
COMMENT :
A deterioration in the appearance of the coating of the metal does not necessarily relate to a deterioration in the weathertightness of the roof cladding.

8.4.4 Profiles

Profiles covered in this Solution are shown in Figure 33, and includes the following:

a) **Corrugated** – curved with a minimum crest height of 16.5 mm;
b) **Trapezoidal** – symmetrical or asymmetrical with a minimum crest height of 19 mm, and for asymmetrical a flat or lightly profiled pan width of 210 mm maximum between crests; and
c) **Trough profile** – vertical ribs at a minimum height of 38 mm, and flat or lightly profiled pans of 210 mm maximum between crests.

Figure 33: **Profiled metal profiles**
Paragraphs 8.4.4, 9.5.1, 9.5.5 and Table 3



COMMENT :
The exposure zone in which a building is located can affect the durability.
Corrosion due to geothermal or corrosive industrial atmospheres, as defined in NZS 3604, require specific design.
Exposure zones are based on AS/NZS 2728.
AS/NZS 2728 lists atmospheric classes derived from ISO 9223 for Australia and New Zealand.

8.4.5 Roof pitch

For roofs up to 18 metres in length without end laps, the roof pitch shall be in accordance with the following:

a) Corrugated – not less than 8° (1:7).
b) Trapezoidal – not less than:
    i) 4° (1:14) where the crest height is less than 27mm, or
    ii) 3° (1:20) where the crest height is 27 mm or higher.
c) Trough profile – not less than 3° (1:20).

COMMENT :
For roofs over 18 metres in length, refer to the manufacturer for minimum pitch requirements. Where manufacturers have more stringent requirements, these should be followed to optimise performance and to avoid invalidating guarantees.

8.4.6 Structure

The maximum span and fixing patterns of particular profiled metal roof cladding between purlins to comply with this Solution are given in Tables 11 and Table 12 for corrugate profiles, Table 13 for trough profiles, and Tables 14, 14A, 15 and 15A for trapezoidal profiles. Spans shown are for steel with BMT, grade and profile as specified in each Table.

Tables 11 and 12 and Tables 14, 14A, 15 and 15A define fixing patterns in terms of numbers of fixing per roofing sheet for those sheets of up to 770 mm effective cover.

See Figures 33B, 34B and 34C for illustrations of fixing patterns.

COMMENT :
For purlin sizes, spacing and fixing, refer to NASH Standard Part 2.
Additional support will be required around roof-mounted services such as air-conditioning in order to avoid roof distortion.

Figure 33B: **Fixing pattens for corrugate profiled roofing.**
Paragraphs 8.4.8, Tables 11 and 12

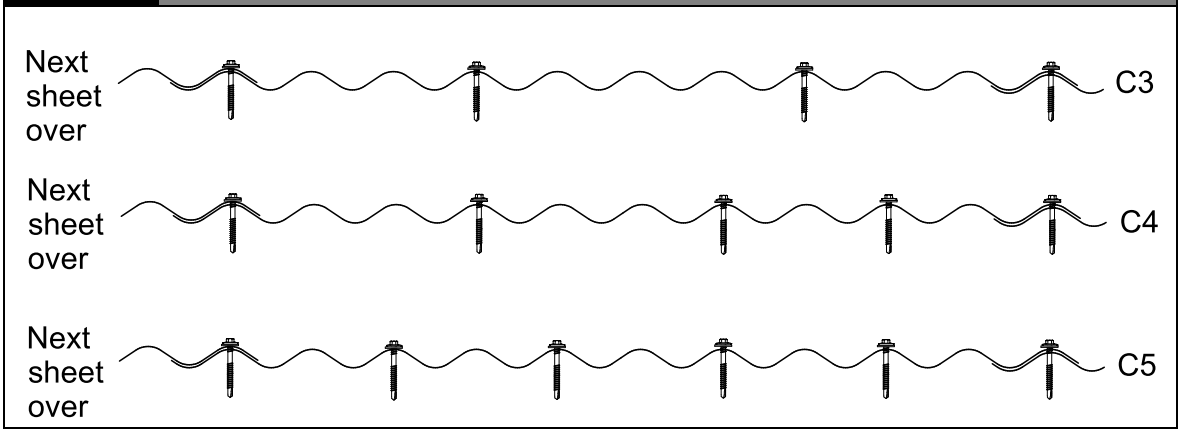


Table 11: **Steel corrugate profiled roofing – 0.4 mm BMT and minimum profile height 16.5 mm**
Maximum spans and fixing patterns. Refer to Paragraph 8.4.6

Purlin spacings (metres)		**Wind Zones - NZS 3604:2011**				
End span	**Intermediate span**	**Low**	**Medium**	**High**	**Very High**	**Extra High**
0.4	**0.6**	C3	C3	C3	C3	C3
0.6	**0.9**	C3	C3	C3	C4	C4
0.8	**1.2**	C3	C3	C4	C5	SED

NOTES:
Refer to Figure 33B for illustration of fixing patterns
C3 fixing pattern is - 3 fasteners per sheet
C4 fixing pattern is - 4 fasteners per sheet
C5 fixing pattern is - 5 fasteners per sheet
SED Specific engineering design is required
Steel shall be grade G550

Table 12: **Steel corrugate profiled roofing – 0.55 mm BMT and minimum profile height 16.5 mm**
Maximum spans and fixing patterns. Refer to Paragraph 8.4.6

Purlin spacings (metres)		**Wind Zones - NZS 3604:2011**				
End span	**Intermediate span**	**Low**	**Medium**	**High**	**Very High**	**Extra High**
0.4	**0.6**	C3	C3	C3	C3	C3
0.6	**0.9**	C3	C3	C3	C3	C3
0.8	**1.2**	C3	C3	C3	C3	C4
1.0	**1.5**	C3	C3	C3	C4	C4

NOTES:
Refer to Figure 33B for illustration of fixing patterns
C3 fixing pattern is - 3 fasteners per sheet
C4 fixing pattern is - 4 fasteners per sheet
C5 fixing pattern is - 5 fasteners per sheet
Steel shall be grade G550

Table 13:	**Steel trough profile roofing – 0.55 mm BMT with profile height 38 mm minimum, and pan width 210 mm maximum(2)** Maximum spans. Refer to paragraph 8.4.6	
	All building wind zones	
	Maximum span of roof cladding mm	
	End span	**Intermediate span**
	1100	1600
NOTE: (1) Trough profile with 0.4 mm BMT steel is excluded from this Standard. (2) For profile heights and pan widths outside this range, refer to supplier's literature for fixing patterns and spans		

COMMENT :
It is recommended that access to the roof is limited to within 100 mm of purlin lines to avoid damaging the roof cladding.

8.4.7 Underlay

All profiled metal long-run roofing shall have a roof underlay installed in accordance with Table 23 (see also 8.1.5).

8.4.8 Fixings of corrugated and trapezoidal

Fixings shall be as given in Table 11, Table 12, Table 14, and Table 15.
Fixings shall be a minimum of 12-gauge class 4 screws (see Figure 34).

8.4.8.1. Fixing requirements

Fixings shall be in accordance with the following:

a) be fixed through crests;

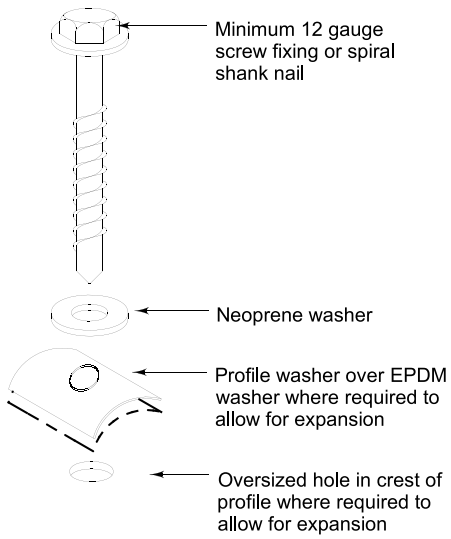
b) penetrate purlins by a minimum of 3 threads; and

c) include sealing washers of:

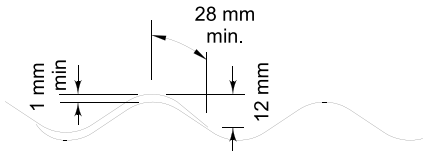
i. neoprene having a carbon black content of 15% or less by weight; or

ii. profiled washer and EPDM washer to allow for expansion of the profiled metal roof cladding

Figure 34: **Corrugated and trapezoidal fixings and sheet lap**
Paragraphs 8.4.8, 9.5.6, Tables 20, 22 and 24



TYPE OF FIXING FOR PROFILED METAL ROOFING



CORRECT WAY TO LAP SHEETS

Figure 34B: **Fixing pattens for 5 rib trapezoidal roofing**
Paragraphs 8.4.8, Tables 14A and 14B

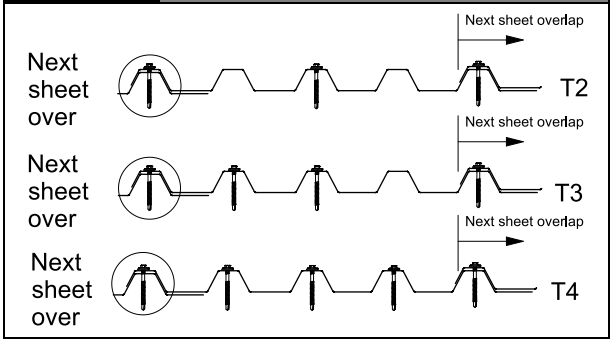


Figure 34C: **Fixing pattens for 6 rib trapezoidal roofing**
Paragraphs 8.4.8, Tables 15A and 15B

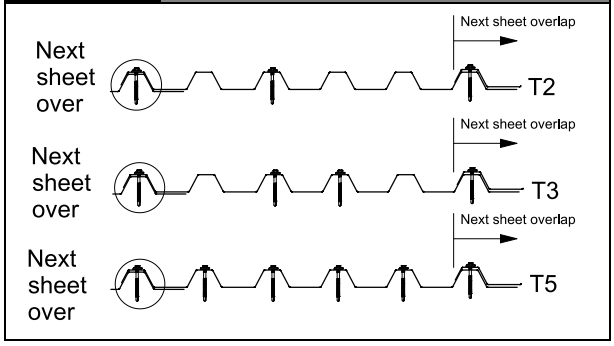


Table 14A: **Steel trapezoidal 5 rib profiled roofing – 0.4 mm BMT and minimum profile height 19 mm**
Maximum spans and fixing patterns. Refer to Paragraph 8.4.6

Purlin spacings (metres)		**Wind Zones - NZS 3604:2011**				
End span	**Intermediate span**	**Low**	**Medium**	**High**	**Very High**	**Extra High**
0.4	**0.6**	T2	T2	T2	T2	T2
0.6	**0.9**	T2	T2	T3	T3	T4
0.8	**1.2**	T2	T2	T3	T3	T4
1.0	**1.5**	T2	T3	T3	T4	T4

NOTES:
Refer to Figure 34B and 34C for illustration of fixing patterns
T2 fixing pattern is - 2 fasteners per sheet
T3 fixing pattern is - 3 fasteners per sheet
T4 fixing pattern is - 4 fasteners per sheet
Steel shall be grade G550

For the numbers of ribs per sheet different from Figure 34B or 34C, or for profile heights or pan widths outside this range, refer to manufacturer's literature for fixing patterns and spans

Table 14B: **Steel trapezoidal 5 rib profiled roofing – 0.55 mm BMT and minimum profile height 19 mm**
Maximum spans and fixing patterns. Refer to Paragraph 8.4.6

Purlin spacings (metres)		**Wind Zones - NZS 3604:2011**				
End span	**Intermediate span**	**Low**	**Medium**	**High**	**Very High**	**Extra High**
0.4	**0.6**	T2	T2	T2	T2	T2
0.6	**0.9**	T2	T2	T2	T2	T2
0.8	**1.2**	T2	T2	T2	T2	T3
1.0	**1.5**	T2	T2	T2	T3	T3
1.2	**1.8**	T2	T2	T3	T3	T4

NOTES:
Refer to Figure 34B and 34C for illustration of fixing patterns
T2 fixing pattern is - 2 fasteners per sheet
T3 fixing pattern is - 3 fasteners per sheet
T4 fixing pattern is - 4 fasteners per sheet
Steel shall be grade G550

For the numbers of ribs per sheet different from Figure 34B or 34C, or for profile heights or pan widths outside this range, refer to manufacturer's literature for fixing patterns and spans

Table 15A:	**Steel trapezoidal 6 rib profiled roofing – 0.4 mm BMT and minimum profile height 19 mm** Maximum spans and fixing patterns. Refer to Paragraph 8.4.6					
Purlin spacings (metres)		**Wind Zones - NZS 3604:2011**				
End span	**Intermediate span**	**Low**	**Medium**	**High**	**Very High**	**Extra High**
0.4	**0.6**	T3	T3	T3	T3	T3
0.6	**0.9**	T3	T3	T3	T3	T5
0.8	**1.2**	T3	T3	T3	T3	T5
1.0	**1.5**	T2	T3	T3	T5	T5
NOTES:	Refer to Figure 34B and 34C for illustration of fixing patterns T3 fixing pattern is - 3 fasteners per sheet T5 fixing pattern is - 5 fasteners per sheet Steel shall be grade G550 For the numbers of ribs per sheet different from Figure 34B or 34C, or for profile heights or pan widths outside this range, refer to manufacturer's literature for fixing patterns and spans					

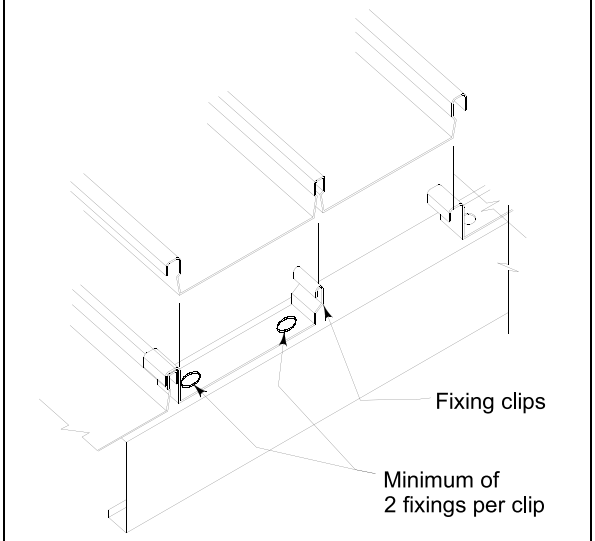
Table 15B:	**Steel trapezoidal 6 rib profiled roofing – 0.55 mm BMT and minimum profile height 19 mm** Maximum spans and fixing patterns. Refer to Paragraph 8.4.6					
Purlin spacings (metres)		**Wind Zones - NZS 3604:2011**				
End span	**Intermediate span**	**Low**	**Medium**	**High**	**Very High**	**Extra High**
0.4	**0.6**	T3	T3	T3	T3	T3
0.6	**0.9**	T3	T3	T3	T3	T3
0.8	**1.2**	T3	T3	T3	T3	T3
1.0	**1.5**	T3	T3	T3	T3	T3
1.2	**1.8**	T3	T3	T3	T3	T5
NOTES:	Refer to Figure 34B and 34C for illustration of fixing patterns T3 fixing pattern is - 3 fasteners per sheet T5 fixing pattern is - 5 fasteners per sheet Steel shall be grade G550 For the numbers of ribs per sheet different from Figure 34B or 34C, or for profile heights or pan widths outside this range, refer to manufacturer's literature for fixing patterns and spans					

8.4.9 Fixings: trough profile

Clip fixings for trough profiles and spans shall be as given in Table 13 and Figure 35, and be in accordance with the following:

a) have a minimum BMT of 0.9 mm;
b) be a minimum width of 30 mm;
c) be made from a material compatible with the cladding (see Table 20 and Table 21); and
d) have clips fastened with a minimum of two 10-gauge waferhead screws with a minimum of Class 3.

Figure 35: **Typical trough profile fixing**
Paragraph 8.4.9



NOTE: Roof underlay/thermal break not shown for clarity

8.4.10 Allowance for expansion

Allowance shall be made for expansion of corrugated and trapezoidal roof cladding as given in Table 16.

Where Table 16 requires profiled washers, allowance shall be made for expansion by:

a) fixing the top 50% of the roofing (closest to the ridge) with conventional fixings; and
b) fixing the lower 50% with sealing washers over profiled washers as given in Figure 34, and the following:
   i) using oversized holes; and
   ii) positioning the fixing in the centre of the hole.

Table 16: **Expansion provisions**
Paragraph 8.4.10. Figure 64

Material	< 8 m	< 8-12 m	12-18 m	> 18 m
Steel	NSR	Profiled washers	Profiled washers	SD
Aluminium	Oversized holes	Profiled washers	SD	SD

SD – requires specific design

NSR – No specific requirements

8.4.11 Flashing requirements

The roofing shall be flashed at all boundaries in accordance with the following:

a) all edges discharging to spoutings with eaves flashings as given in Figure 40(a);
b) soft edges to cover flashings complying with 4.5 (see also Figure 36 and Table 21 and Table 22);
c) notched turn-downs to cover flashings as given in 4.5 (see also Figure 37);
d) materials for flashings be compatible with the roof cladding material as given in Table 21, Table 22, and 4.4; and
e) provides expansion joints as given in 4.4.2.

8.4.11.1. Fixing flashings

The fixing of flashings shall be in accordance with the following:

a) when fixing flashings to the structure, use screws as specified for roofing (see 8.4.8);
b) when fixing flashings to other flashings or to roofing, the following fixings be used:
   i) for galvanized steel, 4 mm diameter monel metal as given by Table 21;
   ii) for aluminium-zinc coated steel, 4 mm diameter aluminium rivets;
   iii) for aluminium, 4 mm diameter aluminium rivets, and
   iv) rivets shall be sealed against moisture entry.
c) flashing joints, including expansion joints, be in accordance with 4.4.2 and Figure 3;
d) end-laps be formed as given in Figure 3 and with an 8mm diameter bead of neutral cure sealant before joining the two parts. The sealant will be one of the following:
   i) Type F, Class 20LM, or Class 25LM in accordance with ISO 11600; or
   ii) Low modulus Type II Class A in accordance with the Federal Specification TT-S-00230C.

Blind rivets shall be sealed against moisture.

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.

Figure 36: **Soft edge flashing**
Paragraphs 4.5, 8.4.12 and 8.4.11

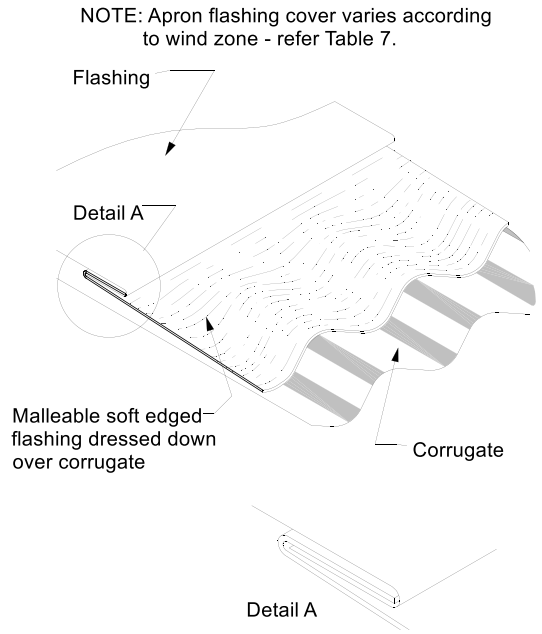
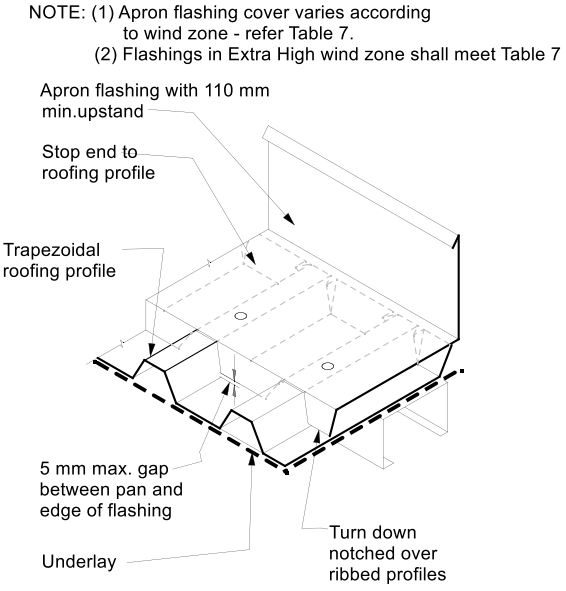


Figure 37: **Trapezoidal notched flashing**
Paragraphs 4.5, 8.4.11 and 8.4.12



8.4.12 Flashing details

The roof shall be flashed in accordance with the following:

a) Ridge to hip as given in Figure 38;
b) Apron flashing and change in pitch as given in Figure 39;
c) Roof/wall ridge as given in Figure 40;
d) Eaves flashing as given in Figure 40(a) required whenever all of the following apply:
   i) roof slope is less than 10°, and
   ii) soffit width is 100mm or less, and
   iii) Wind Zone is Very High or Extra High.
e) Ridge and hip as given in Figure 41;
f) Barge flashing as given in Figure 42; and
g) Apron flashing – parallel flashing to profile as given in Figure 43.

COMMENT :
Reduced cover for barge and apron flashings may be applicable for specifically designed roofs in low wind zones. Refer to the New Zealand Metal Roof and Wall Cladding Code of Practice for additional guidance on ridge to hip flashings.

Figure 38:	**Ridge to hip flashing** Paragraphs 8.4.11, and 8.4.12

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.

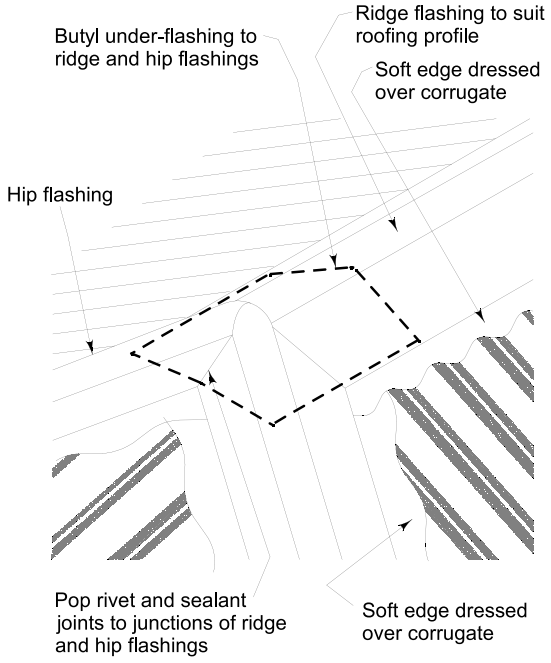


Figure 39: **Apron flashing and change in pitch for profiled metal**
Paragraphs 4.5, 8.4.11, 8.4.12, Table 7

NOTE: (1) No pitch change allowed in Extra High wind zone
(2) Flashings in Extra High wind zone shall meet Table 7
(3) X = variable according to wind zone - refer Table 7

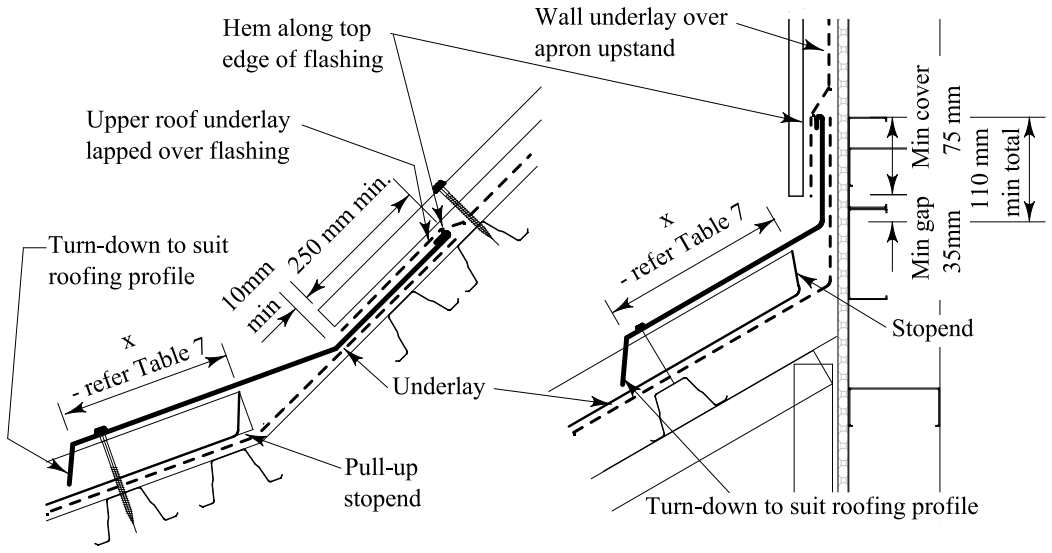


Figure 40: **Eaves and roof/wall ridge for profiled metal**
Paragraphs 4.5, 8.4.11, 8.4.12, Table 7

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

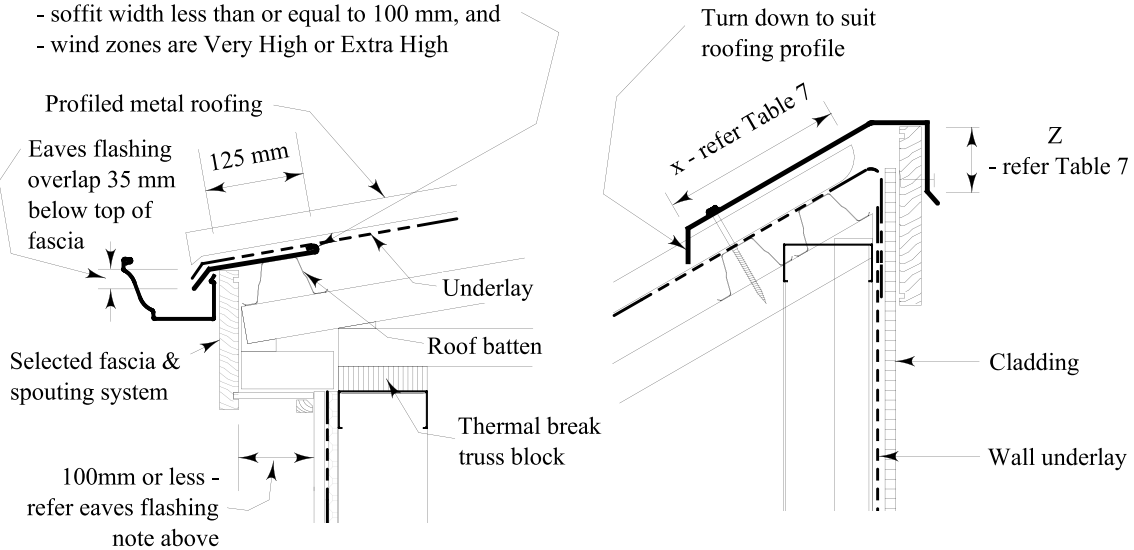


Figure 41: **Ridge and hip for profiled metal**
Paragraphs 4.4, 4.5, 8.4.11, 8.4.12 Table 7

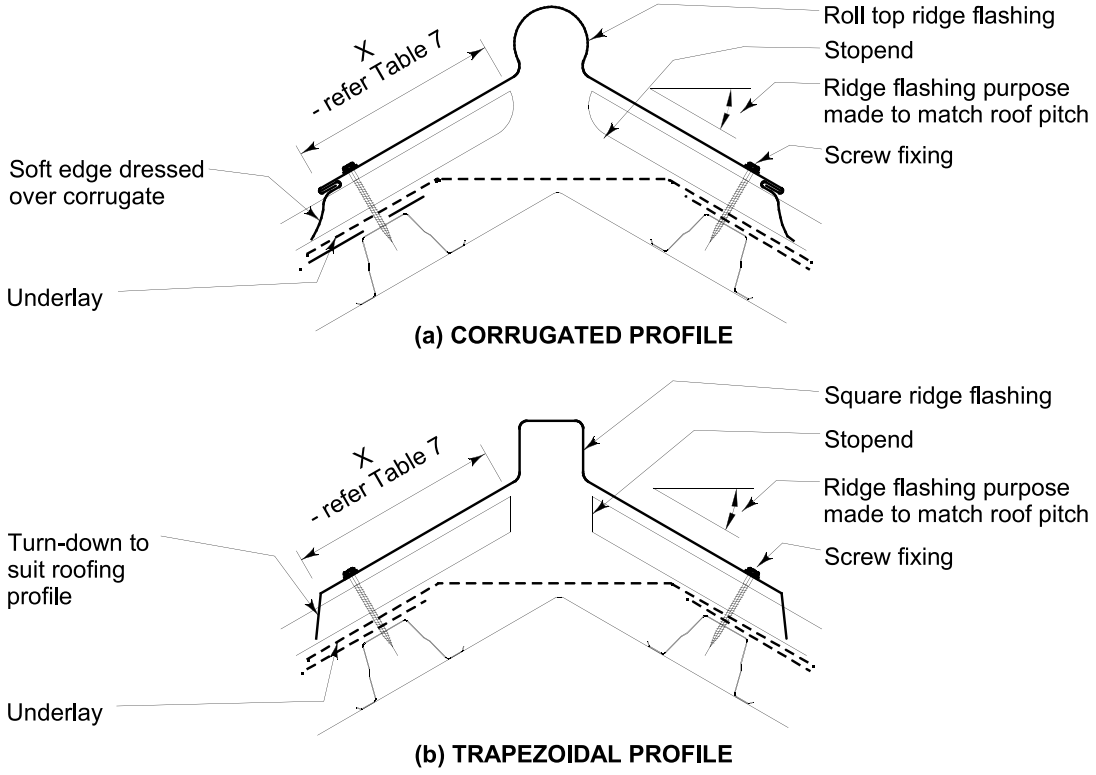
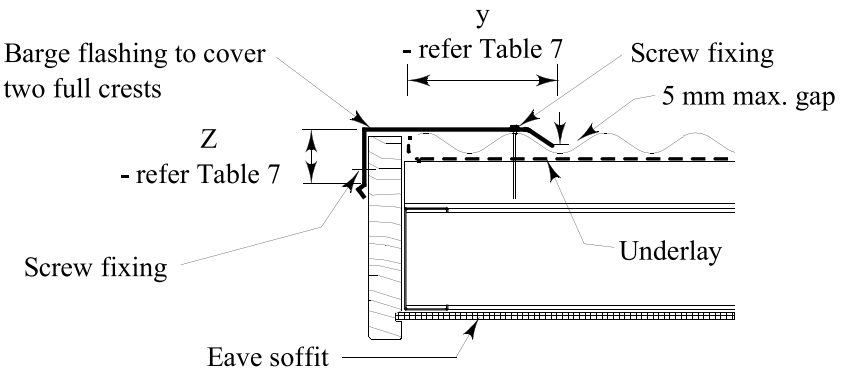
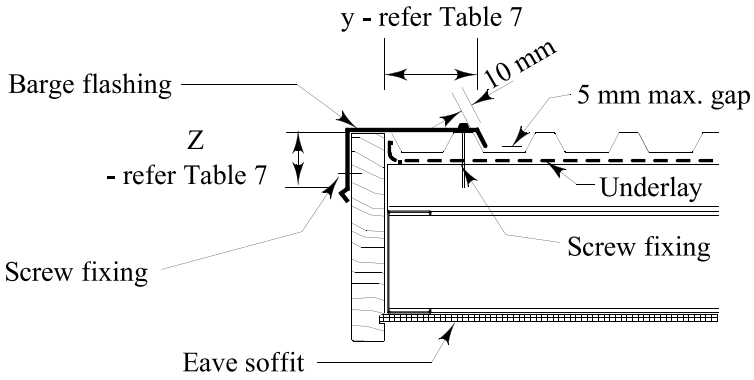


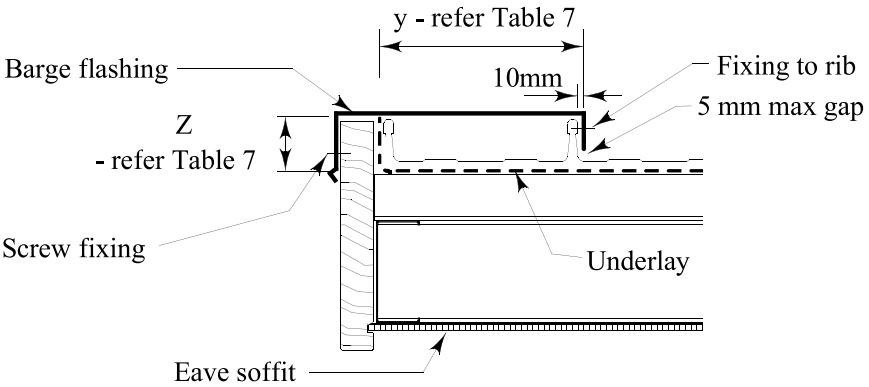
Figure 42: **Barge flashing for profiled metal**
Paragraphs 8.4.11, 8.4.12, Table 7



(a) CORRUGATED PROFILE

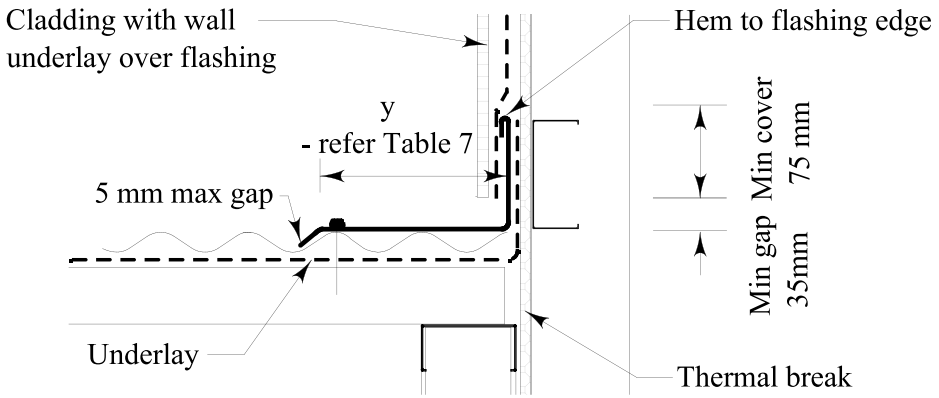


(b) TRAPEZOIDAL PROFILE

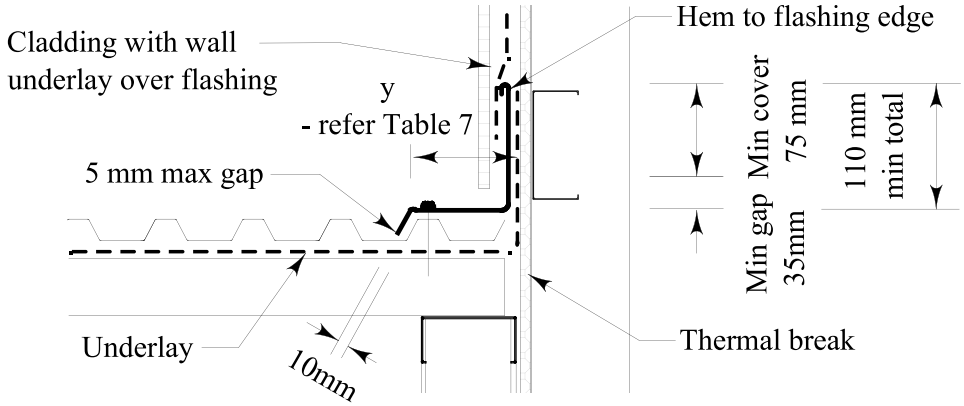


(c) TROUGH PROFILE

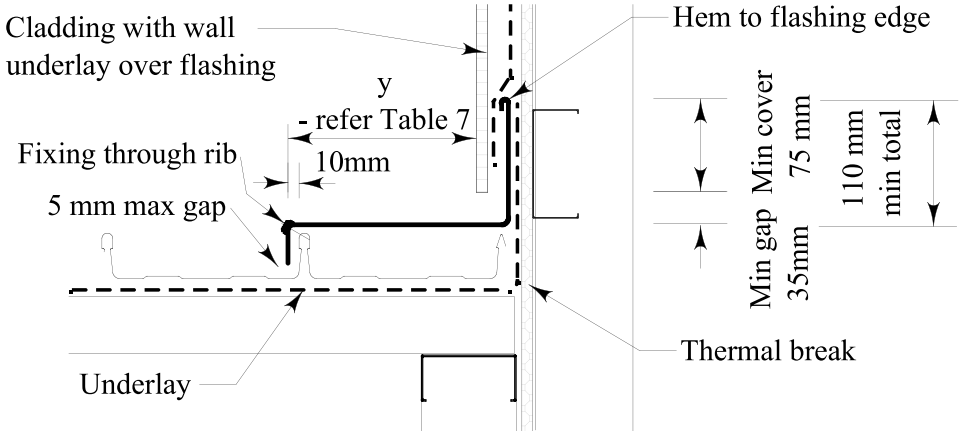
Figure 43: **Parallel apron flashing for profiled metal**
Paragraphs 8.4.11, 8.4.12, Table 7



(a) CORRUGATED PROFILE



(b) TRAPEZOIDAL PROFILE



(c) TROUGH PROFILE

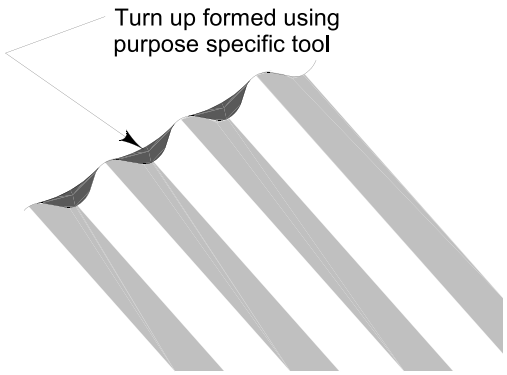
Note: Flashings in Extra High wind zone shall meet Table 7.

8.4.13 Stopends

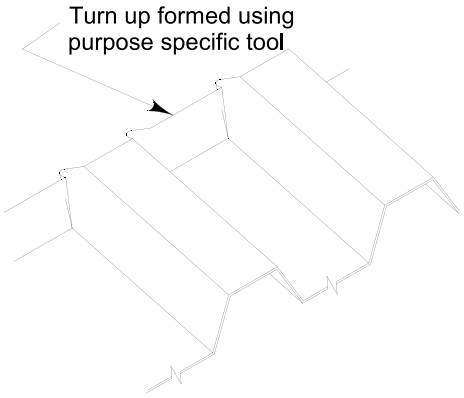
The top of profiled metal roof cladding shall have stop-ends as given in Figure 44 for trapezoidal and trough profile metal roof cladding, if either of the following apply:

a) The roof pitch is less than 25°; or
b) The building is in a High, Very High, or Extra High wind zone.

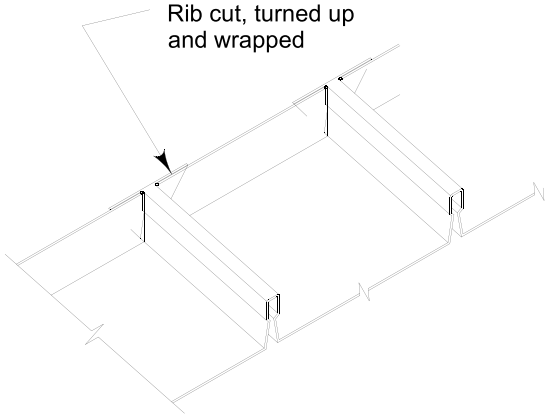
Figure 44: **Profiled metal stopend**
Paragraph 8.4.13, Figure 87



(a) CORRUGATED PROFILE



(b) TRAPEZOIDAL PROFILE



(c) TROUGH PROFILE

8.4.14 Turn-downs at gutters

The lower ends of trapezoidal and trough profile roofing shall be turned down at gutters where the roof pitch is less than 10°.

The turn-down shall be 30° from the plane of the sheet.

COMMENT :
Specific tools are available and should be used to turn up or turn down ends. Care should be taken to ensure the sheet does not split.
Refer to the New Zealand Metal Roof and Wall Cladding Code of Practice for guidance on methods.

8.4.15 Profile closure

Preformed compressible seals shall not be used at the eaves.

COMMENT :
Refer to the New Zealand Metal Roof and Wall Cladding Code of Practice for guidance.

8.4.16 Hidden, valley and internal gutters

Hidden, valley, and internal gutters shall be in accordance with 8.1.6.

8.4.16.1. Hidden gutters

Parallel hidden gutters shall be as given in Figure 45 and 8.1.6.2.

8.4.16.2. Valley gutters

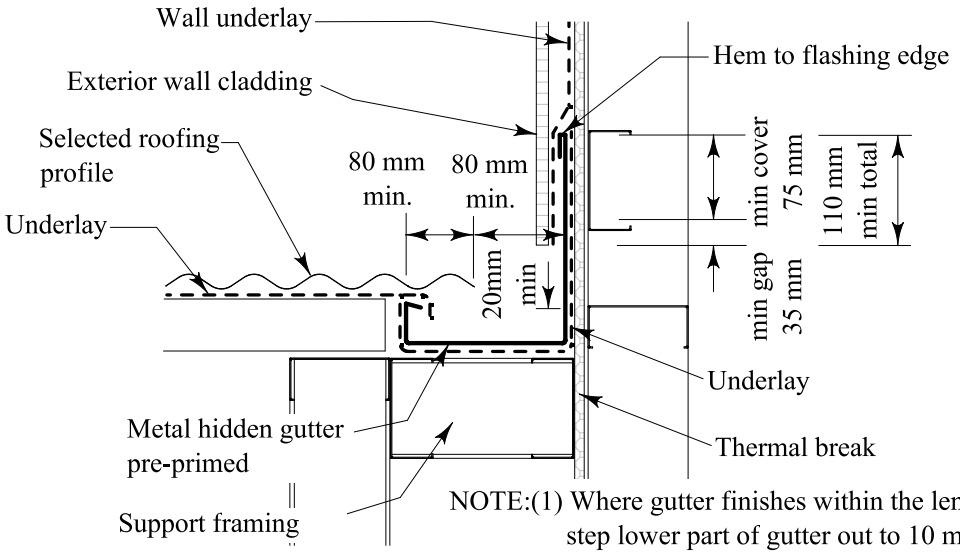
Valley gutters shall be in accordance with catchment areas given in Table 8, Figure 46, and 8.1.6.2.

COMMENT :
Refer to the New Zealand Metal Roof and Wall Cladding Code of Practice for additional guidance on sizing, materials and fixing.

8.4.16.3. Internal gutters

Internal gutters shall be as given in Figure 47 and 8.1.6.1.

Figure 45: **Parallel hidden gutter for profiled metal**
Paragraphs 4.3, 4.5, 8.1.6.2 and 8.4.16



NOTE:(1) 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.
(2) Flashings in Extra High wind zone shall meet Table 7.

Figure 46: **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.

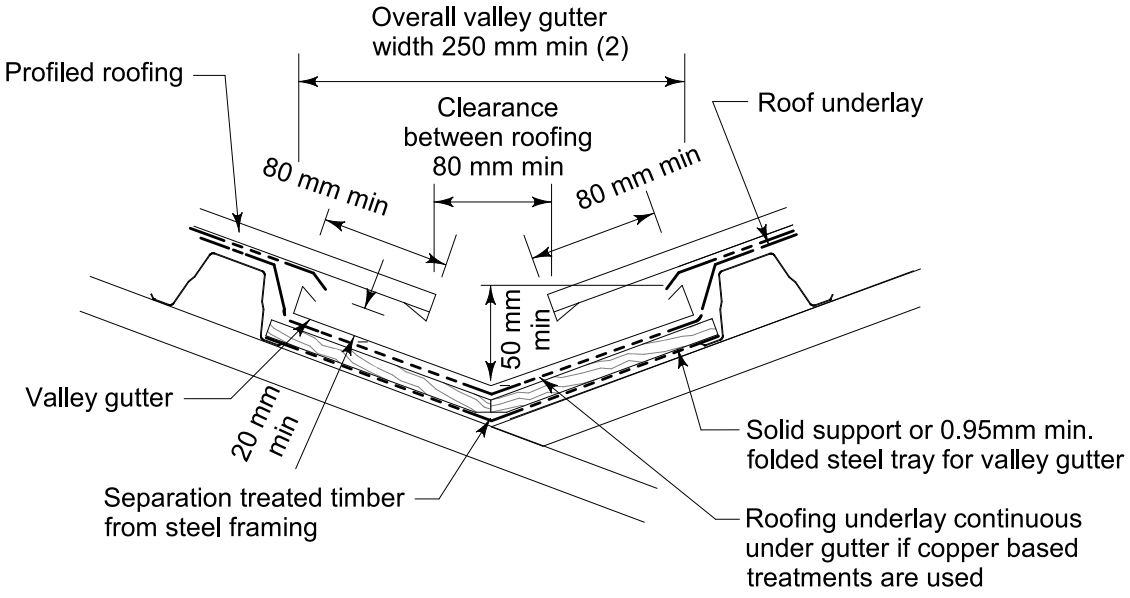
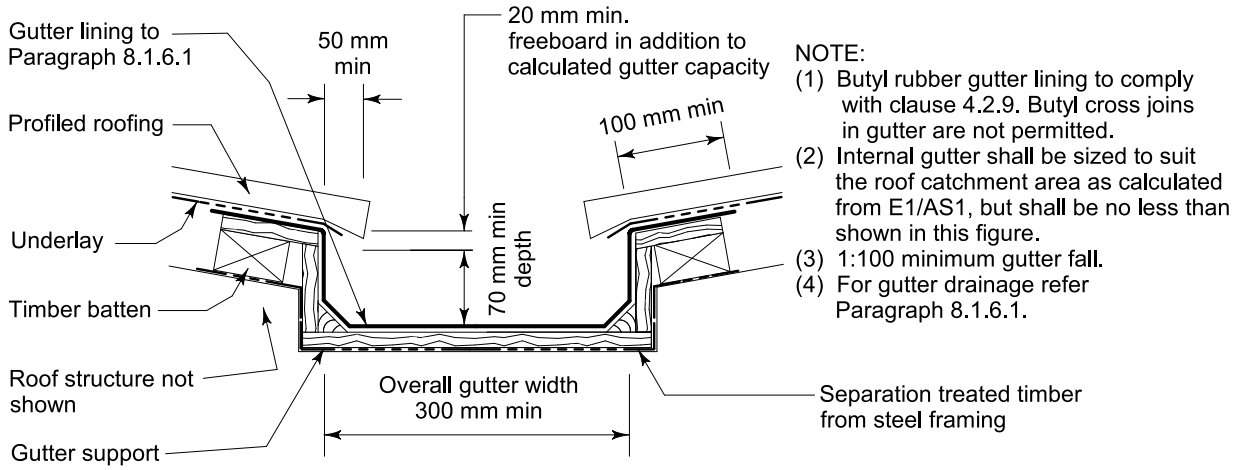


Figure 47: **Internal gutter for profiled metal**
Paragraphs 4.3, 4.5, 8.1.6.2 and 8.4.16



8.4.17 Roof penetrations

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

The edge of roofing penetrations over 200 mm wide shall be supported in either direction with additional framing as given in Figure 16.

Roof penetrations shall be flashed as follows:

a) Pipe penetrations up to 85 mm be flashed using an EPDM boot flashing a shown in Figure 48,
b) Pipe penetrations up to 500 mm be flashed using a soaker flashing and EPDM boot flashing as given in Figure 49;
c) Rectangular penetrations up to 1200 mm wide be flashed using a soaker type flashing as shown in Figure 50.

COMMENT :

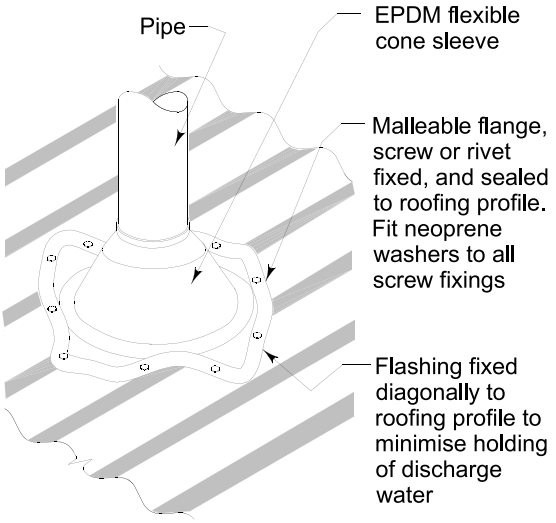
Penetrations on lower pitched roofs, larger penetrations, or needing specialised complex flashings will require specific design to suit the particular circumstances.
The New Zealand Metal Roof and Wall Cladding Code of Practice should be consulted for guidance

Table 17: **Catchment areas for profile metal**
Paragraph 8.4 7, 8.4.17 Table 9, Figure 17

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

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

Figure 48: **Flashing for small pipes**
Paragraphs 8.3.10, 8.4.17, 9.5.8.5 and 9.5.9.6



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.

Figure 49: **Soaker flashing for pipe penetrations**
Paragraph 8.4.17

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

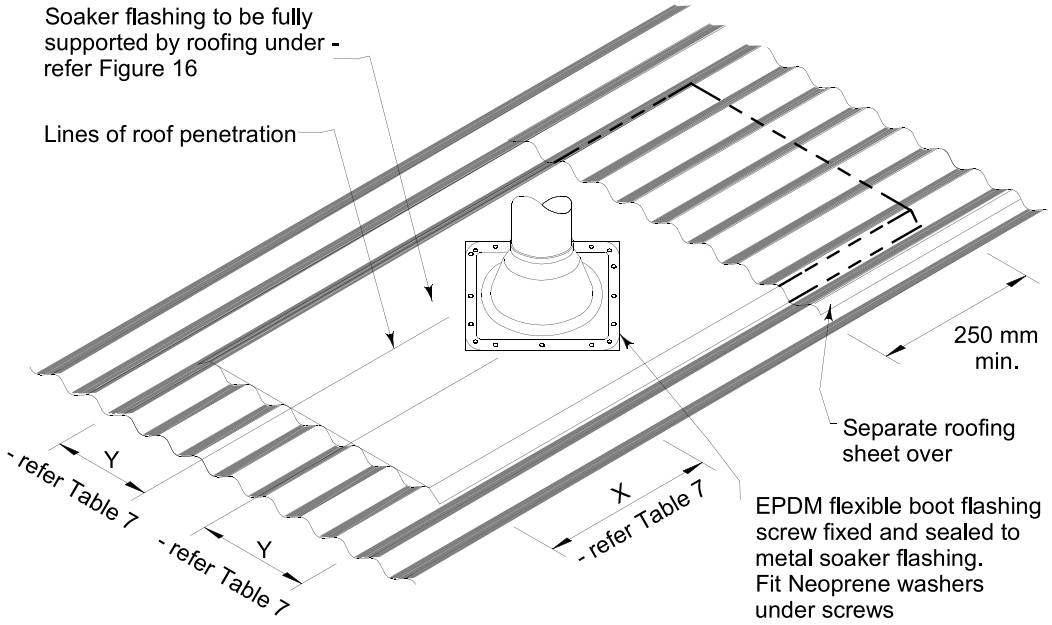
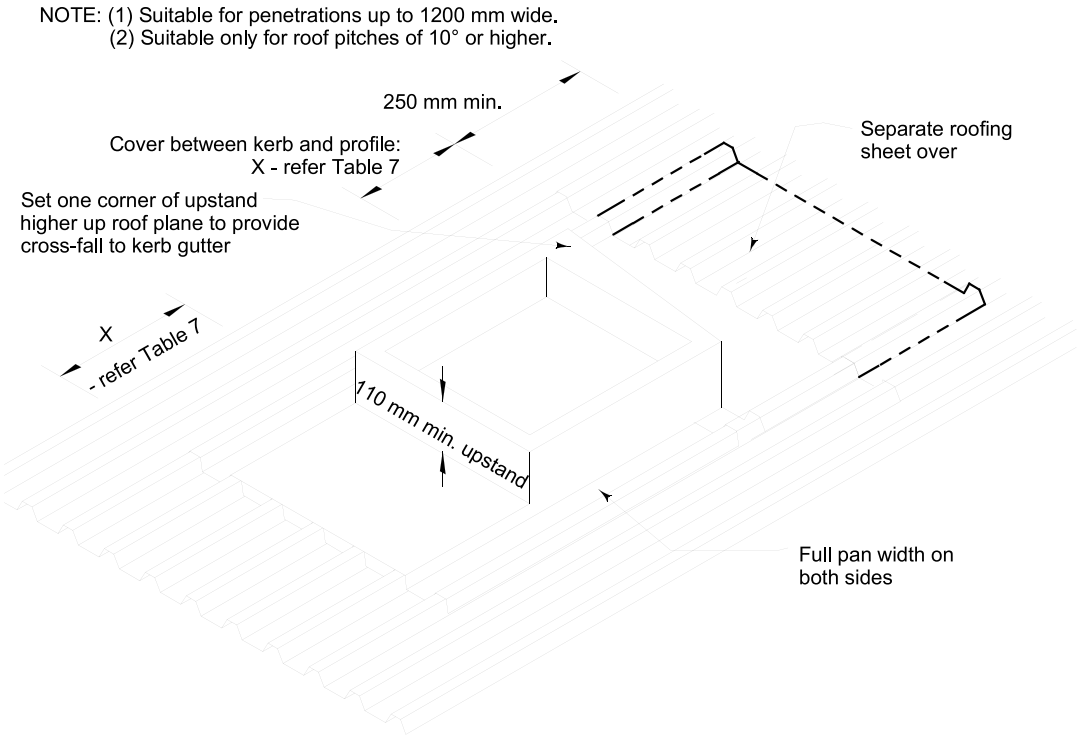


Figure 50: **Soaker flashing for other penetrations**
Paragraph 8.4.17 Table 17



8.5 Membrane roofs and decks

8.5.1 Limitations

This Standard is limited to membranes composed of butyl or EPDM installed over plywood substrates for the following applications:

a) roofs with a minimum fall of 2° (1:30);
b) decks with the following:
   i) a minimum fall of 1.5° (1:40);
   ii) a maximum area of 40 m^2;
   iii) no steps in level within deck area except into gutters;
   iv) no integral roof gardens; and
   v) no downpipe direct discharge on to the deck;
   vi) internal gutters with a minimum fall of 1:100, with no cross seams in the gutters; and
   vii) removable raised surfaces to give level access as given in Figure 13A.

The application of directly applied wearing or decorative surfaces to membranes is not covered in this Solution.

COMMENT :
EPDM and butyl rubber membranes are subject to damage when on trafficable roof-decks**.** A suitable wearing surface will help reduce such damage.

8.5.2 General

Closed-in construction spaces under membrane roofs and decks require adequate ventilation to prevent the accumulation of moisture under the membrane.

A minimum gap of 20 mm between the underside of the substrate and any insulation, and for membrane roofs greater than 40 m^2,shall be maintained (refer to manufacturer's details for roof cavity vents and/or substrate vent requirements).

COMMENT :
Refer to 1.5 for qualification of installers.

8.5.3 Plywood substrates

Plywood substrates shall be in accordance with the following:

a) A minimum of 17 mm and be in accordance with AS/NZS 2269;
b) At least CD Grade Structural plywood with the sanded C face upwards;
c) H3 in accordance with AS/NZS 1604 Part 3 with a treatment type compatible with membrane and adhesives used; and
d) DPC separation between steel framing and treated plywood substrate.

COMMENT :
If using plywood containing copper-based preservatives, check with the product manufacturers for compatibility with the adhesives and membranes. LOSP preservative is not recommended by membrane suppliers.

8.5.4 Butyl and EPDM

Butyl rubber and EPDM rubber sheet and system components used for membrane roofing or decks shall be in accordance with the following:

a) be a minimum thickness of:
   i) 1 mm for roofing, or
   ii) 1.5 mm for decks.
b) the following parts of Table 1 in ASTM D6134:
   i) tensile strength;
   ii) elongation;
   iii) water absorption;
   iv) water vapour permeance; and
   v) heat aging followed by:
      1) tensile strength; and
      2) elongation.
c) have adhesives, primers, seam tapes, and pre-formed components where supplied by the manufacturer that:
   i) comply with BRANZ EM 5; and
   ii) are part of a complete system approved by the manufacturer or supplier of the membrane.

See also 8.1.6.1 for membranes to gutters

8.5.5 Installation

8.5.5.1. Plywood

Substrates shall be dry when membranes are applied.

The plywood and any timber substructure shall have a maximum moisture content of 20% when a membrane is adhered.

COMMENT :
This requirement will generally require substrates to be covered to prevent rain wetting, or to be pre-primed to avoid moisture uptake.
Manufacturers' recommendations should be consulted, as some require a lower moisture content in order to validate guarantees.

Plywood substrates shall be fixed in accordance with the following:

a) panels be laid with staggered joints (brick bond);
b) panels be laid with the face grain at right angles to the main supports;
c) be fixed to main supports with a maximum spacing of 400 mm centres;
d) ensure the edge of sheets are supported with nogs or framing before fixing;
e) chamfer the external edges of sheet with a minimum radius of 5 mm;
f) ensure a 20 mm H3.2 triangular fillet be used at the base of any 90° upstand; and
g) panels be fixed with 3 mm gaps between all sheets; and
h) panels be fixed using 10 g stainless steel or Class 4 countersunk head screws at 150 mm centres on edges, and at 200 mm centres in the body of the sheets.

8.5.5.2. Butyl and EPDM

Seam tapes shall be used on all joints in the following applications:

a) Roofs or decks with falls less than 5° (1:12);
b) Penetrations through the membrane where butyl or EPDM flashing is required;
c) EPDM membrane; and
d) Butyl membranes that contain EPDM.

COMMENT :
Coloured butyl membranes contain EPDM, which makes them more difficult to adhere properly.
Seams should be aligned parallel to the fall of the deck to minimise ponding.
Where a penetration is made through the membrane subsequent to laying, the flashing should be installed by the applicator of the membrane system.

All joints in the plywood and junctions of plywood with other materials shall have 25 mm polyethylene release tape applied before application of the membrane.

8.5.6 Roof and deck drainage

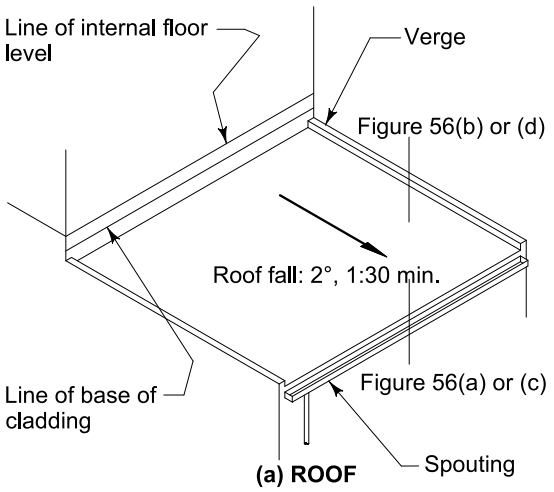
Membrane roofs and decks shall be constructed to provide the following:

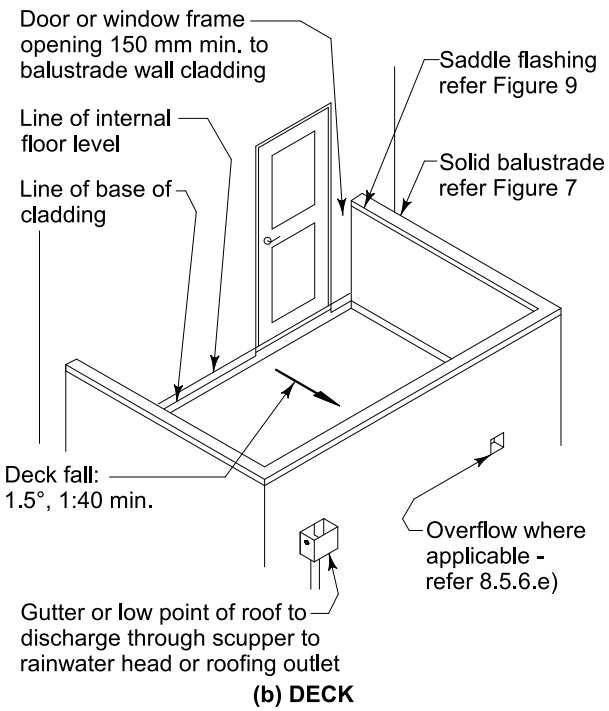
a) falls as given in Figure 51 and Figure 52 to Figure 59;
b) a minimum of 100 mm below an adjoining threshold as given in Figure 57;
c) membrane upstands against all walls, parapets, or enclosed balustrades extending to a minimum level of 150 mm above the finished deck level as given in Figure 57;
d) Gutters formed with continuous butyl or EPDM strip complying with 4.2.9, with no cross-joints; and
e) Water discharging into either:
   a. a roof or gutter outlet with a minimum diameter of 75 mm as given in Figure 59 with either:
      i. an overflow as given in Figure 58(c); or
      ii. an extra outlet, with both outlets sized to take the full required capacity.
   b. a scupper, into a gutter or rainwater head, as given in Figure 58 (a), in Figure 58 (b), and in Figure 58 (d).

COMMENT :
If the clearance of the cladding from the deck or roof surface is at the minimum of 35 mm, an overlap of 115 mm to the cladding could be considered.
Refer also to E1/AS1 for specific drainage requirements outside the scope of this 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.

Figure 51: **Fall in membrane roofs and decks**
Paragraph 8.5.6, Figure 56, 57, 58 and 59.

NOTE:
(1) Refer Figure 57 for thresholds and clearances.





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 Solution.

Figure 52: **External corner in upstand**
Paragraph 8.5.6, Figure 54, 57, 58 and 59.

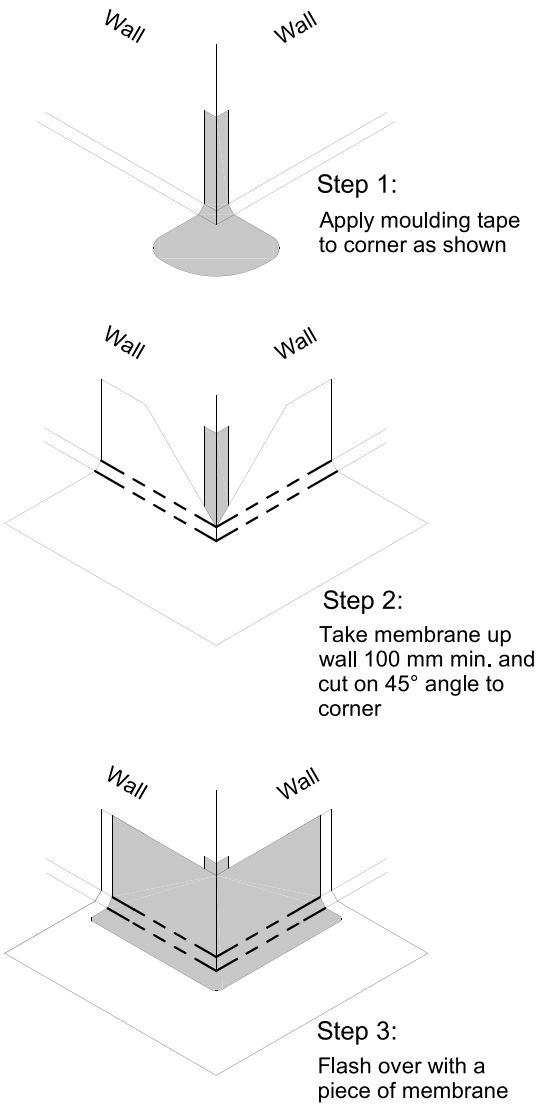
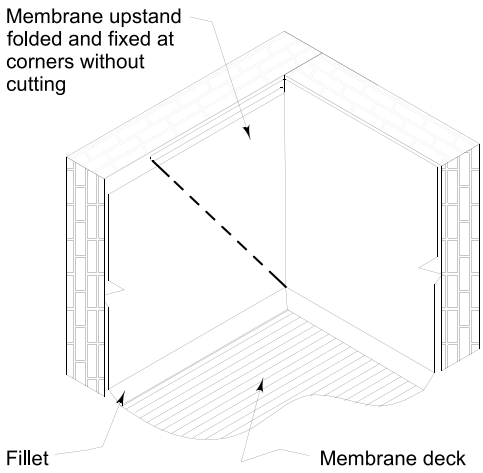


Figure 53: **Internal corner in upstand**
Paragraphs 8.5.8 Figures 57 and 59



8.5.8 Junctions

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

a) external corner in upstands (see Figure 52);
b) internal corner in upstands (see figure 53);
c) verges and eaves (see Figure 56);
d) junctions of decks and walls (see Figure 57); and
e) Other drainage details (see 8.5.6).

8.5.8.1. Junctions with walls

Junctions of membrane decks or walls shall be formed as given in Figure 58.

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

8.5.9 Penetrations

Penetrations through membrane roofs and decks shall be as given in Figure 54 and Figure 55.

Figure 54: **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 52.

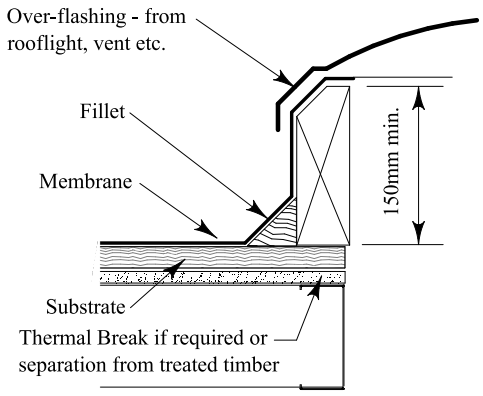
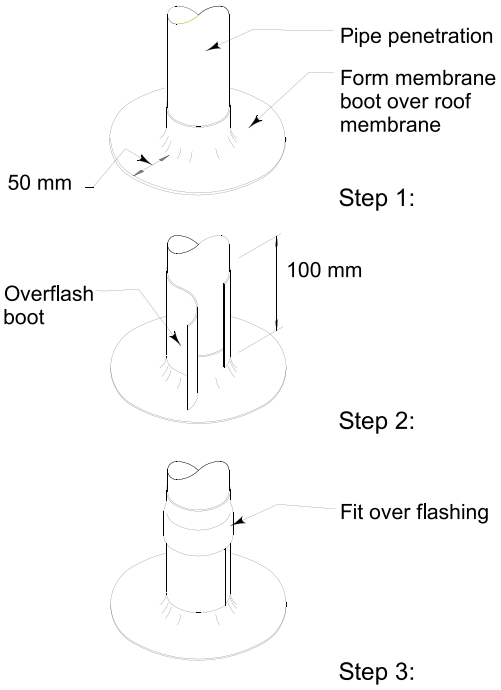
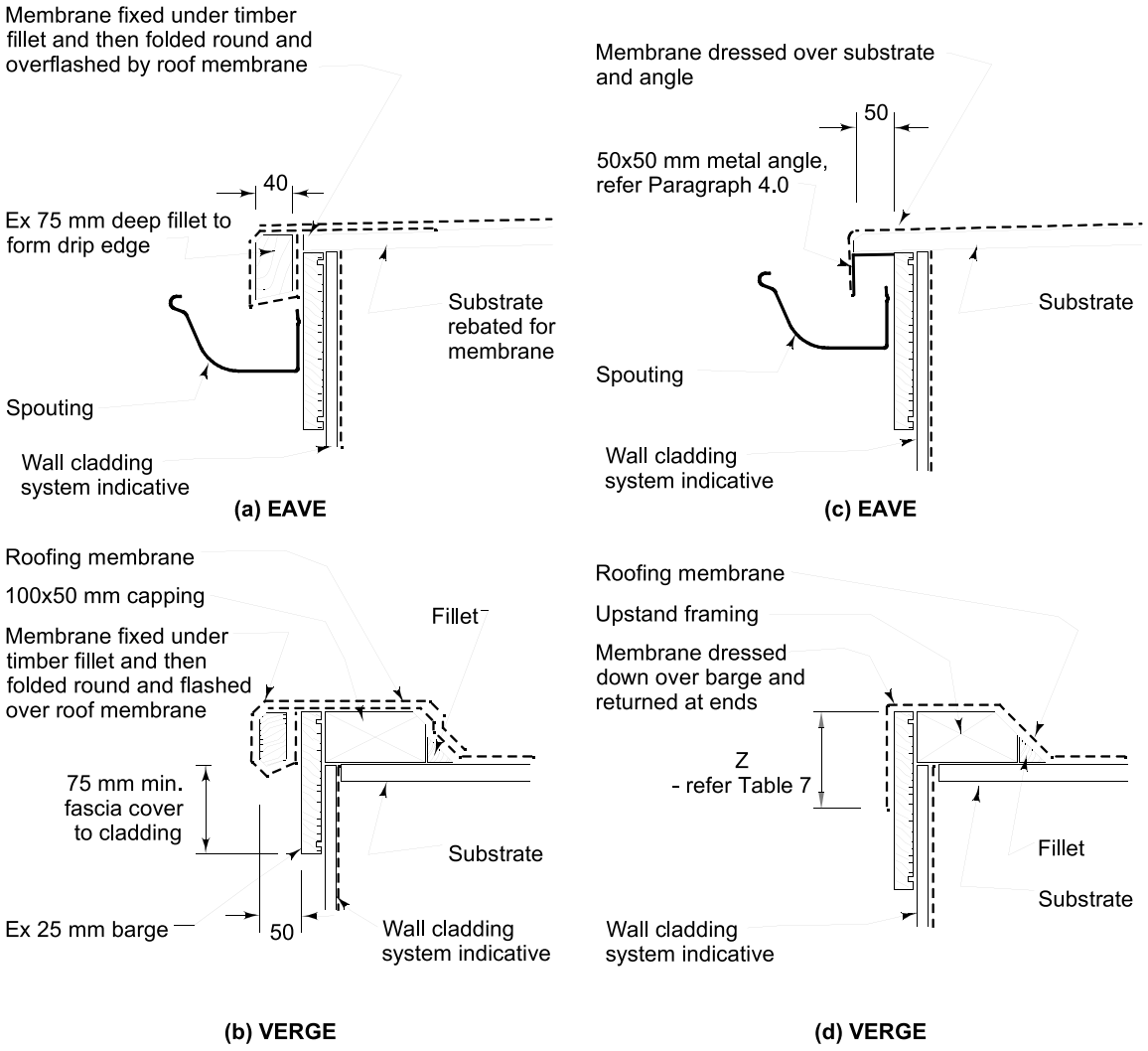


Figure 55: **Pipe penetration in membrane**
Paragraphs 8.5.9



Or to Manufacturers recommendation

Figure 56: **Verges in membrane**
Paragraph 8.5.8 Figure 51



8.5.9.1. Handrails

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

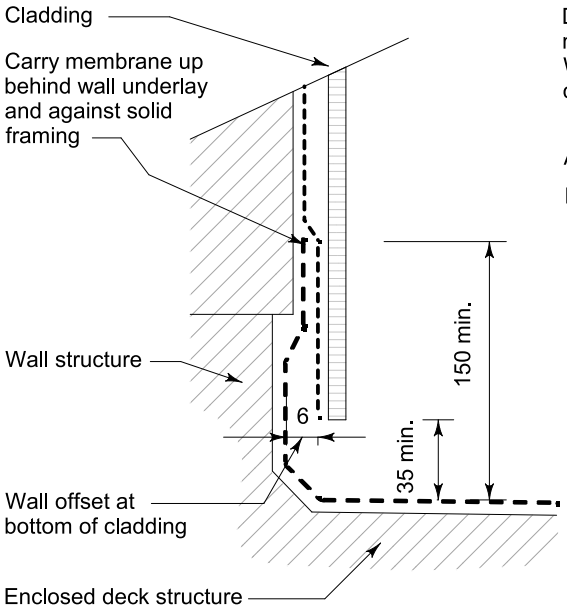
8.5.10 Gutters

Deck gutters and internal outlets shall be constructed as given in Figure 59.

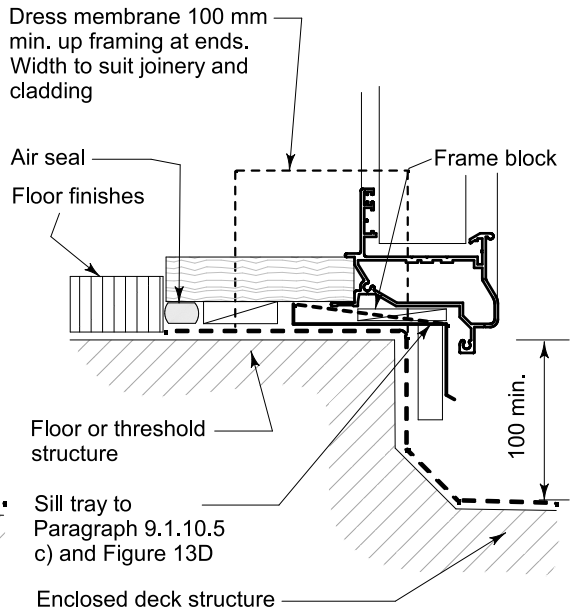
COMMENT :
Internal outlets should have a dome-type cover to reduce risk of blockage, except where this could constitute a pedestrian hazard.

Figure 57: **Junctions with walls for membrane**
Paragraph 7.4.3 Figure 51

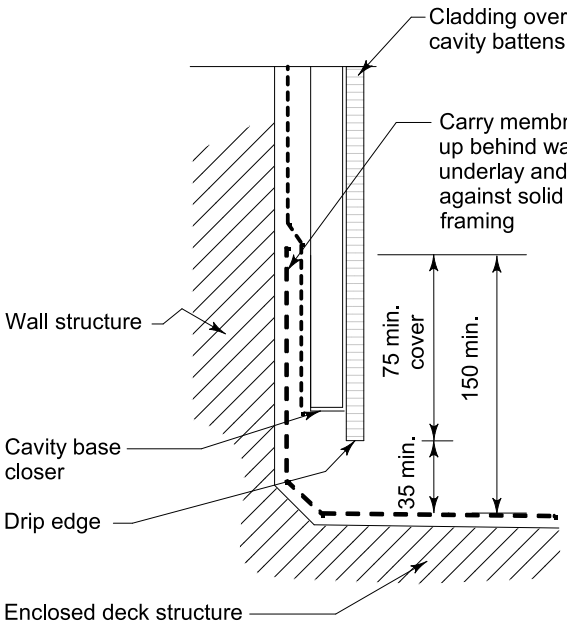
NOTE: (1) Internal corners to be formed as shown in Figure 53.
(2) Dimensions are shown to membrane. However, where there is an additional material applied over the membrane, all dimensions shall apply to the highest level of the wearing surface.



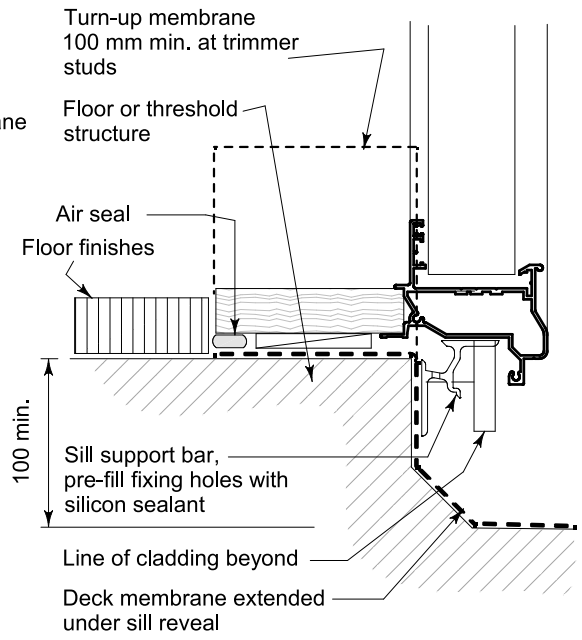
(a) DIRECT FIX CLADDING



(b) DIRECT FIX THRESHOLD AT OPENING



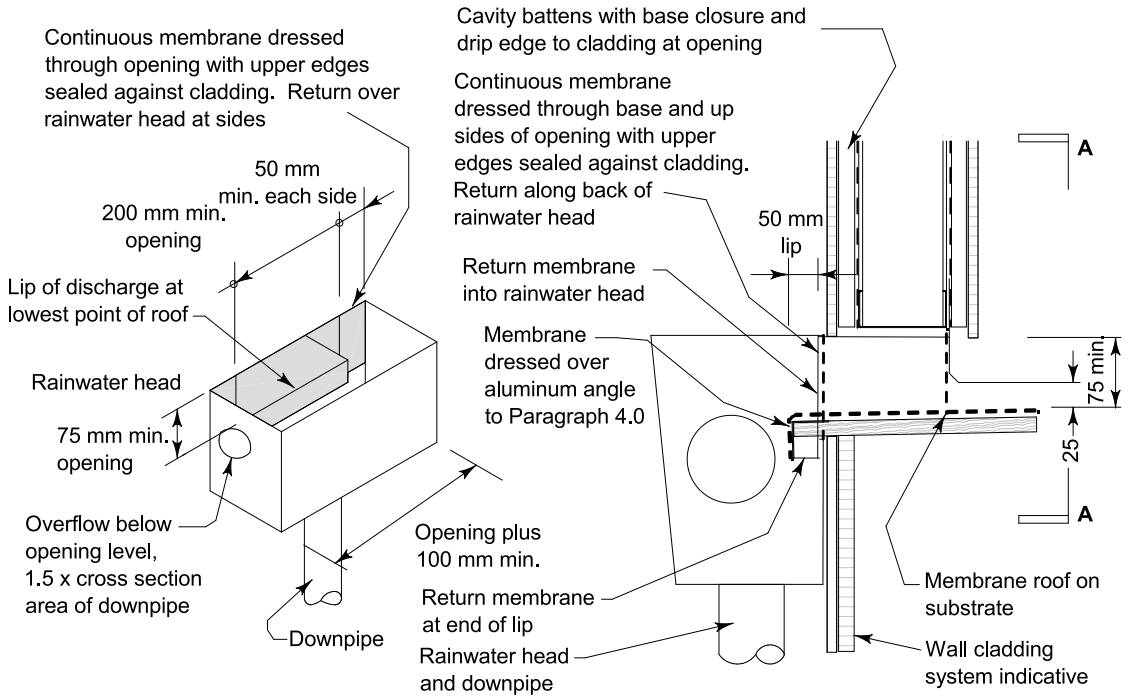
(c) CAVITY FIXED CLADDING



(d) CAVITY THRESHOLD AT OPENING

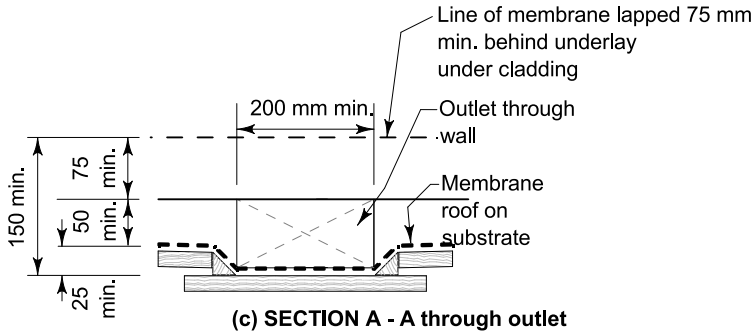
Figure 58: **Rainwater head scupper opening and overflow in membrane**
Paragraph 8.5.6 Figure 51

NOTE: (1) Use preformed scuppers where provided by the membrane supplier.
(2) External corners of scupper opening to be formed as shown in Figure 52.

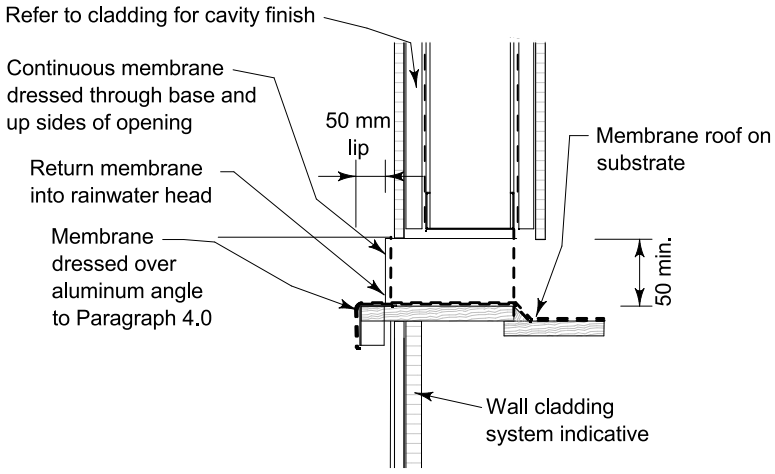


(a) RAINWATER HEAD AND SCUPPER

(b) OUTLET THROUGH WALL

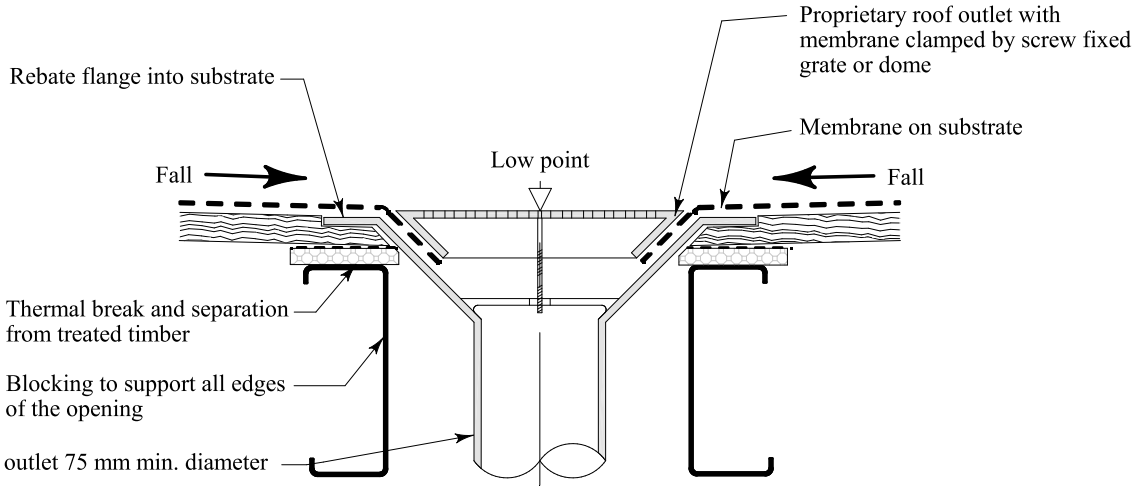


(c) SECTION A - A through outlet

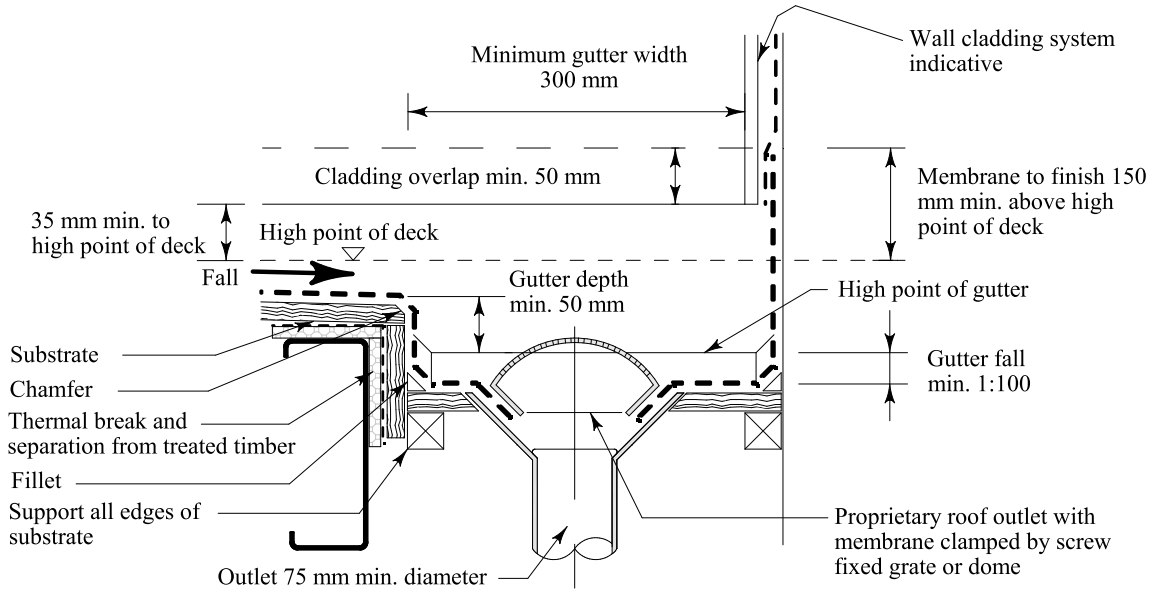


(d) Overflow

Figure 59: **Gutters and outlets in membrane**
Paragraph 8.5.6 and 8.5.10

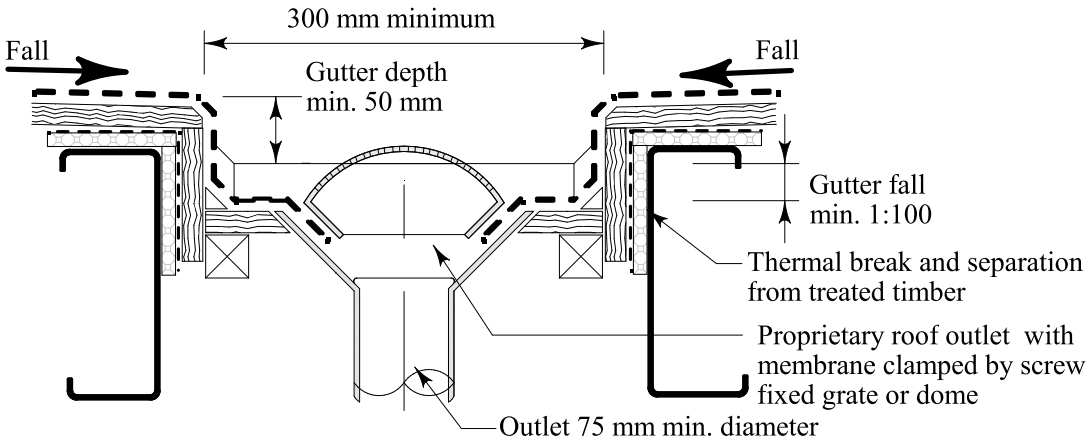


(a) TYPICAL ROOF OUTLET



(b) EDGE GUTTER

Figure 59: (Continued) **Gutters and outlets in membrane Paragraph 8.5.6 and 8.5.10**



(c) CENTRAL GUTTER

9.0 WALL CLADDINGS

9.1 General

Wall claddings shall meet the requirements of NZBC E2.3.2 to E2.3.7, and comply with the provisions of 9.1.1 to 9.8. Claddings in Extra High wind zones require particular attention, refer to Paragraph 2.5.

Wall claddings shall have thermal breaks that comply with Section 11.

Thermal breaks shall be installed in conjunction with wall underlays given in Table 23.

9.1.1 Limitations

This Solution is limited to the wall cladding systems listed in 3.3.

Table 3 lists wall cladding systems that shall be used for buildings with varying risk scores.

The method of establishing the level of risk associated with the use of a specific wall cladding shall be is given in 3.1. Based on the risk score, a wall cladding may require the inclusion of a drained cavity as given in 9.1.8.

9.1.2 Maintenance

Maintenance of wall claddings shall be carried out as necessary to achieve the required durability of the material (see 2.7).

9.1.3 Bottom of cladding

Separations, clearances to ground level, and overlaps shall be as given in Figure 60 and Table 18.

Clearances to roof claddings and decks shall be a minimum of 35 mm (see Table 7 and Figure 14).

Clearances shall be measured to the following:

a) The finished plane of any adjacent horizontal surface; or
b) The top surface of any adjacent sloped or horizontal apron flashing.

COMMENT:
This keeps the bottom edge of the cladding dry, and allows cleaning and painting of the bottom surfaces.

Figure 60: **Levels and garage openings**
Paragraphs 9.1.3, 9.1.3.4, 9.2.5. Table 18

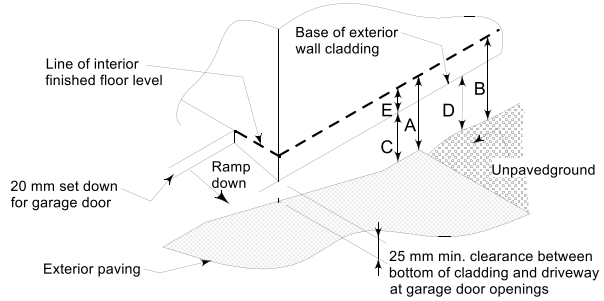


Table 18: **Minimum clearances**
Paragraph 9.13, 9.131, 9.1.3.2, 9.1.3.3, 9.1.3.4, 9.1.3.5 and 9.2.7. Figure 60.

Minimum clearances (mm)	Masonry veneer		Other claddings				
	A	B	A	B	C	D	E
Concrete slab	100	150	150	225	100	175	50
Timber floor (1)					100	175	50 (2)

NOTE: 1) Refer to NZS 3604 for requirements.
2) Cladding to extend minimum 50 mm below bearer or lowest part of subfloor framing

9.1.3.1. Concrete ground slabs

Every slab-on-ground floor shall incorporate a continuous damp-proof membrane as per NZS 3604, Section 7.5.

Slab levels shall be set to allow reinstatement of final landscaped ground levels as given in Figure 60 and Table 18.

A DPM shall be installed under the concrete slab in accordance with Table 23 and NZS 3604.

9.1.3.2. Masonry veneer clearances

The height of the floor slab above finished ground level shall be in accordance with Figure 68(d) and as given in Table 18.

COMMENT:
Greater ground clearance may be required depending on floor type and materials.
The likely final landscaped ground levels are to be taken into account when planning foundations and earthworks to avoid reductions to the minimum ground clearance in the finished building.

9.1.3.3. Bottom of wall claddings for concrete ground slabs (except masonry veneer)

At concrete slab level, the base of the cladding system shall be as given in Table 18, and in accordance with the following:

a) finished at a minimum of:
   i) 100 mm above a paved surface, or
   ii) 175 mm above finished unpaved surface.
b) overlapping the concrete slab by 50 mm; and
c) be offset horizontally by a minimum of 6 mm for direct fixed claddings to prevent capillary action.

9.1.3.4. Garages and openings to garages

Garage spaces within, or attached to, the building envelope shall have the following:

a) openings provided with a 50 mm minimum total level change between the interior and the exterior paving;
b) provision to drain water away from the threshold of the opening;
c) rigid wall underlays in accordance with Table 23 where external garage walls are unlined
d) linings for garage walls adjoining habitable spaces;
e) weather resisting garage doors; and
f) window and door details, where included, in accordance with 9.2 to 9.9.

COMMENT :

Methods for achieving the required steps may include:

- A 50 mm difference in finished ground level adjacent to the opening, or
- A raised threshold at the opening, or
- Concrete nibs at the opening.

Figure 60 and Table 18 provide further requirements for the overall level change.

This Solution does not apply to garages that are detached outbuildings.

9.1.3.5. Bottom of wall claddings at ground level

At ground floor level, the base of the cladding system shall be in accordance with the following:

a) Overlap the framed floor structure by a minimum of 50 mm;
b) be offset horizontally from a concrete foundation wall by a minimum of 6 mm for walls with direct fixed claddings; and
c) Have no direct connection between subfloor spaces and drained cavities.

COMMENT :

Where claddings require drained cavities, care should be taken to ensure air from the subfloor space cannot enter the cavity. This is important, as moisture levels in subfloor air can be high.

9.1.4 Barriers to airflow

External walls shall have barriers to airflow, in accordance with the following:

a) Interior linings with all joints stopped for wind zones up to and including Very High, or
b) Rigid underlays (and drained cavities) for buildings in Extra High wind zones (see 9.1.7.2).
c) Where walls are not lined, such as attic spaces at gable ends, an air barrier complying with Table 23, fixed to *framing* prior to fixing cladding or cavity battens.
d) For attached garages, an air barrier as an underlay to 9.1.3.4.

Where walls are not lined, such as attic spaces at gable ends, an air barrier complying with Table 23 or rigid underlay, shall be fixed to framing prior to fixing cladding or cavity battens.

COMMENT :

The primary function of air barriers and air seals is to moderate airflows at junctions and inside the wall cavity.

Airflows in certain weather conditions encourage significant amounts of water to move along their path, and it is therefore important to manage airflow in cavity walls with barriers and air seals.

In the absence of internal linings, an air barrier is required to support wind pressures at locations such as gable ends and unlined garage spaces. Air pressure drop is not always across the internal lining, indicating the wall underlay acts as an air barrier as well.

The inclusion of a thermal break should also be considered to ensure the consistency of the wall thickness

9.1.5 Wall underlays to wall openings

Prior to window or door installation, wall underlay shall be in accordance with the following:

a) flexible wall underlay be cut and dressed into all sides of openings as given in Figure 67(a) and Figure 67(b); and

b) flexible flashing tape be applied to head and sill framing as given in Figure 67(a) and Figure 67(b).

Flexible flashing tape shall be in accordance with the following:

a) comply with Parts 3.2 and 4 of ICBO Acceptance Criteria AC148, and
b) be compatible with the wall underlay.

COMMENT :
Dressing the wall underlay around the framing and providing a flexible air seal limits airflows around the window reveal.
The flexible flashing tape keeps any water that does get past the cladding, or through the joinery, from direct contact with the framing member.

9.1.6 Air seals

Window, door, and other penetration openings shall be provided with flexible air seals to minimise the risk of airflows carrying water into the building wall.

The air seal shall be in accordance with the following:

a) be provided between the reveal or frame and the wrapped opening (see Figure 76);
b) be installed over a closed cell polyethylene foam (PEF) backing rod, or similar;
c) be made of one of the following:
   i) self-expanding polyurethane foam, or
   ii) sealant complying with:
      c) Type F, Class 20LM or 25LM of ISO 11600, or
      d) low modulus Type II Class A of Federal Specification TT-S-00230C.

COMMENT :
Some sealants can react with bitumen based flashing tape, preventing full curing of the sealant. Where necessary, consult sealant manufacturers for application requirements.
Backing rods are used for sealant and for self-expanding polyurethane foam as there is a danger foam will expand to the outside of the wall and form a moisture bridge to the interior. For further information refer to ASTM C1330 for backing rod material performance.

9.1.7 Wall underlay

9.1.7.1. Flexible wall underlays

Flexible wall underlays shall be in accordance with Table 23 and the following:

a) be run horizontally;
b) have upper sheets lapped over lower sheets to ensure that direction of laps will allow water to be shed to outside of the wall underlay;
c) be lapped not less than 75 mm at horizontal joints;
d) be lapped not less than 150 mm over studs at vertical joints;
e) extend 35 mm below bottom plate or bearer; and
f) be restrained from bulging into a drained cavity as given by 9.1.8.5.

9.1.7.2. Rigid wall underlays

Rigid wall underlays, with drained cavities (including direct fixed corrugated profiled metal), shall be required in Extra High wind zones (see Table 3 and Table 23.

Rigid underlays shall be required for external walls of attached garages that are unlined (see 1.1.1 and 9.1.3.4 c).

Rigid wall underlays shall be in accordance with Table 23, and the following:

a) be a minimum of 7 mm H3 plywood or a 6 mm fibre cement sheet;
b) be installed with sheet edges fixed over solid framing;
c) be over-fixed with a flexible wall underlay given in Table 23 and installed as given in 9.1.7.1;
d) have flexible underlay folded into opening reveals as given in 9.1.5.
e) have cavity battens at a maximum of 600 mm centres; and
f) be finish-flushed with the underside of the bottom plate or bearer.

COMMENT:
Some proprietary systems may not require the addition of a flexible underlay but would be outside the scope of this Solution and thus an Alternative Solution.

External air pressures in higher wind zones can transfer to interior linings, and exceed recommended loadings prescribed by some lining manufacturers. Rigid underlays will protect linings from undue air pressure loadings, and help ensure cavity depths are maintained for the proper functioning of the drained cavity.

9.1.8 Drained cavities

The need to include a drained cavity shall be determined by the risk score for an external wall calculated in 3.1.

Where a wall cladding requires a drained cavity, it shall meet the requirements of 9.1.8 to 9.1.9.4.

LOSP treated timber battens shall be separated from any polystyrene thermal break with a wall underlay or DPC.

Running of services or cables shall not be permitted within any drained cavity.

COMMENT :
Cavities manage occasional ingress of water past the cladding, but should not act as gutters or drains.

9.1.9 Thermal Breaks

Thermal breaks shall be applied to steel frame buildings constructed in accordance with this Standard. These may be full sheets or strips. The requirements are included in Section 11.

9.1.9.1. Limitations

This Solution shall be limited to systems with the following:

a) Cavity battens are fixed by the cladding fixings, to the wall framing;
b) Claddings are fixed through the cavity battens and thermal break into the wall framing; and
c) The drained cavity behind claddings, except in masonry veneer, is not vented at the top.

Systems where the cladding is fixed into the cavity batten only are outside the scope of this Solution.

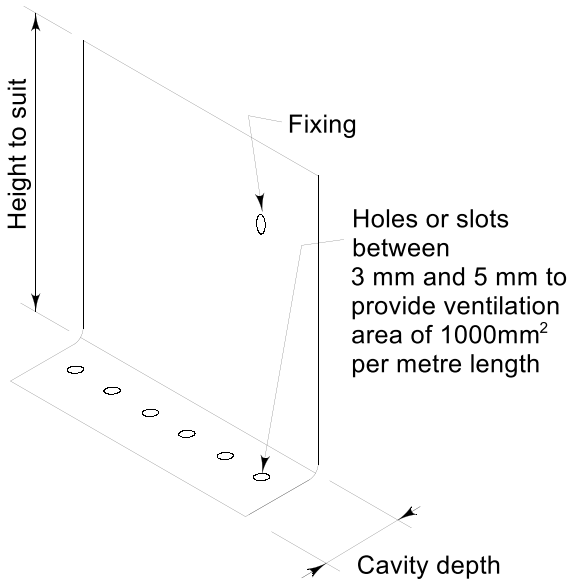
9.1.9.2. Requirements

Where a drained cavity is required, it shall be in accordance with the following:

a) be installed over a wall underlay that is either flexible or rigid, that:
   i) complies with Table 23, and
   ii) is fixed to wall framing.
b) be installed over a thermal break that meets the requirements of Section 11;
c) be formed using vertical cavity battens;
d) restricts air movement between the drained cavity and the following:
   i) floor, wall and roof framing,
   ii) attic roof space, and
   iii) subfloor space.
e) be drained and open to the exterior at the bottom of cavities;
f) use vermin-proofing at the cavity base in accordance with 9.1.9.3 and Figure 61; and
g) where fixing is required between cavity battens, either of the following be used:
   i) cavity spacers as given in Figure 62; or.
   ii) alternative cavity spacers to those described in 9.1.8 (see also 9.1.9.4).

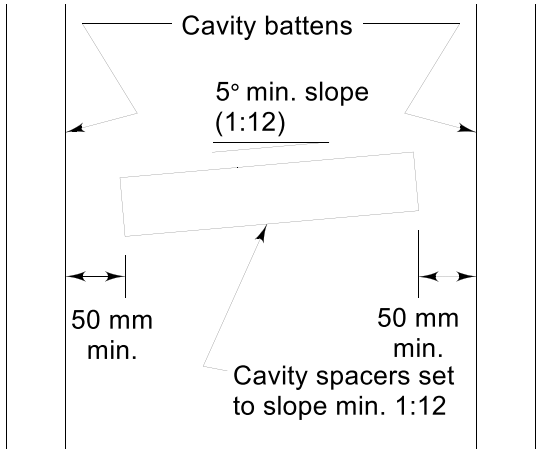
COMMENT :
Solid horizontal cavity spacers risk obstruction of air flow in cavities and risk bridging moisture across the cavity.

Figure 61: **Cavity base closer/vermin proofing**
Paragraphs 9.1.8.2



NOTE: To be used in drained cavities at the base of walls and above window head and inter-storey flashings.

Figure 62: **Cavity spacers**
Paragraphs 9.1.8.2 and 9.1.8.4



NOTE: Spacing of cavity spacers will vary to suit individual cladding fixings.

9.1.9.3. Vermin-proofing

Vermin-proofing shall be provided above window and door heads and at the base of the drained cavity.

Figure 61 provides an example of a cavity closer.

Cavity base closers constructed from aluminium, stainless steel, or uPVC in accordance with 4.1 shall be used.

Where vermin-proofing material is not readily accessible or replaceable.

Vermin-proofing shall be in accordance with the following:

a) provide holes or slots between 3 mm and 5 mm; provide an area of opening of 1000 mm^2 per lineal metre of wall; and
b) be positioned to allow a minimum drip edge to the wall cladding of the following:
   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.

9.1.9.4. Cavity battens and jamb battens

Cavity battens shall be in accordance with the following:

a) be a nominal 20 mm (between the limits of 18 mm and 25 mm in thickness);
b) be a minimum of 45 mm wide; and
c) be fixed, by the cladding fixings, through the wall underlay and thermal break into the framing.
d) if timber, the cavity batten will comply with B2/AS1; and
e) If polystyrene, the cavity batten will comply with either 9.9.3.1 (a), or 9.9.3.1 (b) and be protected from any incompatible treatment vapors. Eg. Those from LOSP.
f) If a proprietary product, meet the requirements of a) to c) above, including E2/VM1 Class 1 testing, B2/VM1, and permitting air circulation. These requirements also apply to cavity spacers that are part of the proprietary system. The Class 1 test must include a horizontal cladding joint supported on a cavity spacer batten of the proposed type.

Jamb battens shall 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 67A.

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

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

9.1.9.5. Wall framing behind cavities

Nogs for direct-fixed vertical weatherboard profiles, and vertical metal corrugated and symmetrical trapezoidal claddings shall be at a maximum 480 mm centres.

Nogs for other claddings shall be at a maximum of 1350 mm centres.

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.

Providing an intermediate means of restraining the flexible wall underlay and insulation bulging into the cavity shall be by the following methods:

a) 75 mm galvanized mesh or wire galvanized in accordance with AS/NZS 4534; or
b) polypropylene tape or galvanized wire at 300 mm centres fixed horizontally and drawn taut;
c) vertical cavity battens at a maximum spacing of 300 mm centres.
d) thermal break sheets as given in Section 11.

9.1.10 Penetrations

9.1.10.1. Penetrations through cavities

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

9.1.10.2. 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.

9.1.10.3. Pipes and service penetrations

Pipes and service penetrations shall be made weathertight by using the methods given in Figure 63 and Figure 64.
Flashing tape shall comply with 4.2.10, and sealant comply 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.

The drained cavity is not a service duct and pipes or cables shall not be laid within it.

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

Figure 63: **General pipe penetration**
Paragraphs 9.1.9.3, Figure 115

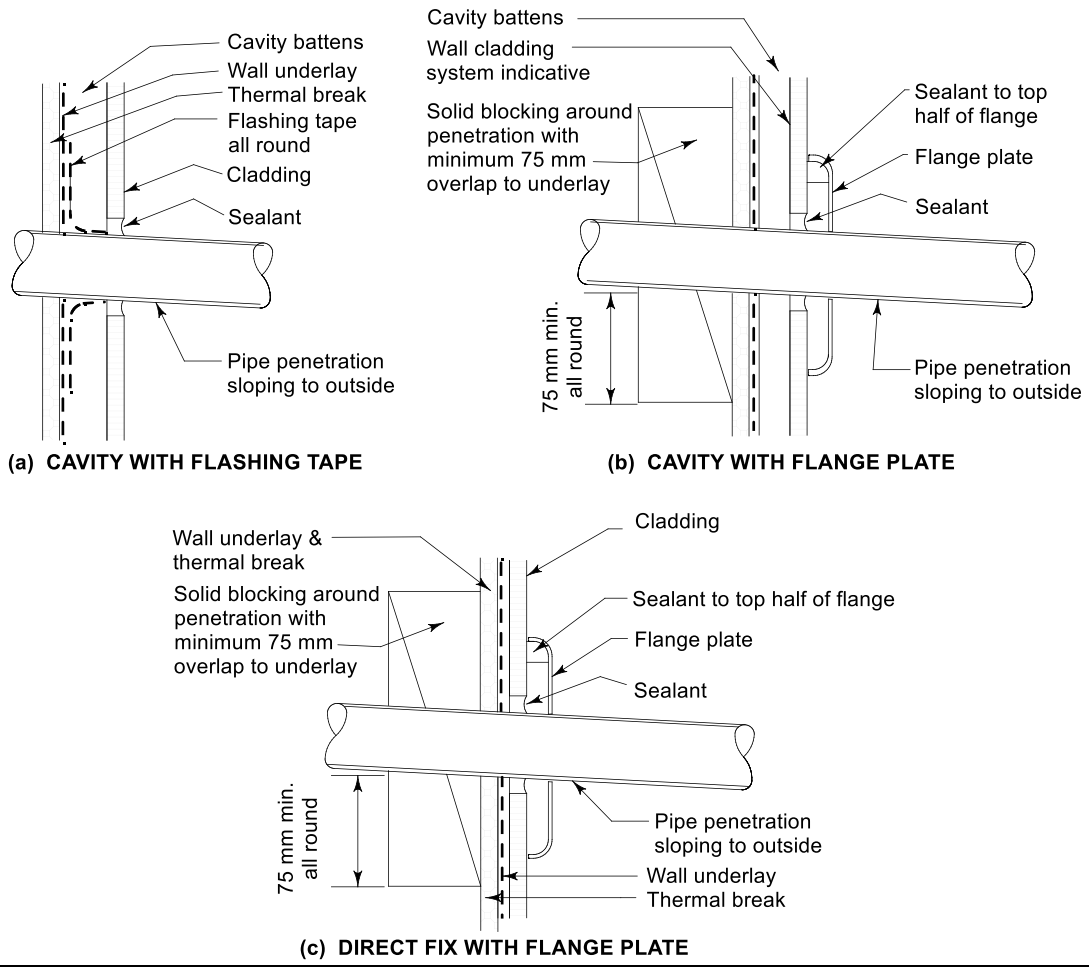
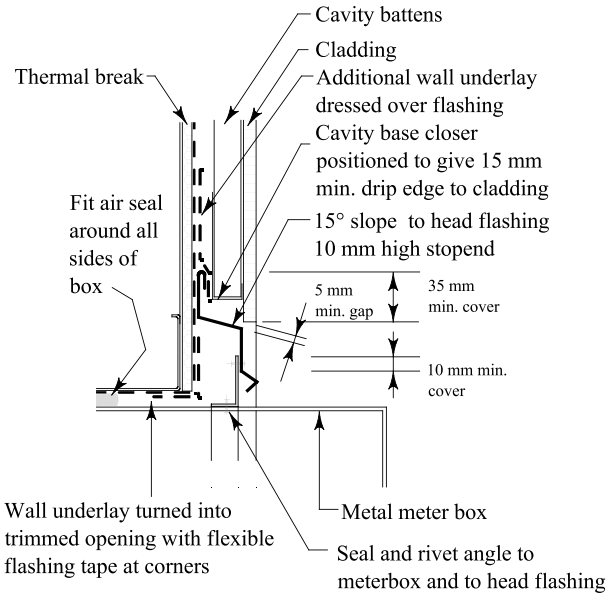


Figure 64: **General meter box and similar penetrations**
Paragraphs 9.1.9.3, 9.5.8.5 and 9.5.9.6



NOTE:
(1) Fix angle and seal to all sides of box.
At sides and base, claddings shall overlap angle by 10 mm minimum. Continuously seal cladding against angle.
(2) Suitable for other similar penetrations.
(3) Flashing in Extra High wind zones shall meet Table 7

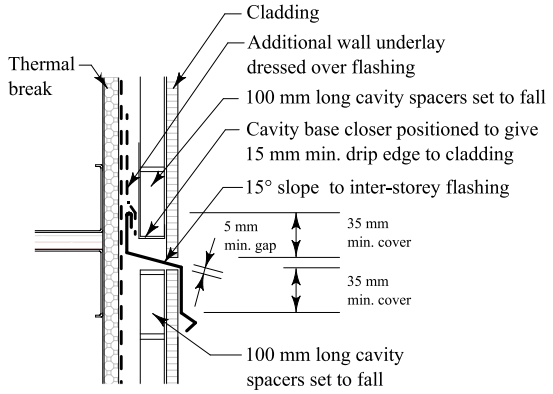
9.1.10.4. Inter-storey junctions

Inter-storey junctions in claddings over drained cavities shall be formed for walls:

a) Up to a maximum of two storeys or 7 metres in height, as shown for the specific wall claddings in 9.2 to 9.9; and
b) Over two storeys or 7 metres by using an inter-storey flashing bridging the drained cavity as given in Figure 65.

COMMENT :
A drained cavity height is limited to manage the moisture handled by the cavity before it is directed to the outside. They should also be checked against the requirements of 1.2.2 for spread of flame

Figure 65: **General inter-storey junction**
Paragraphs 4.6.1.7, 9.1.9.4
Figure 12



NOTE: (1) To be used to limit continuous cavities to the lesser of 2 storeys or 7 metres.
(2) Flashings in Extra High wind zone shall meet Table 7.

9.1.11 Windows and doors

Windows and doors shall comply with the requirements of NZS 4211.

Reveals shall comply with NZS 3602.

Flashings shall comply with Section 4.

Window details specific to particular claddings are given in 9.2 to Paragraph 9.9.

Door details shall be based on window details and shown in Figure 13(a) to Figure 13(d).

After installation, the flange forming the window or door facing shall have an overlap to the surrounding cladding material or associated back flashings of the following:

a) For jambs – 10 mm minimum; and
b) For sills – 8 mm minimum.

9.1.11.1. Scope

This Solution is limited to the aluminium window and door joinery that is in accordance with the following:

a) has horizontal window and door heads only;
b) has a maximum frame dimensions of 5000 mm wide or 5000 mm high; and
c) has a maximum overall frame area, for any one frame of 13.5 m^2, or
d) has maximum width of 6000 mm and maximum overall frame area of 16 m^2 for sills to floor level.

COMMENT :

Sloped heads require specifically designed kick-out flashings at bottom edges of head flashings.

Where width outlined in Paragraph 9.1.10.1 is beyond the limits for sill and head trimmer framing in NASH Standard Part 2 then specific engineering design of the framing is required.

Certain aluminium joinery sections and installation requirements may not be able to meet the details of this Solution, especially in regard to window facing cover, sill support, window fixing, and sill flashing requirements. The window details in these cases require specific design.

9.1.11.2. Treatment of opening

Openings for windows and doors shall be in accordance with the following:

a) window openings for direct fixed wall claddings be treated as given in Figure 67(a);

b) for direct fixed claddings, windows and doors have a 5 mm stand-off of the flange to the cladding to allow for air intrusion in to the trim cavity pressure equalisation;

c) window openings for wall claddings over drained cavities shall be as given in Figure 67(b);

d) for cavity fixed claddings, windows and doors shall finish tight against the cladding, except for flat fibre cement and ply claddings that require a 5 mm stand-off to allow for sealant weatherseals between facings and cladding (see also Figure 107); and

e) materials for flashings shall be selected from Section 4, Table 7, and Table 20.

Comment :

For direct fixed claddings, the stand-off gap is sealed or trimmed down the jambs, but is left open along the sill (see Figure 106).

9.1.11.3. Window and door heads

Windows and doors shall include head flashings, finished to the wall underlay as given in Figure 66.

Head flashings shall be by the following methods:

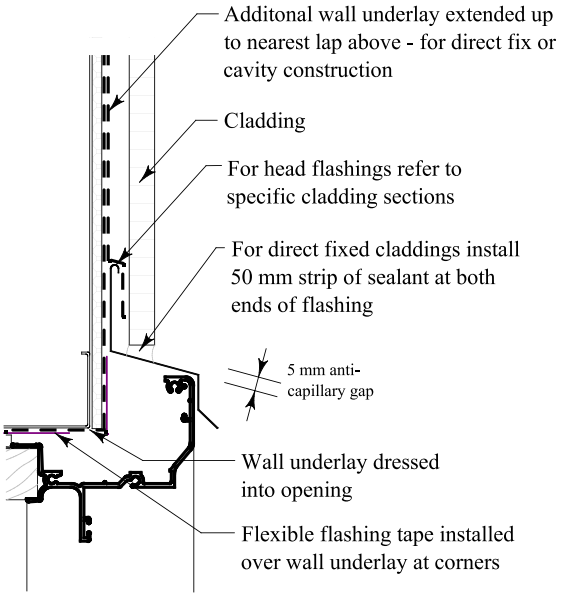
a) using flexible flashing tape; or

b) lapping an additional layer of wall underlay over the upstand.

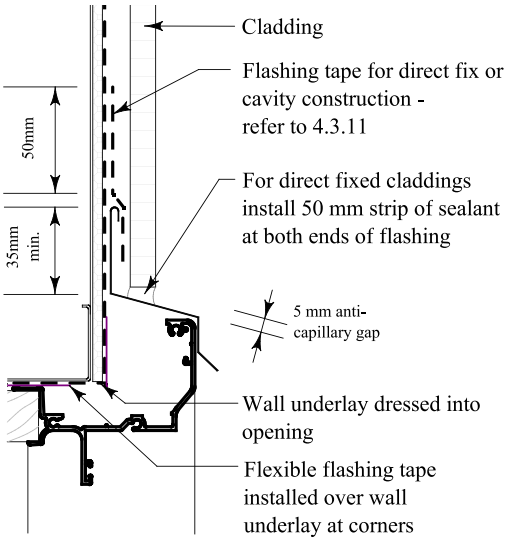
The additional wall underlay shall extend to the top of the wall, or to the nearest lap above, and be lapped under the top layer.

Figure 66: **General sealing of head flashing**
Paragraphs 9.1.7, 9.1.10.3 and 9.1.10.4

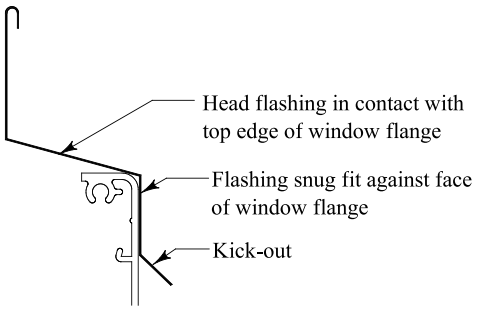
NOTE: (1) May also use wall underlay lapped over flashing upstand in lieu of flexible flashing tape. Refer cladding window details, for example Figure 106.
(2) Flashings in Extra High wind zone shall meet Table 7.
(3) Stop-ends required to head flashings in cavity walls.



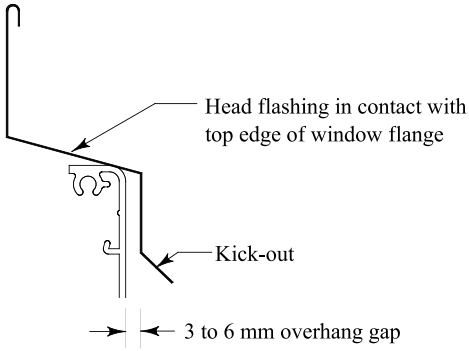
(a) METAL HEAD FLASHING - WITH ADDITIONAL UNDERLAY OPTION



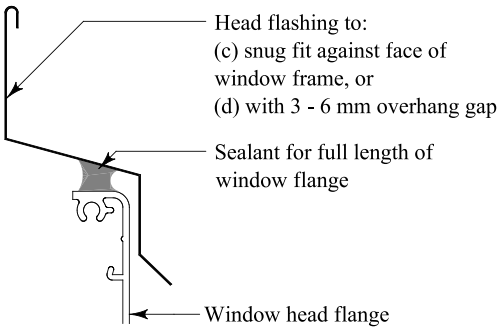
(b) METAL HEAD FLASHING WITH FLASHING TAPE OPTION



(c) HEAD FLASHING and WINDOW FLANGE



(d) HEAD FLASHING OPTION WITH WINDOW FLANGE



(e) METAL HEAD FLASHING SEALANT FOR VERY HIGH AND EXTRA HIGH WIND ZONES

9.1.11.4.Head flashings

Head flashings shall be in accordance with 4.4.1, 4.5.1.7 and Table 7, unless specifically shown otherwise within figures, and shall be in accordance with the following:

a) direct water to the outside of the wall cladding and have a 15° fall, and
b) finish to the window head with clearance dimensions and sealant as shown in Figure 66, and
c) Prevent water runoff blocking the joint between the 'turn-down' of the flashing and window head flange itself by the head flashing installed in direct contact with the top edge of the window flange, as shown in Figure 66(c), and
    i) in Figure 66(c) the head flashing with a kickout and installed in a snug fit against the face of the window flange, or
    ii) in Figure 66(d) with the head flashing overhanging the window head flange up to 6mm, plus the kick out.

COMMENT:

If a head flashing is too tight it is difficult to engage the window frame and will risk distorting the head flashing or damage to the window frame coatings. This can be avoided with a fitting tolerance. Similarly, it is important to prevent water runoff blocking the joint between the flashing and window head flange by using a kickout along the bottom of the flashing, and/or an overhang of the flashing to deflect water off the joint.

d) For direct fixed claddings have 50 mm bead of sealant installed between cladding and each end of the head flashing – refer to Figure 66 (a) and (b)
e) 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, by the installation of cavity base closers as given in Figure 61.
f) for Very High and Extra High wind zones, have sealant installed, across the full width, between the underside of the head flashing and the top edge of the window head flange (see Figure 66(c)).
g) Edge treatment of head flashings in Extra High wind zone, including increased upstand dimensions – refer to 4.4.1 and Table 7.

COMMENT :

Stop-ends are useful to prevent water moving past the ends of head flashings. However, additional problems of weatherproofing occur where the stop-end penetrates the cladding.

9.1.11.5. Window and door sills

a) Direct fixed claddings shall have:
    i) sill tray flashings as shown in 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 is not sealed; and
    ii) direct fixed door sills be installed as for windows, and as shown in Figure 13(e) or as an option have rebate sills into a concrete slab, when selected, as shown in Figure 13(d).
b) Claddings over a drained cavity shall have:
    i) window sills be as shown in 9.2 to 9.9, without sill flashings:
    ii) door sills be as given in Figure 13(c);
    iii) sill support bars and mechanisms for all doors and for windows with a trim opening wider than 600 mm or as an option rebate sills into concrete slab, when selected as shown in Figure 13(f).
c) Sill support bars and mechanisms, where required by (b) above shall:
    i) comply with the BRANZ Evaluation Method EM6s 2016 (where the s designates an edition of the BRANZ EM6s particularly for light steel framing), E2/VM1, and B2/VM1.
    ii) be installed prior to installation of the window or door; and
    iii) be designed not to impede the possible drainage of water from surfaces of sill flashing tape, and
    iv) permit an air passage (of at least 1000 mm^2/m sill width) from the drained cavity to the window/door trim cavity, and
    v) be installed complete with fixings that support the weight and configuration of each particular joinery unit.

COMMENT :

The minimum exterior framing material thickness (BMT) in accordance with NASH Standard Part 2 is 0.75mm and grade G550.

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 appropriate complying support mechanism for the joinery weight. Manufacturers provide build-in instructions for support bars and mechanisms and their fixings.

The evaluation method EM6s 2016 has been published with the maximum deflection at which the serviceability limit load may be calculated and also requirements for permanent marking of tested window or door supports to state both the maximum joinery weight it will support and that it complies with the EM6s version.

d) Mitred aluminium window and door sills, for both cavity and direct fixed, the following shall have a corner soaker fitted to the back of the sill/jamb joint and installed at the 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.

9.1.11.6. Window and door jambs

Jamb flashings shall be installed as given in 9.2 to 9.9.

Jamb flashings shall overlap sill flashings, and direct moisture to the outside face of the cladding system.

Jamb battens shall be installed to all window and door openings in direct fixed claddings. Refer to Paragraph 9.1.8.4 f) and Figure 67A.

9.1.11.7. Closed cell foam tape

Compressible foam tape shown behind window facings and cladding joints shall be closed cell PVC foam.

Compressible foam tape shall be in accordance with the following:

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 for1500 light hours to ASTM G154 or ASTM G155 with no visible deterioration in appearance.

Figure 67A:

General window and door opening for direct fixed
Paragraphs 9.1.5, 9.1.8.4, 9.1.10.2, Figures 76, 77, 78, 79, 85, 90, and 106

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

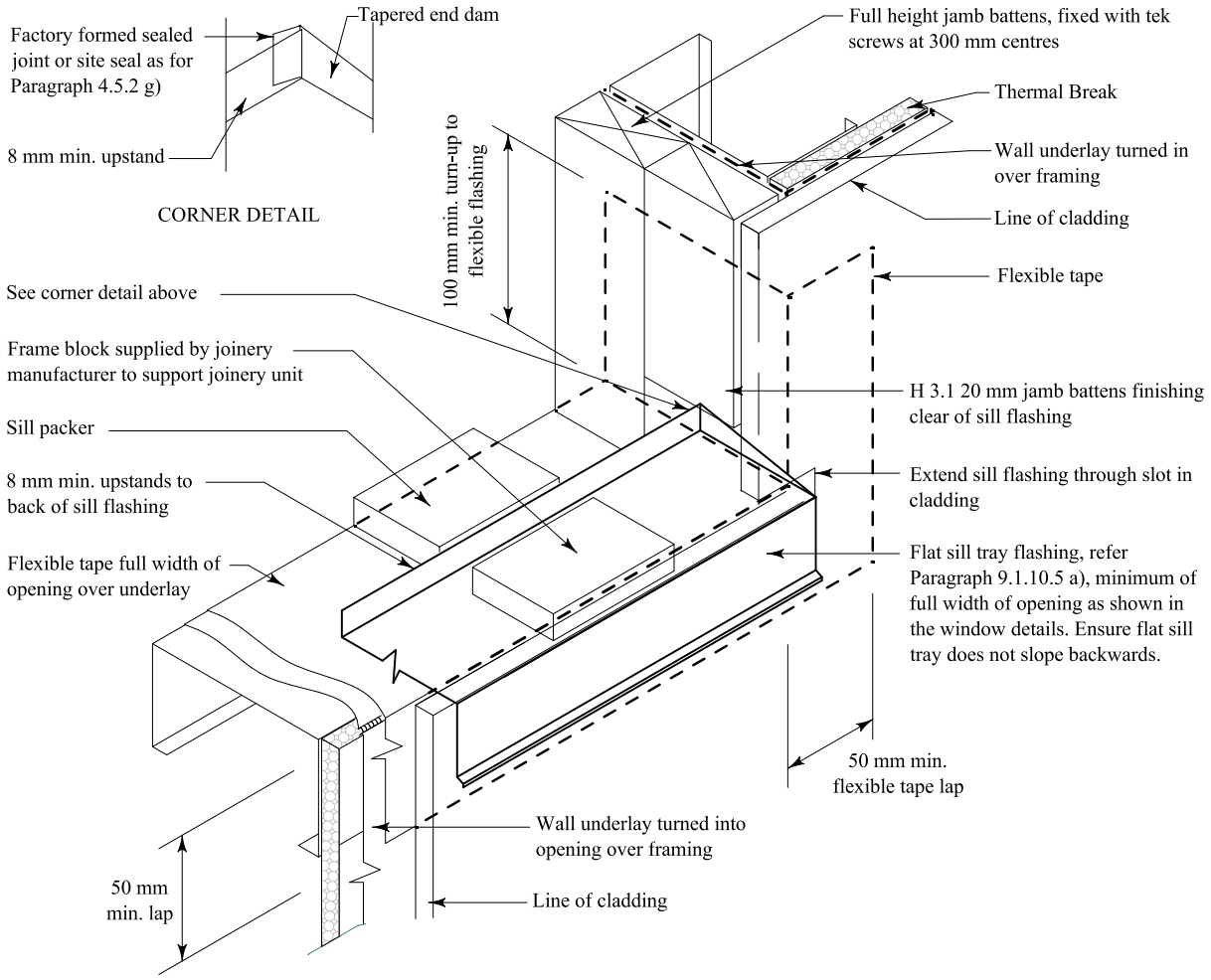
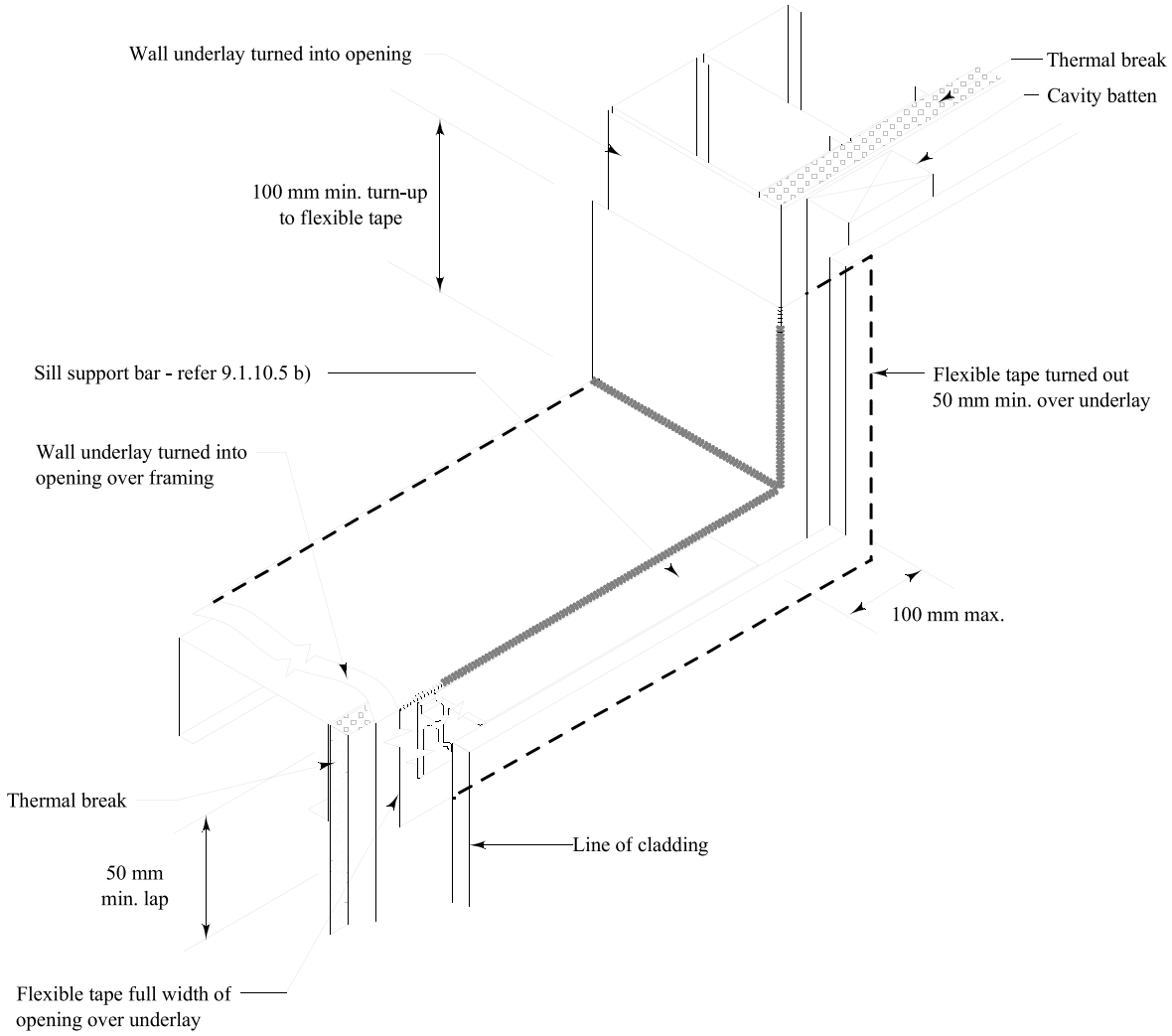


Figure 67B: **General window and door opening for cavity fixed**
Paragraphs 9.1.5, 9.1.9.3, 9.1.10.2, Figures 68C, 71, 80, 81, 86, 94, 107 and 117

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.



9.1.11.8.Attachments for windows and doors

Windows and doors shall be installed using pairs of the following:

a) minimum 10g x 75 class 3 screws; or
b) 8 gauge x 65 mm stainless steel screws.

Windows and doors shall be fixed through reveals into the surrounding framing in accordance with the following:

a) Maximum of 450 mm centres along sills, jambs and heads; and
b) Maximum 150 mm from reveal ends

Packers shall be installed between reveals and framing at all fixing points, except between head reveals and lintels.

COMMENT :
Some proprietary joinery systems are fixed through their wider extrusions either straight onto the external face of the framing or into the inside face of the framing, rather than through the traditional stapled reveals. These proprietary joinery systems are alternative details not covered not within this Solution.

9.2 Masonry veneer

9.2.1 Limitations

This Standard is limited to masonry veneer cladding attached to wall framing on thermal break and wall underlay as outlined in NASH Standard Part 2. The masonry veneer shall be 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 Solution. Refer to the manufacturer's recommendations for specific design information.

Refer to 1.5 for qualification of installers.

9.2.2 General

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.

Masonry units shall be laid-up in running bond.

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

9.2.3 Installation

Masonry veneer construction shall be as given in Figure 68(b).

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

Masonry veneer shall be in accordance with the following:

a) maximum height of veneer above an adjacent finished ground level of 7 m;

b) maximum height of veneer of 4.0 m, measured from the top of the concrete masonry wall, foundation wall or slab edge foundation;

c) maximum height of veneer of 5.5 m on a gable end wall;

d) minimum wall or panel width of 230 mm; and

e) cavity be in accordance with 9.2.6.

COMMENT :

In the case of a veneer faced height, this is measured from the top of that wall.

The bracing demand for framing supporting masonry veneer is determined from NASH Standard Part 2.

Refer to 1.5 for qualification of installers

9.2.4 Flashings

Sill and head flashings shall be as given in 4.4.

Sill and head flashings shall be in accordance with the following:

a) 1.5 mm butyl rubber (see 4.2.9);

b) 2 ply asphaltic pliable waterproofing (see 4.210); or

c) pliable polyethylene minimum 0.5 mm thick complying with DPC/DPM (see Table 23).

Jamb flashings shall be in accordance with the following:

a) 2 ply asphaltic pliable waterproofing membrane complying with AS/NZS 2904; or

b) pliable polyethylene minimum 0.5 mm thick complying with DPC/DPM (see Table 23).

COMMENT :

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

Figure 68A: **Vertical control joint**
Paragraphs 9.2.8

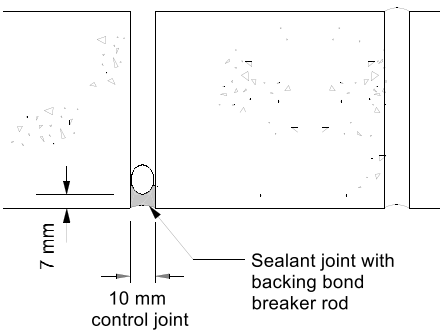
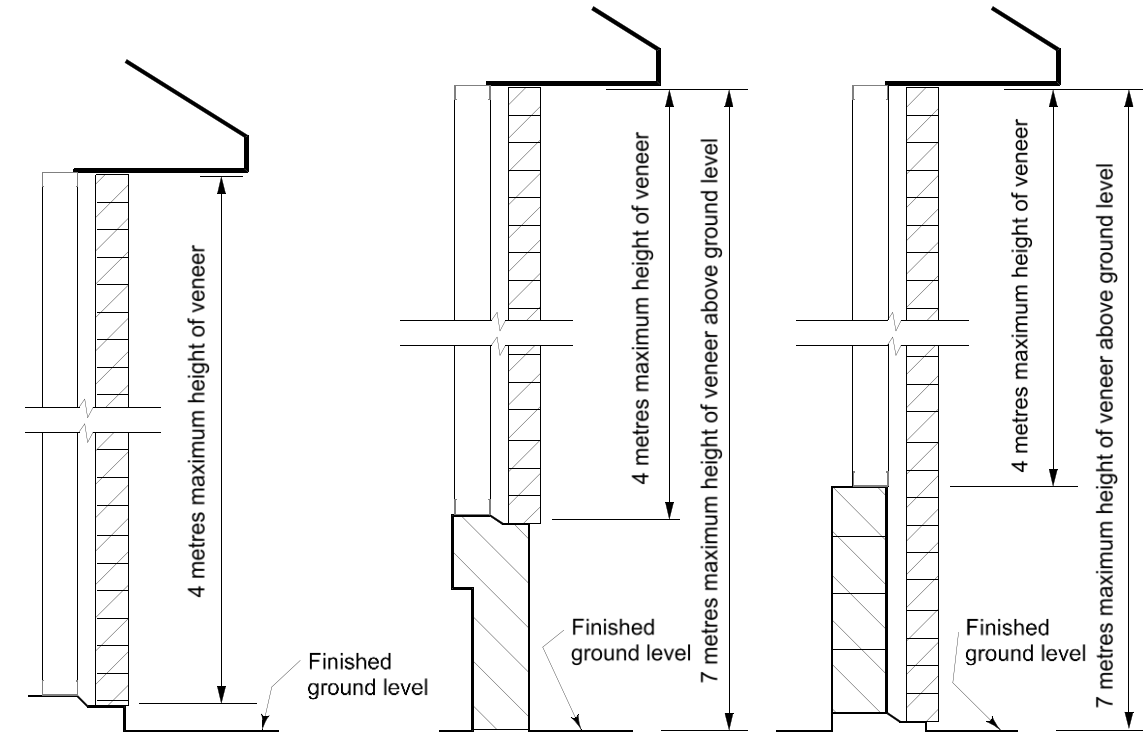
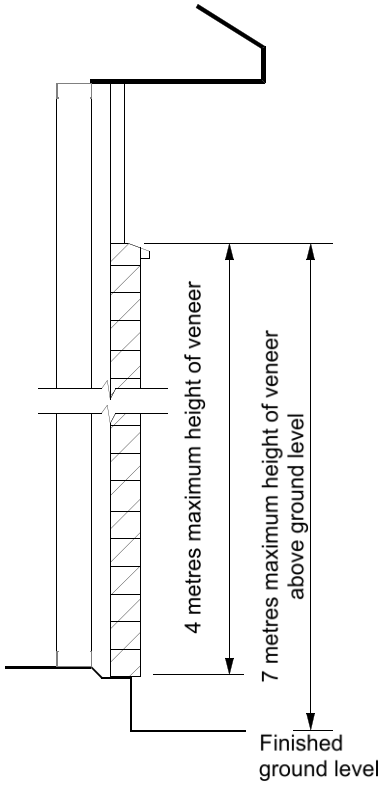


Figure 68B: **Masonry veneer height limitations**
Paragraphs 9.2.3



(a) 1 STOREY **(b) 2 STOREY ON MASONRY** **(c) 2 STOREY VENEER**



(d) 1 STOREY WITH PART STOREY

Figure 68C: **Masonry veneer window and door installation**
Paragraphs 9.2.4, 9.2.6 and 9.2.9

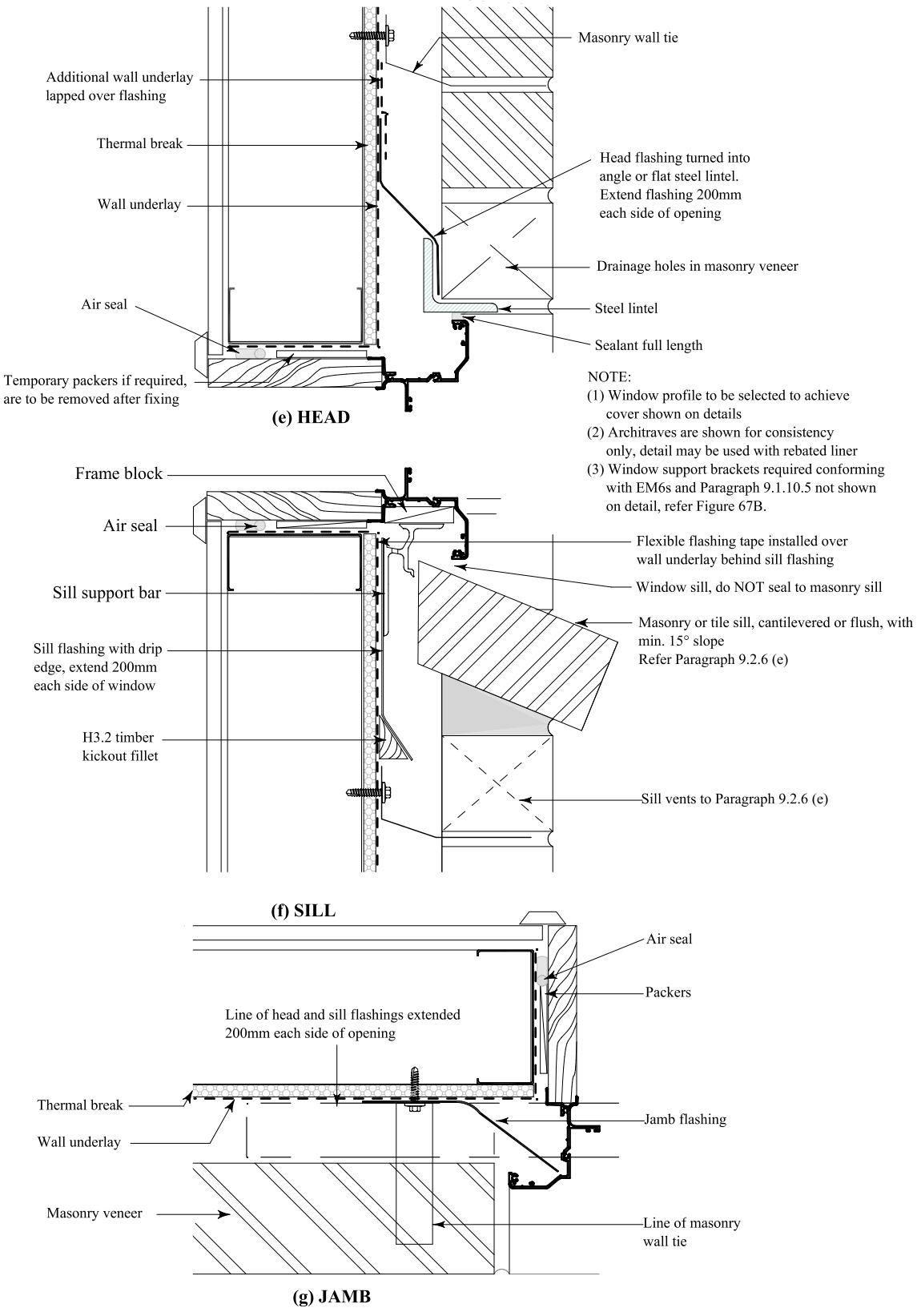


Figure 68D: **Joinery Head light-weight cladding over**
Paragraphs 9.2.11.1

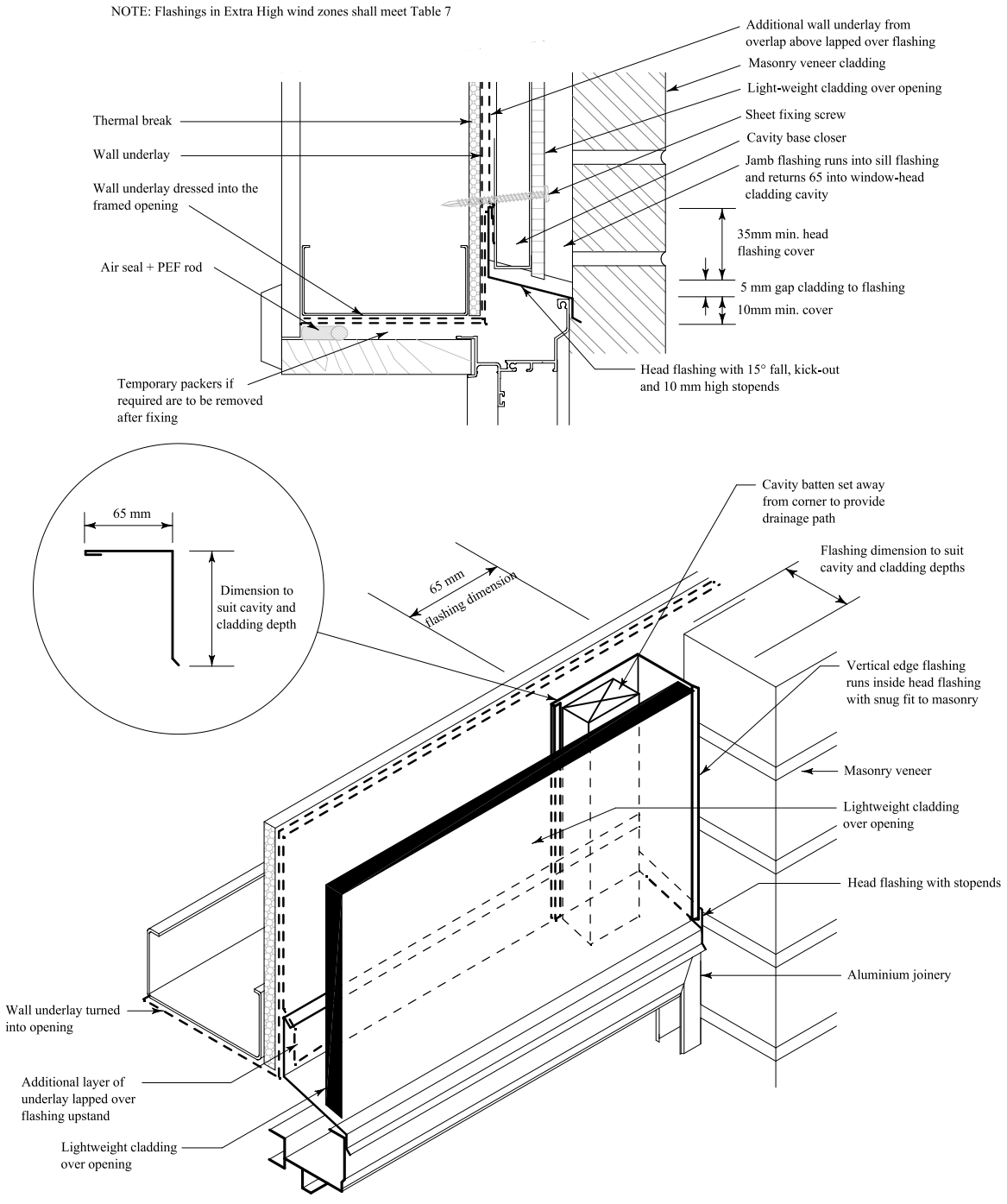
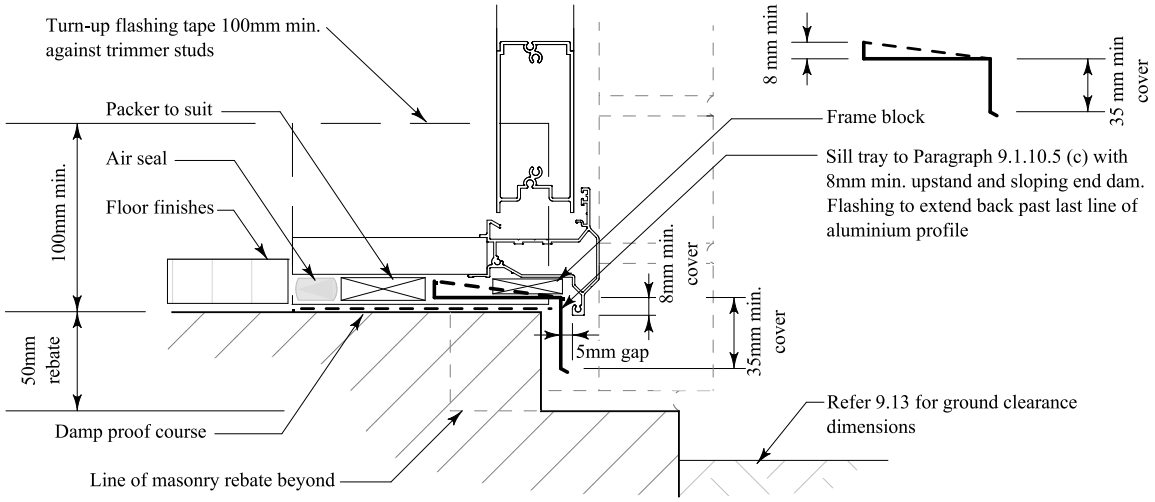
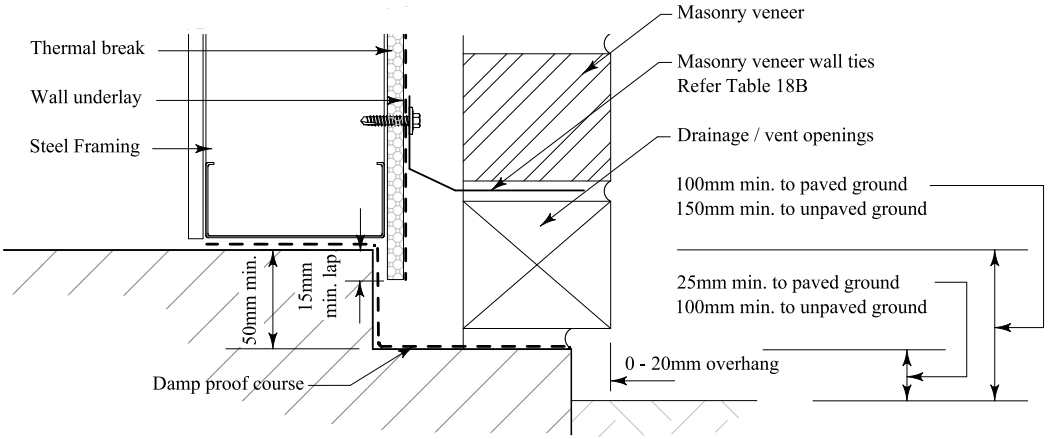


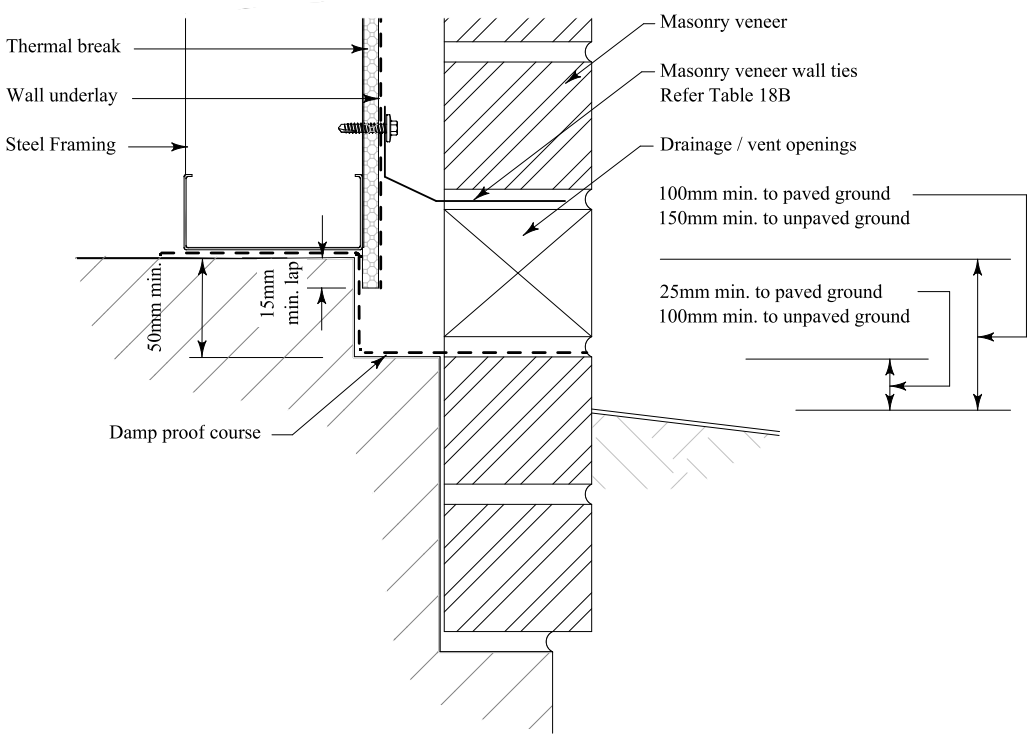
Figure 68E: **Masonry veneer details**
Paragraphs 9.2.5



(h) MASONRY VENEER - DOOR SILL

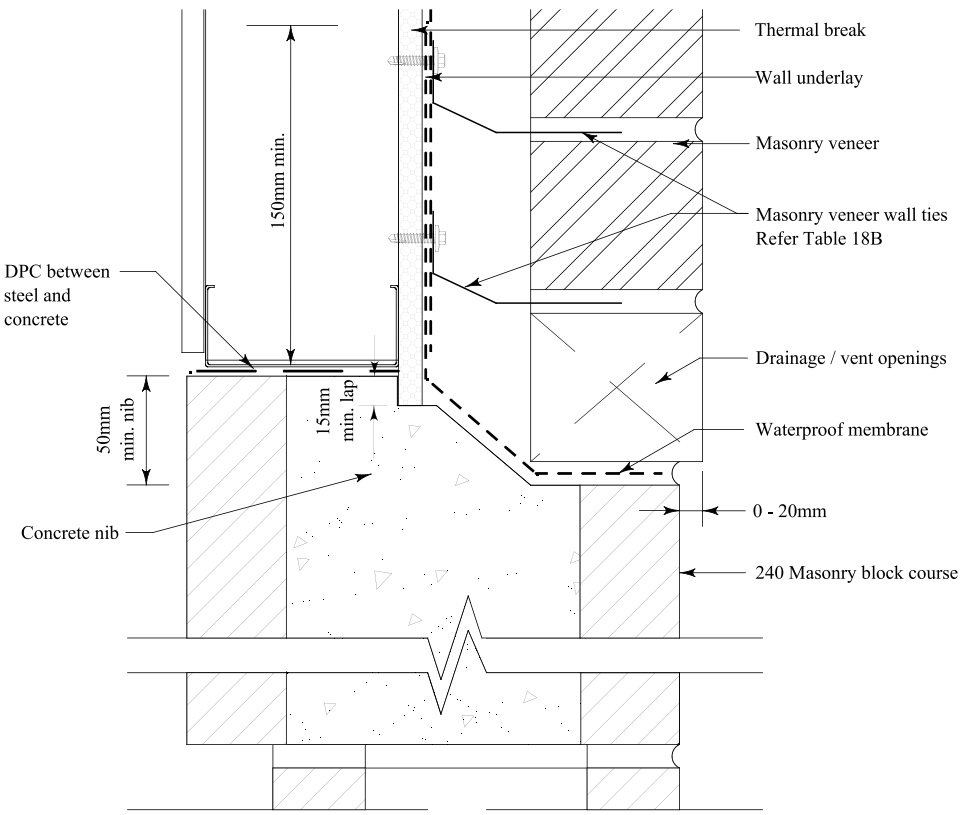


(i) MASONRY VENEER - FLOOR REBATE DETAIL

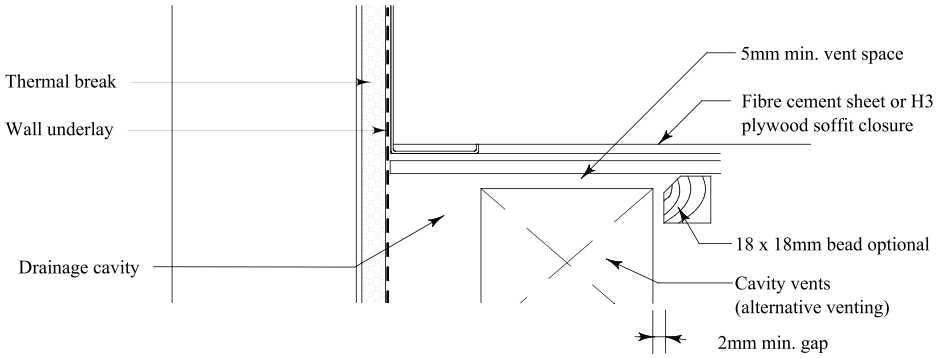


(j) MASONRY VENEER - MASONRY BELOW GROUND DETAIL

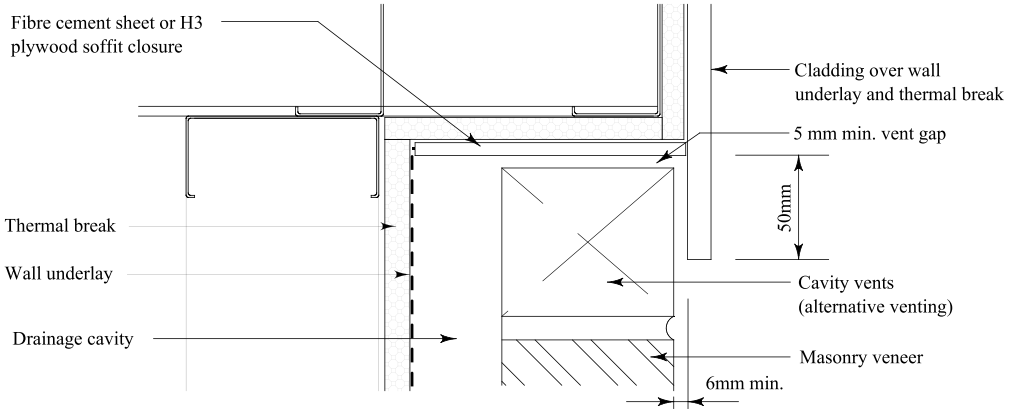
Figure 68F: **Masonry veneer details**
Paragraphs 9.2.5



(k) MASONRY VENEER - ABOVE GROUND SUPPORT



(l) MASONRY VENEER - SOFFIT DETAIL



(m) MASONRY VENEER - CANTILEVER UPPER FLOOR

9.2.5 Foundation support and damp proofing

Foundation support and damp proofing shall be in accordance with the following:

a) masonry veneer be supported by one or a combination of the following:
   i) concrete or masonry foundation wall.
   ii) thickened slab edge footing.
   iii) concrete or masonry lower storey wall.
b) the level of the concrete slab above ground be in accordance with Figure 60.
c) the top of a foundation wall or concrete slab be stepped down, so that the surface supporting the veneer is 50 mm or more below the surface supporting the framing.
d) provide a damp-proof course to the stepped rebates supporting masonry veneer adjacent to all habitable spaces and garages that are attached to habitable spaces. This includes stepped rebates in foundations, or on top of concrete or concrete masonry walls supporting veneers.
e) ensure damp-proofing material be in accordance with Table 23 and for rebates lower than ground floor level be either:
   i) two coats of bituminous liquid;
   ii) 1.0 mm butyl rubber;
   iii) 1.0 mm bituminous sheet;
   iv) 0.25 mm polythene; or
   v) 0.25 mm polyethylene damp-proof membrane.
f) ensure damp-proofing material be in accordance with Table 23 and for rebates above ground floor level be either:
   a. 0.25 mm polythene; or
   b. 0.25 mm polyethylene damp-proof membrane.
g) lap joints in flashings be a minimum of 150 mm; and
h) dimension rebates accommodate the required cavity width given in 9.2.6 and the thickness of the veneer so that the veneer is supported within the tolerances given in Figure 68(e) and Figure 68 (f).

9.2.6 Cavities

Masonry veneer cavities shall be in accordance with 9.1.8.2(a), 9.1.8.5, and 9.1.9.3.

Masonry veneer cavities shall be in accordance with the following:

a) the clear width of cavity between the masonry veneer and the exterior face of the wall underlay and thermal break or bracing attaching to framing not be less than 40 mm or more than 75 mm wide measured at any part of the cavity.
b) pipes and services not be placed in the cavity other than passing directly through the cavity to the exterior.
c) the cavity be drained to the outside at the bottom of wall panels, and above openings by open perpends that are in accordance with the following:
   i) minimum of 75 mm in height, by the width of the vertical mortar joint;
   ii) not exceeding 800 mm (where drainage/weep holes are less than 75 mm high, decrease spacing to give a ventilation area of 1000 mm2/m wall length) at centres.
   iii) are fitted with vermin proofing where gaps greater than 13 mm exist.
d) the cavity 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 the outside that maintains a minimum 2 mm gap to masonry (see Figure 68E (l)).
e) the cavity be vented under openings exceeding 2.4 metres wide through gaps in perpends positioned at $^1/_3$ points along the opening except at the opening ends. Where these vent openings are used, protect from water entry using cantilevered sill bricks (see Figure 68F (f)).
f) the cavity shall be sealed off from the floor and roof space.

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.

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

Table 18A:	**Specification of maximum tie spacings for type B (4) veneer ties** Paragraph 9.2.7						
Seismic zone Refer 3.3.1	**Masonry veneer Less than 180 kg/m^2**			**Masonry veneer 180 - 220 kg/m^2**			**Masonry veneer more than 220 kg/m^2**
	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 if the horizontal spacings do not exceed 400 mm and the vertical spacings do not exceed 300 mm
(4) Type B and Prefix E indicated masonry ties manufactured to AS/NZS 2699.1
(5) L (Light), M (Medium), H (High) indicate strength capacity of ties in AS/NZ 2699.1
(6) Use seismic zone 2 (minimum) for Christchurch region comprising Christchurch City, Waimakariri District and Selwyn District.

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 NZS 4210 and Table 18A, Table 18B, and Table 18C.

Screw fixings shall be minimum of 12 gauge, 35 mm long hex washer face, to suit the ties required under Table 18C.

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 Bottom of veneer panel supported on steel angle lintel	Within 300 mm or two courses (whichever is the smaller) from bottom of veneer
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 using screws outlined in Paragraph 9.2.7.

9.2.7.1. Wall ties and screws

Wall ties and screws shall be determined by the durability zone given in NZS 3604 and Table 18C.

Table 18C:	**Corrosion protection to masonry wall ties and screws** 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	-

9.2.8 Control joints

9.2.8.1. Clay bricks

Control joints in clay brick masonry veneer shall not be required.

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 in accordance with the following:

1. within 600 mm of T joints;
2. within 600 mm of L shaped corners or by restricting the spacing to the next control joint to 3.2 m maximum;
3. at changes in wall height, exceeding 600 mm; and
4. at changes in wall thickness.

Control joints shall be formed as given in Figure 68A and include the following:

1. a backer rod of compressible foam; and
2. sealant in compliance 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.

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 shall be permitted to be installed without lintel bars or a head flashing, provided the meter box is sealed to wall underlay with flashing tape as given in 4.2.10.

Steel meter boxes shall be separated from direct contact with masonry veneer or mortar with flashing tape as given in 4.2.10.

Lintels shall be in accordance with the following:

a) be protected against corrosion as given in Table 18D and to exposure zones given in NZS 3604;
b) have a minimum seating into adjacent veneer as follows:
   i) 100 mm for spans up to, and including 2 m; and
   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, 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
Zones 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

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	_

9.2.10 Windows and doors

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

Air seals shall be provided in accordance with 9.1.6.

Window flashings shall be installed in accordance with 9.2.4 and Figure 68C and Figure 68D.

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 in the following areas:

a) face of the cladding,
b) all edges of the cladding; and
c) along a 75 mm minimum perimeter strip on the rear of the cladding.

9.2.11.1. Secondary light-weight cladding above joinery

Use of a, secondary, light-weight cladding above joinery units in masonry veneer cladding shall be as per Figure 68D. Applicable claddings for Figure 68D shall be timber and, fibre cement and plywood sheet.

9.3 Stucco

9.3.1 Limitations

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

a) Solid plaster cladding with a non-rigid backing and a drained cavity on thermal break and wall underlay; and
b) Solid plaster cladding with a rigid backing and a drained cavity on thermal break and wall underlay (see Figure 69).

9.3.2 Structure

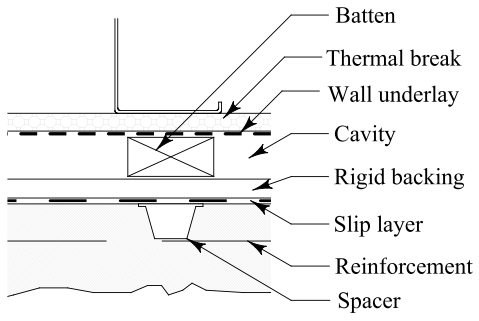
The framing of external walls supporting stucco wall claddings shall comply with NASH Standard Part 2.

The cladding system shall be attached to the wall framing.

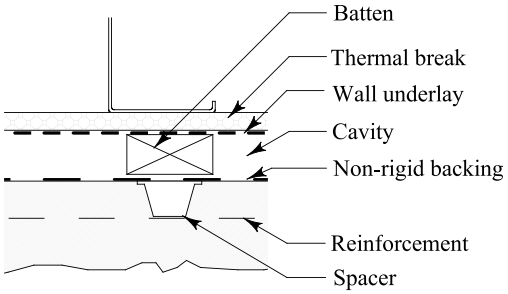
The framing for buildings using stucco exterior cladding systems shall be supported as follows:

a) Concrete slab-on-ground;
b) Continuous reinforced concrete foundation wall; or
c) Reinforced concrete masonry foundation wall.

Figure 69: **Types of stucco cladding**
Paragraphs 9.3.1 and 9.3.3



(a) RIGID BACKING



(b) NON-RIGID BACKING

9.3.3 Stucco cladding system

All stucco claddings shall be used over a drained cavity as given in 9.1.8 and Figure 69, and fixed to the framing in accordance with Table 24.

9.3.3.1. Wall underlay

All stucco cladding shall have wall underlay:

a) As specified in Table 24, 9.1.5 to 9.1.7; and
b) When installed with a ridged backing, have a slip layer that permits the independent movement of plaster and backing.

9.3.3.2. Plaster backing

Plaster backing shall be installed as given in 9.3.5 and 9.3.6.

9.3.3.3. Metal lath

Metal lath reinforcements for stucco plaster shall be attached through the plaster backing as given in Table 24.

9.3.4 Installation

9.3.4.1. General

Activities that will cause impact or vibration during plaster application shall 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.

COMMENT :
See 1.5 for qualification of installers.

9.3.4.2. Movement control joints

Movement control joints shall be as given in NZS 4251.

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 9.1.5–9.1.7.

9.3.6 Rigid plaster backings

Rigid backings shall be made of the following:

a) plywood, or
b) fibre cement sheet.

Rigid backings shall have slip layers as given in 9.3.3.1(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 backing shall be in accordance with the following:

a) Selected from Table 6 of NZS 4251;
b) H3 treated as per AS/NZS 2269; and
c) Fixed as specified in NZS 1604 part 3, except that screws be as follows:
   i) be 10 gauge class 4; and
   ii) penetrate framing by 3 threads minimum.

9.3.6.2. Fibre cement sheet backing

Fibre cement sheet backing shall be in accordance with the following:

a) Comply with AS/NZS 2908.2;
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 NZS 4251, except that screws shall:
   i) be 10 gauge class 4; and
   ii) penetrate framing by 3 threads minimum.

COMMENT :
When the rigid backing is used as bracing, the screwing patterns and cavity batten layout are subject to specific design, and the use of tested and rated systems.

9.3.7 Finishes

All stucco surfaces shall be sealed by applying a minimum of a 2-coat latex exterior paint system complying with AS 3730.7, AS 3730.8, AS 3730.9 or AS 3730.10.

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 9.1.3, and Figure 70.

9.3.9 Parapets and enclosed balustrades

Parapets shall be in accordance with Section 6.

Enclosed balustrades shall be in accordance with 7.4.

Parapets and enclosed balustrades for stucco cladding shall be capped with metal, butyl, or EPDM membrane, complying with Section 4.

9.3.10 Windows and doors

Windows and doors shall comply with 9.1.10, and as given in Figure 71.

Figure 70: **Bottom of stucco cladding**
Paragraphs 9.3.8

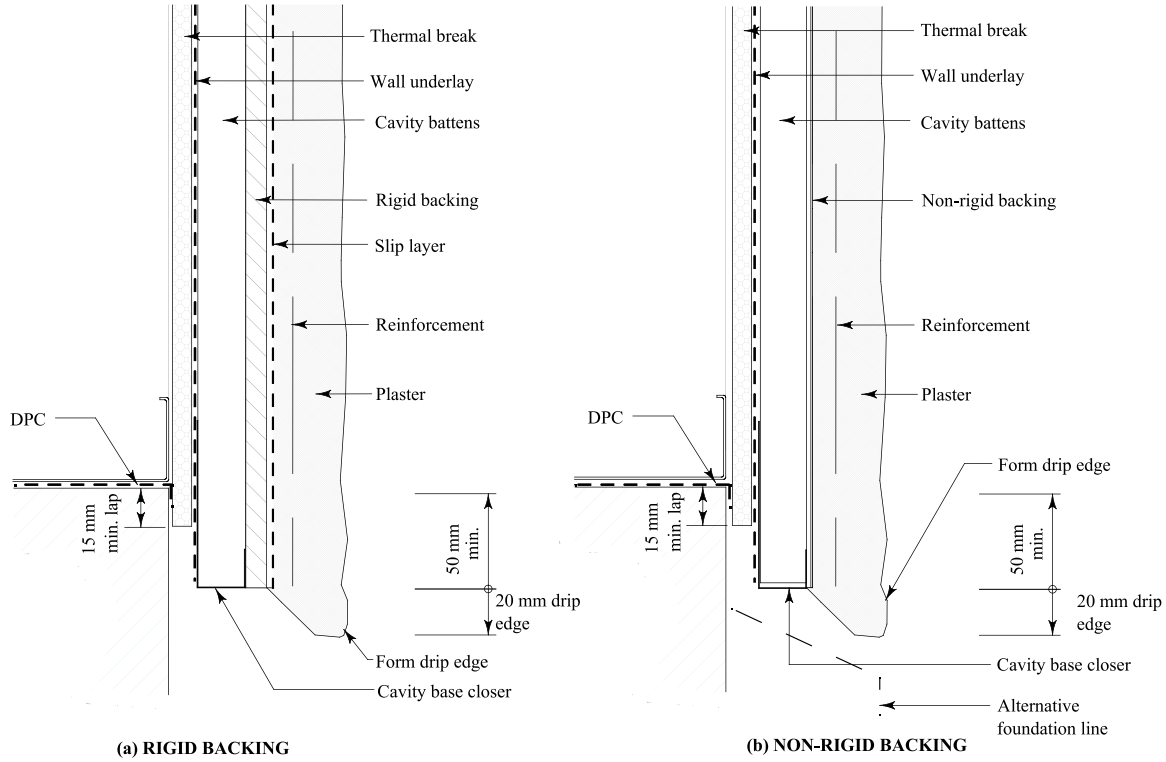
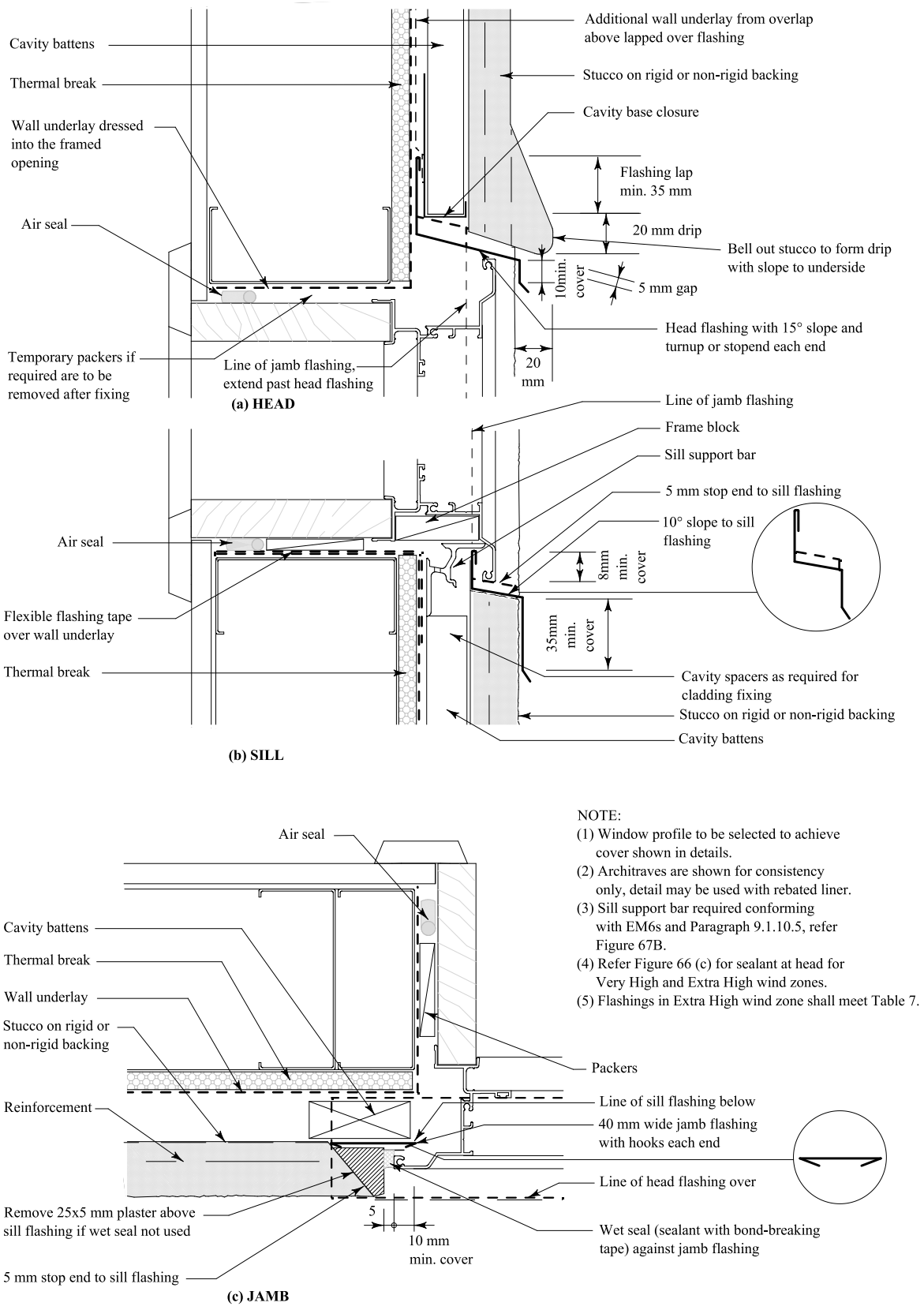


Figure 71: **Windows and doors stucco cladding**
Paragraphs 9.3.10, Figure 67B



9.4 Timber weatherboards

Timber weatherboard claddings shall be either direct fixed to framing over a thermal break and wall underlay or fixed over a drained cavity on thermal break and wall underlay as described in Paragraph 9.1.8.

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

9.4.1 Limitations

9.4.1.1. Weatherboard profiles

This Solution is limited to the following types of timber weatherboards:

a) Horizontal bevel-back,
b) Horizontal rebated bevel-back,
c) Horizontal rusticated,
d) Vertical shiplap, and
e) Vertical board and batten.

Profiles shall be as given in NZS 3617 or BRANZ Bulletin 411.

9.4.1.2. Vertical weatherboards

This Solution is limited to the use of direct fixed vertical weatherboards in risk categories as shown in Table 3.

COMMENT :
Vertical weatherboards are not used over cavities because of the need for horizontal battens, which if solid would interfere with a drained cavity.
Vertical weatherboards are therefore limited to low risk applications.

9.4.1.3. Horizontal weatherboards

Horizontal weatherboards shall be either direct fixed or fixed over a drained cavity, according to the risk categories as shown in Table 3.

9.4.2 Materials

Timber weatherboard cladding shall include the following features:

a) Wall underlay complying with Table 23 and Paragraphs 9.1.5–9.1.7, and
b) Timber selection and treatment of weatherboards in accordance with NZS 3602.

9.4.3 Installation

A wall underlay complying with Table 23 shall be installed behind:

a) All direct fixed timber weatherboards, or
b) Cavity battens for timber weatherboards installed over a drained cavity.

COMMENT:
Refer to Paragraph 1.5 for qualification of installers.

9.4.3.1. Fixings

Fixings shall comply with Table 20 and Table 24.

Timber weatherboards shall be drilled for fixing at all joints and ends.

All cut ends of painted weatherboards shall be primed.

9.4.4 Horizontal weatherboards

9.4.4.1. Horizontal laps

Horizontal laps shall be in accordance with the following:

a) 32 mm for non-rebated bevel-back boards; or
b) 25 mm horizontal lap for rebated bevel-back and rusticated boards, with a minimum gap of 2 mm at the overlap between boards.

9.4.4.2. Joints

Joints shall only be permitted over supports and be in accordance with the following:

a) corrosion-resistant soakers fitted complying with 4.2.2 to 4.2.8;
b) have scarf or splay joints.

9.4.4.3. Fixings

Boards shall be fixed through the wall underlay and thermal break to the framing in accordance with Table 24.

9.4.4.4. External corners

External corners for rusticated weatherboards shall be weatherproofed in accordance with the following:

a) corner boxes with scribers for bevel-back weatherboards, as given in Figure 73;
b) corner boxes with plugs or scribers for rusticated weatherboards, as given in Figure 73.

c) mitred joints with back flashing as given in Figure 73; or
d) mitred joints with corrosion-resistant soakers as given in Figure 72, and 4.2.2 to 4.2.6.

9.4.4.5. Internal corners

Internal corners shall be made weathertight as given in Figure 74.

A corrosion-resistant flashing shall be fitted behind weatherboards at all internal corners as given in Figure 74.

Figure 72: **Corner soakers for bevel-back weatherboard**
Paragraphs 9.4.4.4

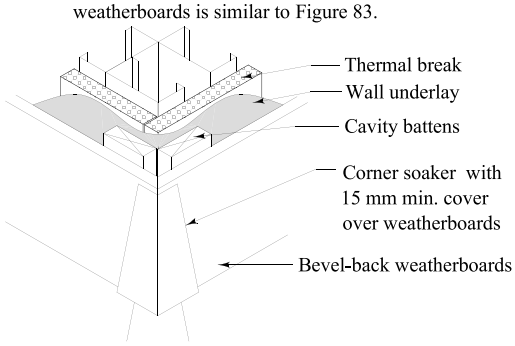


Figure 73: **External corners for horizontal weatherboards**
Paragraphs 9.4.4.4

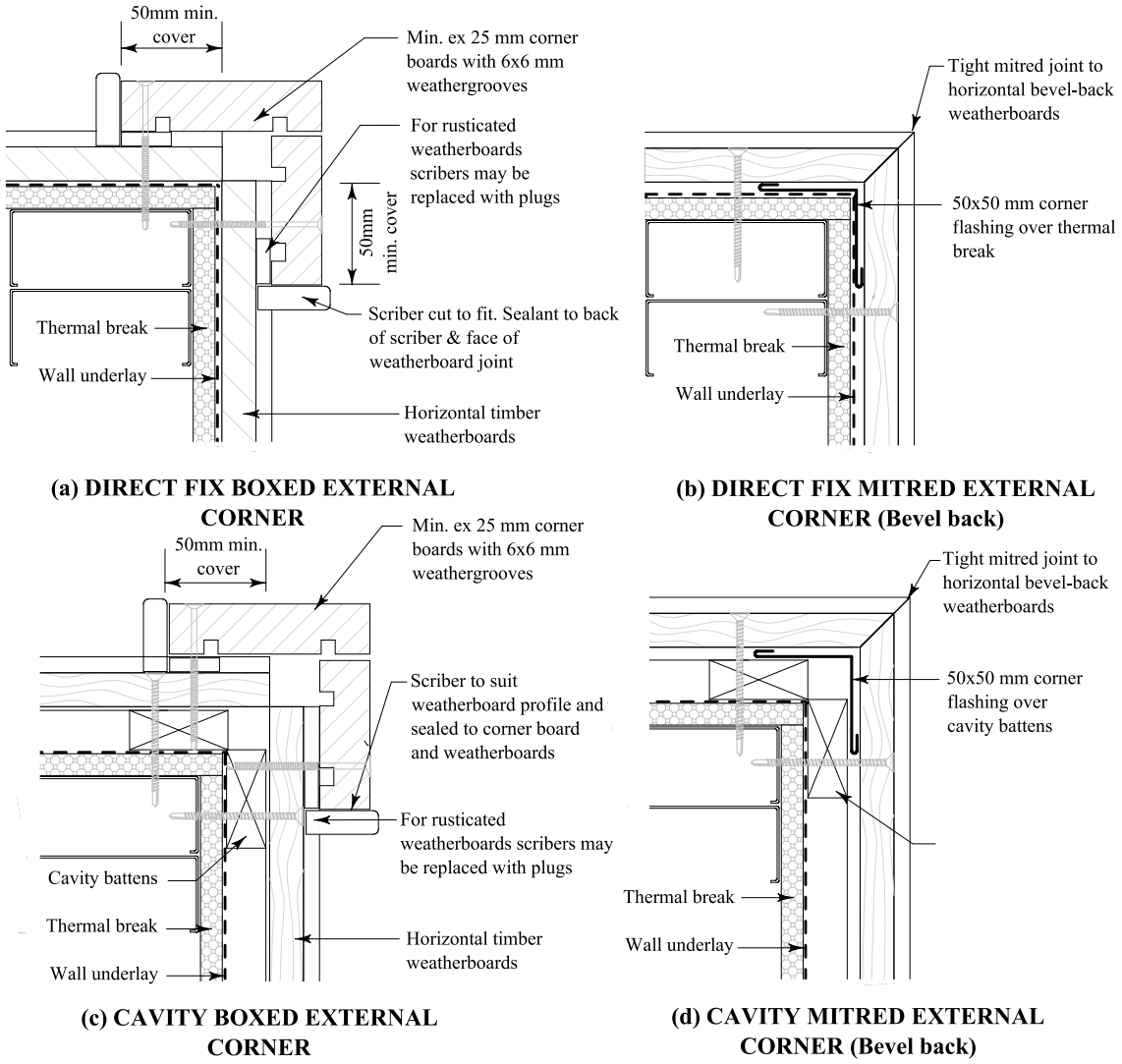
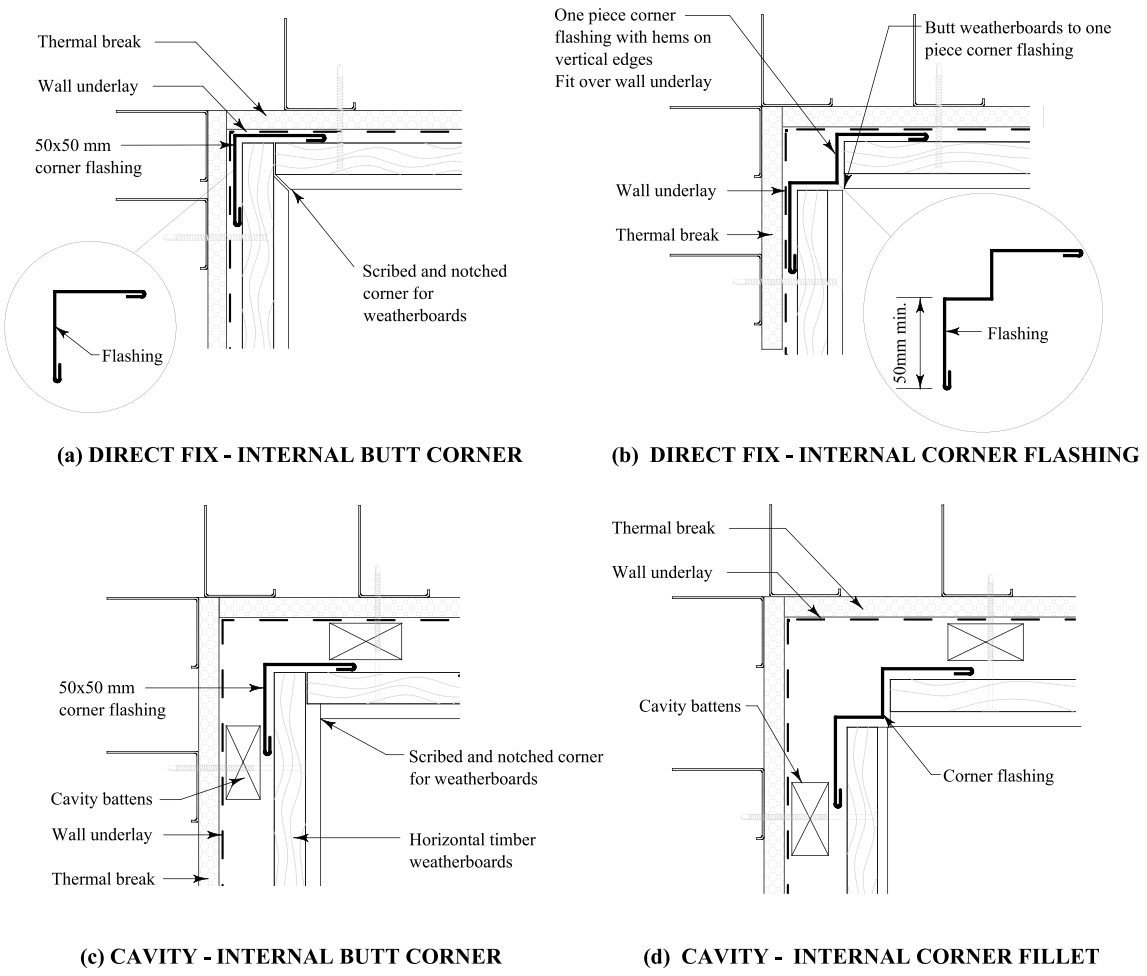


Figure 74: **Internal corners for horizontal or vertical weatherboards**
Paragraphs 9.4.4.5



9.4.5 Vertical weatherboards

Vertical shiplap and board and batten weatherboards shall be in continuous lengths over a storey height.

9.4.5.1. Laps

Vertical shiplap weatherboards shall be fitted with a minimum gap of 2 mm at the overlap between boards.

Board and batten weatherboards shall be in accordance with the following:

a) be fitted with a 5 mm to 8 mm gap between boards; and
b) have weather grooves to boards and battens aligned.

9.4.5.2. Fixings

Vertical weatherboards shall be fixed to nogs at 480 mm maximum centres in accordance with Table 24.

9.4.5.3. Corners

External corners shall be weatherproofed by the use of corner facings as given in Figure 75.

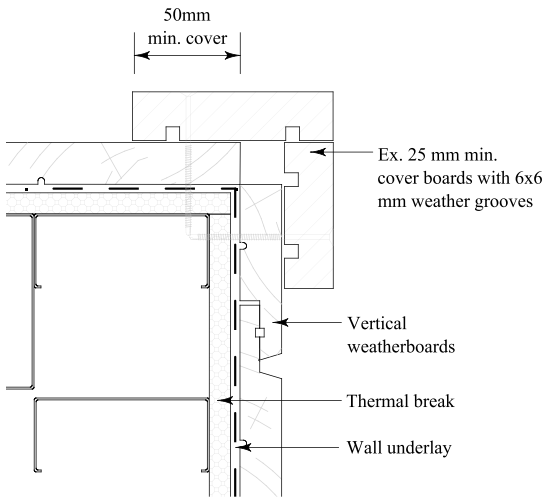
A corrosion-resistant corner flashing, as given in Table 7 and Figure 74, shall be fitted behind the weatherboards at all internal corners.

9.4.6 Windows and doors in direct fixed weatherboards

Window and door shall be installed in accordance with 9.1.10:

a) Direct fixed bevel-back weatherboards (see Figure 76)
b) Direct fixed rusticated weatherboards (see Figure 77);
c) Vertical shiplap weatherboards (see Figure 78); and
d) Vertical board and batten weatherboards (see Figure 79).
e) Door sill details (see Figure 13D)

Figure 75: **External corner for vertical weatherboards**
Paragraphs 9.4.5.3



NOTE: Corner battens shall be sized to provide 50 mm minimum cover over cladding.

9.4.7 Windows and doors in cavity walls

Window and doors shall be installed in accordance with 9.1.10

Window and door details for rusticated

weatherboards on a drained cavity shall be as given in Figure 81.

Door sill details are as given in Figure 13C.

COMMENT :
The junctions around windows are critical, and it is important that responsibility is taken for the weathertightness of the window as installed within exterior walls.
Care should be taken to ensure that this responsibility is clearly defined and assigned. One way is to clearly specify that the window manufacturer shall be responsible for the supply and installation of flashings and frames into openings.

Figure 76: **Windows and doors for direct fixed bevel-back weatherboards**
Paragraphs 9.4.6

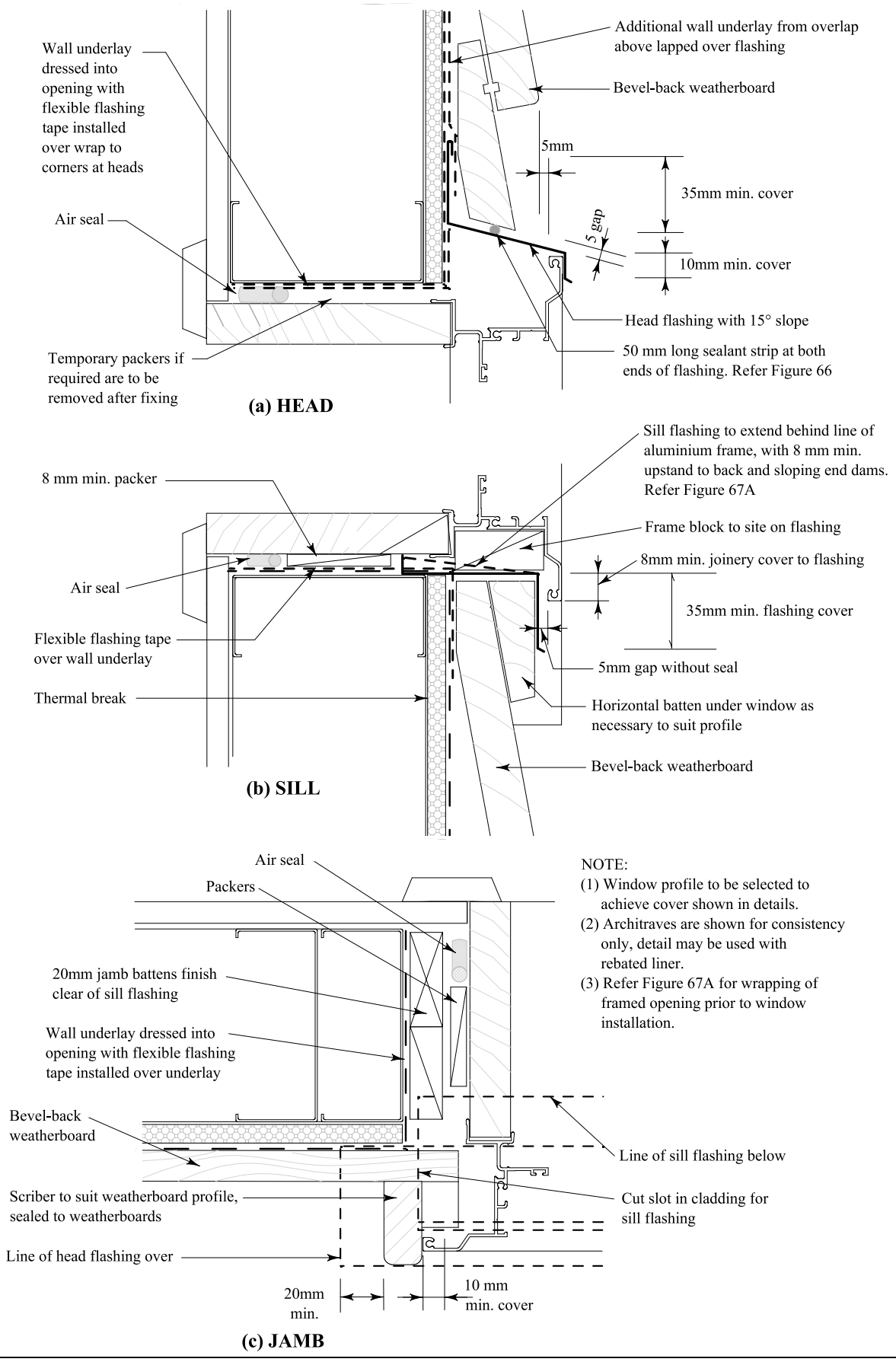
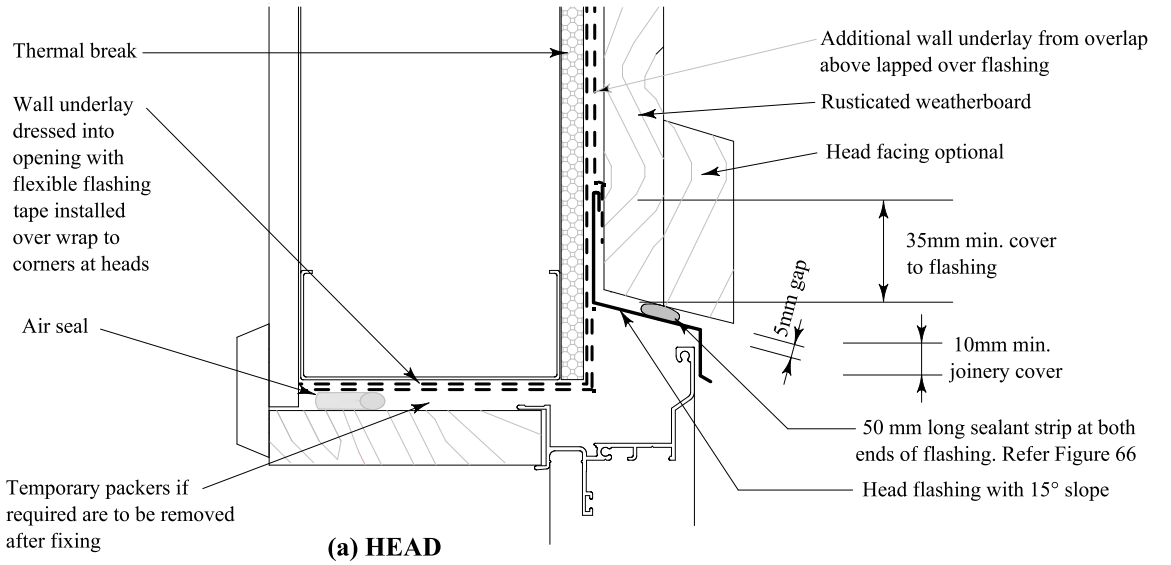
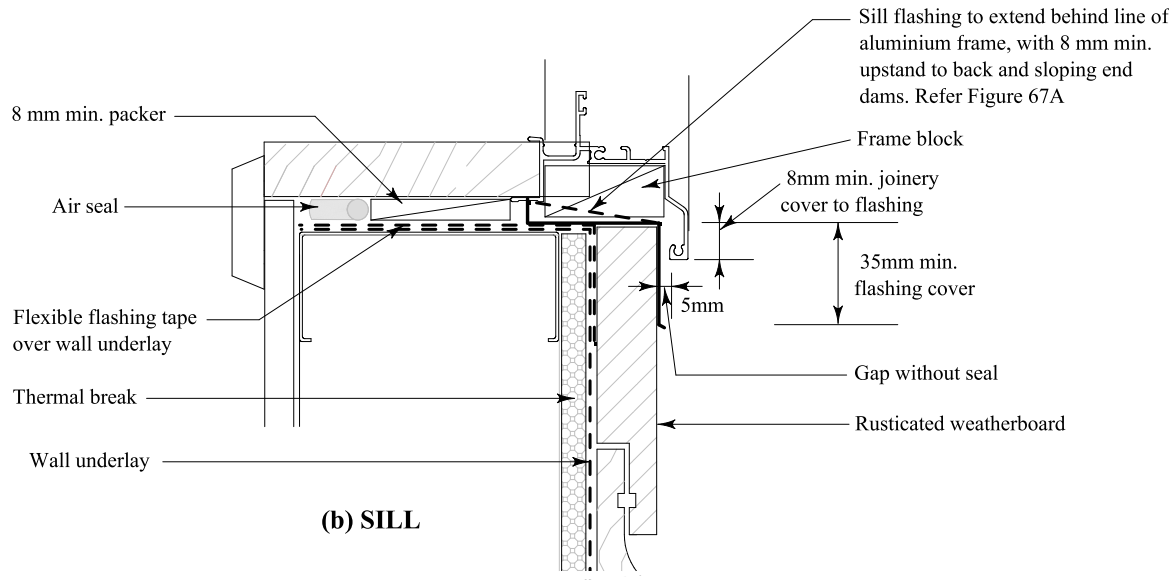


Figure 77: **Windows and doors for direct fixed rusticated weatherboards**
Paragraphs 9.4.6



(a) HEAD



(b) SILL

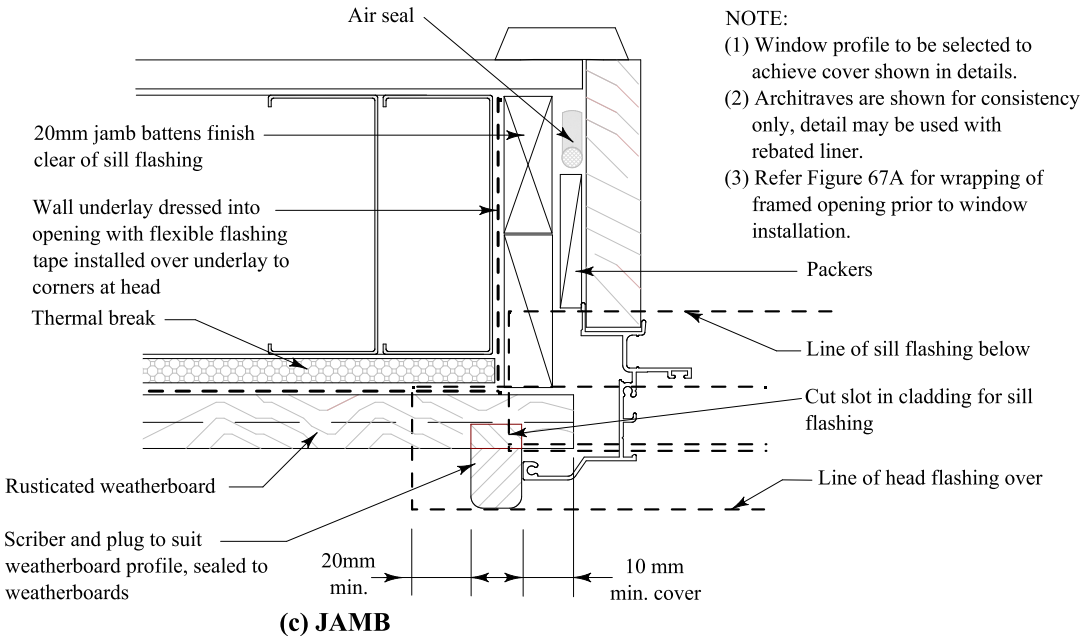


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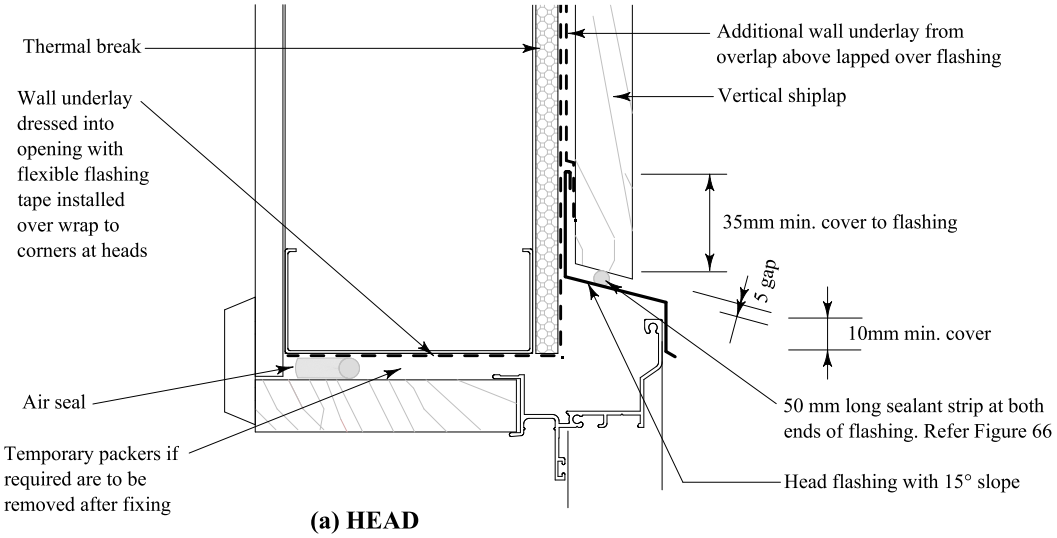
Figure 78: **Windows and doors for direct fixed vertical shiplap weatherboards**
Paragraphs 9.4.6



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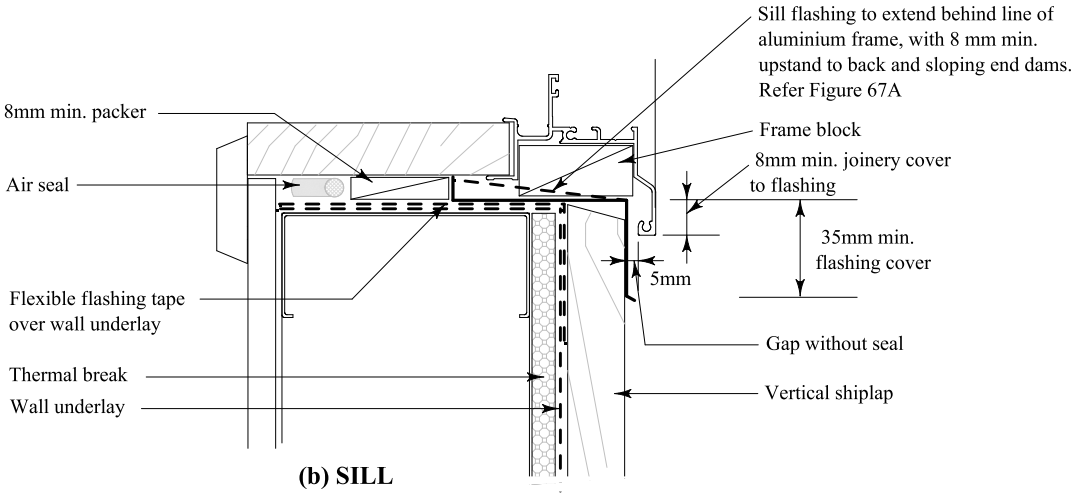

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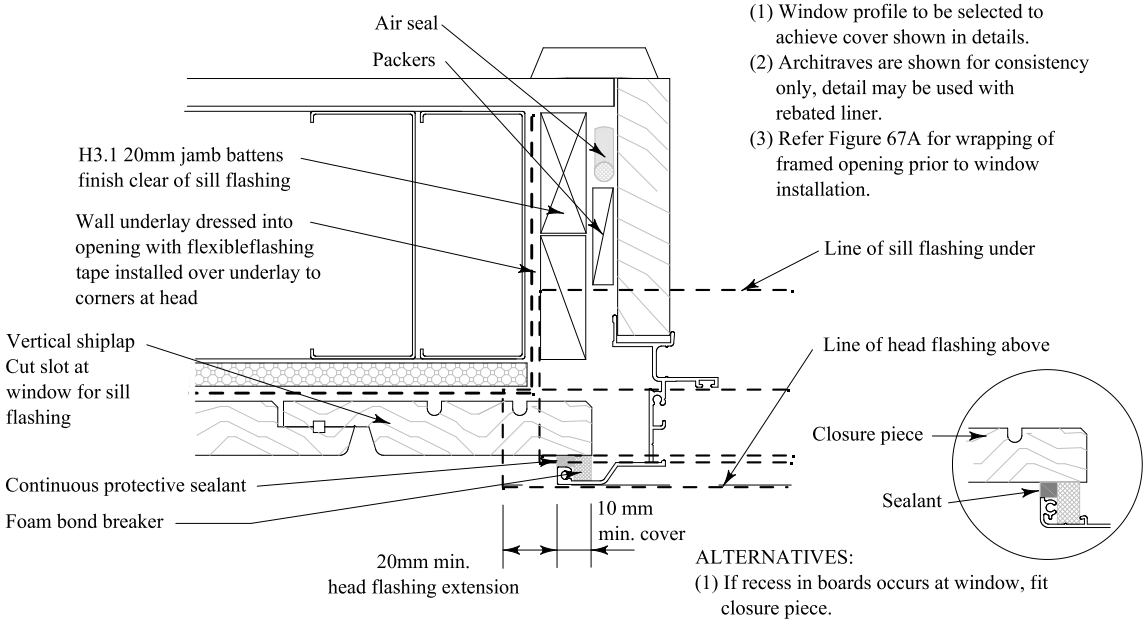
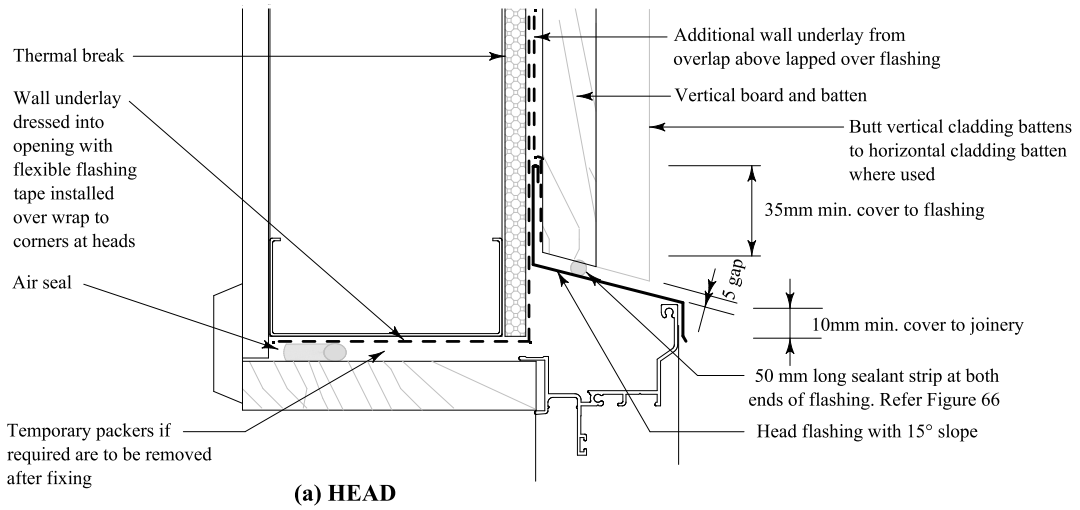
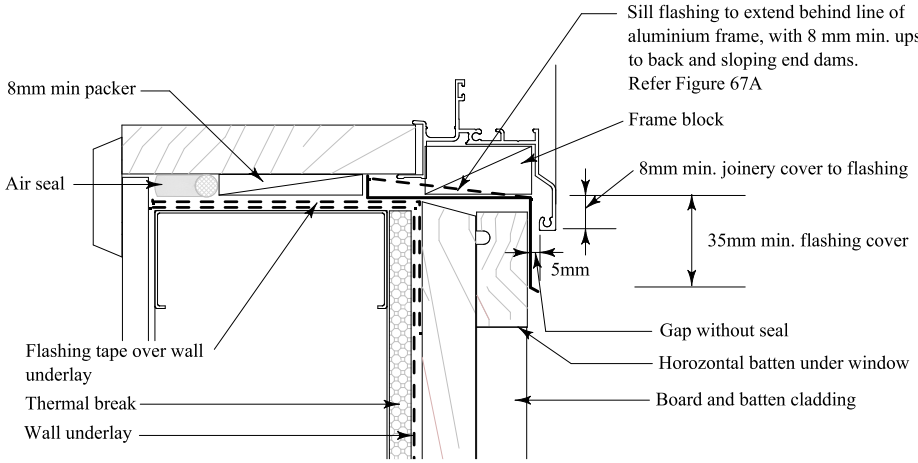


(c) JAMB

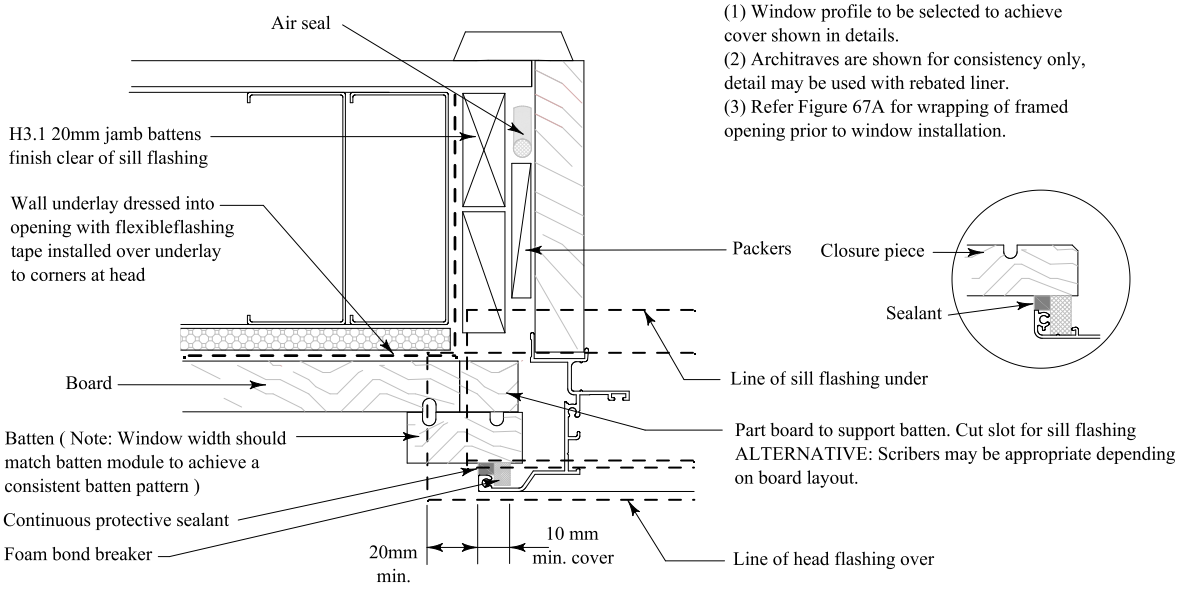
Figure 79: **Windows and doors for direct fixed board and batten weatherboards**
Paragraphs 9.4.6



(a) HEAD



(b) SILL



(c) JAMB

Figure 80: **Windows and doors for bevel-back weatherboards on cavity**
Paragraphs 9.4.7

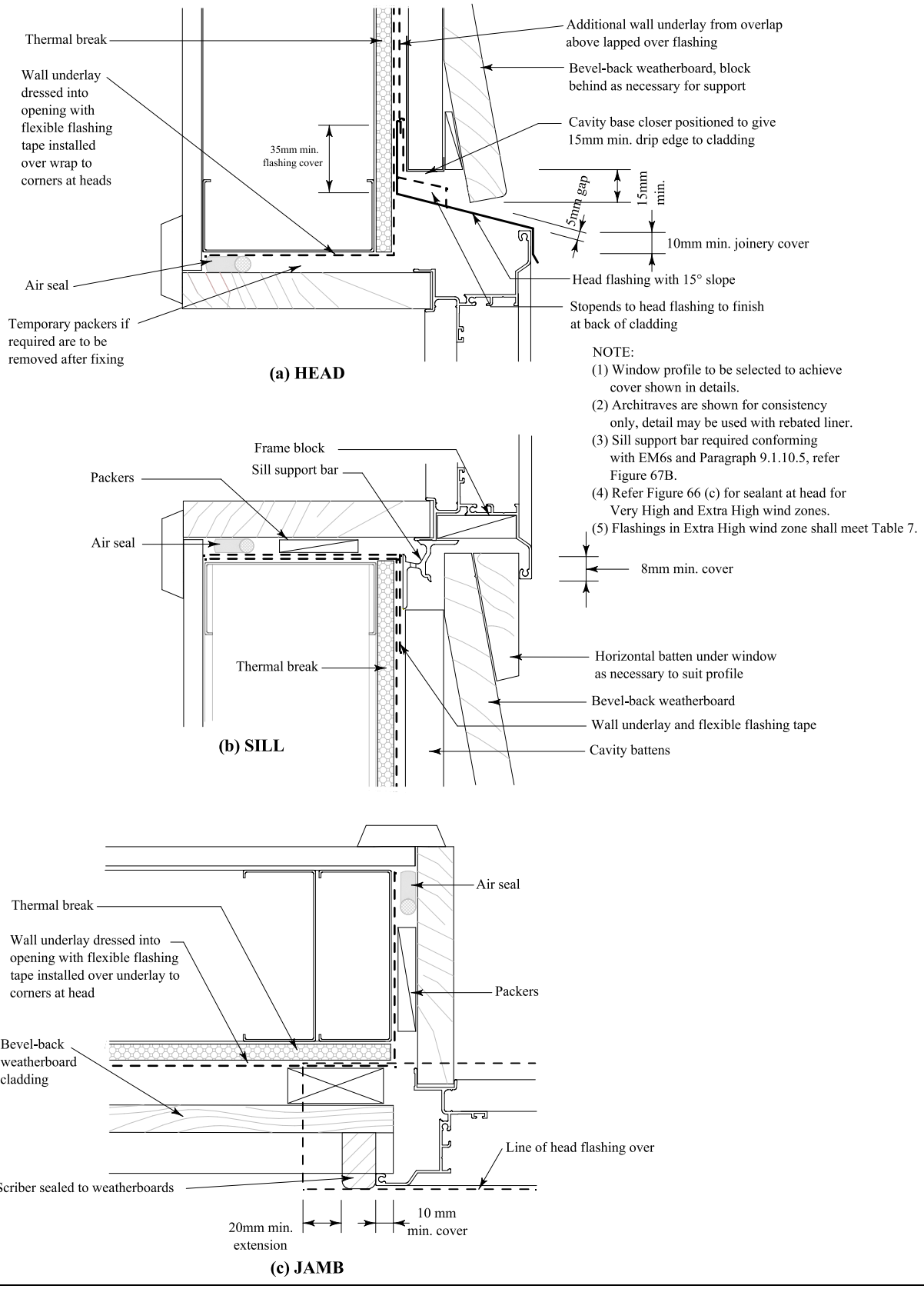
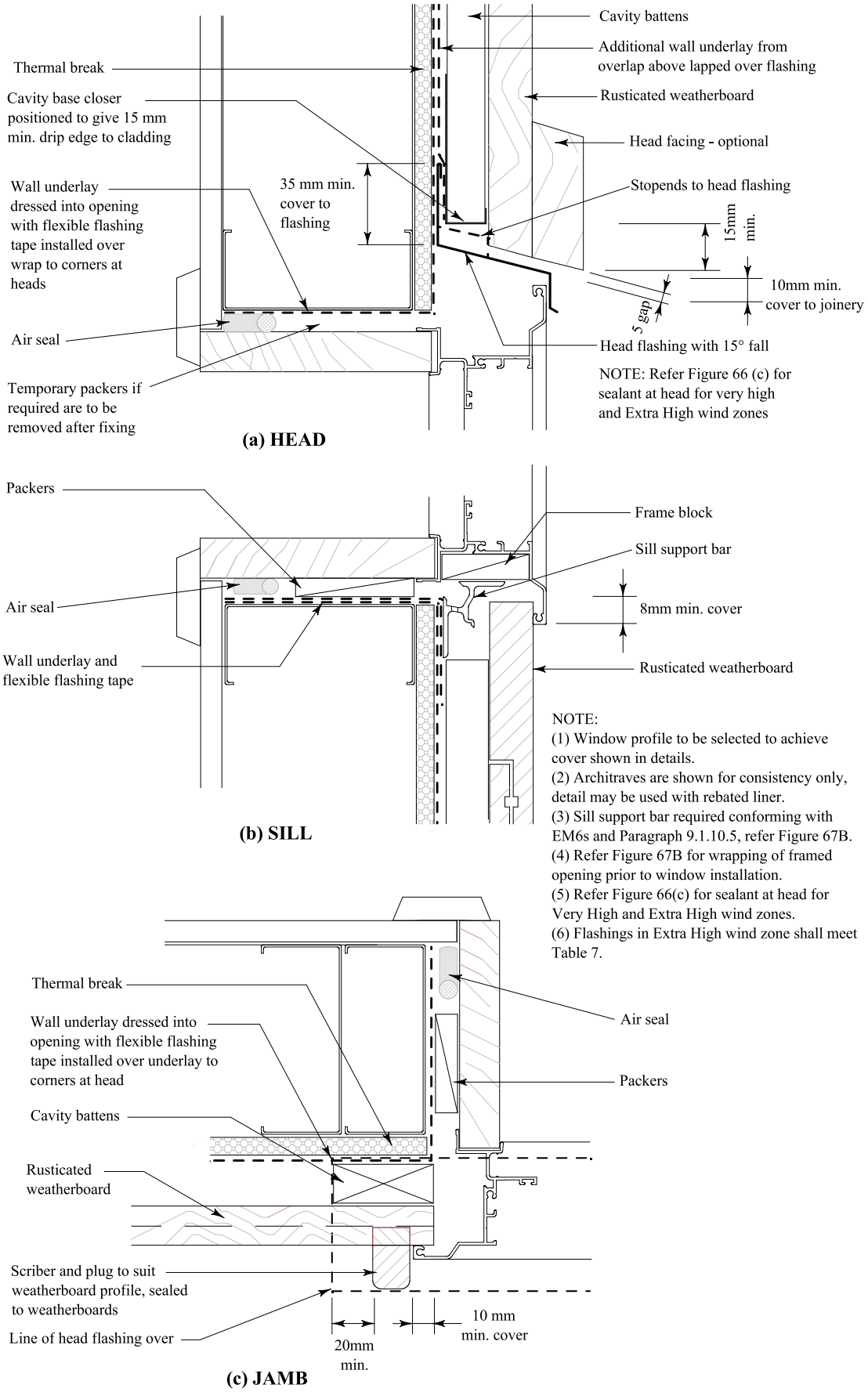


Figure 81: **Windows and doors for rusticated weatherboards on cavity**
Paragraphs 9.4.7



9.4.8 Parapets and enclosed balustrades

Parapets shall be in accordance with Section 6.

Enclosed balustrades shall be in accordance with 7.4.

9.4.9 Finishes

Where a protective finish is required by NZS 3602, all timber surfaces, including end grain and laps, shall be sealed by priming.

Two coats of exterior grade paint shall be applied, after priming, to all exposed surfaces.

Paint systems shall comply with AS 3730.7, AS 3730.8, AS 3730.9, or AS 3730.10.

COMMENT :

The minimum durability period for protective coatings is 5 years. Improvement in durability and stability of weatherboards can be achieved by priming all surfaces including backs of boards.

Manufacturers of coatings which have a proven performance in use may be able to show compliance with NZBC B2 Durability as detailed in B2/VM1 as an alternative to compliance with AS 3730.

With tangentially-sawn weatherboards, particularly painted or stained in dark colours, cupping is possible. Providing additional fixings may help restrain the board, but will usually result in splitting of the boards.

9.5 Fibre cement weatherboards

Fibre cement weatherboard claddings shall be either direct fixed to framing over a thermal break and wall underlay, or fixed over a drained cavity on a thermal break and wall underlay as given in 9.1.8.

Based on the calculated risk score for an external wall from 3.1, the fibre cement weatherboard cladding may require the inclusion of a drained cavity.

9.5.1 Limitations

This Solution is limited to flat fibre cement weatherboards, with a minimum thickness of 7.5 mm.

9.5.2 Material performance

Fibre cement weatherboards shall comply with AS/NZS 2908.2.

9.5.3 Installation

A wall underlay, as given in Table 23 and 9.1.5 to 9.1.7, shall be installed behind fibre cement weatherboard claddings.

COMMENT:

See 1.5 for qualification of installers.

9.5.3.1. Fixings

Fibre cement weatherboards shall be fixed through the wall underlay to the framing at a maximum of 600 mm centres as given in Table 24.

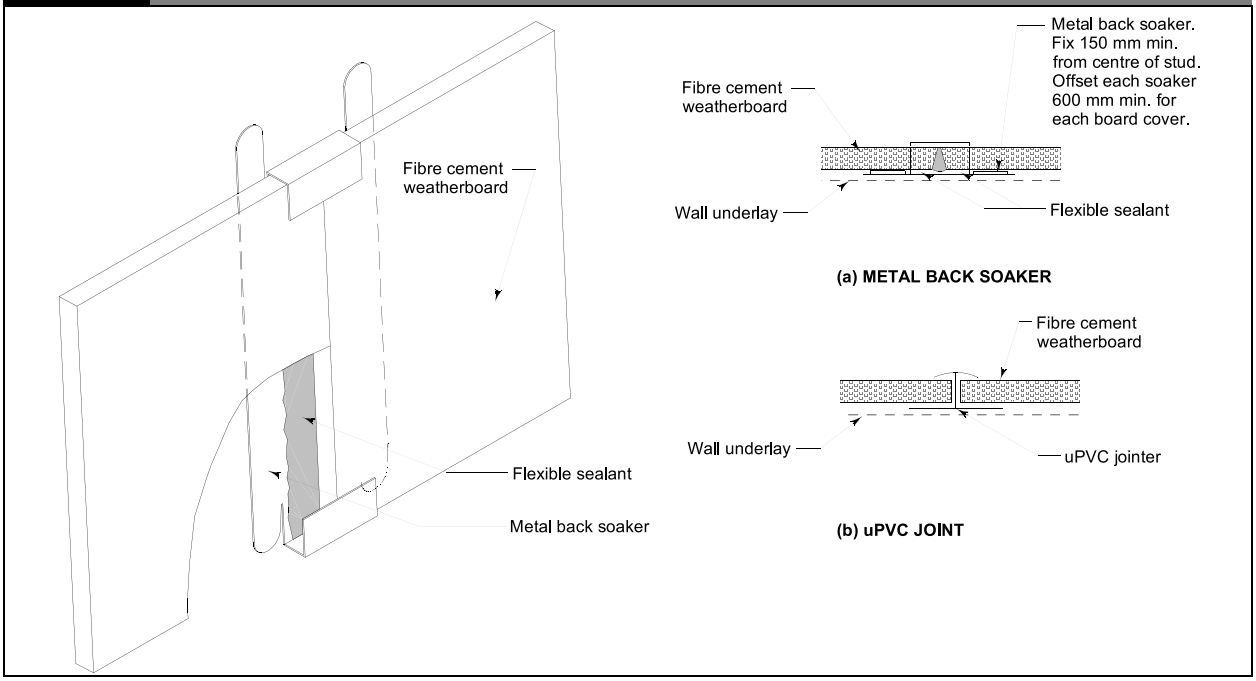
9.5.3.2. Laps and joints

Horizontal laps shall be a minimum of 30 mm.

Joints shall be:

a) positioned between studs;
b) staggered at a minimum of 600 mm from joints in the adjacent boards; and
c) weatherproofed in accordance with the following:
   i) uPVC H jointers as given in Figure 82; or
   ii) hidden soakers as given in Figure 82; with sealant used between the ends of boards complying with:
      1) Type F, Class 20LM or 25LM of ISO 11600; or
      2) Low modulus Type II Class A of Federal Specification TT-S-00230C.

Figure 82: **Joints in fibre cement weatherboards**
Paragraphs 9.5.3.2



9.5.3.3. External corners

External corners shall be weatherproofed as given in Figure 83 by:

a) The use of corrosion-resistant soakers complying with 4.2.2 to 4.2.6; or
b) Facings with weather grooves.

9.5.3.4. Internal corners

Internal corners shall be weatherproofed by metal corner flashings as given in Figure 84.

9.5.4 Windows and doors

Windows and doors shall be installed in accordance with 9.1.10.

9.5.4.1. Windows and doors – direct fixed

For direct fixed fibre cement weatherboards, windows and doors shall be in accordance with Figure 85 and Figure 13D.

9.5.4.2. Windows – on cavity

For fibre cement weatherboards fixed over a drained cavity, windows and doors shall be as given in Figure 86 and Figure 13C.

9.5.5 Parapets and enclosed balustrades

Parapets shall be in accordance with Section 6.

Enclosed balustrades shall be in accordance with 7.4.

9.5.6 Protective coating

The exposed faces, including top edges at sills and all bottom edges of horizontal fibre cement weatherboards shall be finished with a minimum of a 2-coat latex exterior paint system complying with AS 3730.7, AS 3730.8, AS 3730.9 or AS 3730.10.

Figure 83: **External corners in fibre cement weatherboards**
Paragraphs 9.5.3.3

NOTE: (1) Boxed external corner details for cavity walls are similar.
(2) Soaker corners for cavity walls are similar to Figure 72.

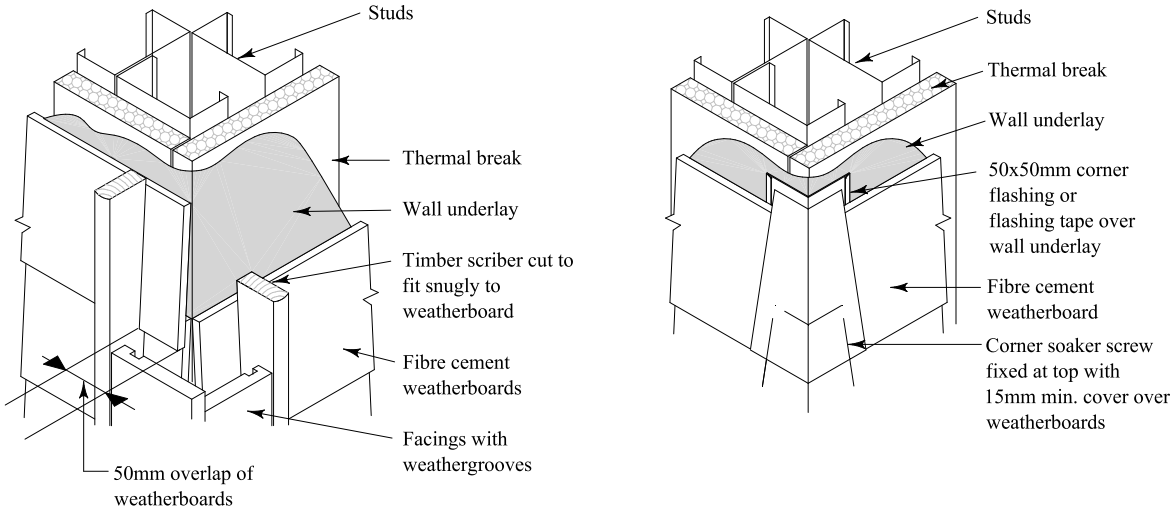


Figure 84: **Aluminium corners in fibre cement weatherboards**
Paragraphs 9.5.3.4

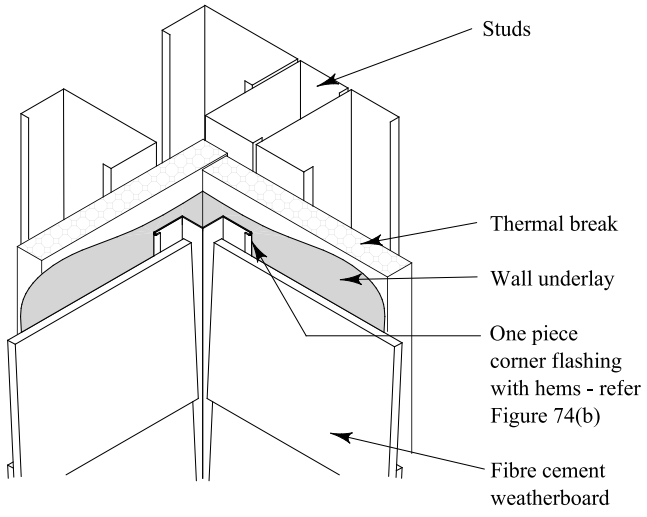
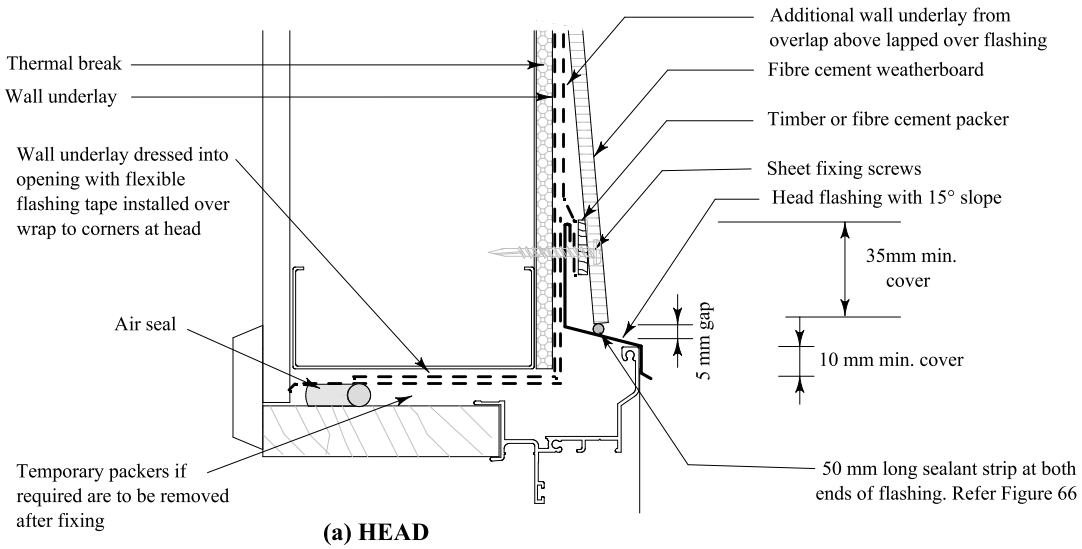
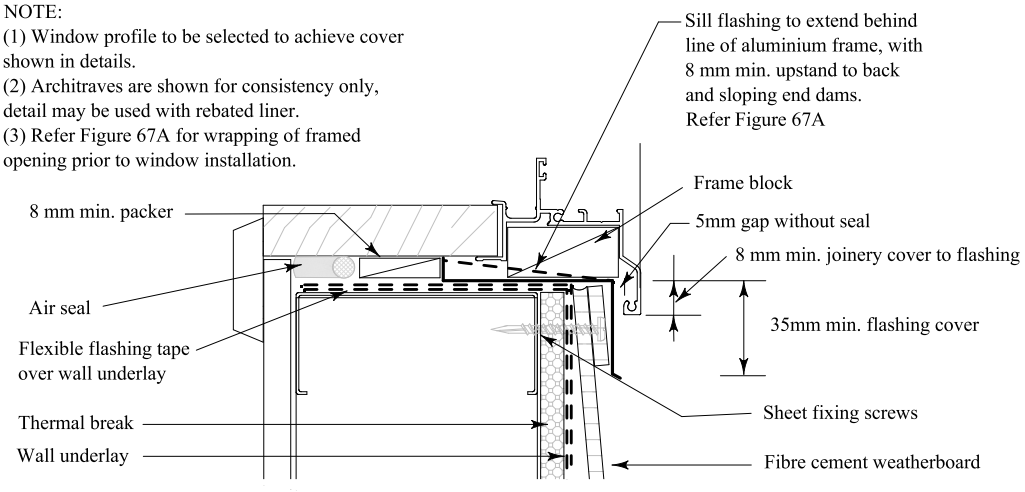


Figure 85: **Windows and doors in fibre cement direct fixed weatherboards**
Paragraphs 9.5.4.1

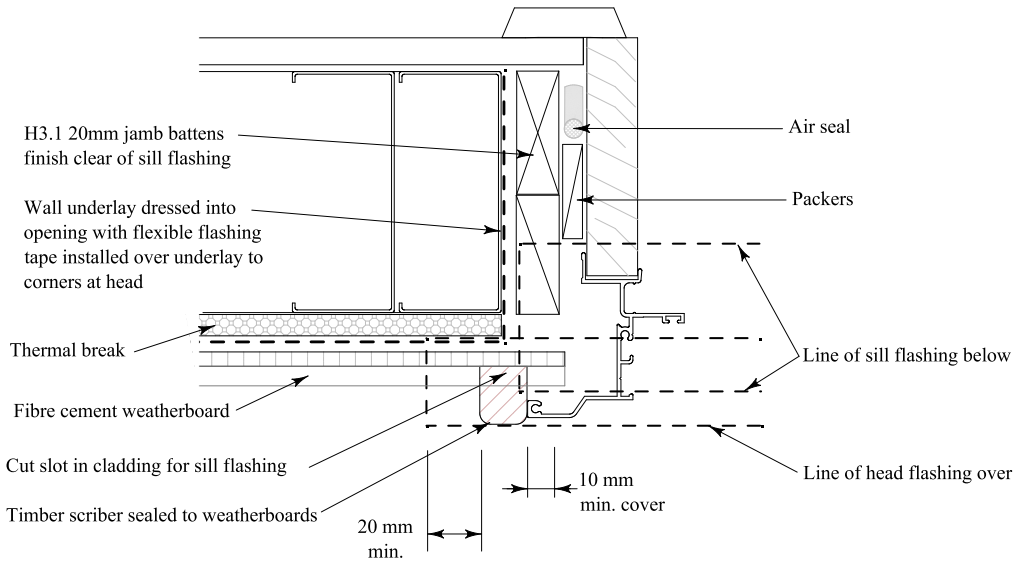


(a) HEAD

NOTE:
(1) Window profile to be selected to achieve cover shown in details.
(2) Architraves are shown for consistency only, detail may be used with rebated liner.
(3) Refer Figure 67A for wrapping of framed opening prior to window installation.

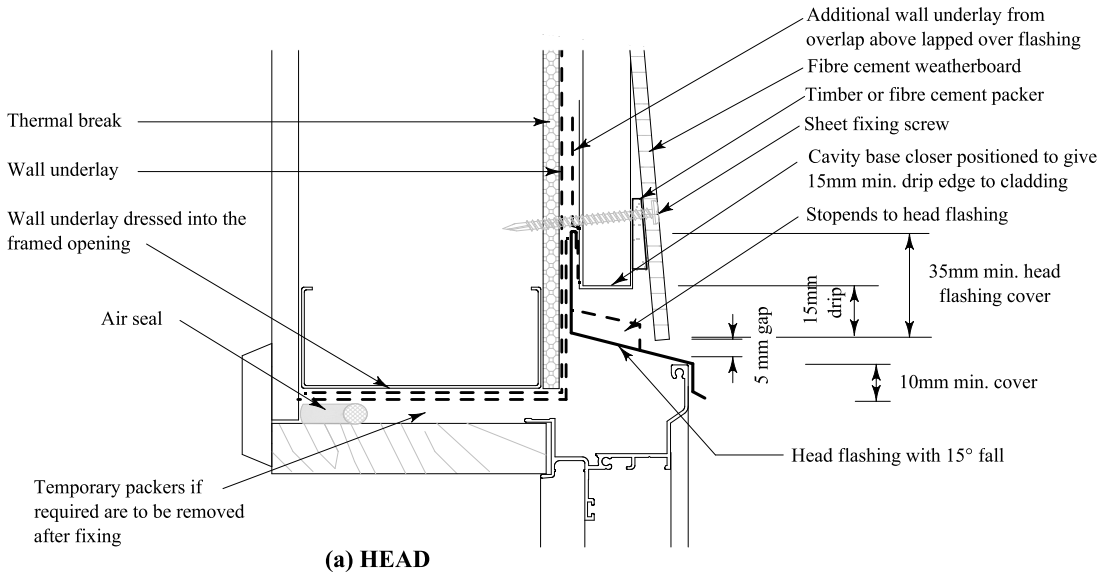


(b) SILL

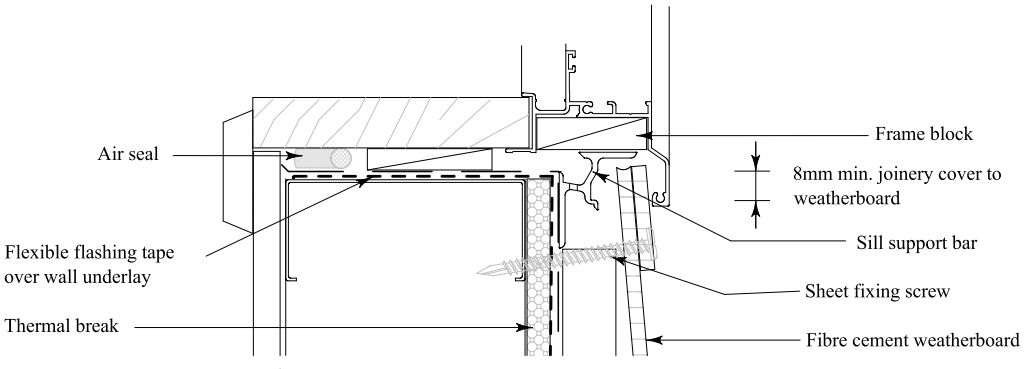


(c) JAMB

Figure 86: **Windows and doors in fibre cement weatherboards on cavity**
Paragraphs 9.5.4.2

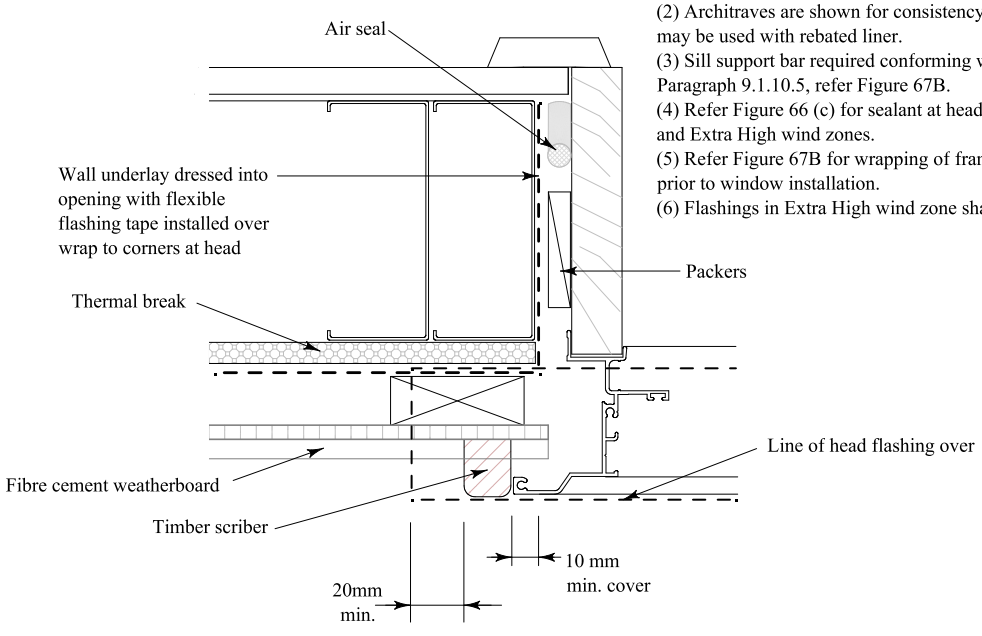


(a) HEAD



(b) SILL

NOTE:
(1) Window profile to be selected to achieve cover shown in details.
(2) Architraves are shown for consistency only, detail may be used with rebated liner.
(3) Sill support bar required conforming with EM6s and Paragraph 9.1.10.5, refer Figure 67B.
(4) Refer Figure 66 (c) for sealant at head for Very High and Extra High wind zones.
(5) Refer Figure 67B for wrapping of framed opening prior to window installation.
(6) Flashings in Extra High wind zone shall meet Table 7.



(c) JAMB

9.6 Profiled metal wall cladding

Horizontal profiled metal wall cladding shall be fixed over a drained cavity on thermal break and wall underlay as given in 9.1.8 or direct fixed to framing over a thermal break and roof underlay (see Table 3).

9.6.1 Limitations

This Solution is limited to corrugated or trapezoidal metal wall cladding with the profiles, as given in Figure 33, and applied as given in Table 3.

9.6.2 General

Metal cladding shall be installed by a suitably qualified and capable practitioner.

COMMENT :

Refer to Paragraph 1.5 for qualification of installers.

9.6.3 Materials

9.6.3.1. Choice of metal

The metal cladding shall be selected according to the exposure conditions in Table 20.

COMMENT :

The exposure zone in which a building is located can affect the durability of flashings.

Exposure zones are defined in NZS 3604, based on the likely exposure to wind-driven sea-salt. Corrosion due to geothermal or corrosive industrial atmospheres, as defined in NZS 3604, requires specific design.

Exposure zones are based on AS/NZS 2728.
AS/NZS 2728 lists atmospheric classes derived from ISO 9223 for Australia and New Zealand.

9.6.3.2. Steel

Materials for profiled steel cladding shall be in accordance with the following:

a) have a BMT of 0.4 mm minimum;
b) be grade G550, or G300 for curved and crimped cladding; and
c) be selected for corrosion protection according to the intended exposure zone as given in Table 20.

9.6.3.3. Aluminium

Aluminium for the profiled wall cladding shall be in accordance with the following:

a) AS/NZS 1734;
b) BMT of a minimum of 0.7 mm;
c) minimum of 5000 series; and
d) for pre-painted aluminium, a factory-applied finish complying with AS/NZS 2728 be applied.

9.6.4 Maintenance

Maintenance shall be as given in 2.6.

9.6.5 Profiles

Profiles covered in this Solution include the following:

a) Corrugated – curved with a minimum crestheight of 16.5 mm minimum; and
b) Trapezoidal – symmetrical and asymmetrical with a minimum crest height of 19 mm.

Further details of these profiles is given in Figure 33.

9.6.6 Fixing

The cladding shall be screw-fixed through the troughs and battens into the framing.

Fixings shall be in accordance with the following:

a) be a minimum of 12-gauge hexagonal head, self-drilling screws;
b) penetrate the framing by a minimum of 3 threads;
c) be a minimum of Class 4 as selected from Table 20;
d) include neoprene (having a carbon black content of 15% or less by weight) or EPDM sealing washers as given in Figure 34;
e) be used on the cladding at side laps and every second trough or for trapezoidal where the rib centres exceed 150 mm, at side laps and every trough as follows:
   i) to framing; and
   ii) at all external and internal corners.

9.6.7 Flashings

Flashings used with metal wall cladding shall be in accordance with Section 4, and with the following:

a) Hooks and hems be as given in Figure 2;
b) joints formed with laps and sealant as given in Figure 3,
c) sealant be neutral cure complying with the following:
   i) Type F, Class 20LM or 25LM of ISO 11600, or
   ii) low modulus Type II Class A of Federal Specification TT-S-00230C.

d) under-flashings be fixed to framing at 600 mm maximum centres.
e) flashings be fixed together at junctions at 50 mm maximum centres or to cladding at 900 mm centres with the following:
   i) for galvanized steel, 4 mm diameter monel metal, where compatible as given in Table 21;
   ii) for aluminium-zinc coated steel, 4 mm diameter aluminium rivets; or
   iii) for aluminium, 4 mm diameter aluminium rivets.

9.6.8 Vertical profile – direct fixed

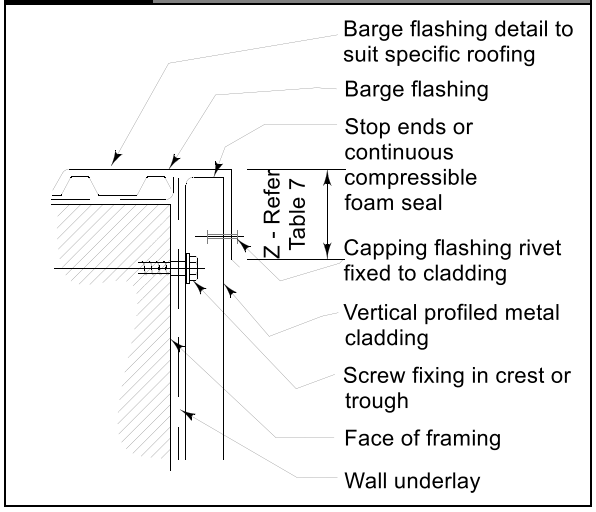
9.6.8.1. Installation

For direct fixed vertical profile, the wall underlay shall be in accordance with the properties listed for roof underlay given in Table 23.

9.6.8.2. Barges

Barge flashings shall be as given in Figure 87.

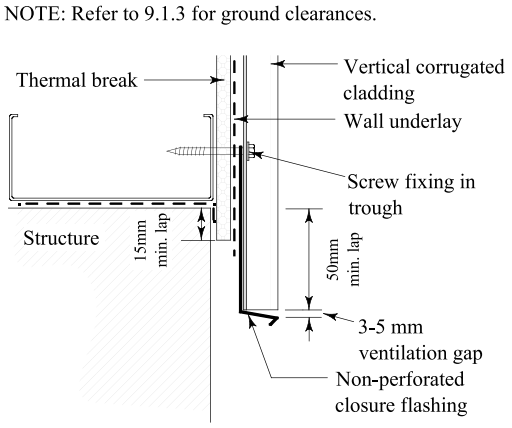
Figure 87: **Barge for vertical profiled metal** Paragraphs 9.6.8.2



9.6.8.3. Bottom of cladding

The bottom edge of the cladding shall overlap the foundation wall as given in 9.1.3 and Figure 88.

Figure 88: **Bottom of cladding for vertical profiled metal** Paragraphs 9.5.8.3



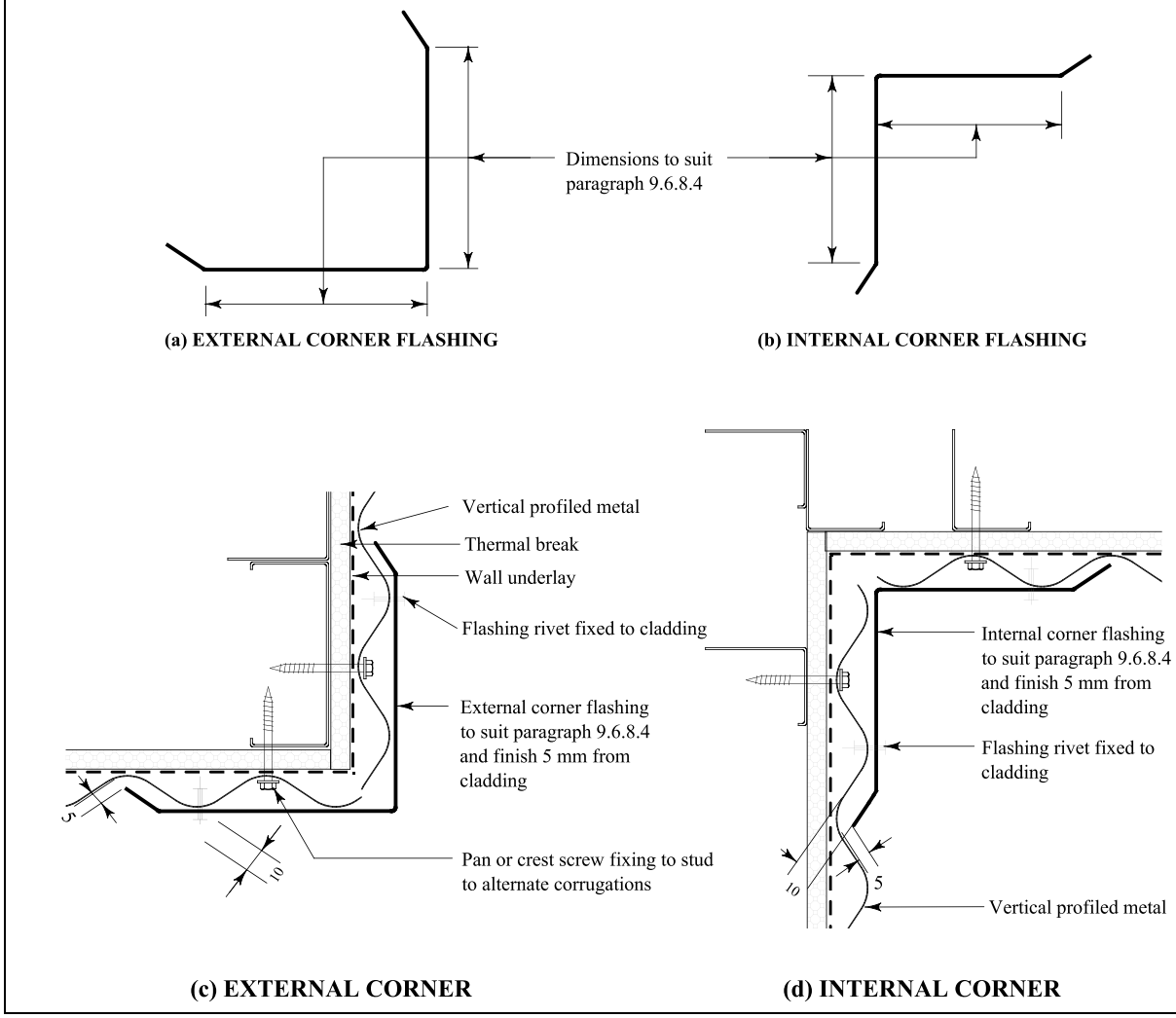
9.6.8.4. Corners

Direct fixed vertical profiled metal wall cladding shall be over-flashed at external and internal corners as given in Figure 89.

The cover of the flashings shall be in accordance with the following:

a) be dimensioned to suit the metal wall cladding profile
b) cover at least two crests for corrugated and single crests for other profiles; and
c) terminate as given in Figure 88.

Figure 89: **Corners for vertical profiled metal**
Paragraphs 9.6.8.4



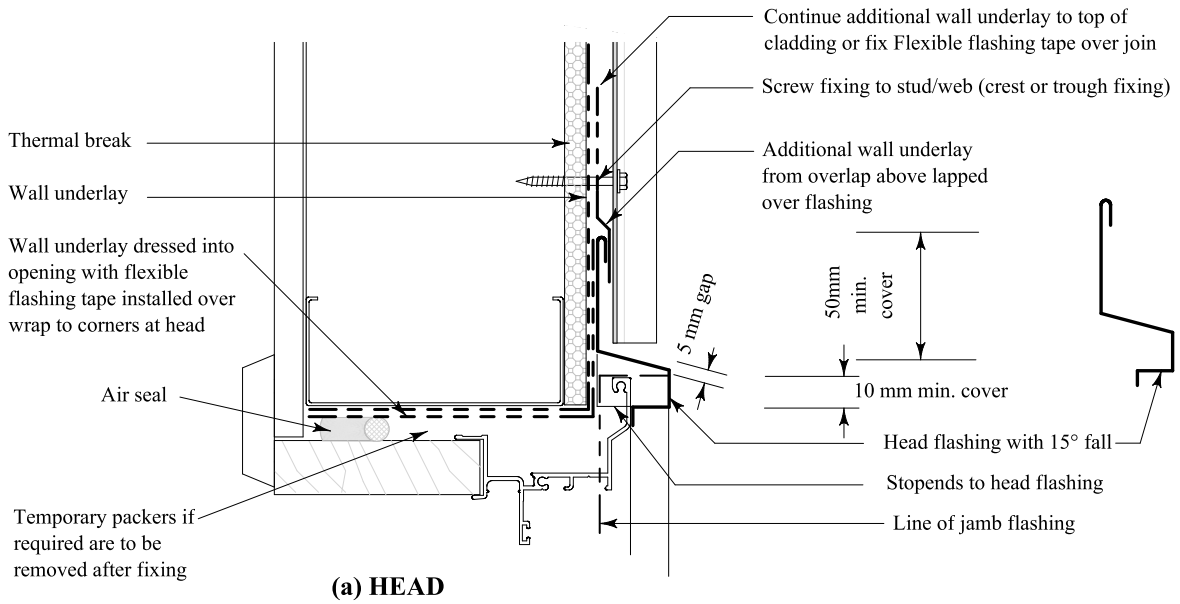
9.6.8.5. Vertical profile: penetrations

Pipe penetrations shall be as given in Figure 48. The heads of larger penetrations shall be flashed in accordance with to Figure 64, with head flashings adjusted to suit the profile and other flashings as given for windows and doors (see 9.5.8.6).

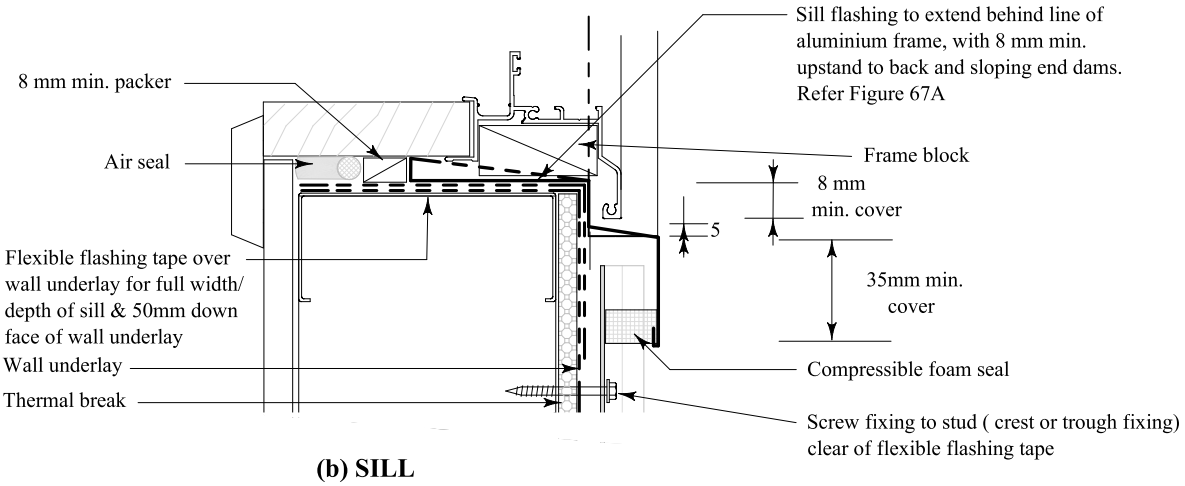
9.6.8.6. Vertical profile: windows and doors

Windows and doors in vertical profiled metal claddings shall be flashed as given in Figure 90 and Figure 95.

Figure 90: **Windows and doors for vertical profiled metal**
Paragraphs 9.6.8.6

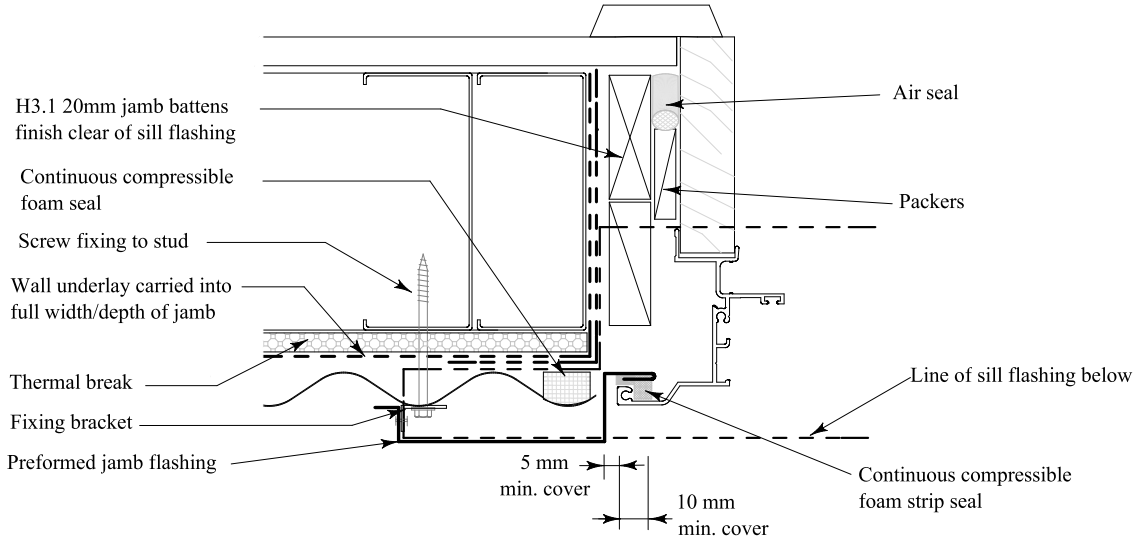


(a) HEAD



(b) SILL

NOTE:
(1) Window profile to be selected to achieve cover shown in details.
(2) Architraves are shown for consistency only, detail may be used with rebated liner.
(3) Refer Figure 67A for wrapping of framed opening prior to window installation.
(4) Refer Figure 95 for sketch of flashings.
(5) Refer Figure 66 (c) for sealant at head for Very High and Extra High wind zones.



(c) JAMB

9.6.9 Horizontal profiled metal on cavity

9.6.9.1. Installation

A wall underlay, as specified in Table 23 and 9.1.5 to 9.1.7, shall be installed over the outside face of the framing.

9.6.9.2. Cavity battens

If the cavity batten contains copper, such as CCA, copper azole, or ACQ, appropriate separation between the back of the cladding and the cavity batten shall be provided. For information on treatment used for timber battens refer to NZS 3640.

Examples of suitable separation are as follows:

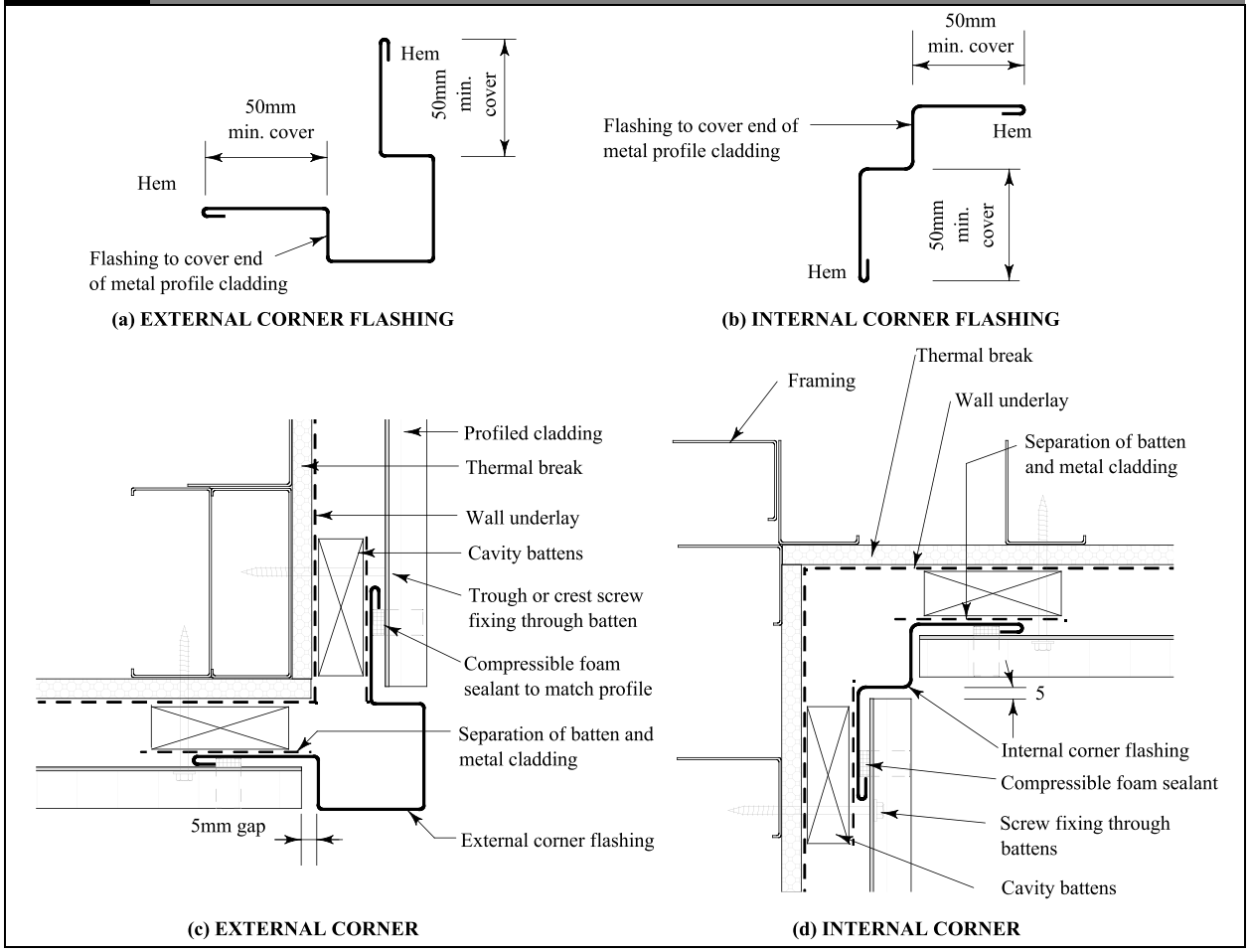
a) an additional layer of paper-based underlay,complying with Table 23, over cavity battens
b) strips of paper-based underlay complying with Table 23 on the face of cavity battens; or
c) Pre-priming cavity battens**.**

9.6.9.3. Corners

Corners shall be weatherproofed by using the flashings and details given in Figure 91.
Horizontal profiled metal wall cladding shall be under-flashed using butt flashings which shall be in accordance with the following:

a) be formed in one shaped piece;
b) allow metal cladding to butt, with a separation of 5 mm, against sides of the exposed flashing corner; and
c) use profiled compressible foam to seal between the flashing underlap and underside of cladding.

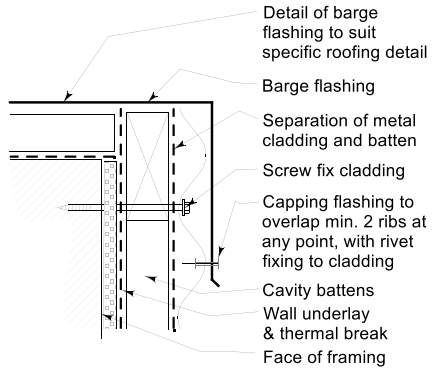
Figure 91: **Corner flashing for horizontal profiled metal**
Paragraphs 9.6.9.3



9.6.9.4. Barges

Barge flashings shall be as shown in Figure 92.

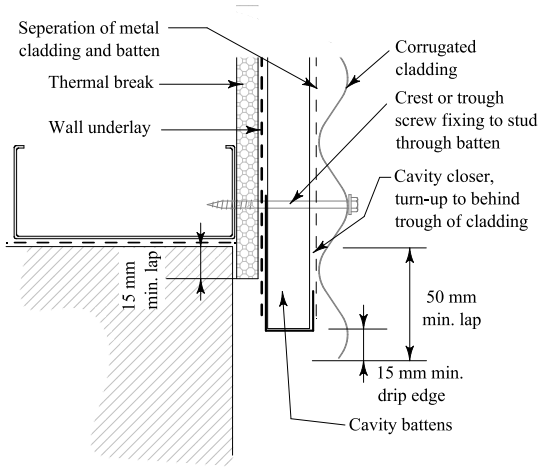
Figure 92: **Barge for horizontal profiled metal**
Paragraphs 9.6.9.4



9.6.9.5. Bottom of cladding

The bottom edge of the cladding shall overlap the foundation wall as given in 9.1.3 and Figure 93.

Figure 93: **Bottom of cladding**
Paragraphs 9.6.9.5



9.6.9.6. Horizontal profile: penetrations

All services penetrations through claddings shall be flashed and sealed.

Pipe penetrations are shown in Figure 48.

The heads of larger penetrations shall be flashed in a similar fashion to Figure 64.

9.6.9.7. Horizontal profile: windows and doors

Windows and doors shall be installed in accordance with 9.1.10, Figure 94, and Figure 95.

9.6.9.8. Parapets and balustrades

Parapets shall be in accordance with Section 6.

Enclosed balustrades shall comply with 7.4.

Horizontal and vertical profiled metal shall be in accordance with Figure 96 and Figure 97.

COMMENT :
Side fixings of handrails or other attachments to enclosed balustrades or parapets will require specific design to demonstrate weathertightness, together with specific structural design for stanchion fixings.

Figure 94:

Windows and doors for horizontal profiled metal on cavity
Paragraphs 9.6.9.7

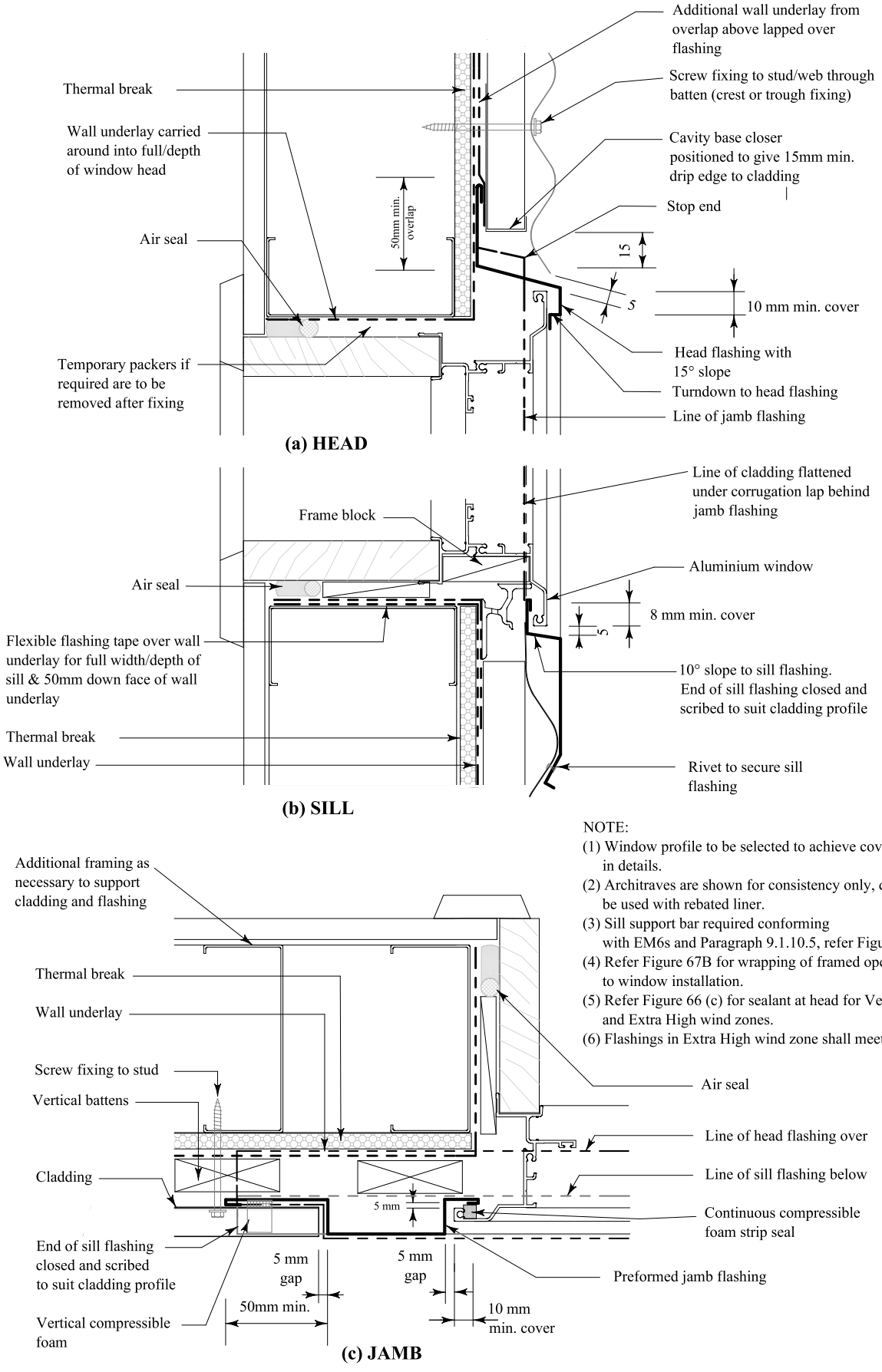


Figure 95: **Window and door flashing for profiled metal**
Paragraphs 9.6.8.6 and 9.6.9.7, Figures 90 and 94

NOTE: (1) Detail (a) Direct fixed vertical profile: refer Figure 90 for window.
(2) Detail (b) Horizontal profile on cavity: refer Figure 94 for window.
(3) Wall underlay omitted for clarity.

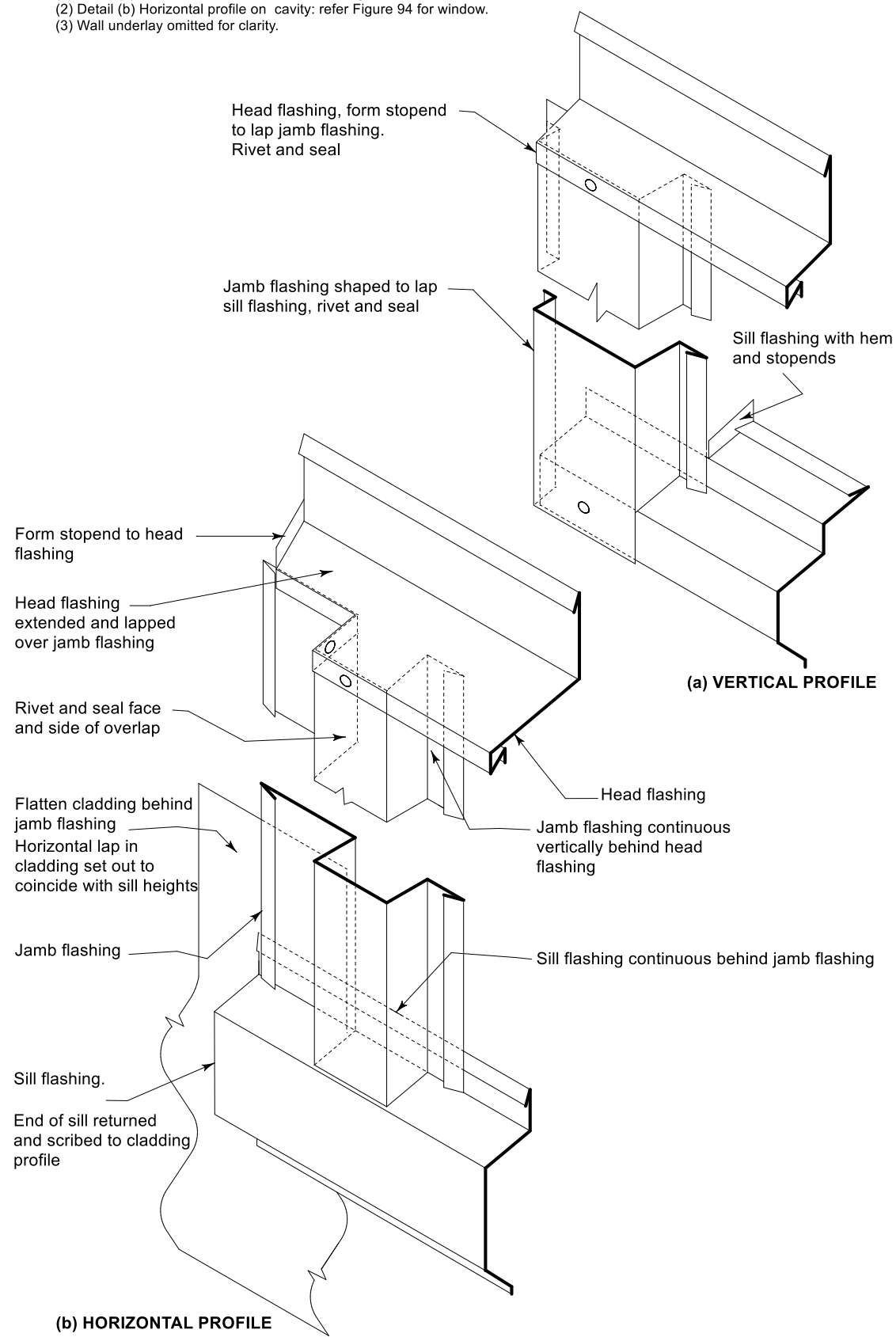


Figure 96: **Balustrade and parapet for vertical profiled metal**
Paragraphs 9.6.9.8

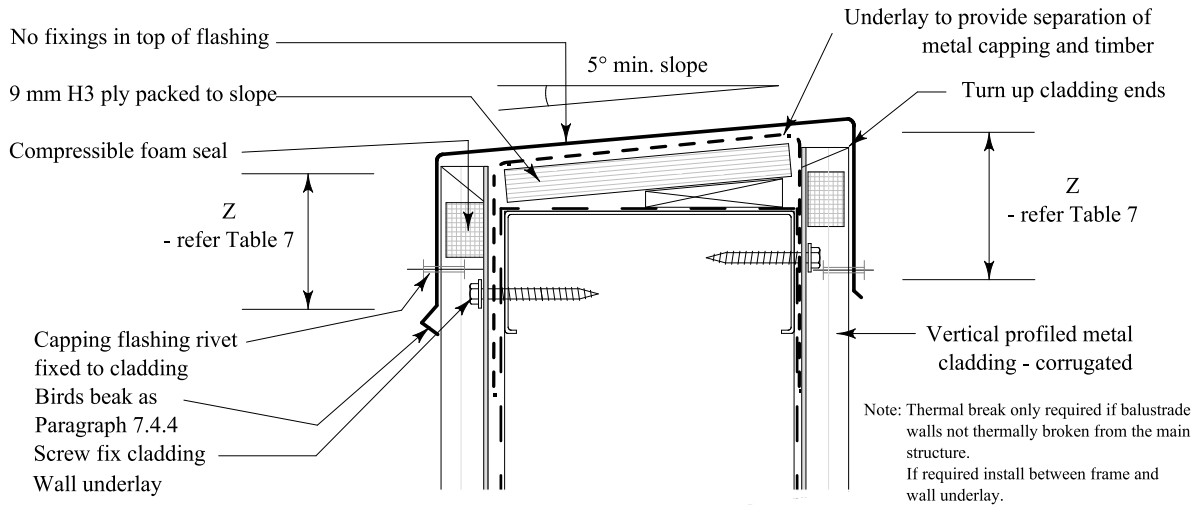
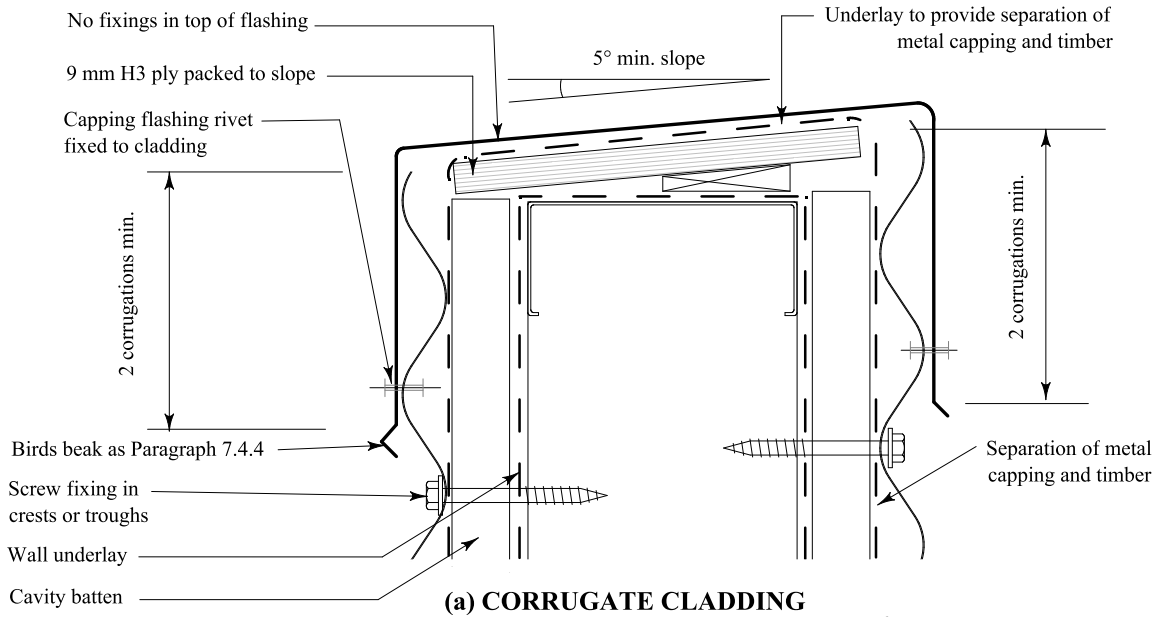
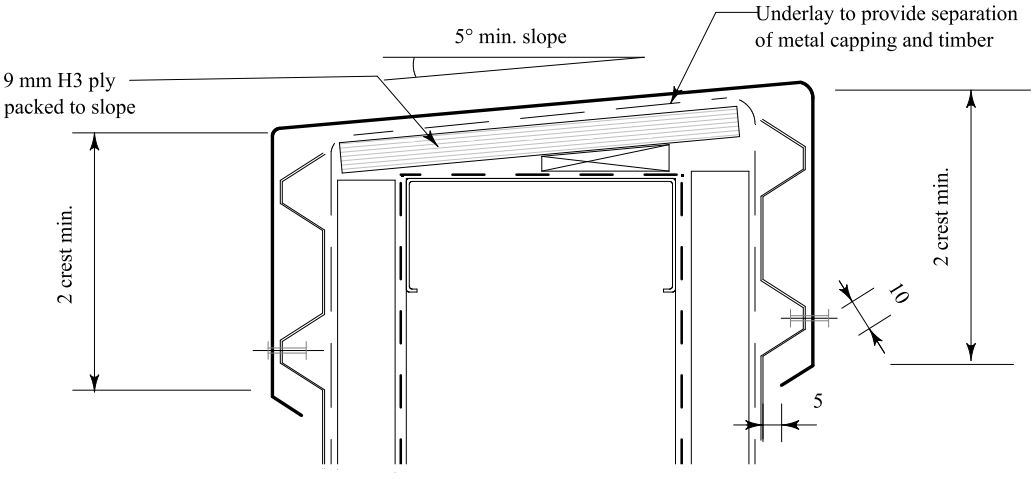


Figure 97: **Balustrade and parapet for horizontal profiled metal**
Paragraphs 9.6.9.8



(a) CORRUGATE CLADDING



(b) TRAPEZOIDAL CLADDING

Note: Thermal break only required if balustrade
walls not thermally broken from the main structure.
If required install between frame and wall underlay.

9.7 Fibre cement sheet

Fibre cement sheet claddings shall be either direct fixed to framing over a thermal break and wall underlay, or fixed over a drained cavity on a thermal break and wall underlay based on the risk score for an external wall, calculated in accordance with Table 1 and Table 3.

9.7.1 Limitations

This 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 the following:
   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;
   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

b) Jointed systems in accordance with 9.7.3 using sheets of 6 mm minimum thickness with the following:
   i) purpose-made jointers; or
   ii) timber battens over joints.

9.7.2 Material and installation – both direct fixed and cavity based

Fibre cement shall be in accordance with AS/NZS 2908.2.

9.7.2.1. Installation

Fibre cement sheets shall be installed in accordance with the following:

a) paint seals to all sheet edges and cut edges, including 100 mm across back face from each edge;
b) wall underlay, as given in Table 23 and 9.1.5 to 9.1.7, installed behind fibre cement sheet claddings;
c) fixings as given in Table 24, installed through the wall underlay into the wall framing; and
d) all sheet joints located over solid framing.

The applicator of the flush-finished jointing and coating shall be trained and approved by the supplier of the jointing and finish system.

COMMENT:
See 1.5 for the qualification of installers.
Edge sealing can be improved by application of a second seal coating.

9.7.3 Jointed systems

Jointed systems shall be in accordance with the following:

a) Vertical joints with the following:
   i) uPVC jointers (see Figure 98A); or
   ii) timber battens (see Figure 99).
b) Internal corners with the following:
   i) uPVC jointers (see Figure 98B); or
   ii) timber battens (see Figure 98B).
c) External corners with timber battens (see Figure 99);
d) Horizontal joints with the following:
   i) “Z” flashings, to Figure 100 for Direct fixed claddings; or
   ii) “Z” flashings to Figure 101 for cavity fixed systems.

Flashings shall be either, uPVC, aluminium or stainless steel in accordance with 4.3.

Timber battens shall comply with NZS 3602.

Figure 98A: **Vertical uPVC joints for fibre cement sheet**
Paragraphs 9.7.3

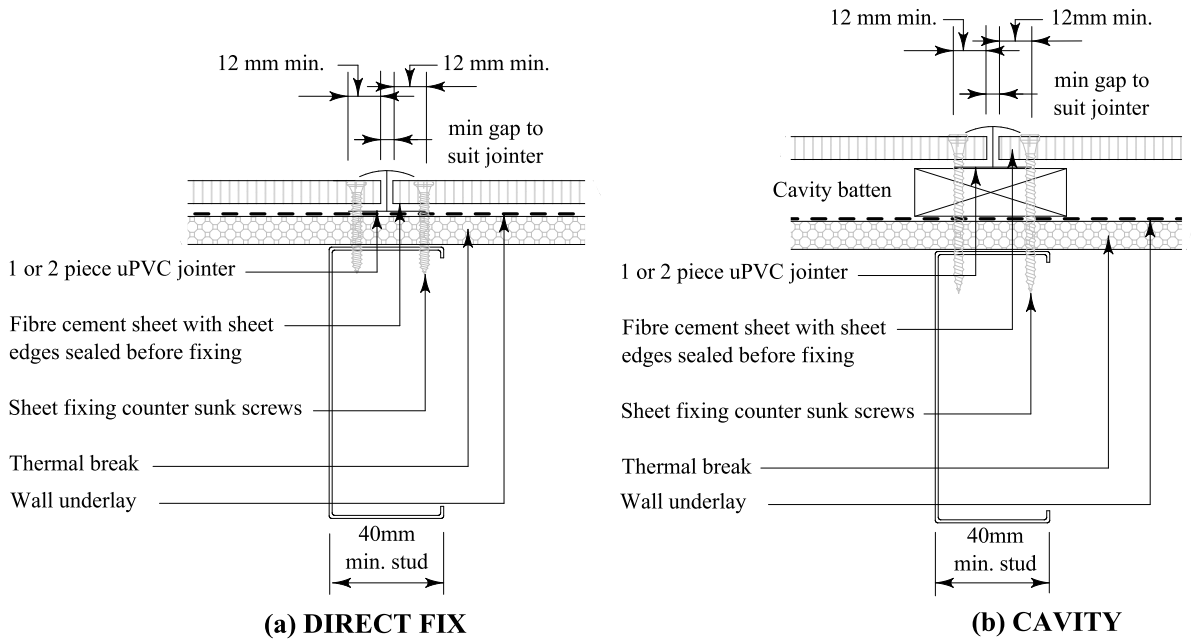


Figure 98B: **Internal corners for fibre cement sheet**
Paragraphs 9.7.3

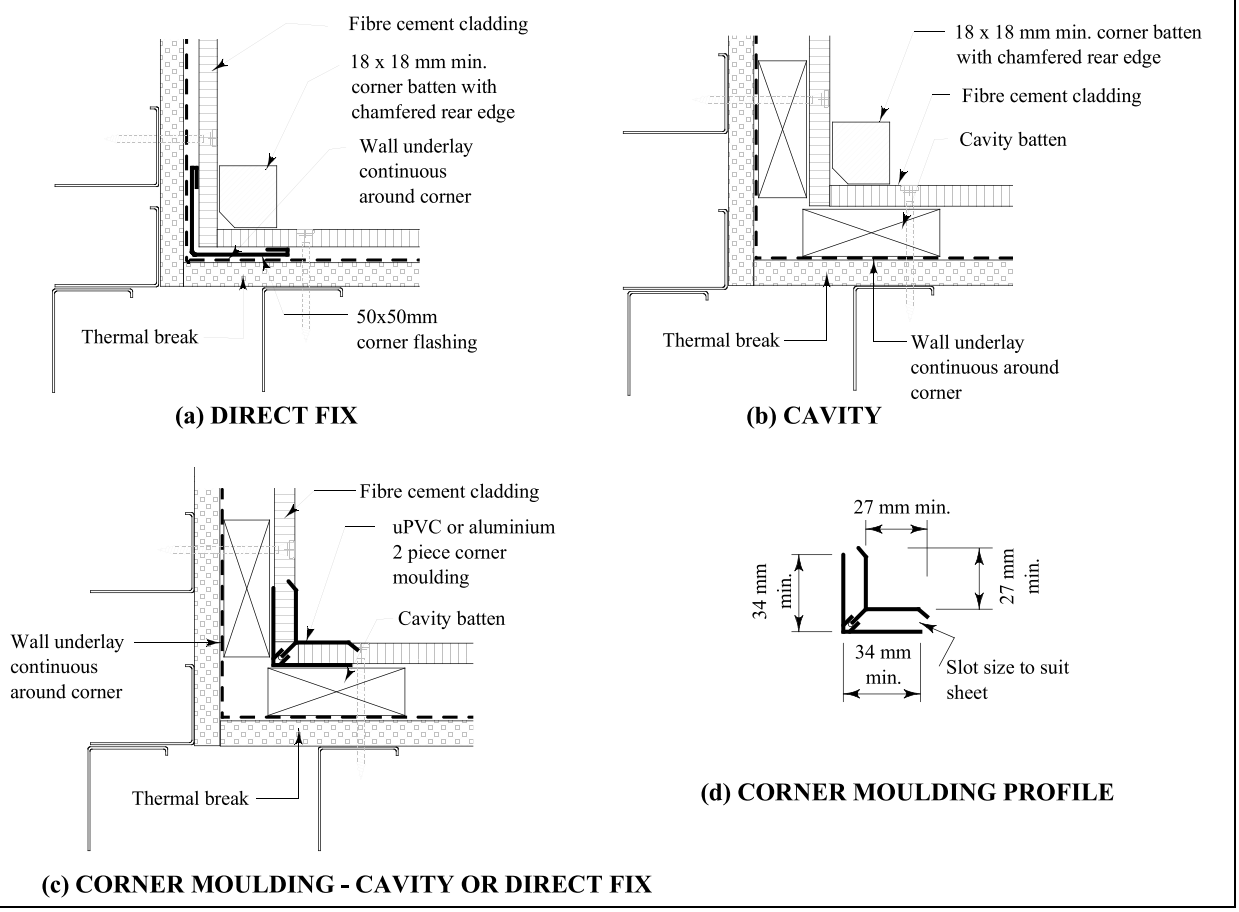
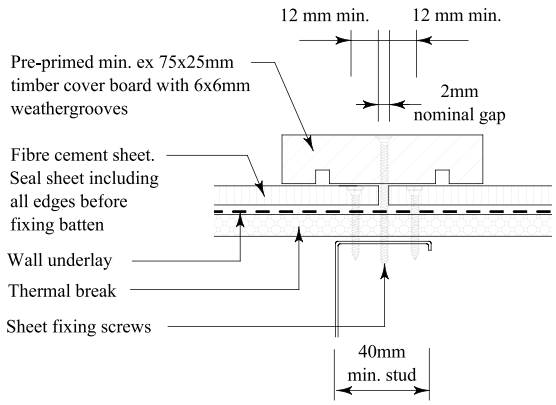
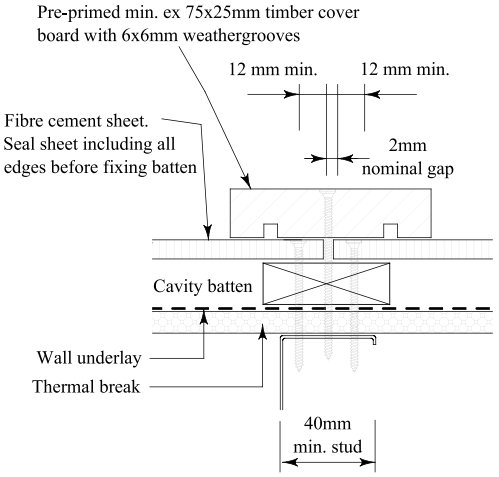


Figure 99: **Vertical timber batten joints for fibre cement sheet**
Paragraphs 9.7.3

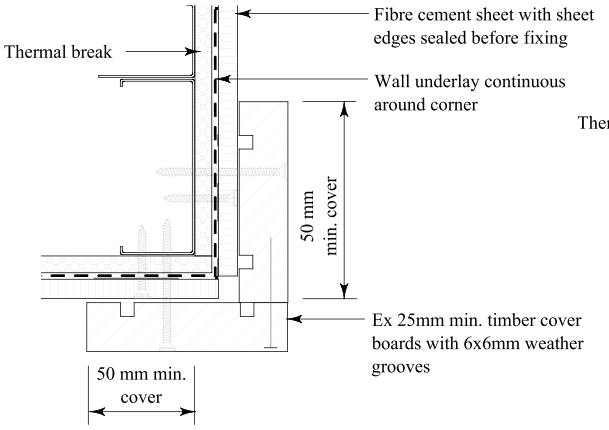
NOTE:
(1) Fibre cement sheet to be sealed including all edges before fixing batten.
(2) Corner battens shall be sized to provide 50mm min. cover over cladding.



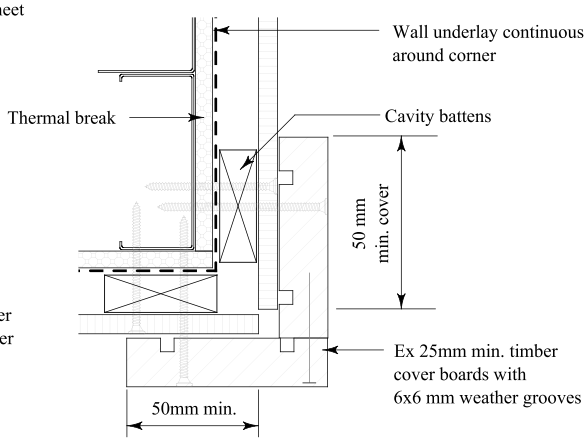
(a) SHEET JUNCTION DIRECT FIX



(b) SHEET JUNCTION CAVITY



(c) EXTERNAL CORNER DIRECT FIX



(d) EXTERNAL CORNER CAVITY

Figure 100: **Horizontal joints for direct fixed fibre cement sheet**
Paragraphs 9.7.3

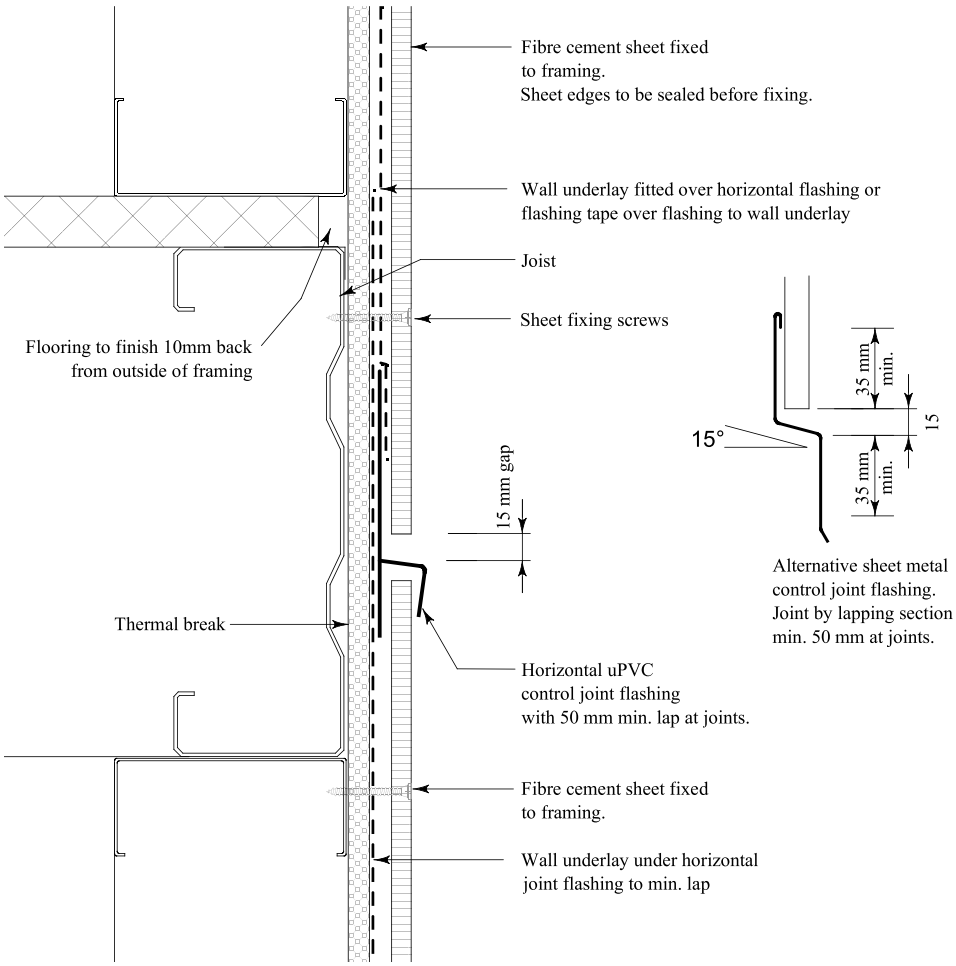
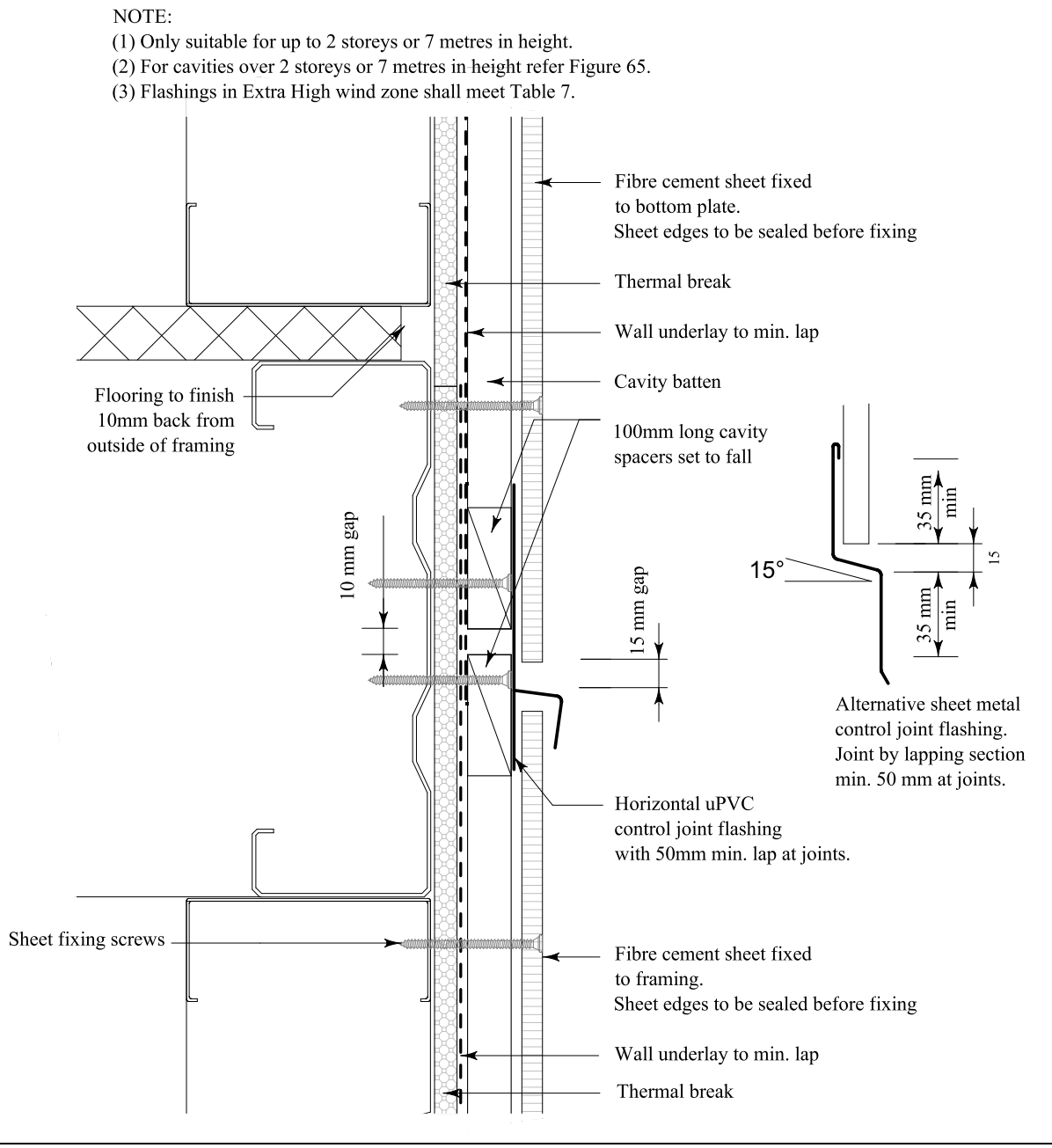


Figure 101: **Horizontal joints for fibre cement sheet on cavity**
Paragraphs 9.7.3



9.7.3.1. Paint finish

For jointed systems, all sheet edges shall be sealed prior to fixing.

Fibre cement shall be finished with a latex exterior paint system complying with AS 3730.7, AS 3730.8, AS 3730.9, or AS 3730.10.

9.7.4 Flush-finished systems

Flush-finished systems shall be constructed over a drained cavity as given in 9.1.8.

Flush-finished joints shall be finished with a textured finish system in accordance with the following:

a) complies with BRANZ EM 4, when tested with the specific fibre cement substrate and jointing system used for the cladding;
b) has all components approved by the supplier of the jointing and finish system; and
c) where a topcoat of paint over the finish is required to provide weather protection, is a latex exterior paint system complying with any of AS 3730.7, AS 3730.8, AS 3730.9, or AS 3730.10.

Joints shall be positioned in accordance with the following:

a) they do not occur at corners of window or door openings, or at changes in the height of a wall;
b) are a minimum of 200 mm on either side of the jamb-line of an opening; and
c) are as given in Figure 102.

External corners shall use uPVC corner reinforcement beneath tape and finishing compound as given in Figure 104.

Internal corners shall use a sealant-filled joint over compressible foam tape as given in Figure 103 (b) with polyethylene bond breaker tape behind joint.

9.7.4.1. Control joints

Vertical control joints shall be located as given in Table 19, and as follows:

a) be permitted to occur at the edge of window or door openings;
b) extend the full height of the wall, including where there is a horizontal joint and a vertical control joint on the wall (see Figure 103); and
c) be permitted to be staggered across horizontal control joints.

Table 19: **Control joints for flush-finished fibre cement**
Paragraph 9.7.4.1, Figure 103

Vertical control joints	Horizontal control joints
5400 mm centres max. (6000 mm allowed on walls that finish at an exterior corner)	5400 mm centres max. (on nogs between full-height, continuous studs)
All internal corners	All floor joist locations
NOTE: Non-flush-finished joints are control joints	

9.7.4.2. Finishes

Finish colour shall have a reflectance of 40% or more, as given in 2.6.

9.7.5 Soffit details

Soffits shall be detailed as shown in Figure 105 for flush-finished, and Figure 5A for jointed.

9.7.6 Windows and doors

Windows and doors shall be installed in accordance with 9.1.10 and the following:

a) Direct fixed windows and doors be detailed as given in Figure 106; and
b) windows and doors on cavity be detailed as given Figure 107.

9.7.7 Parapets and enclosed balustrades

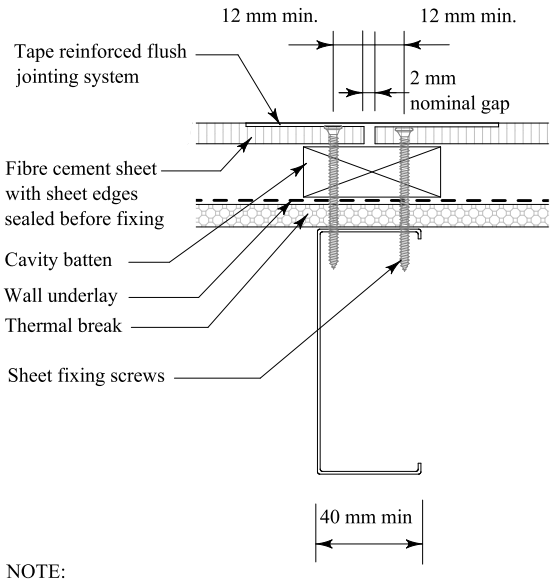
Parapets shall be in accordance with Section 6.

Enclosed balustrades shall be in accordance with 7.4.

Balustrade cappings shall be permitted to include:

a) Metal, butyl or EPDM as given in 6.3; or
b) Flush-finished fibre cement to and Figure 108.

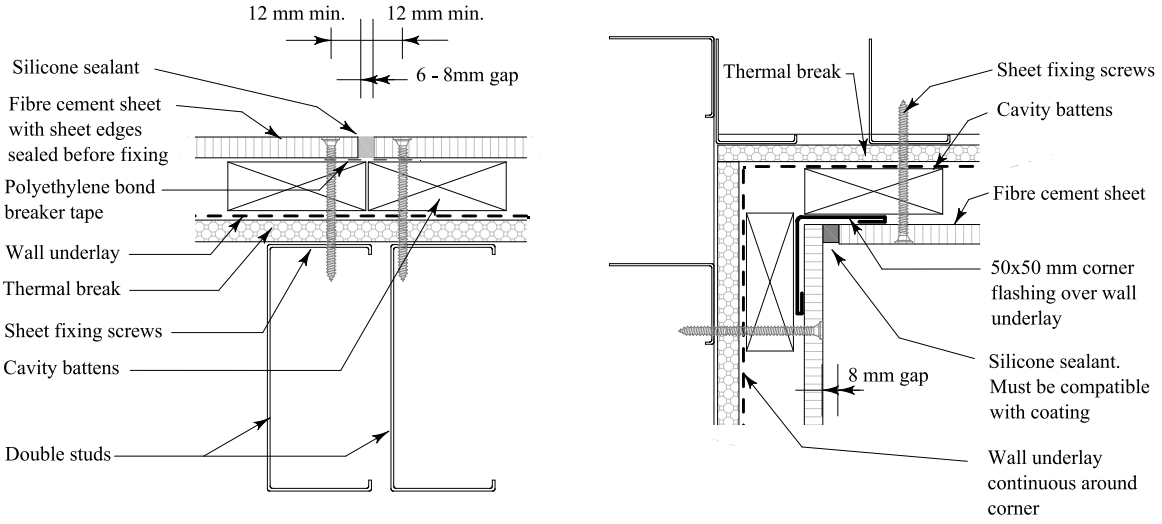
Figure 102: **Flush-finished joints for fibre cement sheet**
Paragraphs 9.7.4



NOTE:
Fibre cement sheet used for this joint must be designed with recessed edge (site produced recesses to compatible sheets are permissible).

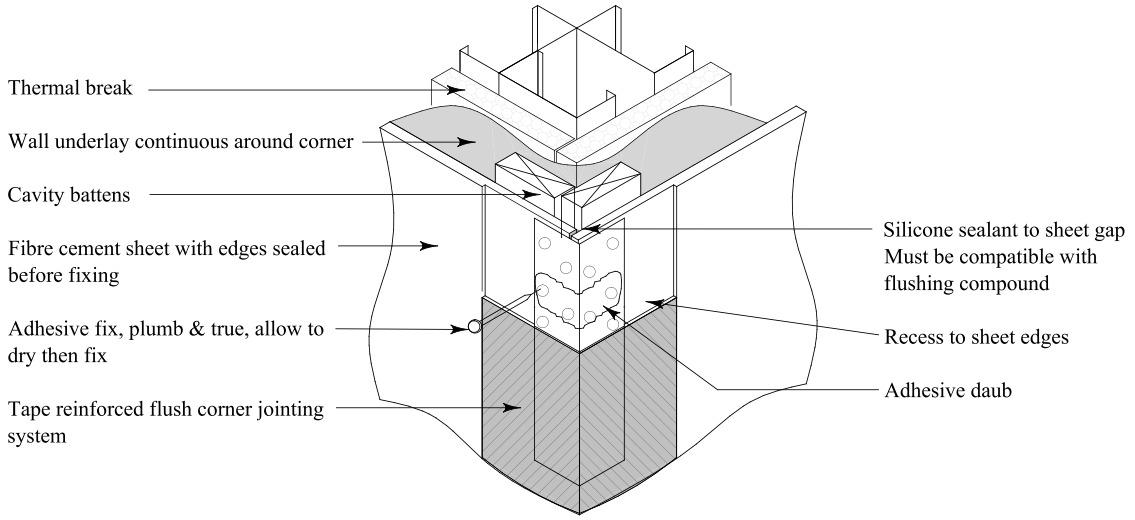
Figure 103: Vertical movement control joint for flush-finished fibre cement sheet
Paragraphs 9.7.4.1

NOTE:
(1) Fibre cement sheet and edges sealed before fixing batten.
(2) Do not apply paint over sealant. If texture coated, use polyethylene bond breaker tape.



(a) SHEET JUNCTION CAVITY FIX **(b) INTERNAL CORNER CAVITY FIX**

Figure 104: Flush-finished external corners for fibre cement sheet
Paragraphs 9.7.4



NOTE:
(1) Fibre cement sheet used for this joint must be designed with recessed edge (site produced recesses to compatible sheets are permissible).
(2) Internal corners similar.

Figure 105: **Soffit for flush-finished fibre cement sheet**
Paragraphs 9.7.5

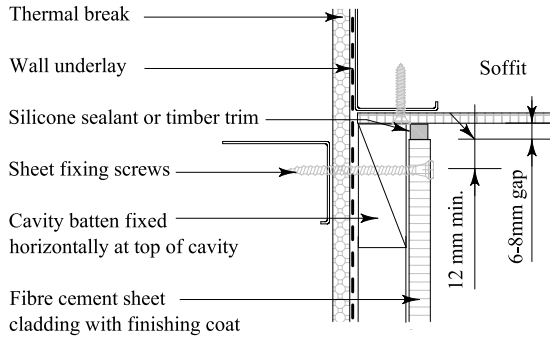
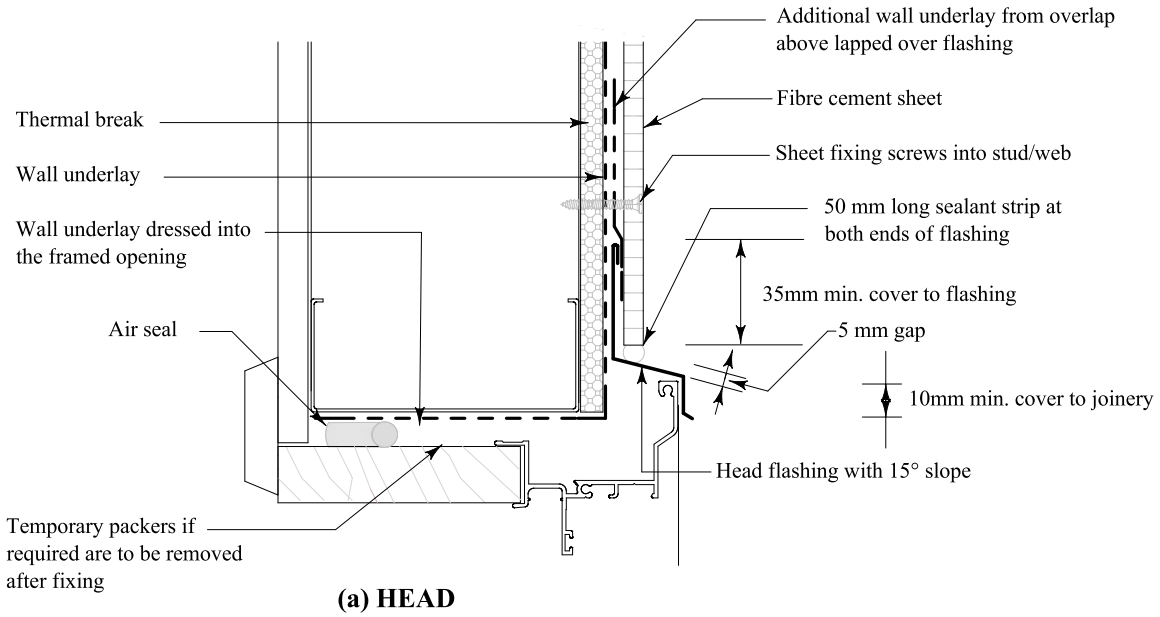
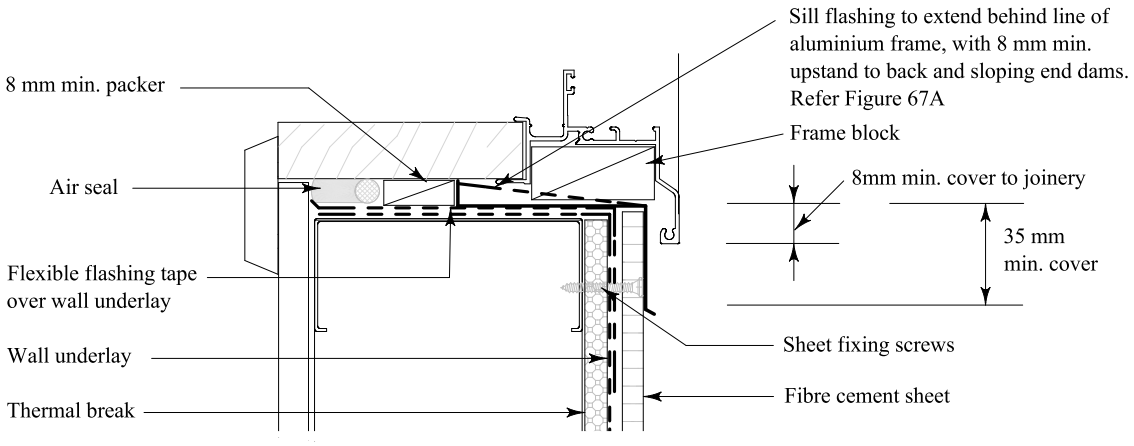


Figure 106: **Windows and doors for direct fixed fibre cement sheet**
Paragraphs 9.7.6

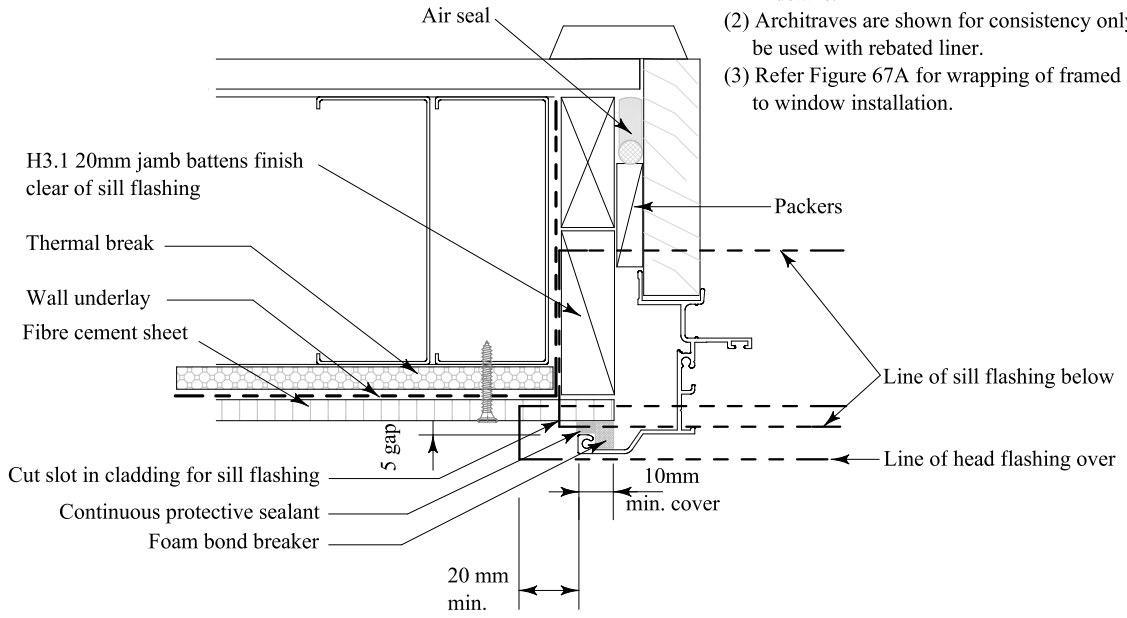


(a) HEAD



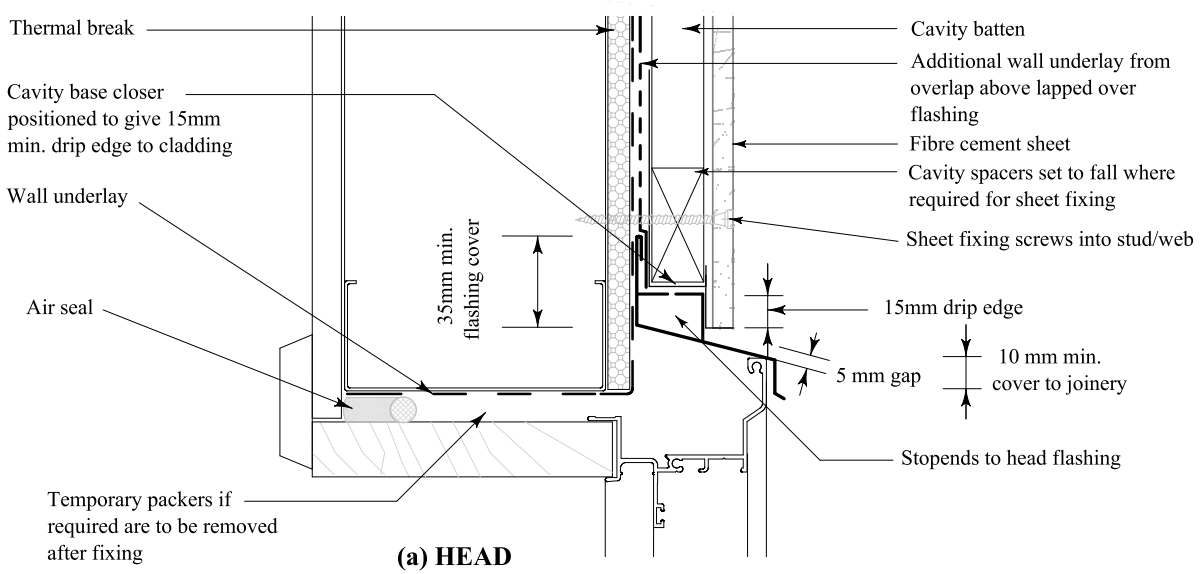
(b) SILL

NOTE:
(1) Window profile to be selected to achieve cover shown in details.
(2) Architraves are shown for consistency only, detail may be used with rebated liner.
(3) Refer Figure 67A for wrapping of framed opening prior to window installation.

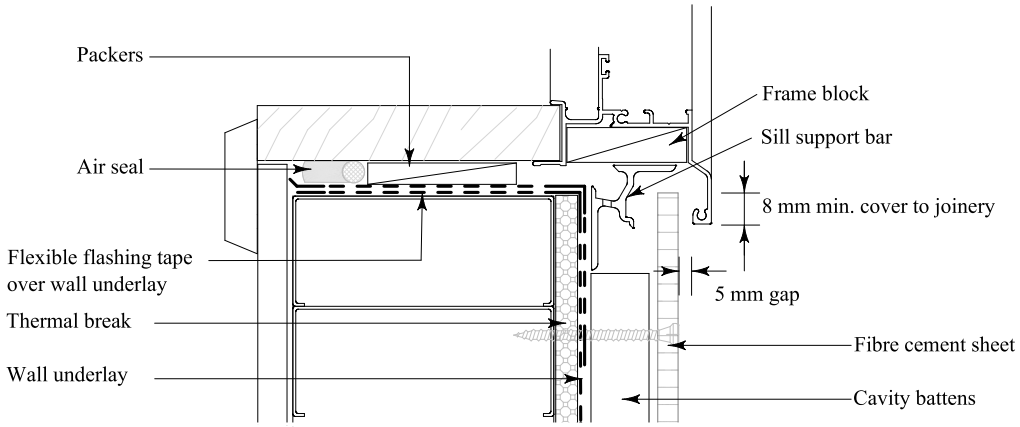


(c) JAMB

Figure 107: **Windows and doors for fibre cement sheet and flush-finished fibre cement on cavity**
Paragraphs 9.7.6

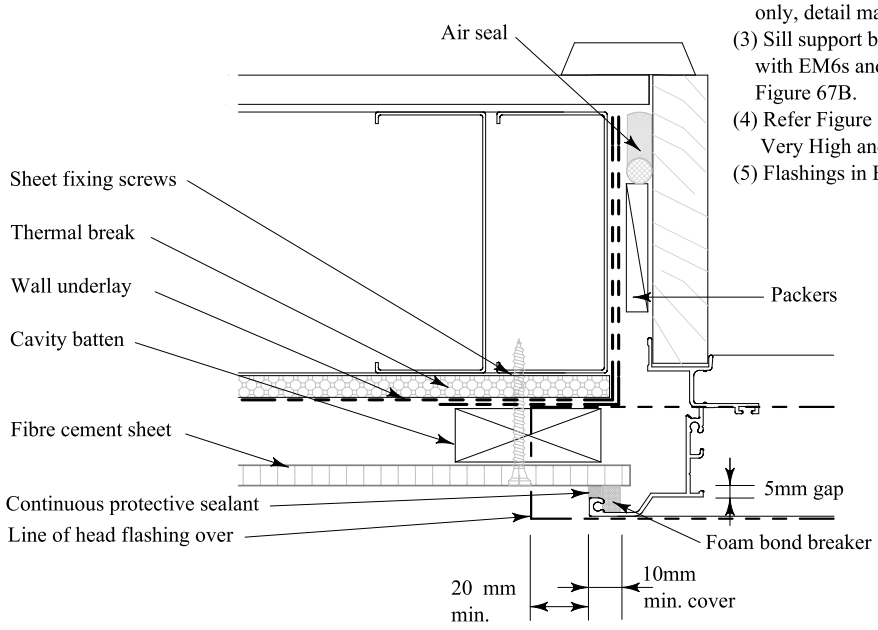


(a) HEAD



(b) SILL

NOTE:
(1) Window profile to be selected to achieve cover shown in details.
(2) Architraves are shown for consistency only, detail may be used with rebated liner.
(3) Sill support bar required conforming with EM6s and Paragraph 9.1.10.5, refer Figure 67B.
(4) Refer Figure 66 (c) for sealant at head for Very High and Extra High wind zones.
(5) Flashings in Extra High wind zone shall meet Table 7.



(c) JAMB

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).

Flush finished topped balustrades shall be wrapped, as given in Figure 108, with a waterproofing membrane and approved by the supplier of the jointing and finish system.

The membrane shall be fully protected by the coating.

The membrane 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 need not be required.

9.7.8 Decorative attachments

Where decorative attachments are used, sheets shall be sealed prior to attachment of the decorative elements.

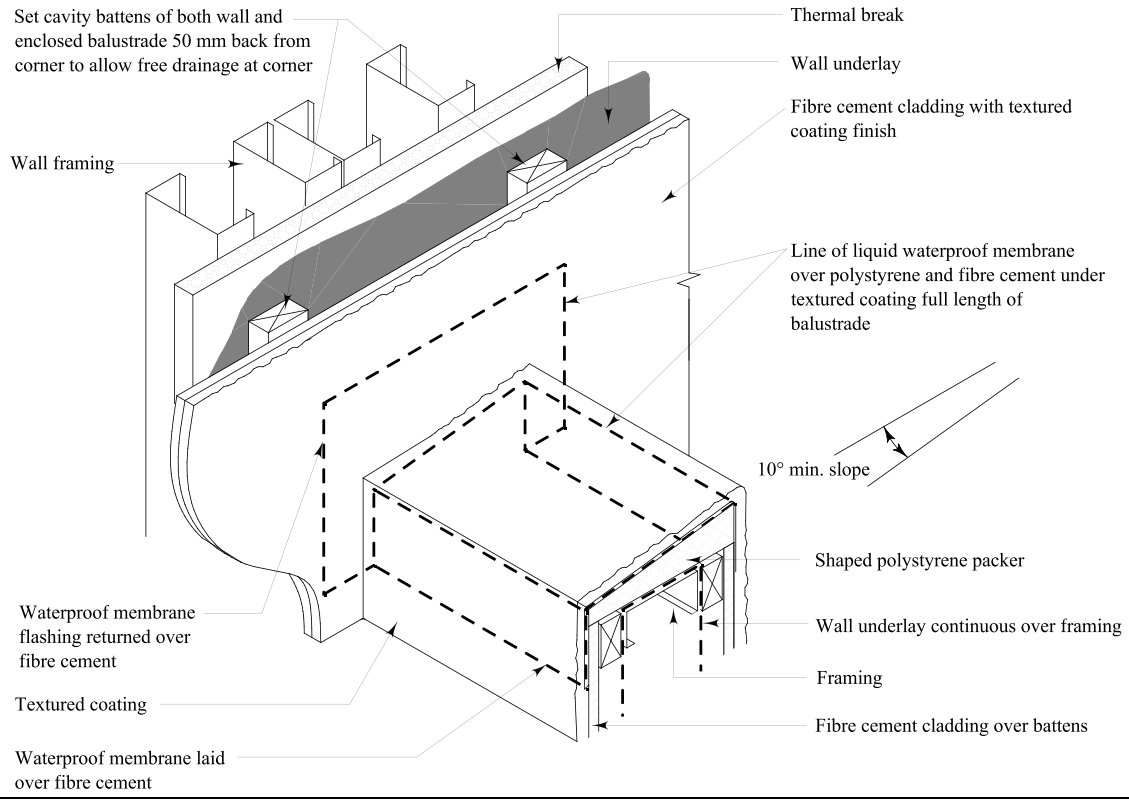
The final weatherproofing system shall be applied over decorative elements and wall cladding. Horizontal decorative elements shall have top surfaces sloped to a minimum of 10º and drip mouldings to bottom edges.

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.

Figure 108: **Enclosed balustrade to wall for fibre cement sheet**
Paragraphs 6.7 and 9.7.7.1

NOTE: (1) Refer Figure 8 and Figure 9 for details of framing and bridge over cavity.
(2) Flush finish fibre cement balustrades only permitted with cavity construction - refer 9.1.8.



9.8 Plywood sheet

Plywood sheet claddings shall be either direct fixed to framing over a thermal break and wall underlay, or fixed over a drained cavity on a thermal break and wall underlay.

The method for fixing the plywood sheet cladding shall be based on the risk score for an external wall as calculated as in accordance with 3.1 and Table 3.

9.8.1 Limitations

This Solution covers plywood panel claddings over a thermal break with vertical battened joints and flashed horizontal joints.

9.8.2 Materials

Batten-jointed panels shall have weather grooved timber battens as given in Figure 109.

Plywood panels shall be in accordance with the following:

a) manufactured to AS/NZS 2269, grade CD;
b) minimum of 5 ply;
c) minimum of 12 mm in thickness; and
d) treated as given in NZS 1604 Part 3.

9.8.3 Installation

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

COMMENT:
See 1.5 for qualification of installers.

9.8.3.1. Fixings

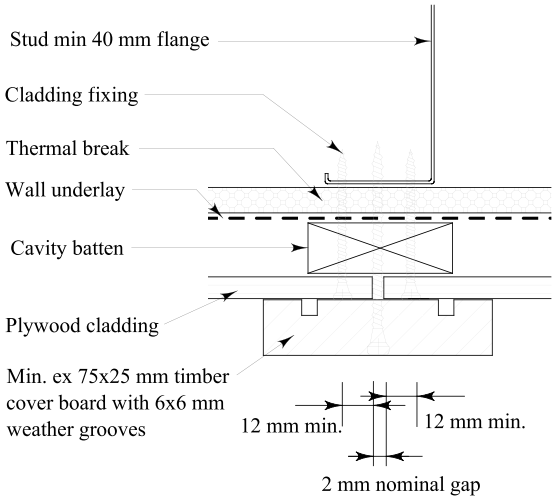
Plywood sheets shall be fixed through the wall underlay and thermal break into the wall framing with fixings as given in Table 24.

9.8.3.2. Joints

All joints shall be in accordance with the following:

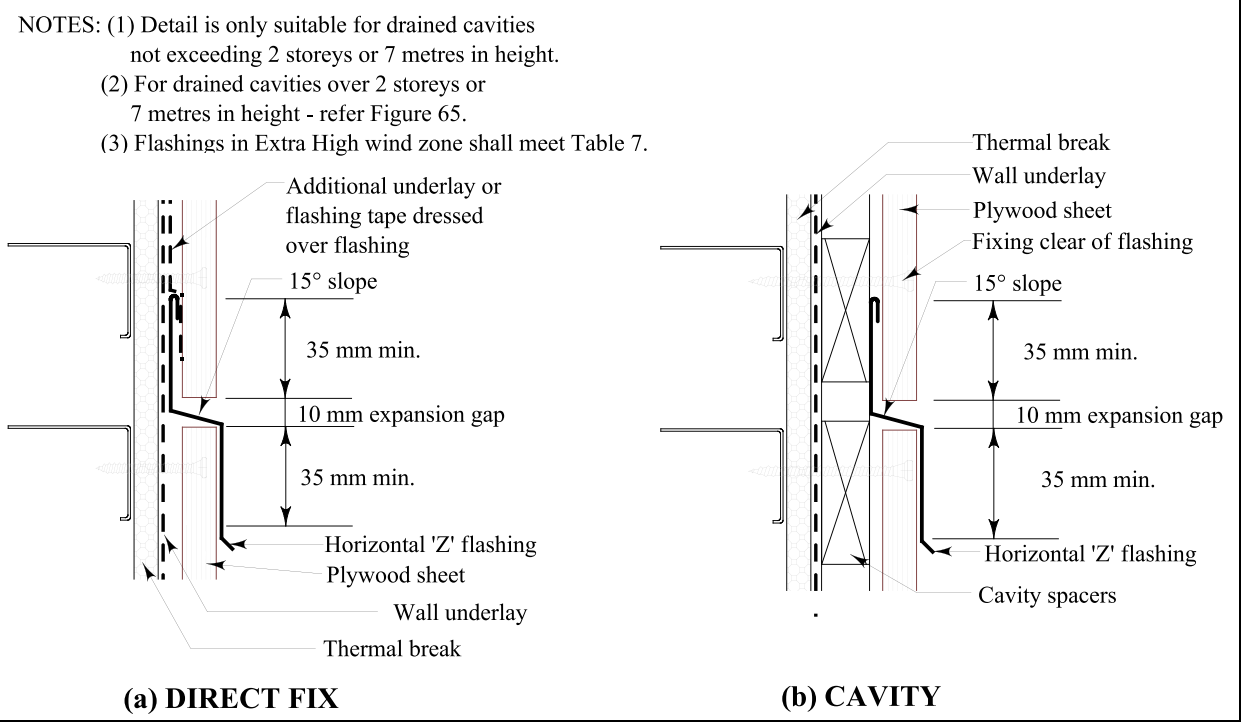
a) Be made only over supports; and
b) the following as applicable:
   i) incorporate a 10 mm expansion gap, and be fitted with a flashing if horizontal as given in Figure 110; or
   ii) battened joints if vertical joints (see Figure 109).

Figure 109: **Battened joints for plywood sheet**
Paragraphs 9.8.2 and 9.8.3.2



NOTE: Direct fixed similar

Figure 110: **Horizontal joints for plywood sheet**
Paragraphs 9.8.3.2



9.8.4 Corners

9.8.4.1. External corners

External corners shall be installed as given in Figure 111.

9.8.4.2. Internal corners

Internal corners shall be as given in Figure 112 and accordance with the following:

a) Flashings and timber battens for direct fix; or
b) Timber battens for cavity fix.

9.8.5 Flashing material

Flashings shall be metal selected in accordance with Table 20 to Table 22 and 4.3.

9.8.6 Soffit details

Soffits shall be as given in Figure 5A and 5.3.

9.8.7 Parapets and enclosed balustrades

Parapets and enclosed balustrades shall be capped with metal, butyl or EPDM membrane.

Cappings shall be in accordance with Section 4.

Parapets shall be in accordance with Section 6.

Enclosed balustrades shall be in accordance with 7.4.

9.8.8 Windows and doors

Windows and doors shall be installed in accordance with 9.1.10.

The same principles of window installation shall apply to both fibre cement and plywood sheet cladding.

9.8.8.1. Windows and doors: direct fixed

Windows and doors shall be detailed as given for fibre cement sheet cladding (see Figure 106).

9.8.8.2. Windows and doors: with cavity

Windows and doors shall be detailed as given for fibre cement sheet cladding (see Figure 107).

9.8.9 Finishes

A solution of 12.5% copper naphthenate in white spirits, or mineral turpentine, shall be brushed on to any edges cut after treatment. Avoid fresh turpentine and vapours coming into contact with thermal break material as this may cause determination of the thermal break.

Direct fixed plywood cladding used as bracing requires a minimum 50-year durability, and shall be treated to H3, painted on all edges and the outer face with a latex exterior paint system in accordance with AS 3730.7, AS 3730.8, AS 3730.9, or AS 3730.10.

COMMENT :

Plywood for cladding, treated to H3, does not require painting.

While H3 plywood can be left unpainted, it is likely to develop checking and mould growth on the surface. Plywood cladding used as bracing requires painting and regular maintenance of the paint finish to ensure the 50-year durability is achieved.

Figure 111: **External corner for plywood sheet**
Paragraphs 9.8.4.1

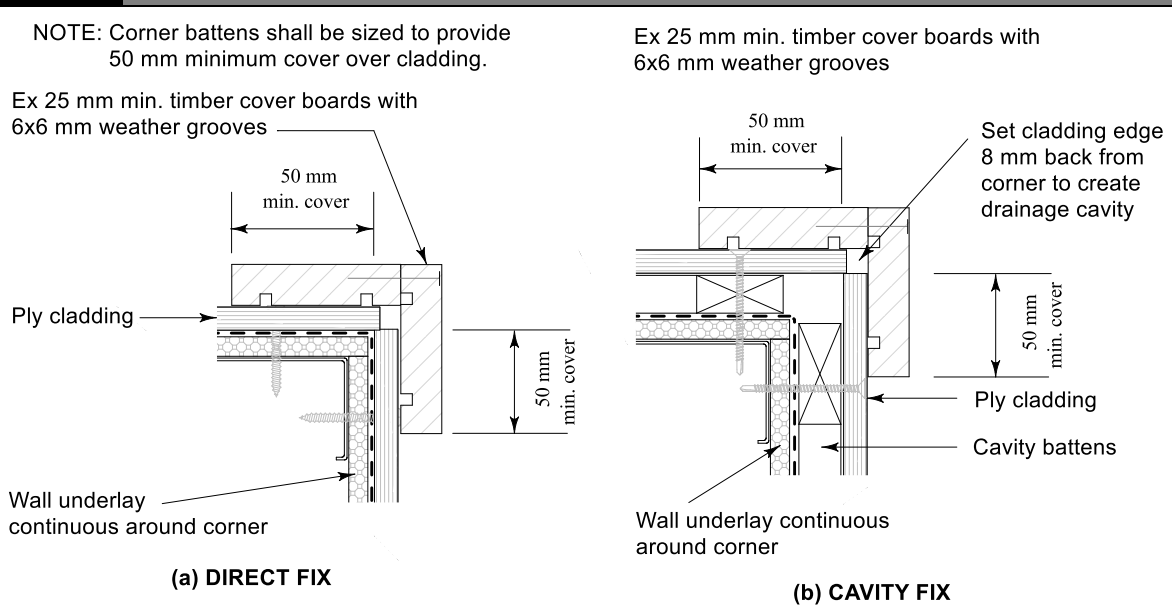
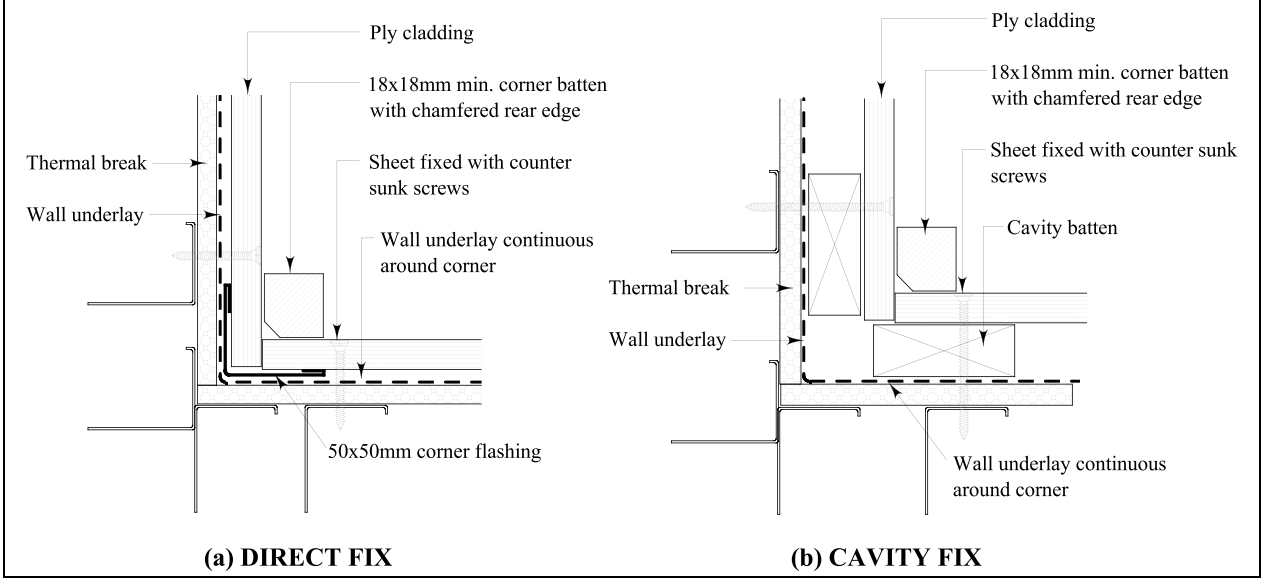


Figure 112: **Internal corners for plywood sheet**
Paragraphs 9.8.4.2



9.9 EIFS

This Solution includes 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 given in 9.1.8 and on a thermal break and wall underlay.

9.9.1 Limitations

This Solution is limited to EIFS cladding systems that are in accordance with the following:

a) Designed and tested as a total system; and
b) Not fixed so as to form a horizontal surface;
c) Not designed as a replacement for roofing; and
d) Not designed so as to allow water to pond.

9.9.2 General

EIFS cladding systems shall be installed by suitably qualified practitioners.

COMMENT :
See 1.5 for qualification of installers.

9.9.3 Materials

EIFS cladding systems shall comprise the following parts:;

a) polystyrene sheet cladding material;
b) polymer-modified cement-based plaster or a polymer-based plaster, reinforced with fibreglass mesh;
c) polymer-modified cement or polymer-based finishing plaster, and a latex exterior paint system complying with AS 3730.7, AS 3730.8, AS 3730.9, or AS 3730.10;
d) range of head, sill, jamb, corner, and base mouldings suitable for exterior use; and
e) flexible polymeric neutral cure sealant that is in accordance with the following:
    i) approved by the cladding system supplier;
    ii) complies with the following:
        1) Type F, Class 20LM or 25LM of ISO 11600; or
        2) 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 Solution.

9.9.3.1. Polystyrene sheet

Polystyrene sheets shall be a minimum of 40 mm thick and in accordance with the following:

a) Expanded polystyrene (EPS) complying with AS 1366.3, Class H or Class S; or
b) Extruded polystyrene (XPS) that complies with AS 1366.4.

9.9.3.2. Fibreglass reinforcing mesh

Fibreglass reinforcing mesh shall be alkali resistant fibreglass mesh, and in accordance with the following:

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 101.91 test No. 6.3 and ASTM E2098.

9.9.4 Installation

A wall underlay, as given in Table 23 and 9.1.5 to 9.1.7, shall be fixed to the framing.

9.9.4.1. Fixings

Polystyrene sheets shall be fixed through the cavity battens, wall underlay, and thermal break into the wall framing with fixings and spacings as given in Table 24.

Fixings shall be class 3 screws used in conjunction with a 40 mm minimum diameter plastic washer.

COMMENT :
The use of a vented cavity behind EIFS cladding means a thermal break is required to meet the performance requirement as per NZBC E3.

9.9.4.2. Joints

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

Rebated or tongued boards shall be permitted to be jointed away from solid framing 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 be located over framing.

Control joints shall be as given in Figure 113, and in accordance with the following:

a) on all walls over 20 metres long or over 7 metres high including gables;
b) at abutments to different cladding types;
c) where cladding covers different structural materials such as steel to concrete; and
d) over a movement control joint in the underlying framing.

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

9.9.4.4. Fixing blocks

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

Timber blocks shall be separated from steel framing with DPC.

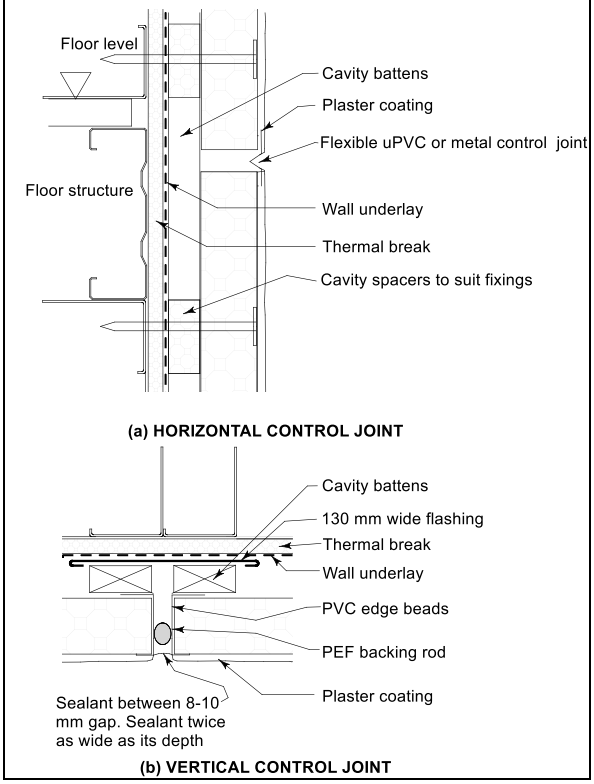
The blocks shall be selected to suit the polystyrene thickness, and fixed to framing or cavity battens.

Prior to applying the plaster basecoat, a patch shall be applied as follows:

a) Extends over the block face and overlaps the adjacent polystyrene by a minimum of 50 mm;
b) Is suitable for the direct application of the base coat, and is either:
   i) butyl-based flexible flashing tape that complies with Parts 3.2 and 4 of ICBO Acceptance Criteria AC148; or
   ii) waterproofing membrane that complies with the requirements of AS/NZS 4858 Table 8, Parts (a) to (e), except that bleach and detergent immersion as set out in Appendix A1 need 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 Solution and would require specific design**.**

Figure 113: **Control joints for EIFS**
Paragraphs 9.8.4.3



9.9.5 Battens

Cavity battens shall comply with 9.1.8.4 and be installed as given in 9.1.8.

COMMENT :
Cavity spacers should be short and sloped to prevent water being trapped by the battens and ventilation being restricted.

9.9.6 Coating

Suppliers of EIFS cladding systems shall demonstrate that their systems meet the tensile-adhesion performance requirements of ASTM E2134.

9.9.6.1. Reinforcing

The entire surface of the polystyrene sheet (including corners) shall be continuously reinforced with alkali-resistant fibreglass reinforcing mesh as given in 9.8.3.2.

9.9.6.2. Reinforcing base coat

The reinforcing base coat shall be in accordance with the following:

a) a base coat plaster at the greater of the system supplier's minimum recommended thickness or 3 mm thick, and be either
   i) polymer-modified cement-based; or
   ii) polymer-based.
b) reinforcing with an alkali-resistant fibreglass mesh (see 9.8.3.2); and
c) cover to mesh by at least 1.5 mm plaster.

9.9.6.3. Finish coats

Finish colour shall have a reflectance of 40% or more, as given in 2.6.

The finish shall be in accordance with the following:

1) One or more coats of polymer-modified cement-based plaster or polymer-based plaster;
2) One or more coats of a pre-coloured polymer-modified cement-based plaster; or
3) A pre-coloured polymer-based plaster applied according to the conditions specified by the plaster manufacturer.

Where necessary to maintain weathertightness, EIFS shall be finished with a latex exterior paint system in accordance with AS 3730.7, AS 3730.8, AS 3730.9, or AS 3730.10.

Polymer-modified cement-based plaster shall only be applied out of direct sunlight and when the temperature is between 5˚C and 30˚C, with the expectation that the temperature will be in that range for the following 24 hours.

9.9.6.4. Decorative mouldings

Decorative mouldings shall be formed from polystyrene, and be glued or mechanically fastened to ensure they remain securely attached to EIFS cladding or framing.

Where decorative mouldings are attached, the basecoat shall be applied before the moulding.

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

9.9.7 EIFS/floor slab junction

The bottom of the EIFS cladding shall be as given in Figure 114.

9.9.8 Pipes and other penetrations

All pipes and other penetrations through the EIFS shall be made weatherproof.

EIFS shall be in accordance with the following:

a) a sleeve or conduit penetrating the EIFS and sealed into the EIFS system as given in Figure 115;
b) a face-fitted flange at EIFS surface as given in Figure 63, sealed with a neutral cure sealant that complies 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.
c) pipe penetrations be installed to slope downwards to the exterior (see Figure 115 and Figure 63).

Where cables penetrate cladding, a sleeve or conduit shall be provided and sealed into the EIFS system. All wires that pass through a conduit shall be sealed into position inside the conduit.

For meter box penetrations refer to Figure 64.

Figure 114: **Bottom cladding for EIFS**
Paragraphs 9.8.7

NOTE: (1) 6 mm offset of framing to foundation is not necessary where drained cavities are used.
(2) Refer to 9.1.3 for ground clearances.

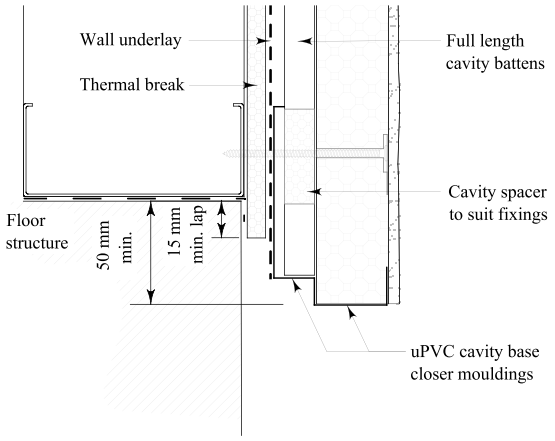
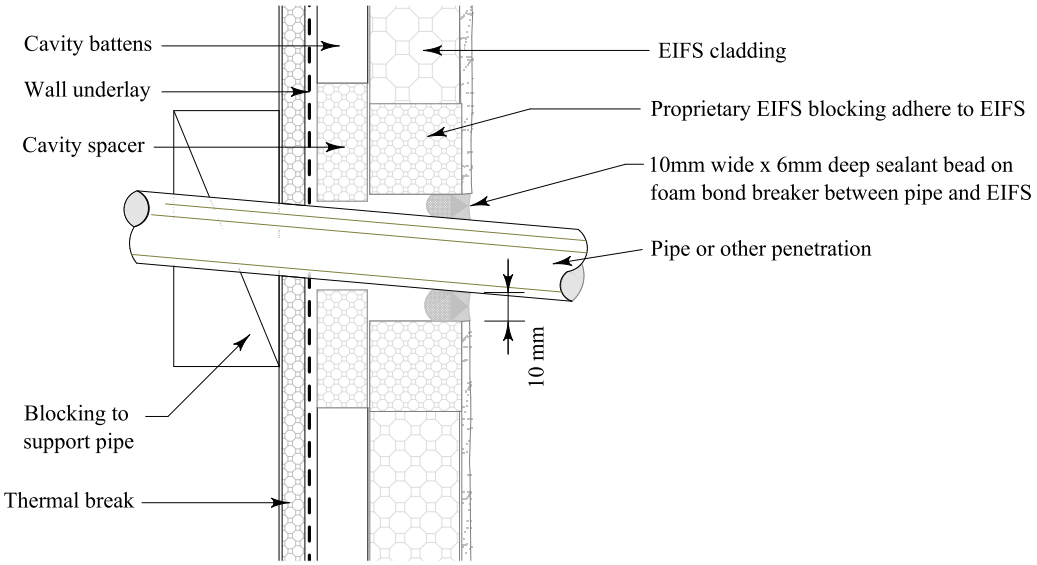


Figure 115: **Penetration for EIFS**
Paragraphs 9.8.8

NOTE: Refer Figure 63 for pipe sealing to wall underlay



9.9.9 Windows and doors

Windows and doors shall be installed in accordance with 9.1.10 and as given in Figure 13(c), Figure 116 and Figure 117.

Install uPVC three-way corner flashings at jamb/sill junctions, as given in Figure 116 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 Section 6.0.

Enclosed balustrades shall comply with 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).

Tops to enclosed balustrades shall be wrapped as given in Figure 118, with a liquid waterproofing membrane coating approved by the supplier.

The EIFS shall be in accordance with the following:

a) be fully protected by the waterproof coating,
b) 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 need not be required.

9.9.10.2. Metal cappings

Metal cappings shall comply with the requirements of 6.4, and be as given in Figure 119.

Where a parapet or an enclosed balustrade meets EIFS wall cladding, a saddle flashing shall be used, as given in Figure 9.

Figure 116: **Window and door corner flashing for EIFS**
Paragraphs 9.8.9

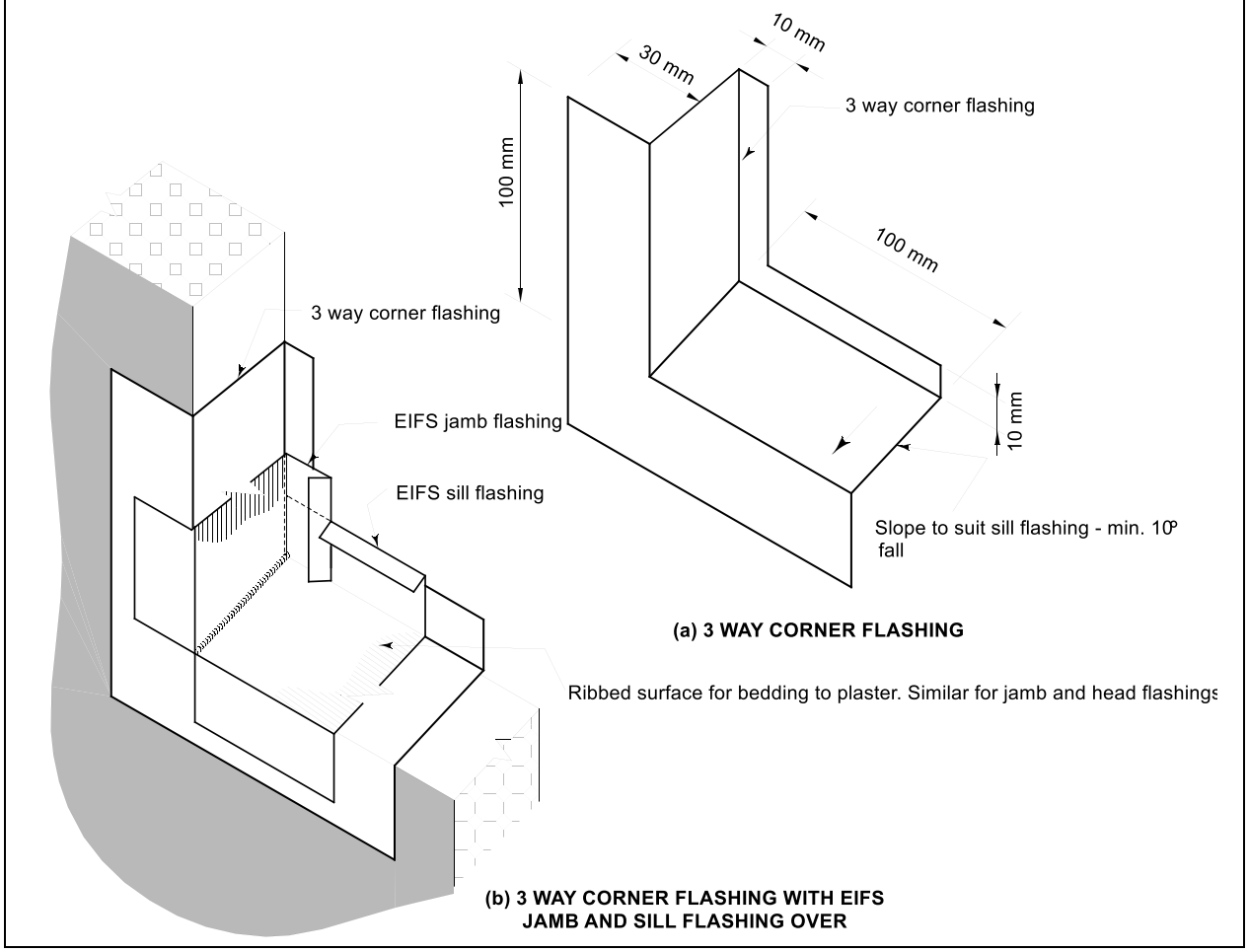
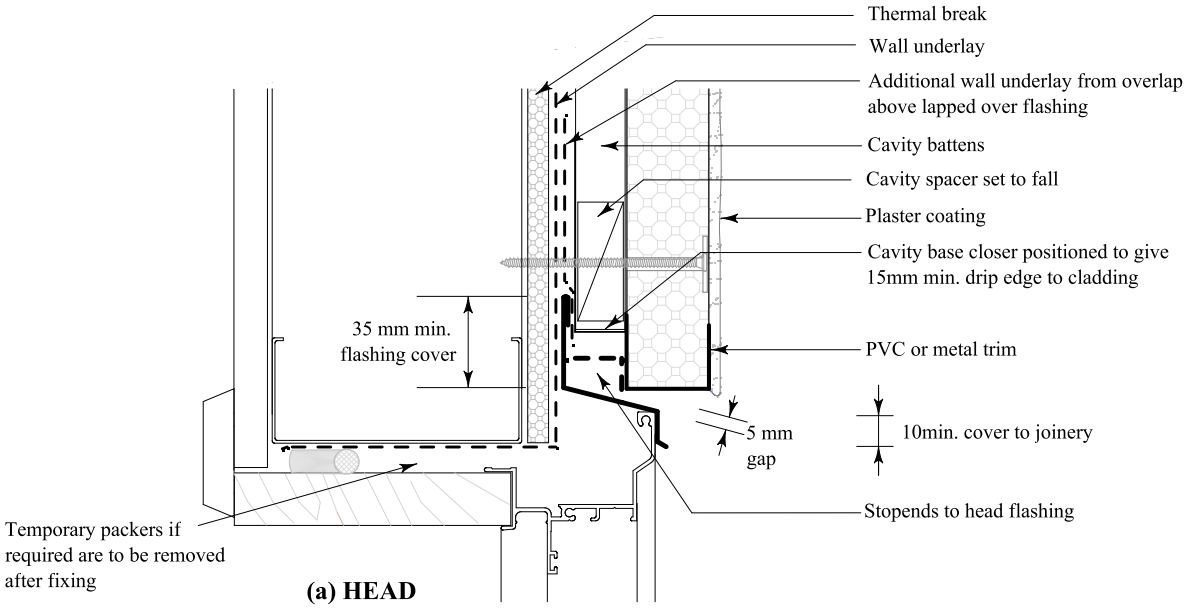
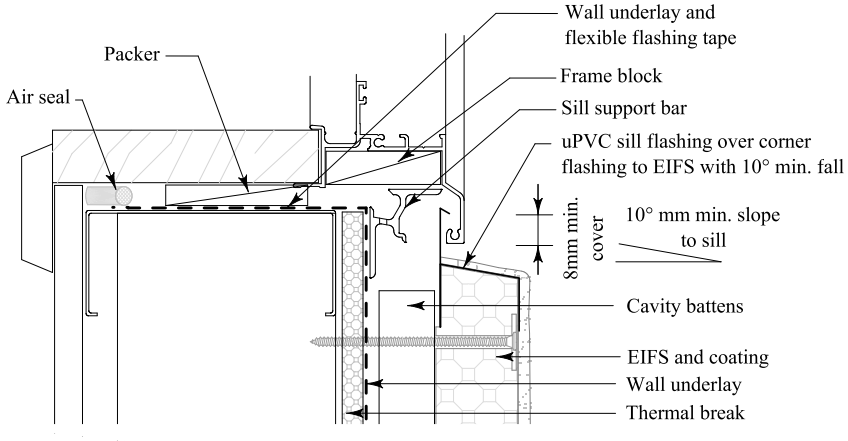


Figure 117: **Window and door in EIFS**
Paragraphs 9.9.9

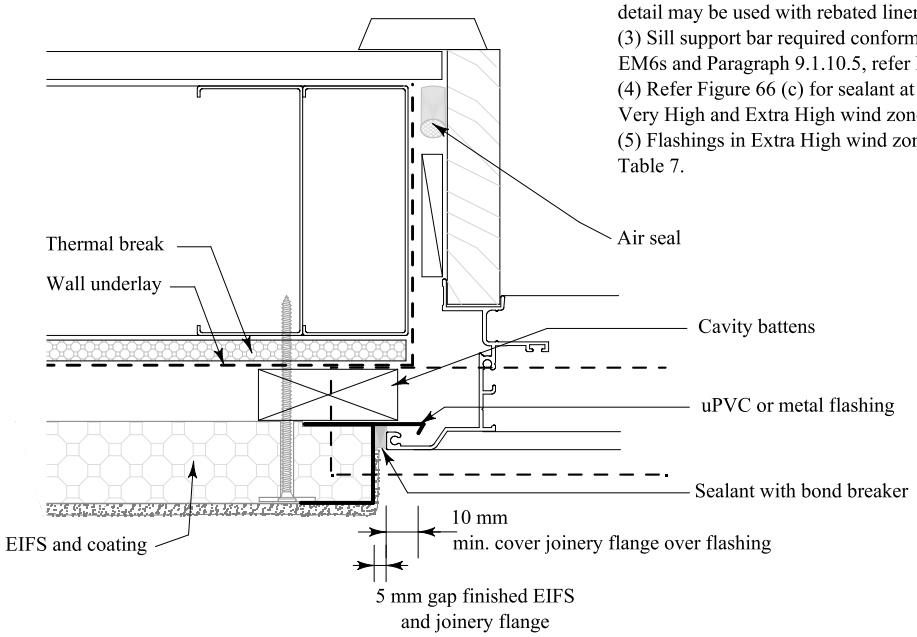


(a) HEAD



(b) SILL

NOTE:
(1) Window profile to be selected to achieve cover shown in details.
(2) Architraves are shown for consistency only, detail may be used with rebated liner.
(3) Sill support bar required conforming with EM6s and Paragraph 9.1.10.5, refer Figure 67B.
(4) Refer Figure 66 (c) for sealant at head for Very High and Extra High wind zones.
(5) Flashings in Extra High wind zone shall meet Table 7.



(c) JAMB

Figure 118: Enclosed balustrade-to-wall junction for EIFS
Paragraphs 6.6 and 9.9.10.1

NOTE: (1) Refer Figure 8 for framing, flexible flashing tape and bridge over drained cavity.

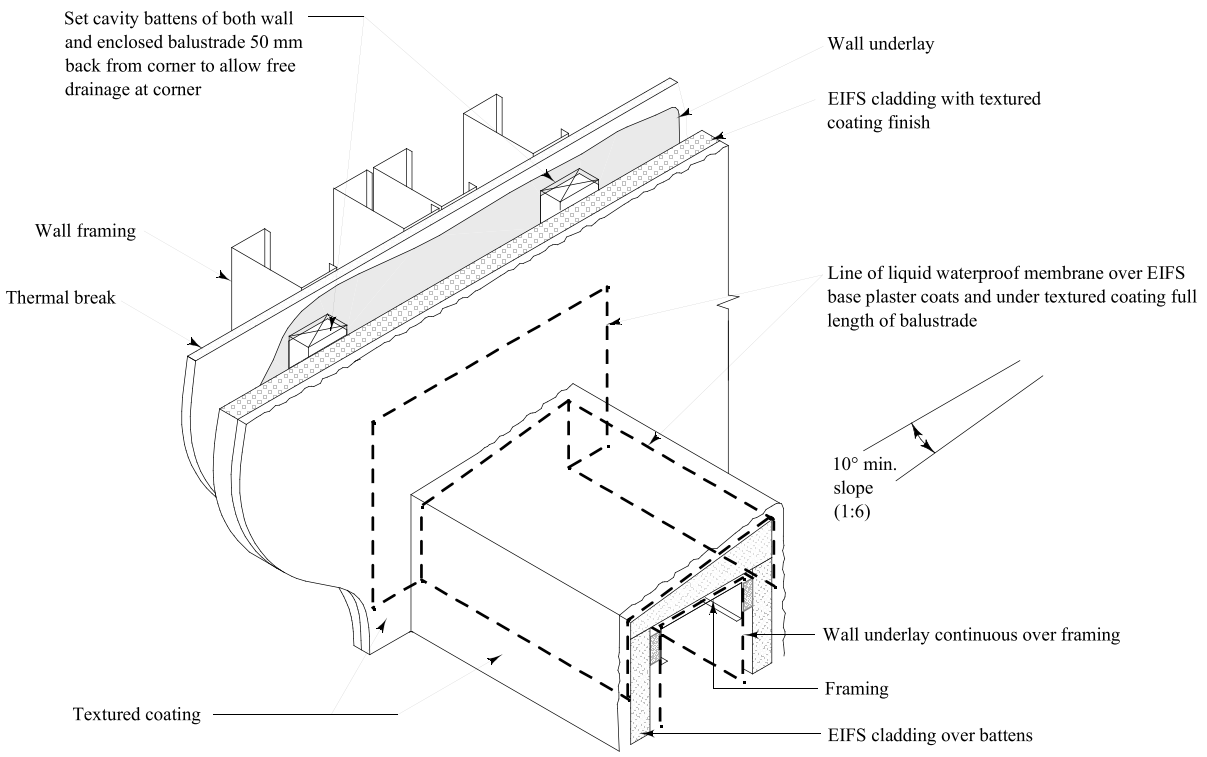
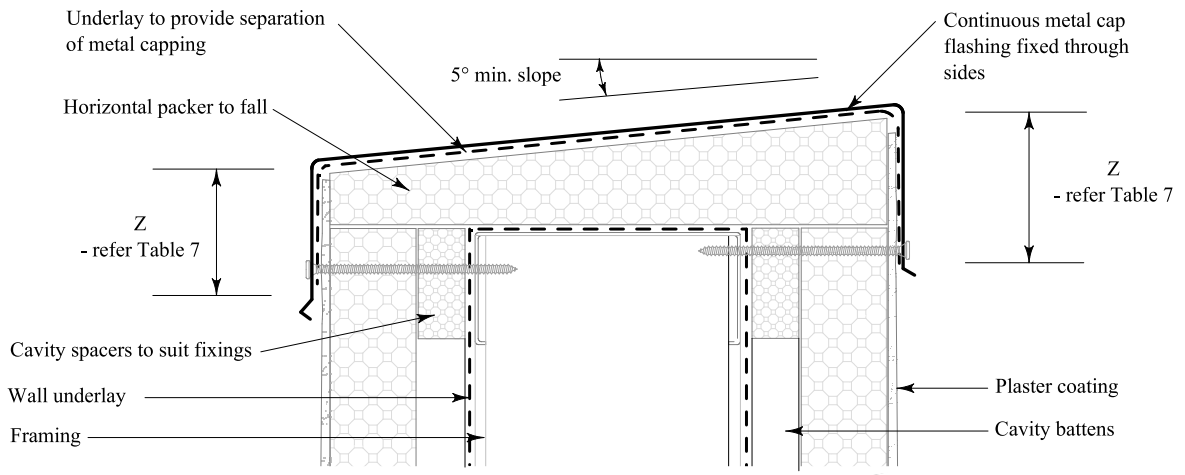


Figure 119: Parapet with metal capping for EIFS
Paragraphs 9.9.10.2



10.0 CONSTRUCTION MOISTURE

10.1 Moisture in materials

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

Construction moisture includes the moisture contained in:

a) Materials that have been exposed to the weather, or
b) Concrete, mortar or plaster that is not completely cured.

Steel framing does not contain moisture, however any accumulated moisture in plates or door and window heads from weather during construction shall be dried prior to internal lining taking place.

10.2 Maximum acceptable moisture content

The maximum moisture content shall be in accordance with the following:

a) For timber weatherboards and exterior joinery, 20% at the time of painting;
b) For reconstituted wood products, 18% at all times; and
c) For concrete floors, sufficiently dry to give a relative humidity reading of less than 75% at the time of laying fixed floor coverings.

10.3 Framing separation

Steel framing shall be separated from concrete and copper based treated timber with a layer of DPC

10.4 Measuring moisture content

Measurement shall be made in accordance with BRANZ Bulletin 585: 2015 Measuring moisture in timber and concrete.

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, 4.1.2, 4.2.3, 4.2.4, 4.2.8, 4.2.10, 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				
	Exposure(1)(2)(4)(6)		**Acceptable Exposure Zones as per NZS 3604 – Section 4 (3)(4)(6)**		
	NOTE: Consider all walls as 'Sheltered' for steel based claddings(8)			15 years	50 years for hidden elements(2)(9)
Material			**Type**		
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	
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	
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	
Pressed metal tiles aluminium-zinc and factory painted as per paragraph 8.3.4.2	Exposed		Type 6	B,C,D,E	
	Sheltered		Type 6	B,C,D	
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	Hidden (5)(9)	Class 3 (11)		B,C,D,E (3)(4)	B,C,D,E
	Exposed	Class 4 (11)		B,C,D	
	Sheltered	Class 4 (11)		B,C	

Table 20: **Material selection - continued**

Note:

1) Refer to manufacturer's information for maintenance requirements in Exposed and Sheltered locations.

2) The term "hidden" means concealed behind another element such that no part is visible. Hidden elements require a 50 year durability under the NZBC. See also the Comment at Paragraph 4.2 for further information on the durability of flashings that are partially hidden. The term "exposed" means having surfaces exposed to rain washing. The term 'sheltered' means being visible, but not rain washed. For diagrammatic outline, refer NZS 3604 Figure 4.3(a). Exposed and sheltered elements require a 15 year durability. Where an element can be categorised as both 'sheltered' and 'exposed', the 'sheltered' condition will apply.

3) AS/NZS 2728 lists atmospheric classes derived from ISO 9223 for Australia and New Zealand, determined by exposure to wind-driven sea-spray. NZS 3604 references atmospheric classes B (Low), C (Medium) and D (High). E2/AS1 references atmospheric zones B,C,D,E. For the purposes of cladding selection, Zone E (Severe marine classified as breaking surf beach fronts) has been included. Designers should consult metal supplier's information for specific durability requirements of sites in Zone E.

4) The geographic limits of atmospheric classes in NZS 3604 and AS/NZS 2728 may vary. Table 20 uses the limits outlined in NZS 3604.

5) Includes fixings protected by putty and an exterior paint system of primer, undercoat and two top coats of paint.

6) Microclimates based on evidence from adjacent structures of corrosion caused by industrial or geothermal atmospheres are outside the scope of this Solution.

7) Refer to Tables 21 and 22 for compatibility of fixings with metal claddings.

8) Roof only. Coated steel wall claddings should be considered as 'sheltered'.

9) Hidden steel coated elements in ventilated cavities in zones D and E (exposure to salt air) should be considered as 'sheltered'. Refer also to Note 2 above.

10) 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.

11) Screws shall comply with AS 3566.2 -2002.

Table 21: Compatibility of materials in contact

This Table shall be read in conjunction with Table 20 and Table 22

Refer relevant cladding and flashings paragraphs for material and coating specifications Paragraphs 2.2, 4.2.2, 4.5.2, 8.2.4, 8.4.11, 8.4.11.1 and 9.6.7

	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)	Brass	Glass	Glazed roof tiles	Lead (including lead-edged) unpainted	Plastics	Stainless steel	Steel, galvanized coil-coated	Steel, galvanized (unpainted)	Zinc	Zinc/aluminium coated (1)	Zinc/aluminium, (unpainted)
Aluminium, anodised or mill-finish	✓	✓	✓	✗	✓	✗	✗	✗	✓	✗	✗	✓	✓	✗	✓	B	✓	✓	✓	✓	✓
Aluminium, coated (1)	✓	✓	✓	B	✓	✗	✗	✗	✓	✗	✗	✓	✓	B	✓	B	✓	✓	✓	✓	✓
Butyl rubber & EDPM	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CCA-treated timber (2)	✗	B	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	B	✗	✗	B	✗
Cedar	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✗
Cement plaster (uncoated)	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✗
Ceramic tiles (cement grout)	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗
Clay bricks (cement mortar)	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗
Concrete old (unpainted)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Concrete green (unpainted)	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✗	✗	✗	✗	✗
Brass	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	B	✓	B	✗	✗	✗	✗	✗
Glass	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Glazed roof tiles	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Lead (including lead- edged) unpainted	✗	B	✓	✓	✓	✗	✓	✓	✓	✗	B	✓	✓	✓	✓	B	B	B	B	B	✗
Plastics	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Stainless steel	B	B	✓	✓	✓	✓	✓	✓	✓	✓	B	✓	✓	B	✓	✓	B	✗	✗	B	B
Steel, galvanised coil-coated (Steel framing)	✓	✓	✓	B	✓	✓	✓	✓	✓	✗	✗	✓	✓	B	✓	B	✓	✓	✓	✓	✓
Steel, galvanized (unpainted)	✓	✓	✓	✗	✗	✓	✓	✓	✓	✗	✗	✓	✓	B	✓	✗	✓	✓	✓	✓	✓
Zinc	✓	✓	✓	✗	✗	✓	✓	✓	✓	✗	✗	✓	✓	B	✓	✗	✓	✓	✓	✓	✓
Zinc/aluminium, coated (1)	✓	✓	✓	B	✓	✓	✓	✓	✓	✗	✗	✓	✓	B	✓	B	✓	✓	✓	✓	✓
Zinc/aluminium (unpainted)	✓	✓	✓	✗	✗	✗	✗	✗	✓	✗	✗	✓	✓	✗	✓	B	✓	✓	✓	✓	✓

LEGEND:

✓ Materials satisfactory in contact.

✗ Contact between materials is not permitted. Minimum gap of 5 mm is required to prevent moisture bridging.

B Avoid contact in sea-spray zone or corrosion zone D.

NOTES:

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

(2) Includes copper azole and copper quaternary salts.

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, 4.4, 8.2.4, 8.4.3 and 9.8.5

Materials that Water flows onto / Materials 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)	Brass	Glass	Glazed roof tiles	Lead (including lead-edged) unpainted	Plastics	Stainless steel	Steel, galvanized 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	✓	✗	✓	✓	✗	✗	✗	✗	✗
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.

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) [3]				NZS 2295: 2006 section 2 No minimum Absorbency requirement		
	Direct fixed non-absorbent claddings				NZS 2295: 2006 section 2 No minimum Absorbency 100 g/m2 tested to NZS 2295		
Rigid Wall Underlay (for plywood[5])	Wall claddings over a cavity[6] Direct fixed absorbent wall claddings (eg timber, fibre cement etc)	≤ 7 MN s/g ASTM E96 B.		≥ 20mm NZS 2295			
	Direct fixed non-absorbent claddings[6]	≤ 7 MN s/g ASTM E96 B.	≥ 100 g/m2 AS/NZS 4201:Part 6	≥ 20mm 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 (3) NZS 2295	≥ 20mm 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. Refer 8.1.5
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 AS/NZS 1604.3
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.

Table 24:	**Fixing selection for wall claddings** Minimum fixings for non-structural claddings shall be class 3 for climate zones B, C and D (as outlined in NZS 3604) **Comment:** Some Manufacturers may require more durable fixings than those specified below to maintain product warranties. Paragraphs: 9.4.4.3, 9.4.5.2, 9.5.3.1, 9.7.2.1, 9.8.3.1, 9.9.4.1 and Table 18B

Joint	Gauge x length (mm) and type	Minimum framing penetration	Fixing pattern	Requirements
Cavity battens				
Battens to framing	NA	NA	NA	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.
Stucco Plaster				
Rigid backing to batten	8g x 32 button head drill point 8g x 32 button head needle point or equivalent	3 threads	150mm centres to sides and 300mm centres in middle	
Metal lath to framing	10 x 45 wing drill point or equivalent	3 threads	150mm centres	
Fibre cement weatherboards				
Weatherboard DIRECT FIXED	6g x 50 Csk wing drill point 10g x 45 Csk wing drill point or equivalent	3 threads	Single fixing 20mm above lower board, through both thicknesses	
Weatherboard OVER CAVITY	6g x 75 Csk wing drill point 10g x 75 Csk wing drill point or equivalent	3 threads	As above	
Timber weatherboards: paint finish **DIRECT FIXED**				
Horizontal bevel back	6g x 50 Csk wing drill point 10g x 45 Csk wing tek or equivalent	3 threads	Single fixing 10mm above top of lower board	
Horizontal rebated bevel-back	as above	3 threads	as above	
Horizontal rusticated	as above	3 threads	as above	
Vertical shiplap	as above	3 threads	Single fixing 10 mm from side lap (40 mm) from edge of board	Nogs at maximum 480 mm centres
Board and batten: board	6g x 75 Csk wing drill point 10g x 75 Csk wing drill point or equivalent	3 threads	Single fixing in centre	as above
Board and batten: batten	6g x 75 Csk wing drill point 10g x 75 Csk wing drill point or equivalent	3 threads	Single fixing in centre of batten	as above
Timber weatherboards: paint finish **OVER CAVITY**				
Horizontal bevel – back	6g x 75 Csk wing drill point 10g x 75 Csk wing drill point or equivalent	3 threads	Single fixing 10 mm above top of lower board	
Horizontal rebated bevel –back	6g x 75 Csk wing drill point 10g x 75 Csk wing drill point or equivalent	3 threads	as above	
Horizontal rusticated	6g x 75 Csk wing drill point 10g x 75 Csk wing drill point or equivalent	3 threads	as above	

NOTE: Fastener lengths are designed for minimum penetration of framing. If thickness of the batten or cladding is varied, length shall be adjusted accordingly.

Table 24:	Fixing selection for wall claddings (continued)			
Joint	**Gauge x length (mm) and type**	**Minimum framing penetration**	**Fixing pattern**	**Requirements**
Timber weatherboards: stained or bare finish DIRECT FIXED				
Horizontal bevel – back	6g x 50 Csk wing drill point 10g x 45 Csk wing drill point or equivalent	3 threads	Single fixing 10mm above top of lower board	
Horizontal rebated bevel-back	6g x 50 Csk wing drill point 10g x 45 Csk wing drill point or equivalent	3 threads	as above	
Horizontal rusticated	6g x 50 Csk wing drill point 10g x 45 Csk wing drill point or equivalent	3 threads	as above	
Vertical shiplap	6g x 50 Csk wing drill point 10g x 45 Csk wing drill point or equivalent	3 threads	Single fixing 10mm from side lap (40 mm) from edge of board	Nogs at maximum 480 mm centres
Board and batten: board	6g x 75 Csk wing drill point 10g x 75 Csk wing drill point or equivalent 6g x 85 Csk wing drill point	3 threads	Single fixing in centre	as above
Board and batten: batten	10g x 85 Csk wing drill point or equivalent	3 threads	Single fixing in centre of batten	as above
Timber weatherboards: stained or bare finish OVER CAVITY				
Horizontal bevel – back	6g x 75 Csk wing drill point 10g x 75 Csk wing drill point or equivalent	3 threads	Single fixing 10mm above top of lower board	
Horizontal rebated bevel-back	6g x 75 Csk wing drill point 10g x 75 Csk wing drill point or equivalent	3 threads	As above	
Horizontal rusticated	6g x 75 Csk wing drill point 10g x 75 Csk wing drill point or equivalent	3 threads	As above	
Vertical profiled metal: DIRECT FIXED			**Refer 9.6.6**	
Horizontal profiled metal: OVER CAVITY			**Refer 9.6.6**	
Plywood sheet: DIRECT FIXED				
Plywood	6g x 50 Csk wing drill point 10g x 45 Csk wing drill point or equivalent	3 threads	150 mm centres to sides, 300 mm centres in middle	
Cover batten	6g x 75 Csk wing drill point or equivalent	3 threads	300 mm centres in centre of batten	
Plywood sheet: OVER CAVITY				
Plywood	6g x 75 Csk wing drill point 10g x 75 Csk wing drill point or equivalent	3 threads	150 mm centres to sides, 300 mm centres in middle	
Cover batten	6g x 75 Csk wing drill point or equivalent	3 threads	300 mm centres in centre of batten	
NOTE: Fastener lengths are designed for minimum penetration of framing. If thickness of the batten or cladding is varied, fastener length shall be adjusted accordingly.				

Table 24:	Fixing selection for wall claddings (continued)			
Joint	**Gauge x length (mm) and type**	**Minimum framing penetration**	**Fixing pattern**	**Requirements**
Plywood sheet: stained or bare finish DIRECT FIXED				
Fibre cement sheet: joints expressed DIRECT FIXED				
Sheet	8g x 50 Csk wing drill point 10g x 45 Csk wing drill point or equivalent	3 threads	150 mm centres to sides, 300 mm centres in middle	
External cover batten	10g x 45 Csk wing drill point or equivalent	3 threads	Single fixing in centre of batten	
Fibre cement sheet: joints expressed OVER CAVITY				
Sheet	8g x 75 Csk wing drill point 10g x 75 Csk wing drill point or equivalent	3 threads	150 mm centres to sides, 300 mm centres in middle	
External cover batten	10g x 75 Csk wing drill point or equivalent	To cavity battens only	Single fixing in centre of batten	
Fibre cement sheet: flush finish				
Sheet DIRECT FIXED	8g x 50 Csk wing drill point 10g x 45 Csk wing drill point or equivalent	3 threads	150 mm centres to sides, 300 mm centres in middle	
Sheet OVER CAVITY	8g x 75 Csk wing drill point 10g x 75 Csk wing point or equivalent	3 threads	as above	
EIFS				
40 mm polystyrene sheet OVER CAVITY	8g x 90 drill point 10g x 90 drill point or equivalent	3 threads	as above with 40mm plastic washer on external corner fixings	
NOTE: Fastener lengths are designed for minimum penetration of framing. If thickness of the batten or cladding is varied, fastener length shall be adjusted accordingly.				

11.0 THERMAL BREAKS

11.1 General

Thermal breaks shall be applied to all steel framing members that are on the outer face of the wall.

A thermal break shall be applied to the heal of all steel truss members.

A thermal break shall be applied to all steel rafter members.

Thermal breaks shall meet the requirements of the NZBC Clause E3.3.1

Claddings fitted over a cavity cannot be treated as a thermal break.

COMMENT:.
Claddings fitted over a cavity allow ventilation in the cavity that expose the steel framing to external temperatures.

A thermal break shall be provided between the heel of each truss and the wall top plate.

Skillion roof framing shall have a thermal break strip fitted to the outer side of the framing including on the end at the soffit and to the underside of the soffit overhang.

Thermal breaks shall be fixed to the framing by glue, screws, staples or gun nails in a manner suitable to hold the material in place until the wall underlay, cavity battens (where required see Table 3) or roof battens and cladding or roofing are fixed to the building.

COMMENT:
The cladding fixings will penetrate through the thermal break and hold them permanently in place.
Thermal breaks reduce the effects of thermal bridging. Thermal bridging occurs where there is a high heat conductance path. In light steel wall framing this occurs anywhere steel members penetrate through the insulation such as at studs, nogs, bottom plates, and top plates. These members can allow heat to move from the warmer interior to the colder exterior through the steel, by-passing any insulation placed between them. This leads to localised cold areas over the framing on the interior face. If the surface temperature were to fall below the internal dew point, condensation could form on these cold bridges. As well as the possibility of condensation, thermal bridges will also significantly reduce wall R-values.

11.2 Thermal break R-value and density

The minimum thermal break required to meet the requirements of NZBC E3 (Internal Moisture) in all NZBC H1 Climate Zones is R 0.25m^2K/W.

COMMENT:
10mm XPS polystyrene and 10mm HD EPS polystyrene are products that meet this requirement.
Thermal breaks are shown in Figures as sheets however they may be in strip form.

The minimum density of a thermal break shall be 34kg/m^3 when installed behind a sill support bar.

11.3 Durability

The durability of the thermal break shall be equivalent to that required to meet the NZBC relating to its location within the building.

Thermal breaks are required to be placed at different locations depending on the building design:

Thermal breaks shall be in accordance with the following:

a) 50 years durability for the following:
   i) behind brick cladding,
   ii) all thermal break packers,
   iii) any application where thermal break is used between load bearing structural framing members.
b) 15 year durability in all other applications not included where 50 year durability is required.

11.4 Construction

11.4.1 Wall construction

This includes studs, bottom and top plates, nogs. braces, lintels and joists.

The thermal break shall extend 15mm minimum above the top plate and below the bottom plates and include the areas in soffits that may not have a cladding attached.

COMMENT:
The compressibility of thermal breaks vary and this should be considered in the design as it is possible for the cladding exterior line to be compromised and an inferior finish line may occur if the thermal break material used is too soft.

Fresh LOSP and LOSP vapour may cause polystyrene thermal breaks to melt. All LOSP, including touched-up cut-ends, should be dry and require a separation layer such as wall underlay between the treated timber and the thermal break.

Cavity battens where required shall be in accordance with Paragraph 9.1.8.4

Wall underlays shall comply with Table 23.

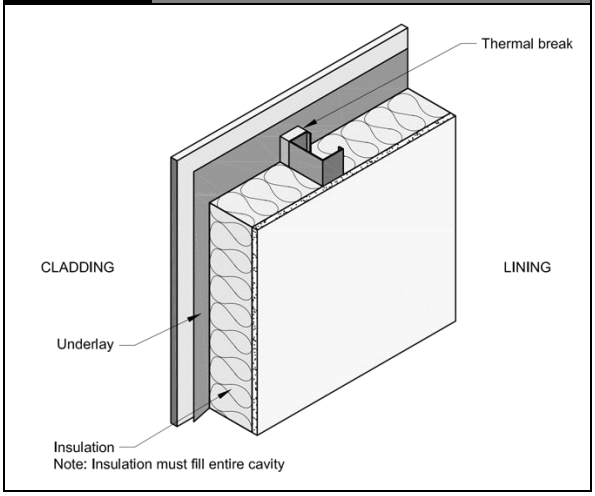
11.4.2 Direct-fixed cladding

11.4.2.1. Thermal break strips

Thermal break strips shall be no less than the width of the steel framing material they are covering and be applied to all steel framing members including, nogs, braces, lintels and joists.

At top and bottom plates thermal break strips shall be installed in accordance with 11.4.1 (see Figure 120).

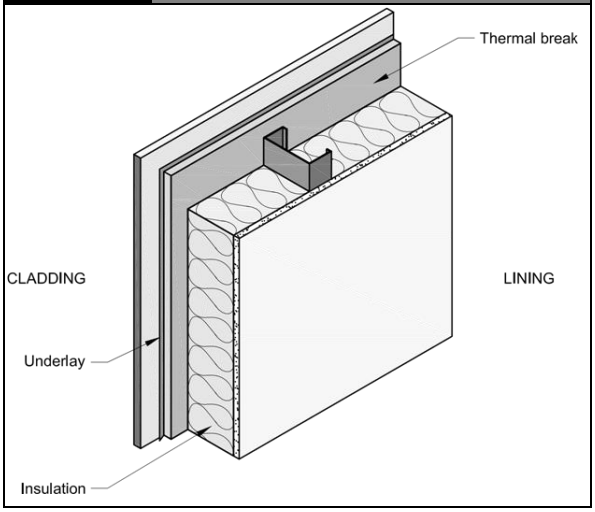
Figure 120: **Direct fix cladding. Thermal break strips** Paragraphs 11.4.3.1



11.4.2.2. Thermal break sheathing

Thermal break sheathing shall, as a minimum, cover all steel framing members and comply with 11.4.1 (see Figure 121).

Figure 121: **Direct fix cladding. Thermal break sheathing** Paragraph 11.4.3.2



11.4.3 Cladding fixed over a cavity

11.4.3.1. Cavity thermal break strips

The width of thermal break strips shall be no less than the steel framing member they are covering.

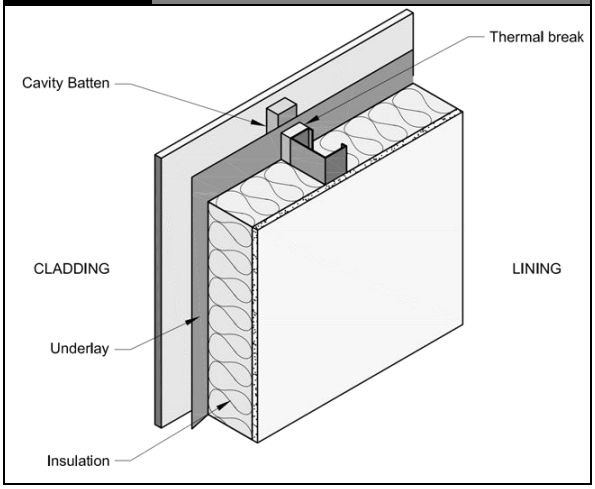
Thermal break strips shall be applied to all steel framing members including, plates, studs, nogs, braces, lintels and joists.

At top and bottom plates thermal break strips shall be installed in accordance with 11.4.1

The cavity construction shall then be created outside of the thermal break and the wall underlay installed as given in Figure 122.

The wall underlay shall be installed in accordance with 9.1.8.5

Figure 122: **Cavity over thermal break strips**
Paragraph 11.4.4.1

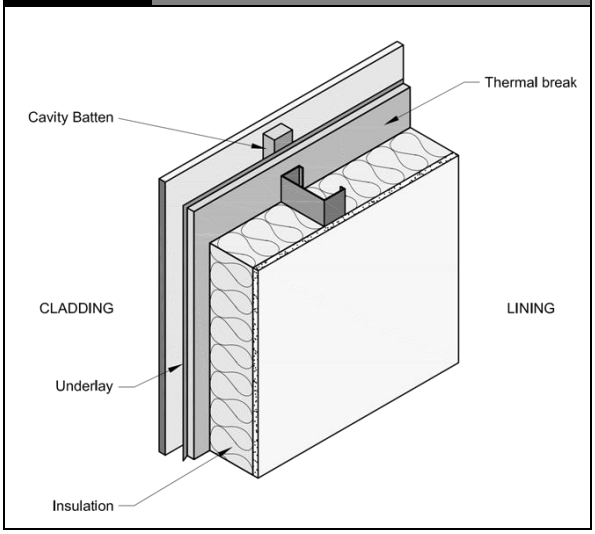


11.4.3.2.Cavity thermal break sheathing

Thermal break sheathing shall cover all steel framing members and comply with 11.4.1.

The cavity shall then be created outside the thermal break sheathing and wall underlay as given in Figure 123.

Figure 123: **Cavity over thermal break sheathing**
Paragraph 11.5.4.2



11.5 Roof Construction

11.5.1 Insulation to ceiling trussed roof

With trussed roof construction, the insulation shall run over and cover the bottom chord of the roof trusses.

COMMENT :
This is achieved by cutting insulation and fitting over the truss chord. The insulation shall be fitted closely around the truss web members and be packed into the channel section of these members. The insulation is to extend out to the edges of the roof space and cover the wall top plate.

11.5.2 Thermal break truss blocks

The thermal break truss block shall be at least as wide as the bottom chord of the truss and the depth of the wall framing (see Figure 126).

COMMENT:
These truss blocks are commonly custom made plastic packers of a thickness to match the depth of ceiling battens.

11.5.3 Skillion roof

Thermal break strips shall be fitted to the top of the skillion roof framing be 15mm wider each side of the rafter flange and also cover the end of the rafter.

A thermal break shall not be required between the top plate and the underside of the rafters (see Figure 127).

11.5.4 Gable ends

Gable ends shall be framed with a gable end truss or gable end frame.
The wall frame top plate at ceiling level shall be separated from the gable end truss, as given in Figure 128, by either:

a) Thermal break truss blocks in accordance with 11.5.2 at 1.2m min centres; or
b) Thermal break with insulation rating of R0.25m^2K/W. and a minimum density 35kg/m^3 for the full width of the gable end truss or gable end frame.

Figure 126: **Thermal breaks and insulation**
Trussed roof
Paragraph 11.5.1 and 11.5.2

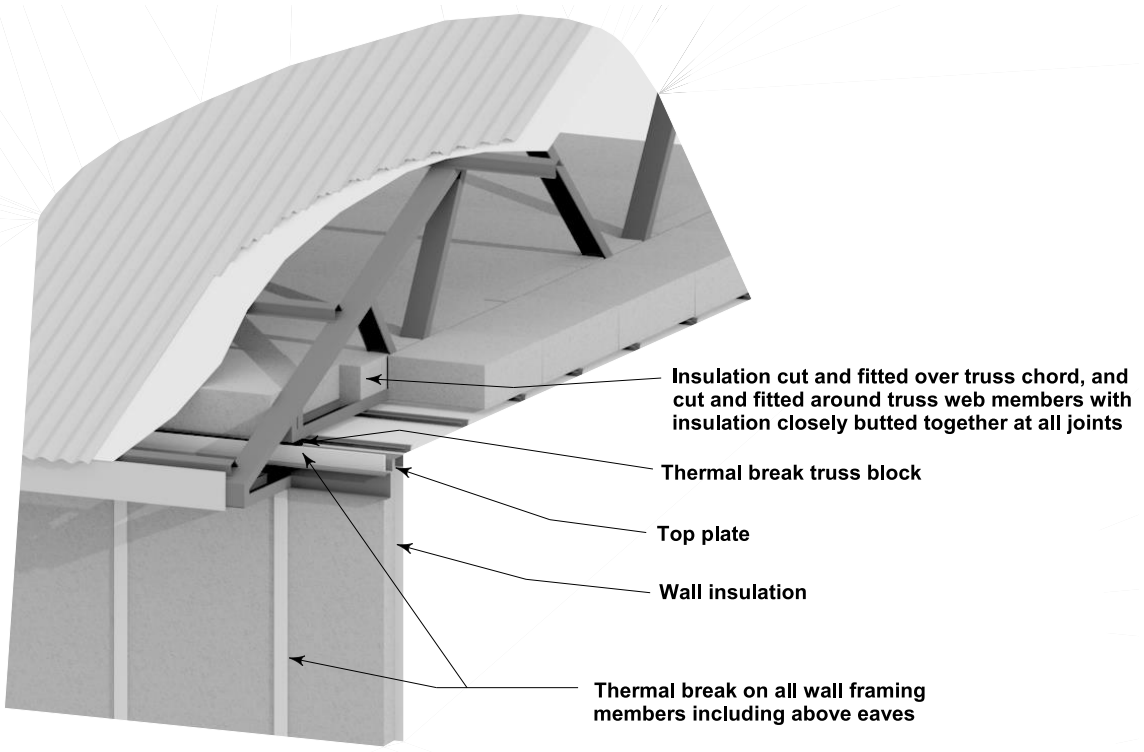


Figure 127: **Thermal breaks and insulation Skillion roof: CSection**
Paragraphs 11.5.3

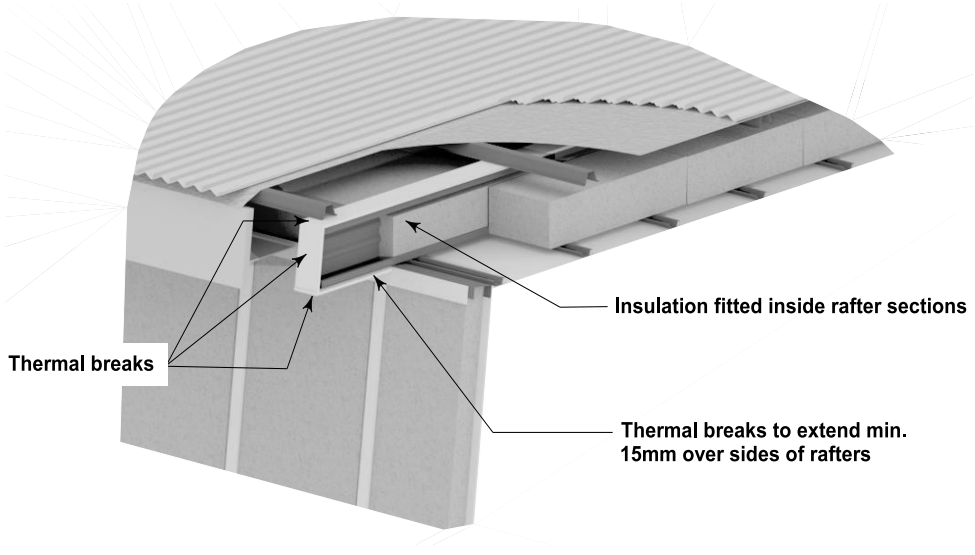
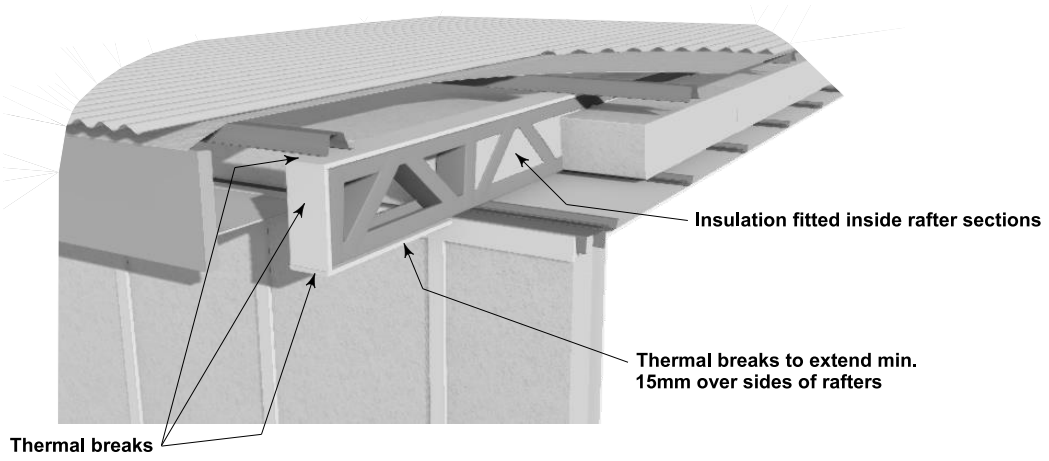
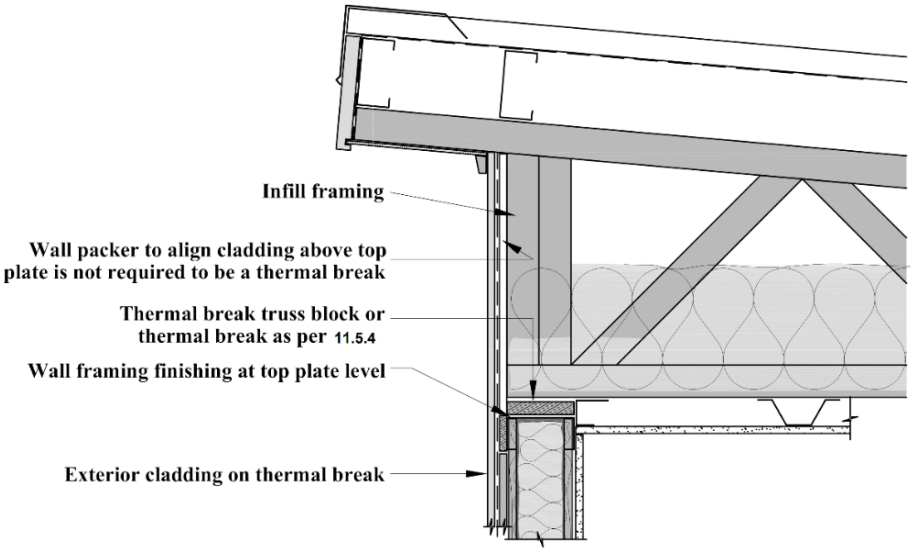


Figure 127: **Thermal breaks and insulation Skillion roof: Web rafters**
Paragraphs 11.5.3



NOTE: Web rafters with a depth greater than 300mm may be classified as trusses for thermal break provisions of this section.

Figure 128: **Thermal break at gable end**
Paragraphs 11.5.4



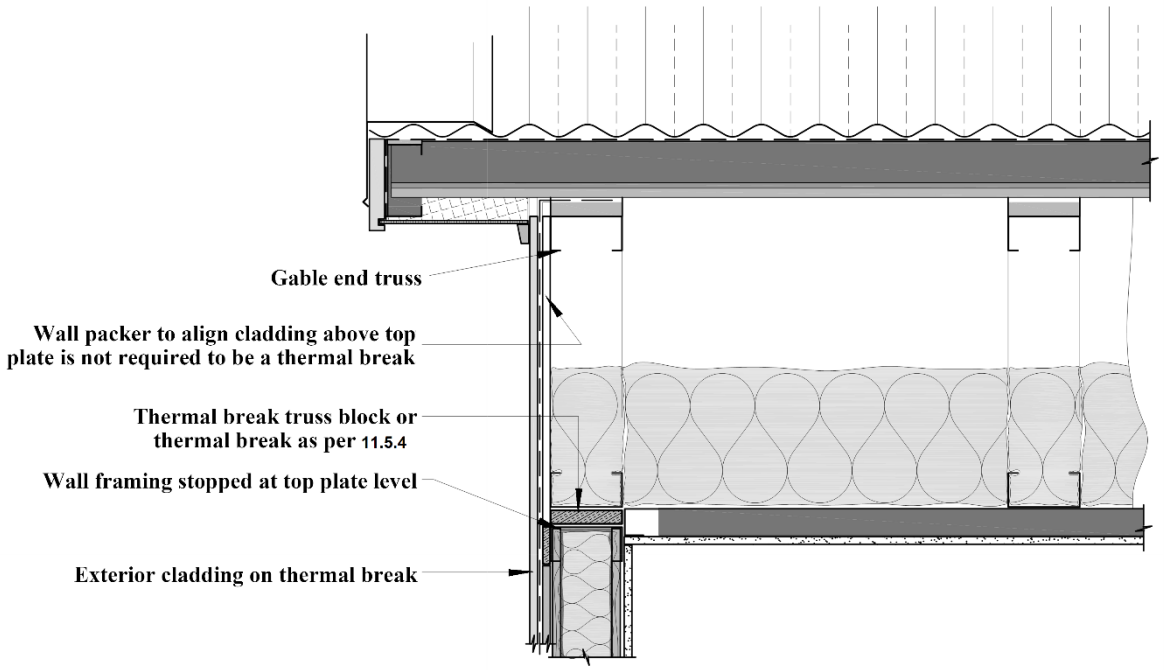
11.5.5 High walls of mono-pitch roofs

Framing between mono-pitch roof trusses shall be separated from the wall framing by the following:

a) Thermal break truss blocks at a minimum of 1.2m centres; or

b) Thermal break with insulation rating of R0.25m2K/W. and a minimum density 35kg/m^3 for the full width of the framing.

Figure 129: **Thermal break and Insulation Mono-pitch roof**
Paragraphs 11.6.5



12.0 DEFINITIONS

This is an abbreviated list of definitions for words or terms particularly relevant to this Standard.

Air seal A continuous seal fitted between a window or door reveal and the surrounding wall framing to prevent the flow of air into the interior of the building.

Anti-ponding board A board laid under the lowest row of concrete and clay roof tiles and supports the roof underlay.

The board is sloped to ensure moisture under the tiles is directed to the exterior of the roof.

Apron flashing A near flat or sloping flashing with a vertical upstand, used at junctions between roofs and walls.

Attached garage A garage that shares a common wall or walls with a habitable building, and is enclosed by roof and wall claddings that are continuous with the habitable part of the building.

Base metal thickness (BMT) The thickness of the bare or base metal before any subsequent coating, such as galvanizing.

Bird's beak A double fold applied to the edge of a horizontal metal flashing to stiffen the edge and to assist in deflecting moisture away from the cladding system below. See also **Kick-out** and **Drip edge**.

COMMENT:
A bird's beak is used at the bottom of a capping to deflect water away from the enclosed balustrade cladding and provide a safer edge where contact with the flashings edge is possible

Butt flashing A preformed wall flashing, used to flash windows and corners on horizontal profiled metal wall cladding.

A butt flashing is shaped to underflash the cladding, with the cladding butting against the exposed box portion of the flashing.

Cantilevered deck A deck where no support is provided at the outer extremities of the deck.

COMMENT:
Cantilevered decks are often constructed by extending framing members through the cladding beyond the building face. Cantilevered decks are sometimes known as balconies.

Capping A flashing formed to cover the top of an enclosed balustrade or parapet.

Cavity batten A vertical packing member used to create a drained cavity as part of a cladding system.

Cavity wall A term used to describe a wall that incorporates a drained cavity.

Cavity spacer A short block used to provide intermittent support for fixings or pipe penetrations through a drained cavity, while not interrupting drainage within the cavity.

A cavity spacer is required to be set to a slight fall (5° minimum from horizontal) to allow drainage of any moisture from the top.

Cladding The exterior weather-resistant surface of a building.

COMMENT:
Includes any supporting substrate and, if applicable, surface treatment.

Cladding system The outside or exterior weather-resistant surface of a building; including roof cladding and roof underlays, wall cladding and wall underlays, and cavity components, rooflights, windows, doors and all penetrations, flashings, seals, joints and junctions.

Where required by this Standard, the cladding system shall include a drained cavity.

Control joint A joint designed to prevent damage by accommodating movement. See also **Expansion joint**.

Damp-proof course (DPC) A strip of durable vapour barrier placed between building elements to prevent the passage of moisture from one element to another.

Damp-proof membrane (DPM) A sheet material, coating or vapour barrier, having a low water vapour transmission, and used to minimise water and water vapour penetration into buildings. Usually applied against concrete in contact with the ground. (Also known as a concrete underlay.)

Deck An open platform projecting from an exterior wall of a building and supported by framing. A deck may be over enclosed internal spaces, or may be open underneath. Refer also **Enclosed deck**. Also known as a balcony.

Direct fixed A term used to describe a wall cladding attached directly to the wall framing through the thermal break, without the use of a drained cavity.

Dormer or **dormer window** A framed structure that projects from a sloping roof, and has a window at its outer end.

Drained cavity A cavity space, immediately behind a wall cladding, that has vents at the base of the wall. Also known as a drained and vented cavity and referred to in this Standard as a cavity or drained cavity.

A drained cavity assists drying by allowing water which occasionally penetrates the wall cladding system to drain to the exterior of the building, and any remaining moisture to dry by evaporation. Where this Standard requires a nominal 20 mm drained cavity, the depth shall be between limits of 18 mm and 25 mm.

For definition of masonry veneer cavity refer to SNZ HB 4236.

Drip edge Fold(s) applied to the edge of a horizontal metal flashing to deflect moisture away from the cladding system below.
Refer also **Bird's beak** and **Kick-out**.

Eaves That part of the roof construction, including cladding, fascia and eaves gutter (spouting), that extends beyond the exterior face of the wall.

EIFS (Exterior Insulation and Finish System).

A polystyrene sheet-based cladding system that uses mesh reinforced polymer- modified cement-based or polymer-based plaster base coats and a protective top coating.

Electrolytic corrosion Galvanic corrosion commonly resulting from the contact of two dissimilar metals when an electrolyte such as water is present.

Enclosed balustrade A timber-framed barrier with cladding across all exposed faces. Refer also **Parapet**.

Enclosed deck A deck, whether over an interior or exterior space, that has an impermeable upper surface and is closed on the underside. May also be known as a balcony.

Envelope complexity The categorisation of the complexity of the total building envelope into one of four classes, depending on the particular features of the building as specified in this Standard.

EPDM (Ethylene Propylene Diene Monomer) A thermosetting synthetic rubber used as a resilient part of a sealing washer, or as a roof membrane.

Expansion joint A joint designed to prevent damage by accommodating movement. See also **Control joint**.

External wall Any vertical exterior face of a building consisting of primary and/or secondary elements intended to provide protection against the outdoor environment.

Finished ground level (FGL) The level of the ground against any part of a building after all backfilling and /or landscaping and/or surface paving has been completed.

Flashing A component, formed from a rigid or flexible waterproof material, that drains or deflects water back outside the cladding system.

Flexible flashing tape A flexible self-adhesive waterproof tape. Usually used as an accessory for wall underlays, to seal corners and intersections.

Flush-finished The description of a cladding and joints system which relies on a protective coating applied to the face of the cladding
to prevent the penetration of water.

Framing Steel members to which lining, cladding, flooring, or decking is attached; or which are depended upon for supporting the structure, or for resisting forces applied to it.

Gutter Channel for draining water off a roof or deck. Refer also **Spouting**

Hem A flat fold, not completely closed, applied to the edge of a metal flashing.

Hidden gutter A gutter located within the boundaries of the roof framing. Hidden gutters may also be known as secret gutters or internal gutters. See also **Valley gutters**.

COMMENT:

Hidden gutters are distinct from gutters or spouting that are externally located beyond the bounds of the roof and wall framing.

Hook An open fold applied to the edge of a metal flashing.

COMMENT:

A hook is distinct from a hem, as it is open at an acute angle rather than flattened.

Kick-out A single fold applied to the edge of a horizontal metal flashing to deflect moisture away from the cladding system below. Refer also **Bird's beak.**

COMMENT:

A **kick-out** is used at the bottom of a capping or other flashing to deflect water away from the cladding below.

Lining The rigid sheet covering for a wall, ceiling or other interior surface.

Masonry tiles Clay or concrete tile roof cladding.

Masonry veneer Clay or concrete block veneer cladding.

Membrane A non-metallic material, usually synthetic, used as a fully supported roof cladding, deck surface or, in conjunction with other claddings, as gutters or flashings.

NZBC New Zealand Building Code.

Nog A (usually horizontal) member fixed through framing. Also known as nogging.

Parallel flashing A roof flashing that runs along the roof slope, parallel to the roof cladding profile. Also known as a longitudinal flashing.

Parapet A timber-framed wall that extends above the level of the roof cladding. Refer also **Enclosed balustrade.**

Purlin A horizontal member laid to span across rafters or trusses, and to which the roof cladding is attached.

Rafter A framing member, normally parallel to the slope of the roof, providing support for sarking, purlins or roof cladding.

Risk matrix A Table that allows the calculation of a risk score by the allocation and summing of scores for a range of design and location factors applying to a specific building design.

Risk score An aggregated numerical score for a proposed building as defined by this Standard. The risk score is determined by completion of the risk matrix**.**

Roof That part of a building having its upper surface exposed to the outside and at an angle of 60° or less to the horizontal.

Roof underlay An absorbent permeable building paper that absorbs or collects condensation or water in association with roof cladding performance.

Saddle flashing A flashing used to weatherproof the junction between a horizontal and vertical surface.

Scupper An opening in a parapet or enclosed balustrade to allow water to drain into a rainwater head.

Sill support bar A bar or mechanism complying with EM6s 2016, E2/ VM1 tests, and Clause B2 of the Building Code, and used to support the weight of aluminium window and door joinery that is installed over drained cavities.

Soft edge A compatible soft edging seamed onto flashings to provide closure to profiled cladding.

Specific design Design and detailing for compliance with the Building Code, of a proposed part or parts of a building which are not shown in this Standard.

Spouting Open gutter attached to eaves.

Stopend A turn-up at the upper edge of profiled metal cladding, or at the end of gutters and some types of flashings.

COMMENT:
A stopend assists the control of moisture by ensuring any moisture reaching the edge of the roofing is deflected from further entry.

Storey That portion of a building included between the upper surface of any floor and the upper surface of the floor immediately above, except the top storey shall be that portion of a building included between the upper surface of the topmost floor and the ceiling or roof above.

Stucco A wall cladding system formed from reinforced solid plaster over a rigid or non-rigid backing.

Stud A vertical steel framing member.

Thermal break A material or product with a minimum R 0.25m2K/W thermal resistance used to create a thermal barrier fitted to the outside face of framing members.

Thermal break truss block A material or product with a minimum R 0.25m2K/W thermal resistance used to create a thermal break between wall framing members and roof truss framing.

Thermal break sheathing A material or product sheet with a minimum R 0.25m2K/W thermal resistance used to create a thermal barrier fitted to the outside face of framing members.

Thermal break strip A material or product strip with a minimum R 0.25m2K/W thermal resistance used to create a thermal barrier fitted to the outside face of framing members.

Transverse flashing A roof flashing that runs across the roof slope, at right angles to the roof cladding profile.

Trapezoidal A type of profiled metal cladding with symmetrical or asymmetrical crests, with troughs between the crests.

Trough profile A type of profiled metal cladding comprising vertical ribs with flat, or lightly profiled pans between the ribs. Also known as ribbed, secret fixed or tray profile.

Underlay The material used behind a roof or wall cladding. See also **Wall underlay** and **Roof underlay**.

Valley gutter A gutter running down the valley formed by the intersection of two pitched roof surfaces.

Wall refer **External wall.**

Wall underlay. A building paper, synthetic material or rigid sheathing used as part of the wall cladding system to assist the control of moisture by ensuring moisture which occasionally penetrates the wall cladding is directed back to the exterior of the building.

Waterproof and **waterproofing** The complete and total resistance of a building element to the ingress of any moisture.

Weathertightness and **weathertight** Terms used to describe the resistance of a building to the weather.

Weathertightness is a state where water is prevented from entering and accumulating behind the cladding in amounts that can cause undue dampness or damage to the building elements.

COMMENT:
The term weathertightness is not necessarily the same as waterproof.
However, a weathertight building, even under severe weather conditions, is expected to limit moisture ingress to inconsequential amounts, insufficient to cause undue dampness inside buildings and damage to building elements. Moisture that may occasionally enter is able to harmlessly escape or evaporate.

Wetwall The exterior cladding on a wall with a drained cavity.

Wind zone Categorisation of wind force experienced on a particular site as determined in NZS 3604 2012.

COMMENT:
Maximum ultimate limit state speeds are:
Low wind zone = wind speed of 32 m/s
Medium wind zone = wind speed of 37 m/s
High wind zone = wind speed of 44 m/s
Very high wind zone = wind speed of 50 m/s
Extra high wind zone = wind speed of 55 m/s.
Specific design is required for wind speeds greater than 55 m/s.

13.0 REFERENCE DOCUMENTS

The following documents are referred to in this document:

Document	Where used
NASH Standards	
NASH Standard Part 1: 2019	Forward
NASH Standard Part 2: 2019	1.0, 1.1, 1.4, 8.4.6, 8.5.1, 9.1.11.1, 9.2.1, 9.2.3, 9.3.2
Standards New Zealand	
AS/NZS 1734: 1997 Aluminium and aluminium alloys-Flat sheet	4.3.2, 8.3.4.2, 8.4.3.3, 9.6.3.3
AS/NZS 1604.3: 2012 Specification for preservative treatment Part 3: Plywood	8.5.3 Table 23
AS/NZS 2269.0: 2012 Plywood - Structural	8.5.3, 9.3.6.1, 9.8.2
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