BRANZ

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BULLETIN

CAVITY BATTENS

June 2022

- Cavity battens are a key component of drained and vented wall cavities and play a vital role in building weathertightness and durability.
- This bulletin gives guidance about the selection and installation of cavity battens in external walls, considering Acceptable Solution E2/AS1 and Alternative Solutions.
- The bulletin includes updated content from Bulletin 582 *Structurally fixed cavity battens* and replaces that publication.

1 INTRODUCTION

1.0.1 Drained and vented cavities are an important element of weathertight construction, especially in higher-risk buildings. Rather than wall claddings being fixed directly to the wall framing, they are fixed to a batten, providing an air cavity behind the cladding (Figure 1). Cavities under Acceptable Solution E2/AS1 can be continuous up to 2 storeys.

1.0.2 Any water that does get through gaps around the cladding can drain down the back of the cladding and out of the bottom of the wall assembly. Air movement in the cavity allows the wall assembly to dry out.

1.0.3 Cavity cladding construction under E2/AS1 is a back-up mechanism only. Buildings must still be designed and constructed to keep water on the outside, where it drains down the face of the building envelope.

1.0.4 While cavity construction has been around for many years, building surveyors say they see many cases of poor installation of cavity battens (see photograph). If battens are not installed properly, they can restrict drainage and air circulation, trapping moisture behind the cladding. This can lead to corrosion, mould or even rot in the wall assembly.

1.0.5 Problems reported include:
- far too many battens on a wall, both vertical and horizontal
- multiple battens placed over studs at the sides of exterior openings with no gap to allow them to dry out
- two or three horizontal castellated battens installed at floor joist lines or onto window lintels
- castellated battens placed together, obstructing or blocking the castellations (notches)
- short horizontal battens (cavity spacers) not fixed on a slope and abutting vertical battens at the ends.

1.0.6 Acceptable Solution E2/AS1 sets out one approach for constructing a drained and ventilated cavity and demonstrating compliance with the Building Code. The use of E2/AS1 is not mandatory, however, and alternative methods (which become Alternative Solutions once consented) can also be used.

1.0.7 This bulletin explains the role of cavity battens as a component of drained and vented cavity wall construction and how they should be installed. It includes the updated content of bulletin 582 *Structurally fixed cavity battens* and replaces that bulletin. It does not cover the cavity behind masonry veneer wall claddings.

1.0.8 The design and installation of wall claddings (including the construction of cavities with battens) in residential low-rise buildings is restricted building work and must be carried out or supervised by a licensed building practitioner.

2 THE ROLE OF CAVITY BATTENS

2.0.1 Ensuring that a wall cladding remains weathertight requires an understanding of the 4Ds – deflection, drainage, drying and durability – and also the importance of moderating the air pressure around a building and in the wall assembly.

An excessive number of battens that will impact drainage and drying in the wall cavity.

2.0.2 What the 4Ds mean:
- Water is first deflected off the exterior surface of the building (Figure 1). The cladding itself and flashings deflect water away, especially from critical junctions.
- Wall assemblies in higher-risk situations must be designed and built to incorporate drainage to allow water that may have penetrated gaps in the exterior cladding to drain down the back of the wall cladding to the outside.
- Ventilation behind the wall cladding allows air movement for drying out moisture absorbed by components of the exterior wall assembly. Removing excess water vapour helps prevent corrosion, timber decay and mould growth in external walls.
- All components of a cladding and wall assembly must meet the durability requirements of the Building Code.

2.0.3 Vented cavities also help to moderate or equalise air pressure differences. Wind impacting on a façade creates a pressure difference across the assembly. If there are any gaps in the building envelope, air can be drawn through, potentially carrying moisture with it. The use of a vented cavity helps to minimise/moderate the pressure difference across the cladding, with a greater proportion of the pressure difference supported across the underlay and internal lining. This results in the air pressure behind the cladding being as close as possible to the air pressure on the exterior surface. The outcome of this moderation is that cavities help reduce the potential for wind-driven water penetration through gaps in the wall claddings at joints and junctions.

2.0.4 A perforated cavity closer along the base of the cavity, which may be uPVC, aluminium, stainless steel or a similar durable material, allows free drainage and ventilation of cavities while keeping vermin out. The cavity must be designed and constructed so that, in buildings with suspended floors, subfloor air/moisture cannot enter the cavity. Similarly, moist air from wall cavities must not be able to enter the roof space.

2.0.5 You can read more on cavities on the BRANZ website www.weathertight.org.nz, especially the page www.weathertight.org.nz/new-buildings/basic-weathertight-design-principles.

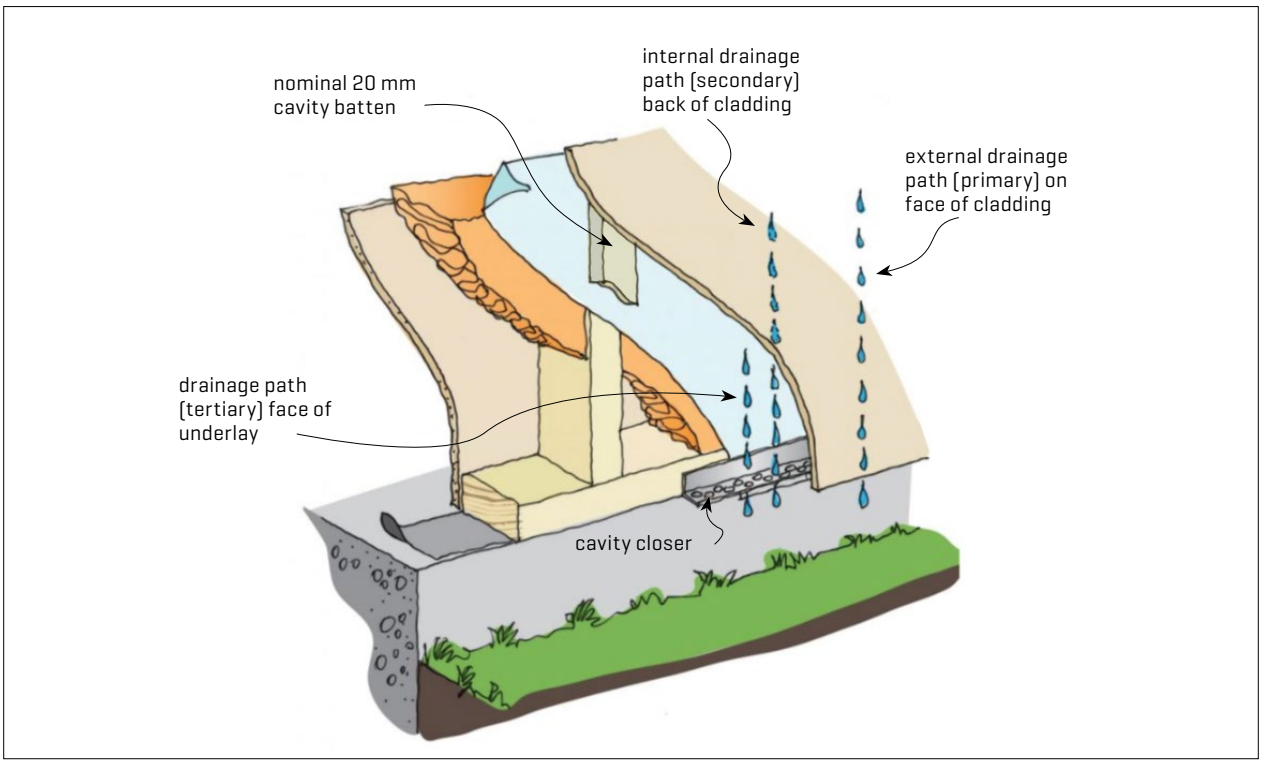

Figure 1. Schematic illustration of a drained and vented cavity wall.

3 THE BUILDING CODE AND E2/AS1

3.0.1 Two key Building Code clauses that relate to cavity wall construction are B2 *Durability* and E2 *External moisture*.

3.0.2 Clause B2 sets out specific periods over which different building elements must continue to satisfy performance requirements with only normal maintenance. Wall claddings and cavity battens must be durable for a minimum of 15 years. Be aware, however, that clause B2.3.2 requires that, in practical terms, anything that is concealed must have the same durability as the item that is concealing it. If wall cladding is expected to last 50 years, the battens behind it must also last 50 years.

3.0.3 Clause E2 states that building exteriors must prevent the penetration and accumulation of water. It recognises that, in some situations, water may penetrate the building exterior and requires that the building be designed to allow water to dissipate that could otherwise cause damage to components or undue dampness.

3.0.4 In Acceptable Solution E2/AS1, buildings in higher-risk situations for weathertightness must incorporate a cavity between the cladding and the wall underlay and timber framing. (Table 3 in E2/AS1 sets out where claddings can be direct-fixed or must be over a cavity, depending on the risk score and the cladding type.) The construction of drained cavities is set out in sections 9.1.8 to 9.1.9.4. Battens are installed vertically over the studs, giving a nominal 20 mm deep cavity behind the cladding (E2/AS1 states limits of 18 mm and 25 mm). Deeper cavity gaps, though generally beneficial, would be consented as an Alternative Solution. Vertical battens should extend the full height of the cavity – it is acceptable if several pieces are joined.

3.0.5 Where a horizontal batten is needed to fix the top or bottom edge of sheet cladding, a cavity spacer (a short length of batten) on a minimum 5° slope is installed. There must be a minimum 50 mm gap between each end of the spacer and the vertical battens to allow drainage and ventilation (Figure 2).

3.0.6 To maximise the drainage and drying capacity of the cavity, install no more battens than are required to support the cladding. Too many battens will reduce the effectiveness of the cavity. Where battens are required side by side, they should be separated with a gap between them.

3.0.7 Where battens are not structurally fixed (see section 6 below) they only need to be tacked in place – they will be permanently fixed by the cladding fixings driven through them into the wall framing.

3.0.8 BRANZ research shows that just having vents at the bottom of the cavity provides sufficient ventilation drying, and this is the solution shown in E2/AS1 as Figure 8A(b). It shows a solid horizontal batten along the top of the wall cavity, which restricts cavity air from reaching the roof space – an important consideration. It should be noted that E2/AS1 paragraph 9.1.8.1 states: "This Acceptable Solution is limited to systems where … c) The drained cavity behind claddings, except in masonry veneer, is not vented at the top."

3.0.9 BRANZ research has also demonstrated that top ventilation can significantly increase drying potential and provide redundancy should the lower vents become restricted. If you opt to ventilate the top of the cavity to increase the amount of ventilation behind the cladding and provide more drying capability and therefore do not install a horizontal batten along the top, it would be consented as

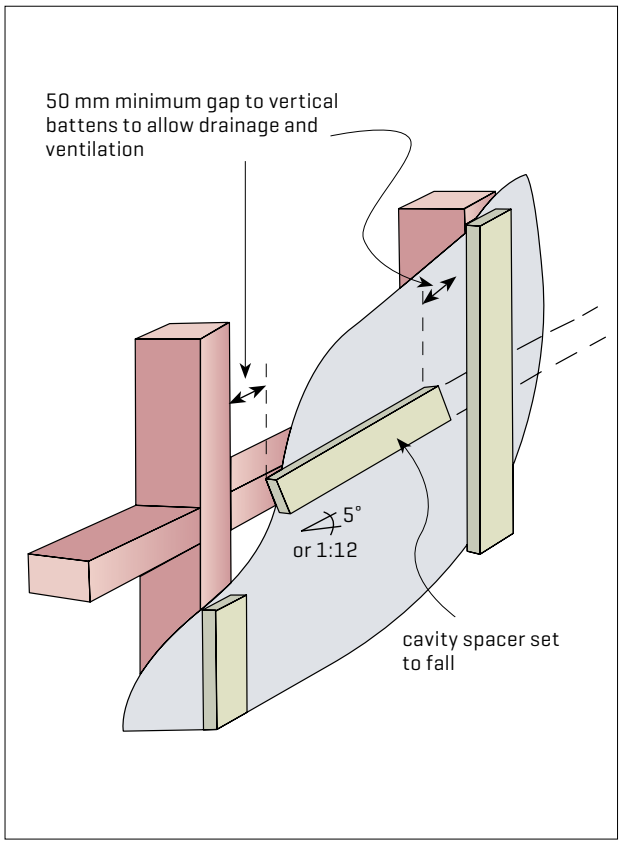

Figure 2. Cavity spacer installation requirements under E2/AS1

an Alternative Solution (see section 4 below). It's important to remember that the wall cavity must still be sealed off from the roof space to achieve compliance with Building Code clause E2.3.5. This can be achieved with a ribbon plate or appropriate soffit detailing. The detail will also need to ensure that wind-blown rain or water from washing the house does not enter at the top of the cavity. MBIE Determination 2013/046 found that "the provision of top vents to wall cavities will, in principle, comply with clauses E2 and B2 of the Building Code".

4 THE BUILDING CODE AND ALTERNATIVE SOLUTIONS

4.0.1 To comply with the Building Code, construction does not necessarily have to follow an Acceptable Solution. In some cases, an alternative method (which becomes an Alternative Solution once consented) may provide advantages over an Acceptable Solution, and in other cases, it may be the only approach available for demonstrating compliance.

4.0.2 There are many alternative paths for helping to demonstrate that construction complies with the Building Code and a combination could be used. They include:

- using a CodeMark certified product
- using information from reputable sources such as an MBIE determination or BRANZ test result or Appraisal
- providing an in-service history where the same method has already been successfully used
- comparing with a previously accepted Alternative Solution with proven performance
- providing an expert opinion.

4.0.3 Full-length horizontal battens, such as those used with vertical weatherboards, are not included in E2/AS1 and therefore must be consented as an alternative method. (These should not be confused with short cavity spacers.) Horizontal battens are typically castellated timber or proprietary plastic battens.

4.0.4 Care is required with using battens horizontally across a wall:

- Battens must be specifically designed for this purpose – standard radiata pine battens with a solid rectangular profile are not appropriate.
- Plain rectangular timber castellated battens with a flat top surface should not be used because the flat horizontal surface does not encourage drainage. (Note that there are proprietary plastic battens that have flat top surfaces, but because they are fluted, water does not track across to the underlay.)
- Battens that are suitable for horizontal use – those with a sloping top edge – need to be installed with the top edge sloping down away from the wall underlay towards the back of the cladding.
- Where castellations are only on one side of the batten, that side must be against the cladding. (In E2/VM1 testing, if water reaches the underlay or drips uncontrolled in the cavity, it is deemed a fail. The slope and the castellations are required to allow any water on the back of the cladding to drain past the batten to the cavity closer.)
- Battens must allow adequate vertical ventilation. BRANZ recommends that they provide at least as much ventilation as cavity closers (i.e. an opening area of 1,000 mm^2 per lineal metre of wall). Some castellated battens have openings at the back to achieve this ventilation in addition to the openings at the front.
- Ensure proprietary battens have adequate supporting documentation.
- With proprietary battens that have a proven Building Code compliance, follow the manufacturer's installation instructions closely.
- Wall claddings must be sufficiently fixed into the framing because horizontal battens are not typically used as structurally fixed battens (see section 6 below).
- In some proprietary systems, the battens are not castellated as the profile of the cladding itself (for example, some aluminium weatherboards) allows drainage and ventilation.

5 BATTENS AVAILABLE AND MANUFACTURERS' REQUIREMENTS

5.0.1 Cavity battens are available in a range of different materials, sometimes designed specifically for a particular type of cladding, and are often proprietary products. There is no standard specifically covering cavity battens. Battens currently available include:

- radiata pine treated to minimum H3.1 (treatment must be carried out when the batten is in its final shape) – radiata pine battens can be generic or proprietary products that are profiled to receive a specific cladding and can have a solid rectangular profile or be castellated with notches along their length

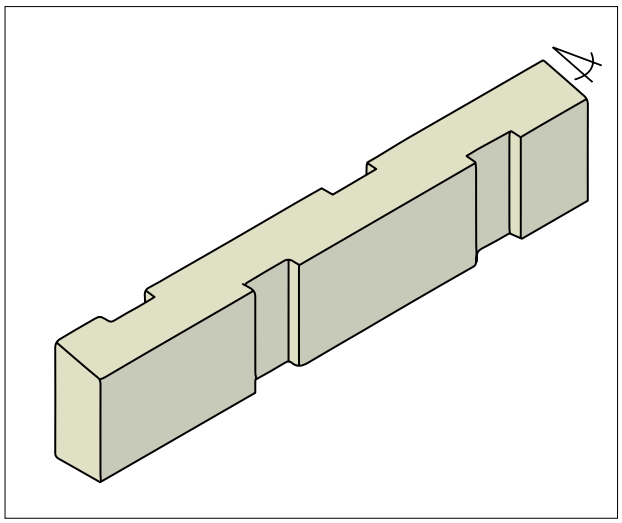

Figure 3. A schematic drawing of castellations in a timber cavity batten. Note the slope at the top.

- western red cedar (designed to be installed horizontally behind vertically installed cladding systems) – like many pine battens, these typically have castellations to both faces (Figure 3) to allow drainage and ventilation
- extruded, fluted polypropylene – drainage and ventilation is provided through the vertical flutes (openings) in the plastic
- extruded aluminium – typically proprietary and more frequently on mid-rise projects
- polystyrene battens – typically part of a proprietary cladding system such as an insulated, plaster-based cladding system
- fibre-cement structural cavity battens – part of a proprietary wall cladding system.

5.0.2 Designers should be aware of and follow the requirements of batten and wall cladding manufacturers. Read the manufacturer's instructions as well as the documents for products with a CodeMark or BRANZ Appraisal. Be aware that some battens:

- require particular fixings (such as stainless steel or silicon bronze)
- are designed to be used only with a proprietary cladding system
- must have a particular side fixed facing outwards, towards the cladding
- must not be in direct contact with metal wall cladding, which can occur where the treatment is copper-based (for example, CCA, copper azole or ACQ) – a suitable separation layer must be used such as an additional layer of paper-based underlay over the cavity battens or strips of paper-based underlay on the face of the cavity battens.

6 STRUCTURALLY FIXED CAVITY BATTENS

6.0.1 This section primarily covers structurally fixed timber cavity battens for weatherboard cladding. There are some proprietary structural cavity battens on the market for other types of claddings. With proprietary products, follow the manufacturer's design and installation instructions.

6.0.2 Under E2/AS1, the fixings for claddings installed over a cavity need to be longer to achieve the minimum framing penetration required by E2/AS1 Table 24. In general, as the length of the fixing is increased, there is an increase in the shank diameter. For weatherboard claddings, using larger fixings – longer than 75 mm – can cause the boards to split. Structurally fixing the cavity battens to the frame (Figures 4 and 5) can resolve this problem, as it will allow standard-length fixings to be used. Not all battens or wall claddings can be used with this method, however.

6.0.3 The structural resistance must be adequate to prevent the fixing from either pulling out of the frame or pulling through the weatherboard. Therefore, there are minimum requirements for the fixing:

- material
- penetration depth into the structural frame
- shank diameter and profile
- head profile and size
- spacing.

6.0.4 The benefit of structurally fixed cavity battens is that the length of the fixing does not have to increase for weatherboards installed over a cavity. The structurally fixed battens are effectively laminated to the framing and become part of the structural frame or stud. This enables the use of fixings 75 mm long to attach a paint

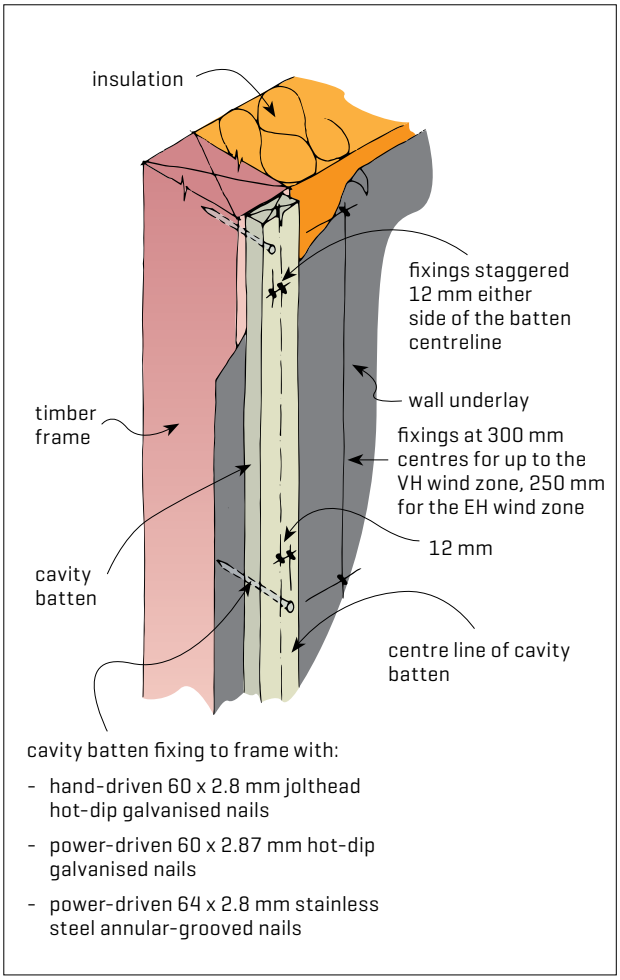

Figure 4. Fixings for a structurally fixed cavity batten.

finish timber bevel-back weatherboard (60 mm for painted rebated bevel-back or rusticated weatherboard) irrespective of whether it is over a cavity or direct-fixed. Fixings for the weatherboards must be located centrally over the battens and studs.

6.0.5 The structural integrity of this fixing arrangement for timber weatherboards was confirmed by BRANZ Test Report ST0589 Version 2 *Fixing horizontal weatherboards to studs over a cavity*. The spacing of the battens needs to be reduced in the extra high wind zone – see Figure 4. Structurally fixed battens are not part of any Acceptable Solution and must be consented as an Alternative Solution.

6.0.6 Structural cavity battens must be:

- vertical and align with underlying framing (studs)
- 18–20 mm thickness (to give a 20 mm maximum depth cavity)
- 40 mm minimum width (E2/AS1 requires 45 mm minimum width)
- kiln dried
- SG6 grade or above radiata pine timber positioned mid-width to the stud and over the wall underlay.

6.0.7 To achieve structural fixing of the timber battens, the fixings should be either:

- 60 x 2.87 mm power-driven hot-dip galvanised nails – these nails have a D head, which provides greater holding power for the batten or

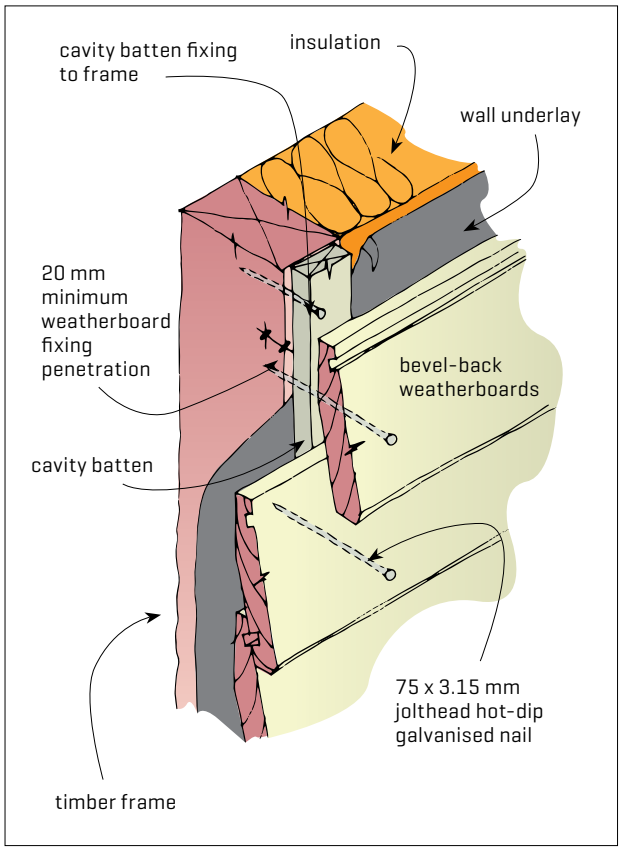

Figure 5. Cladding fixings using structurally fixed battens and flexible wall underlay. Drawing shows 75 x 3.15 mm nails for bevel-back weatherboards – 60 x 2.8 mm can be used for rebated bevel-back and rusticated weatherboards. Longer fixings will be required where rigid wall underlays are used – see 6.0.9.

- 60 x 2.8 mm jolthead hot-dip galvanised nails or
- 64 x 2.8 mm power-driven stainless steel annular-grooved nails.

6.0.8 Structurally fixed timber cavity battens may be used with some claddings other than timber weatherboards although the fixings required may be different lengths. Follow the cladding manufacturer's requirements and refer to E2/AS1 Table 24 *Fixing selection for wall claddings for guidance.*

6.0.9 Fixing lengths here assume flexible wall underlays are used. For rigid wall underlays/air barriers, use an appropriately longer fixing to account for the thickness of the underlay. Some products use structural battens as a means of retaining the sheet, so when horizontal battens (non-structural battens) are used, full fixing of the rigid underlay/air barrier is required so it can resist negative wind pressures.

7 CAVITY BATTENS AND STEEL FRAMING

7.0.1 E2/AS4 is the Acceptable Solution for weathertightness for small buildings with light steel framing. E2/AS4 references the National Association of Steel Framed Housing (NASH) Building Envelope Solutions.

7.0.2 Like E2/AS1, the NASH document has a weathertightness risk matrix, and the risk score determines whether a cladding can be direct-fixed or must be installed over a drained and vented cavity.

7.0.3 Wall claddings fixed to light steel framing must have thermal breaks. The Acceptable Solution only applies to construction where wall claddings are fixed through the cavity battens and thermal break into the wall framing.

7.0.4 Like E2/AS1, the Acceptable Solution for light steel framing only covers vertically fixed cavity battens but makes provision for cavity spacers for fixing between battens. The requirements are the same as those shown in Figure 2 in this bulletin.

7.0.5 Cavity battens with light steel framing must be:

- a nominal 20 mm thick (between 18–25 mm)
- a minimum of 45 mm wide
- if timber, in compliance with B2/AS1 (LOSP-treated timber battens must be separated from any polystyrene thermal break with a wall underlay or DPC)
- if polystyrene, in compliance with either 9.9.3.1 (a) or 9.9.3.1 (b) and be protected from any incompatible materials (such as LOSP-treated timber).

7.0.6 There are also proprietary solutions such as plastic fluted battens that can be used with steel framing.

7.0.7 For more details, see Building Envelope Solutions on the NASH website.

8 MORE INFORMATION

MBIE

E2/AS1 and E2/AS4

NATIONAL ASSOCIATION OF STEEL FRAMED HOUSING (NASH)

Building Envelope Solutions

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