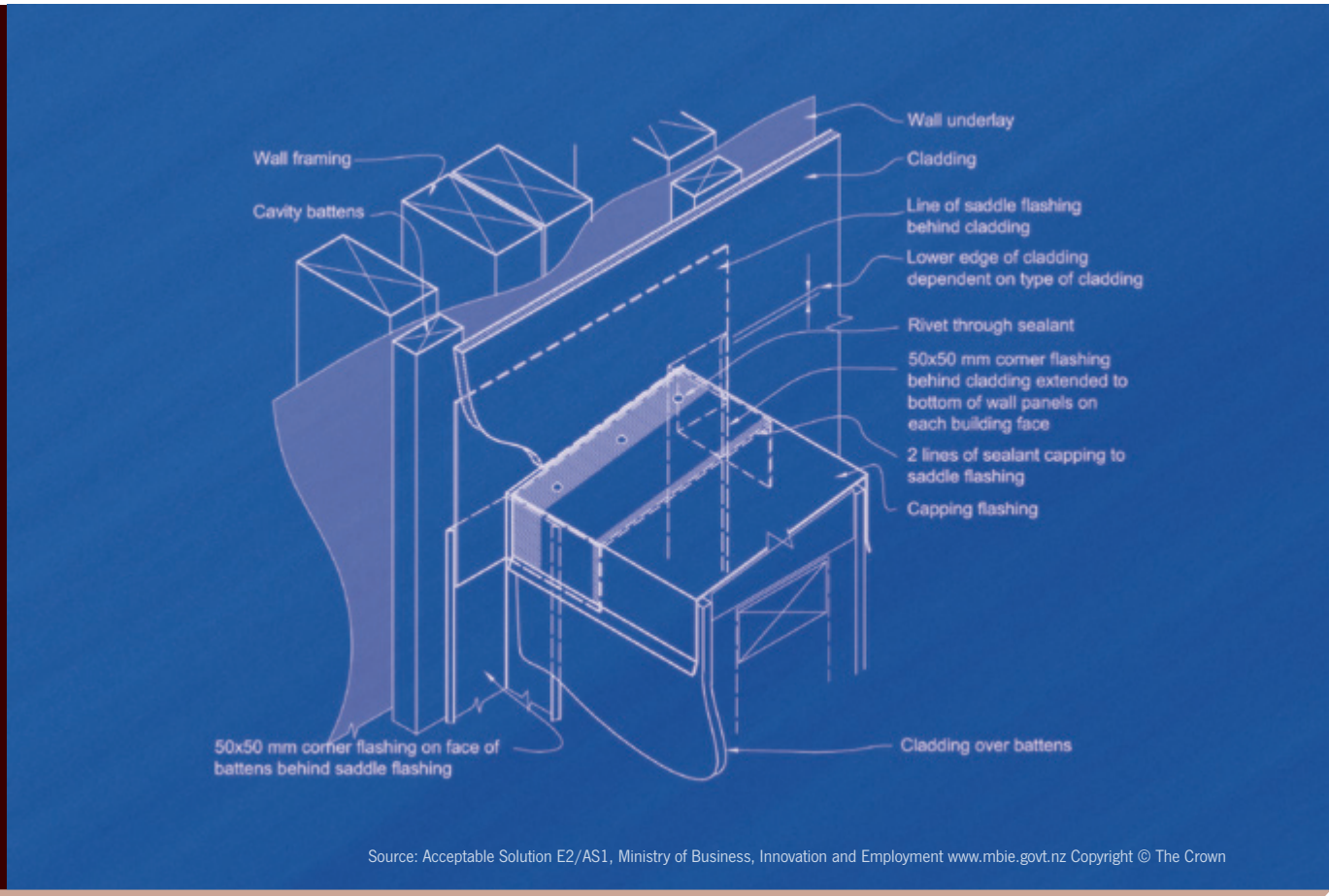
BRANZ

ISSUE567 BULLETIN



E2/AS1 FLASHING REQUIREMENTS

December 2013

Leaks resulting from poor flashing design and installation can be difficult to find and expensive to repair.

Amendment 5 to E2/AS1, which introduced the extra high (EH) wind zone, also modified a number of the requirements for flashings.

This bulletin takes account of those changes and updates/replaces Bulletins 465 *Domestic flashing installation* and 467 *Principles of flashing design*.

1.0 INTRODUCTION

1.0.1 Flashings play an important role in preventing moisture getting into the building envelope and draining out any moisture that does get in.

1.0.2 This bulletin outlines the minimum requirements for flashings to comply with E2/AS1 Third Edition incorporating Amendment 5.

1.0.3 It updates/replaces Bulletins 465 *Domestic flashing installation* and 467 *Principles of flashing design*.

2.0 APPLICATIONS

2.0.1 Flashings can be a primary or secondary defence against water entry. E2/AS1 details are the minimum requirements for buildings within the scope of the document, and designers can choose to increase flashing dimensions.

2.0.2 Flashings are generally required at:
- roof junctions such as gables, hips and barges
- vertical and horizontal junctions between similar or dissimilar cladding materials
- intersections between building elements
- roof or wall penetrations such as windows, doors, meter boxes, flues and pipes
- roof and wall intersections.

3.0 NEW ZEALAND BUILDING CODE

3.0.1 The New Zealand Building Code (NZBC) clause E2 *External moisture* states at E2.3.2 that: "Roofs and exterior walls must prevent the penetration of water that could cause undue dampness, damage to building elements, or both."

3.0.2 Another performance requirement relevant to flashings is E2.3.5: "Concealed spaces and cavities in buildings must be constructed in a way that prevents external moisture being accumulated or transferred and causing condensation, fungal growth, or the degradation of building elements."

3.0.3 Key revisions relating to flashings introduced by Amendment 5 to E2/AS1 include:
- the introduction of the extra high (EH) wind zone (a maximum design wind speed of 55 m/sec)
- for the EH wind zone:
  - increased downturn to barge and gable trims
  - increased flashing dimensions by 25 mm – upstands and cover or downturns
  - increased corner (back or cover) flashing dimensions by 25 mm
  - the provision of a hook or a hem to all upstands
  - a flashed change of roofing pitch is not permitted
- for the low (L), medium (M), high (H) and very high (VH) wind zones, flashing upstands need to:
  - be increased in height by 25 mm, or
  - have a hook or hem
- a flat sill tray is permitted for aluminium windows installed into a direct-fixed cladding along with additional timber packers to the sides of the rough opening
- revision of Figure 6 of E2/AS1 covering flashing joints
- for metal flashings, exposure zones in Table 20 are aligned to NZS 3604:2011 *Timber-framed buildings* – however, E2/AS1 also uses Zone E (close to breaking surf)
- removal of the saddle flashing detail where a solid balcony wall is on the same plane as an adjacent full-height wall
- an increase in the size of pipe penetrations that can be boot flashed from 60 mm to 85 mm
- the requirement for a butyl underflashing at a ridge/hip junction.

3.0.4 For buildings outside the scope of E2/AS1, flashing details must be submitted for consent together with supporting information as an alternative method. Supporting information may be sourced from:
- E2/AS1 requirements
- the NZ Metal Roofing Manufacturers *NZ Metal Roof and Wall Cladding Code of Practice* (NZMRM COP)
- BRANZ Details.

3.0.5 Flashing material selection, design and installation must also meet the requirements of Building Code clause B2 *Durability*.

4.0 SELECTION OF FLASHING MATERIALS

4.0.1 The selection of flashing materials must take account of:
- materials permitted when using E2/AS1 as a means of compliance
- minimum durability requirements of NZBC clause B2
- the environment where the building is located and specific exposure conditions (E2/AS1 Table 20 *Material selection*)
- compatibility with surrounding materials (E2/AS1 Table 21 *Compatibility of materials in contact* and Table 22 *Compatibility of materials subject to run-off*)
- thermal movement and limitations on flashing lengths for given materials and colours (E2/AS1 4.5.2 (b) and (c) and paragraph 6.2 of this bulletin)
- for roof flashings, the suitability of the flashing for use where water is collected from the roof.

4.0.2 Under E2/AS1, flashing materials (and minimum thicknesses) may be:
- uPVC (0.75 mm)
- aluminium (0.7 mm)
- galvanised steel (0.55 mm)
- aluminium/zinc alloy-coated steel (0.55 mm)
- stainless steel (0.45 mm)
- copper (0.5 mm)
- zinc (0.7 mm)
- lead (minimum mass of 17 kg/m^2)
- butyl rubber or EPDM (1 mm)
- bituminous (in concealed applications only).

5.0 SPECIFIC FLASHING REQUIREMENTS

5.1 COVER GENERALLY

5.1.1 Table 7 of E2/AS1 specifies the minimum cover and upstand dimensions for buildings within the scope of the Acceptable Solution.

5.2 APRON FLASHINGS

5.2.1 The requirements for apron flashings installed horizontally across a wall or roof slope are:

- a minimum upstand behind the wall cladding of:
  - in L, M, H and VH wind zones – 110 mm upstand (75 mm behind cladding, plus 35 mm between base of cladding and flashing) plus a hook or hem to the top edge
  - in L, M, H and VH wind zones – 135 mm upstand without a hook or hem (100 mm behind cladding, plus 35 mm between base of cladding and flashing)
  - in the EH wind zone – 135 mm upstand (100 mm behind cladding, plus 35 mm between base of cladding and flashing) plus a hook or hem to the top edge
- a cover of the flashing to:
  - profiled metal roofing:
    - in L, M and H wind zones where the roof pitch is 10° or more (E2/AS1 Table 7 *Metal flashings – general dimensions*, Situation 1) – 130 mm (excluding the soft edge)
    - in L, M and H wind zones where the roof pitch is less than or equal to 10° (E2/AS1 Table 7, Situation 1) – 200 mm (excluding the soft edge)
    - for all roof pitches in VH and EH wind zones – 200 mm
  - clay and concrete tiles – 150 mm
  - metal tiles – a minimum tile upturn of 40 mm with an overflashing to give 35 mm cover to the upturn.

5.2.2 For apron flashings installed parallel to a roof slope:

- for profiled metal – a cover of at least two crests
- for clay and concrete tiles – 150 mm minimum cover
- for metal tiles – a minimum tile upturn of 40 mm with an overflashing to give 35 mm cover to the upturn.

5.3 CAP FLASHINGS

5.3.1 Figure 10 of E2/AS1 details rigid flashings, to form a capping on a parapet or enclosed balustrade. A minimum cross-fall of 5° is required.

5.3.2 Flexible sheet or wet-applied flashings, used for balustrades only, require a minimum cross-fall of 10° (BRANZ recommends 15° minimum).

5.3.3 The overlap with the cladding on both sides of the capping selected to comply with Table 7 in E2/AS1 is a minimum of:

- 50 mm – for up to and including H wind zones where the roof pitch is >10° (see Table 7, Situation 1)
- 70 mm – for VH wind zones and L, M and H wind zones where the roof pitch is <10° (see Table 7, Situation 2)
- 90 mm – for EH wind zones (see Table 7, Situation 3).

5.3.4 Lap or cover dimensions exclude the kick-out and bird's beak dimensions.

5.3.5 Exposed bottom edges must be folded to form a kick-out or a bird's beak as shown in E2/AS1 Figure 5.

5.3.6 Using a bird's beak for a balustrade capping reduces the risk of injury from the protruding sharp edge of a kick-out. Do not allow the edge of the metal flashing to contact the cladding material.

5.4 BARGE FLASHINGS

5.4.1 Barge flashings are required to overlap the barge or fascia board or a cladding by a minimum of:

- 50 mm – for up to and including H wind zones where the roof pitch is >10° (E2/AS1 Table 7, Situation 1)
- 70 mm – for VH wind zones and L, M and H wind zones where the roof pitch is <10° (E2/AS1 Table 7, Situation 2)
- 90 mm – for EH wind zones (E2/AS1 Table 7, Situation 3).

5.4.2 Cover to the roofing shall be:

- for profiled metal – at least two crests (Figure 1)
- for clay and concrete tiles – 150 mm minimum cover
- for metal tiles – a minimum tile upturn of 40 mm with an overflashing to give 35 mm cover to the upturn.

5.5 WALL CLADDING CORNER FLASHINGS

5.5.1 Options at wall cladding corners are:

- cover flashings (all claddings)
- backflashings – E2/AS1 requires 50 x 50 mm flashing with hems except for buildings in EH wind zones where the dimension is increased to 75 x 75 mm with hems. (Note that the 50 x 50 mm and 75 x 75 mm dimensions respectively (taken from Table 7 to E2/AS1, which references Figure 79 as an example – Figure 2 in this bulletin) is an internal corner flashing detail, which may provide insufficient cover to an internal bevel-back weatherboard corner. BRANZ recommends that the dimensions of any corner flashing (internal or external) be based on a minimum cladding cover of 50 mm generally and 75 mm in an EH wind zone, from the actual joint in the cladding, which may be some distance from the corner as shown in E2/AS1 Figure 79 *Internal butt corners*)
- backflashings and corner beads to an internal corner
- soakers to an external corner (weatherboards).

5.6 RIDGE AND HIP ROOF FLASHINGS

5.6.1 The required minimum cover to be provided by a ridge or hip flashing:

- for profiled metal – as given in E2/AS1 Section 5.1 for apron flashings
- for metal tiles – as detailed in E2/AS1 Figure 34
- for clay and concrete tiles – a ridge tile as shown in E2/AS1 Figure 23.

5.6.2 For profiled metal:

- if corrugate – dress the soft edge to the profile (E2/AS1 Figure 41)

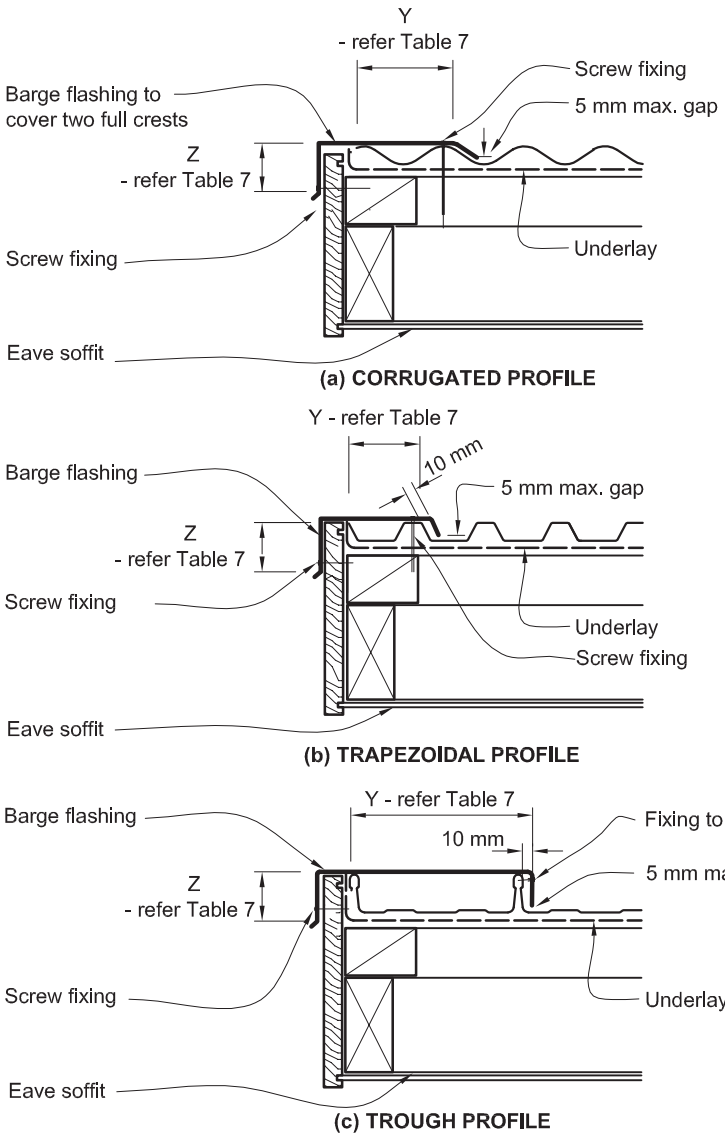


Figure 1. E2/AS1 Figure 47 Barge flashing for profiled metal

- if trapezoid – notch the edge of the flashing downturn to accurately match the profile, leaving a 5 mm gap between the flashing and the cladding as in E2/AS1 Figure 42
- turn up the troughs of the profiled metal roofing where it ends under an overflashing.

5.6.3 For flashings where there is a change in roof pitch:

- see E2/AS1 Figure 44 for profiled metal – note that a change of pitch as detailed in E2/AS1 is outside the document's scope for the EH wind zone
- refer to the roofing supplier's details for clay or concrete tiles and metal tiles as no details are given in E2/AS1.

5.7 ROOF PENETRATIONS

5.7.1 Under E2/AS1, proprietary EPDM boot flashings are:

- not permitted on roof slopes <10° if the base of the flange covers one or more complete troughs
- limited to a pipe diameter of 85 mm
- installed on the diagonal so water will flow around the flashing
- for profiled metal roofing and metal tiles – dressed, sealed and fixed to the roof profile
- for masonry tiles – fitted to a malleable soaker flashing dressed to the tiles (or be a lead flashing with integral lead sleeve).

5.7.2 For larger penetrations, refer to E2/AS1:

- Figure 31 for framed penetrations in a masonry tile roof
- Figure 54 where the proprietary boot flashing is installed to a larger flat soaker flashing or Figure 55, which incorporates a framed opening for the penetration – taking the soaker flashing up the roof to a ridge flashing is considered preferable to inserting the soaker flashing under the roofing as shown in Figures 54 and 55. Note that the NZMRM COP recommends a maximum length for a soaker flashing of 1.5 m to a ridge.

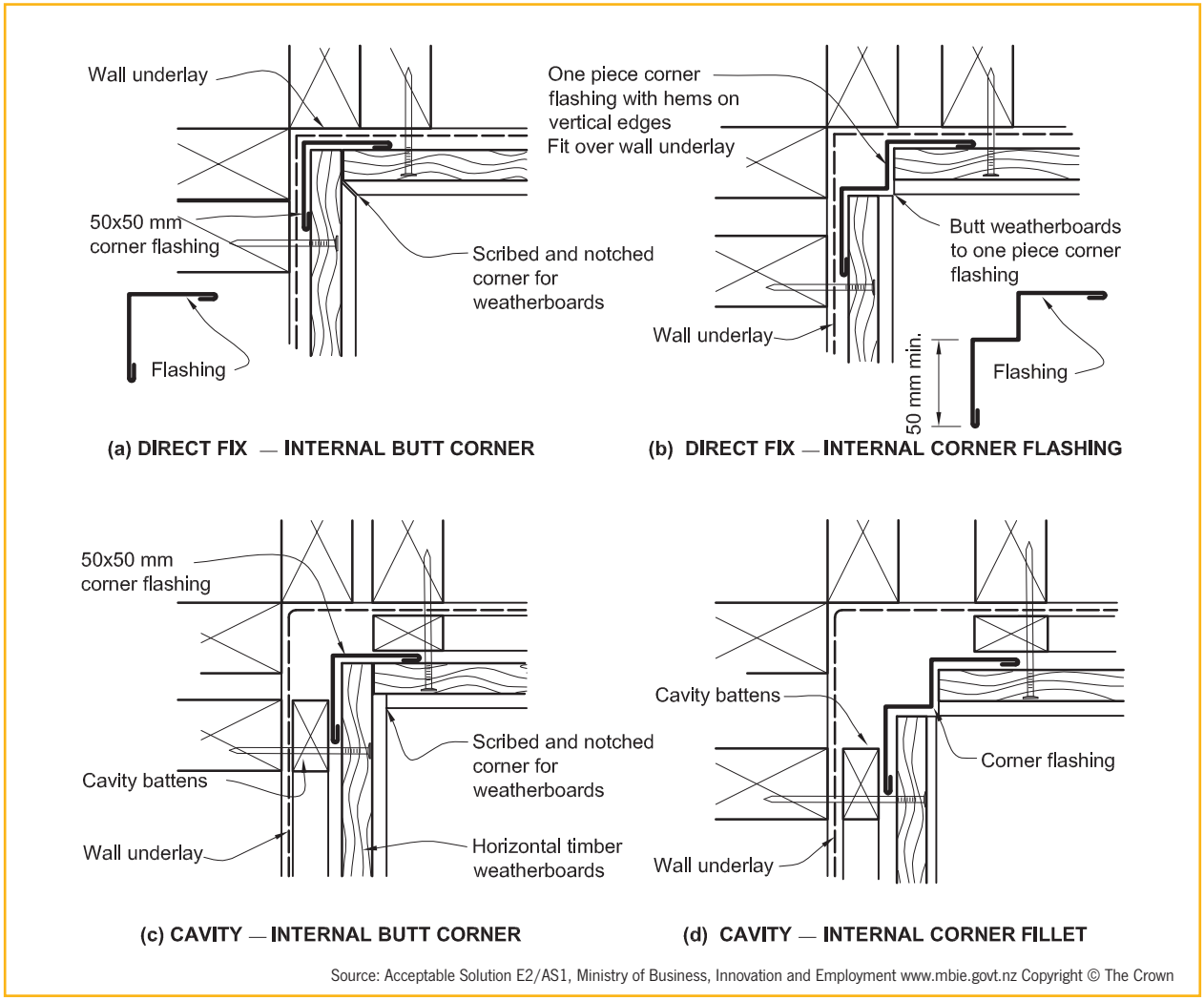


Figure 2. E2/AS1 Figure 79 Internal corners for horizontal or vertical weatherboards.

5.7.3 Specific design will be required for penetrations through roofs at a pitch of less than 10° or with penetrations larger than 1200 mm wide. This applies to the large diameter boot flashing and skirts that are designed to flash metal flues to profiled metal roofing and are located adjacent to a ridge or hip where the top edge of the flashing is overflashed by the ridge or hip flashing.

5.8 DOOR AND WINDOW FLASHINGS

5.8.1 E2/AS1 specifies minimum requirements for window and door flashings.

5.8.2 For head flashings, these are:

- 15° cross-fall
- 10 mm minimum cover (excluding drip edge) to the flange of the window
- 35 mm minimum cladding cover to the flashing upstand (60 mm in EH wind zone)
- bridging the cavity – head flashings must also drain any water in the cavity to the outside across the top of the door or window, and the ends of head flashings must not permit the entry of water
- extending at least 20 mm past the trim around the opening (i.e. past the facing boards and closing scribers)
- for upstands:
  - in L, M, H and VH wind zones – providing flashing upstands (as shown in Table 7 and Figure 71 to E2/AS1) to give 35 mm minimum cladding cover (50 mm for vertical profiled metal) and either a hem or hook as shown in E2/AS1 Figure 5, or no hooks or hems and the flashing upstand increased by 25 mm to give 60 mm cladding cover (75 mm for vertical profiled metal)
  - in the EH wind zone – detailing hooks and hems and increasing the flashing upstand by 25 mm beyond those required by Table 7 or elsewhere in E2/AS1 to give 60 mm cladding cover (75 mm for vertical profiled metal)
- for cavity cladding systems:
  - including 10 mm stop-ends terminating at the back face of the claddings to prevent water running off flashing ends
  - taking flashings back across the cavity and sealing to the underlay
- providing a cavity base closer and vermin proofing across the top of the door or window to allow drainage and ventilation (1000 mm^2/m) but prevent vermin entry
- for direct-fixed claddings – installing a 50 mm long bead of sealant between the cladding and each end of the head flashing to perform the function of stop-ends in cavity systems
- having 10 mm minimum cover (excluding drip edge) to the top window flange
- for VH and EH wind zones - having sealant installed

between the underside of the head flashing and the top edge of the window and door head flange (E2/AS1 Figure 71(c)).

5.8.3 Sill tray flashings are required under E2/AS1 for all windows and doors where the cladding is direct-fixed. The E2/AS1 details for horizontal profiled metal also incorporate a sill flashing to trim the top of the cladding along the sill flange and provide a flat surface for the window to be installed against – E2/AS1 masonry veneer details incorporate a flexible sill flashing.

5.8.4 Jamb flashings are required by E2/AS1 for:
- stucco (E2/AS1 Figure 76)
- profiled metal (E2/AS1 Figures 95, 99 and 100)
- EIFS (E2/AS1 Figures 127 and 128)
- masonry veneer – a flexible flashing (E2/AS1 Figure 73(c)).

5.9 HORIZONTAL JOINT OR INTER-STOREY JUNCTION FLASHINGS

5.9.1 Horizontal 'Z' flashings to claddings are required to have an upstand of 35 mm minimum (60 mm EH wind zone) and 35 mm cover (60 mm EH wind zone) over the lower cladding. A minimum cross-fall of 15° is required. The bottom edge of the flashing requires a kick-out or bird's beak.

5.9.2 Provide a gap of 5 mm above the slope of the flashing to enable water to drain from behind the cladding.

5.10 FLASHING VERTICAL JUNCTIONS BETWEEN DIFFERENT MATERIALS

5.10.1 Care is required when detailing the junction between different claddings, especially when there is a significant difference in thickness or where a flashing is used to define a joint within a wall area. E2/AS1 does not include flashing details for joints between different cladding materials. Solutions are given in BRANZ Details available on the BRANZ website or via BRANZ-Appraised flashing systems.

5.11 FLASHING METER BOXES

5.11.1 Flashings for flat-topped meter boxes and similar penetrations are shown in E2/AS1 Figure 69.

5.12 EAVES FLASHINGS

5.12.1 E2/AS1 requires the installation of an eaves flashing to longrun profiled metal roofing where:
- the roof slope is 10° or less, and
- the soffit width is 100 mm or less, and
- the roof is in a VH or EH wind zone.

5.12.2 Eaves flashings must extend 125 mm back up under the roofing and have a 35 mm overlap to the back upstand of the gutter.

5.13 SADDLE FLASHINGS

5.13.1 Saddle flashings as detailed in E2/AS1 Figure 12 are required at the junction between a framed balcony wall and an adjacent wall and also where parapets at different heights may intersect.

5.13.2 When detailing a saddle flashing (if it cannot be designed out):
- refer to E2/AS1 Figure 11, which gives the internal corner flashing requirements below the saddle flashing
- specify that the saddle flashing be fabricated off-site.

5.14 BACKFLASHED JOINTS

5.14.1 Backflashing of joints can be:
- a proprietary component of a cladding system – E2/AS1 Figure 87 for fibre-cement weatherboard
- installed to add additional protection behind a sealant joint, a movement control joint, a battened joint, a scarfed joint or a beaded internal corner detail.

6.0 INSTALLING FLASHINGS

6.0.1 When installing flashings, ensure:
- the cover dimensions are met – for buildings outside the scope of E2/AS1, covers may need to be increased
- running joints in flashings are lapped away from the direction of the wind that is most likely to cause wind-driven rain leaks – this may not be the prevailing wind direction
- drainage is provided across the top of window head flashings (for example, by having a 5 mm gap between the bottom of a cladding and a flashing)
- sufficient clearance is provided between the bottom of a cladding and an apron flashing – at least 35 mm
- thermal and building movement is accommodated – that is, where a flashing is required between two different structures, the flashing should be flexible or, when rigid, only fixed to one structure to allow free movement (see 6.2 Expansion joints)
- wall underlays lap over the flashing upstand
- fixings are compatible with the materials being fixed (Tables 21 and 22 of E2/AS1)
- black lead pencil is not used on unpainted zinc-aluminium alloy-coated steel or galvanised steel as the carbon black present in the lead promotes corrosion
- screw and nail fixings are installed to allow for movement in the flashing.

6.1 JOINT OPTIONS

6.1.1 Joints in metal flashings (Figure 3) can be formed as:
- overlap joints (parapet flashings, ridge and hip flashings), where the lap required is 100 mm (E2/AS1 Figures 6(a) and 9)
- expansion joints with soaker flashings below (parapet or balcony wall cap flashings) (E2/AS1 Figures 6(b) and 9)
- corner joints in metal cappings (E2/AS1 Figure 9)
- shop-fabricated transition (saddle flashings, balcony and parapet cap flashing corners).

6.2 EXPANSION JOINTS

6.2.1 Expansion joints are required to accommodate

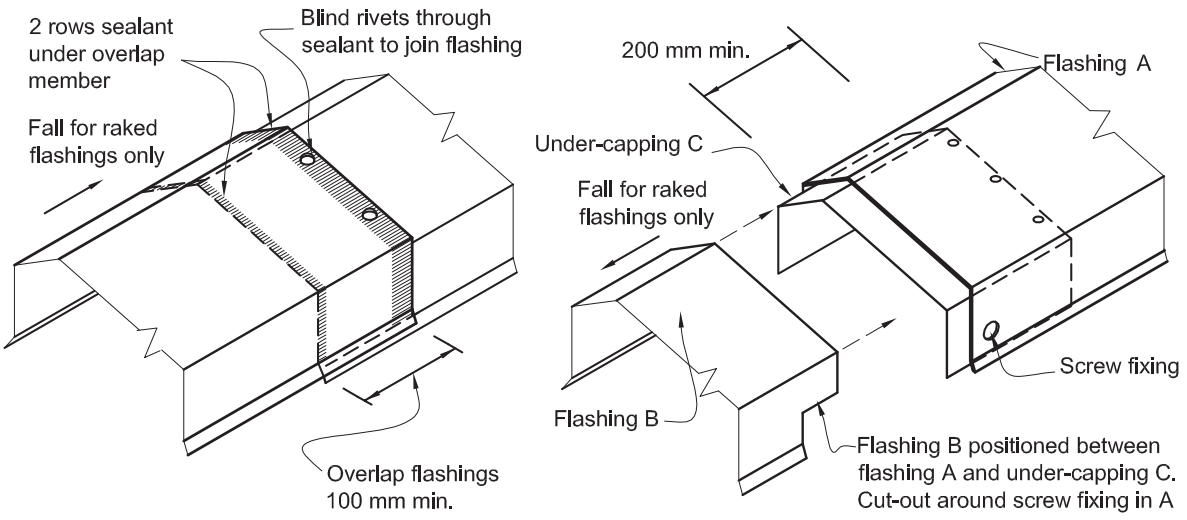


Figure 3. E2/AS1 Figure 6 Joints in metal flashings.

the thermal expansion and contraction of longer length metal flashings at a maximum spacing of:

- 12 m for light-coloured steel and stainless steel
- 8 m for dark-coloured steel
- 8 m for copper
- 8 m for aluminium.

6.2.2 Avoid constraining both ends of a flashing or, if this is unavoidable, incorporate an expansion joint within the length of the element.

6.2.3 An expansion joint requires (E2/AS1 Figure 6(b)):

- minimum 200 mm laps
- mechanically fixing the flashing only on one side of the joint and allowing the adjacent section to move.

6.3 FIXING FLASHINGS

6.3.1 Install fixings for:

- apron, barge and ridge flashings to profiled metal with roofing screws into a purlin or blocking with the shank perpendicular to the surface of the flashing, and ensure the washer is firmly fitted and covers the fixing hole – for barge and apron flashing, fixing through the upturn and downturn will also be required
- for cap flashings to balcony and parapet walls, through the side downturn and not through the top
- for metal tiles refer to E2/AS1 Figures 33–35.

6.3.2 Avoid using rivets (other than where permitted by E2/AS1) because they lock the materials together and do not allow for thermal movement. Where rivets are unavoidable, provide another means of expansion along the flashing (refer E2/AS1 4.5.2).

6.3.3 When fixing flashings with proprietary brackets or clips that allow for movement, ensure they are:

- sufficiently aligned to allow movement
- compatible with the flashing – check against Tables 21 and 22 in E2/AS1.

6.3.4 Fixings should be spaced and have sufficient strength and length to stop the flashing from lifting or flexing in any wind but still allow for thermal movement.

6.4 HANDLING FLASHING MATERIALS

6.4.1 Flashings (or flashing materials) should be:

- supported securely in transit
- stored fully supported, clear of the ground, on a level area
- sheltered from the rain and wind (preferably inside a building)
- protected to prevent damage
- not dragged over finished materials.

7.0 ADDITIONAL INFORMATION

Ministry of Business, Innovation and Employment (MBIE) Building and Housing
New Zealand Building Code Handbook and compliance documents:

- Building Code clause B2 *Durability* and compliance document B2/AS1
- Building Code clause E2 *External moisture* and compliance document E2/AS1

BRANZ publications
BRANZ *House Building Guide*
BRANZ Bulletins: refer to www.branz.co.nz/bulletins for the latest list of available bulletins

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