BRANZ

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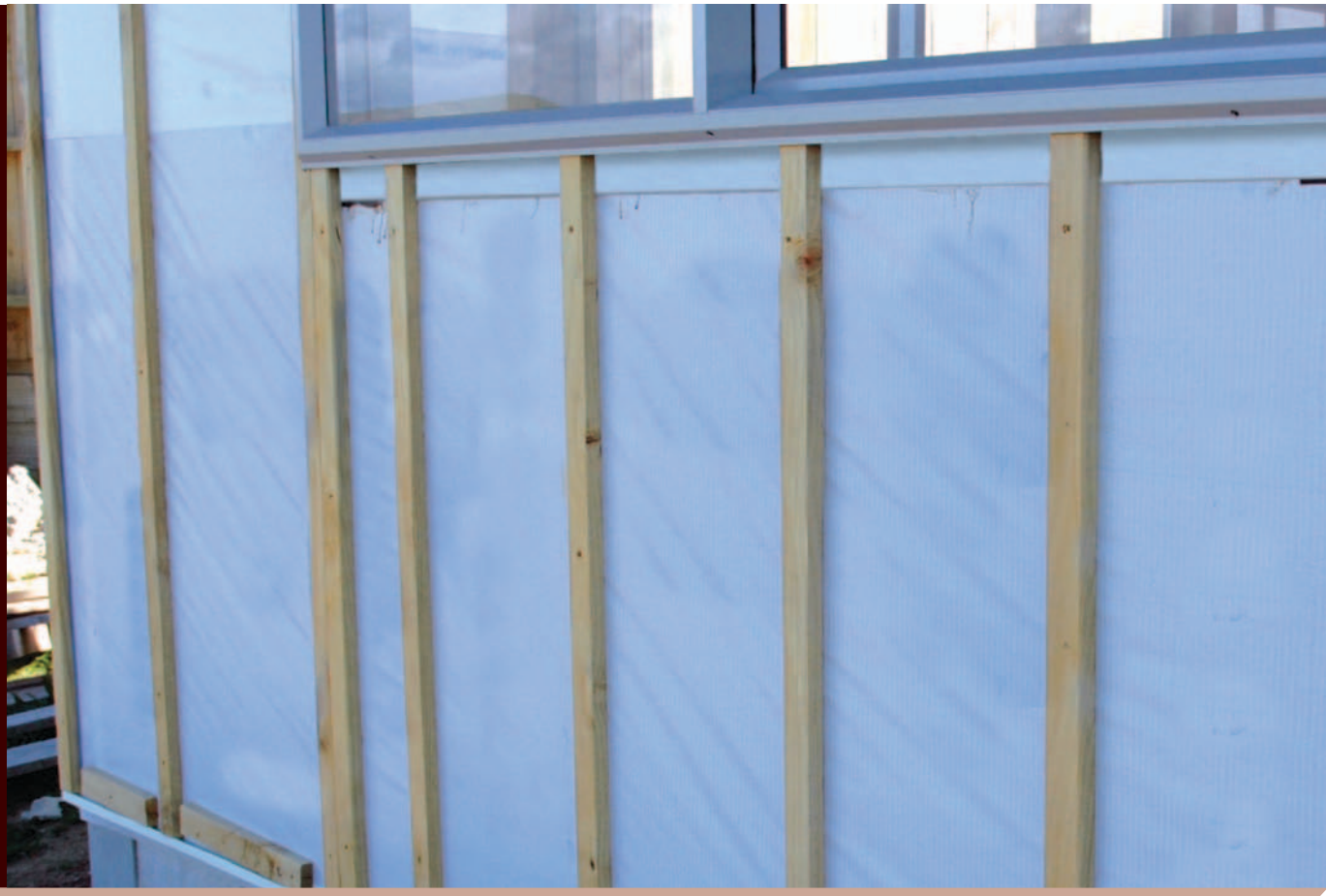

DRAINED AND VENTED CAVITIES

October 2010

There has been a significant increase in the number of new dwellings incorporating a drained and vented cavity behind the cladding.

The cavity provides drainage and drying to manage any water that may penetrate the cladding in extreme circumstances.

This Bulletin outlines the basic requirements for the construction of a drained and vented cavity that is suitable for use behind a range of exterior claddings with the exception of brick veneer and other wet cavity claddings.

1.0 INTRODUCTION

1.0.1 Building Code Compliance requirements, particularly those related to Building Code clause E2 *External moisture* and the associated use of the compliance document E2/AS1 as a means of compliance, have meant a significant increase in the number of new dwellings that require the exterior wall cladding to incorporate a drained and vented cavity.

1.0.2 It is fundamental to the weathertight performance of the building that the wall assembly is designed and constructed to ensure that any water that may penetrate the exterior cladding can be managed by the drained and vented cavity. The cavity must allow gravity drainage of water down the back of the cladding to the building exterior, together with ventilation to dry any moisture that may be absorbed by the assembly components.

1.0.3 Cavity wall construction should be designed and constructed around the 4Ds principles. First, the cladding and elements such as flashings and windows are designed to deflect the water that impacts on them. Second, in the event of failure, the cavity adds a drainage path down the back of the cladding and a vented space to dry water that might be held on the back of the cladding or in components of the wall assembly. The final requirement is that materials will be sufficiently durable for the location they are used.

1.0.4 The cavity is not intended to function as a primary drain. The exterior cladding must be designed and built to deflect water off the surface. By providing drainage and drying of water that might penetrate, the cavity provides a secondary line of defence to manage any water that may penetrate the cladding in extreme circumstances.

1.0.5 This Bulletin outlines the basic requirements for the construction of a drained and vented cavity that is suitable for use behind a range of exterior claddings with the exception of masonry veneer and other wet cavity claddings.

2.0 DRAINED AND VENTED CAVITY CONSTRUCTION

2.0.1 The key components of a nominal 20 mm drained and vented cavity are:

- an air barrier (flexible wall underlay or rigid sheathing in accordance with Table 23 of E2/AS1 or flush-stopped internal linings) combined with air seals around any penetrations in the external cladding
- a well installed wall underlay or rigid air barrier that will allow occasional water that may come into contact with it to drain down its surface to the exterior of the building
- flexible flashing tape, which is compatible with the wall underlay or rigid air barrier, applied to vulnerable areas of framing not covered by the wall underlay, such as across the sill trimmer and at the head and jamb junctions of windows and to minor cladding penetrations such as pipes
- flashed drainage and ventilation openings from the cavity to the cladding exterior, such as at the head of significant cladding penetrations (like windows) and interstorey junctions – under E2/AS1, cavity height is limited to two storeys
- cavity battens forming a nominal 20 mm cavity between the face of the wall underlay and the back of the cladding
- bottom of wall drainage and ventilation openings
- cavity closure devices across all cavity openings that facilitate drainage and ventilation but restrict vermin entry
- closing off the cavity at the top to ensure moisture-laden air is not transferred into the roof cavity or other vulnerable areas.

2.1 AIR PRESSURE BARRIERS

2.1.1 Wind acting on a building creates a pressure difference between the higher pressure outside and the lower pressure inside. The design of a wall system must incorporate an undamaged barrier to resist these wind pressures and to avoid any air leakage paths to the interior of the building. If an air leakage path exists, water can be carried along it into the wall assembly. If not provided with effective air seals, any gaps, joints and junctions in the wall cladding can become air leakage paths that can carry water when present.

2.1.2 An air barrier fixed to the outside face of the framing may be provided by a rigid sheathing (plywood, fibre-cement) or a flexible wall underlay that meets the airtightness requirements given in Table 23 of E2/AS1. An air barrier may also be provided by flush-stopped internal sheet linings.

2.1.3 The gaps around window and door penetrations and any other cladding penetration can form air leakage paths to the interior, which can carry water. To create a complete air barrier, these joints must be sealed – the air barrier then allows the air within the external wall assembly (cavity) to moderate to a level similar to that of the external air pressure, which removes the driving force.

2.1.4 Air seals around windows, doors, meter boxes and similar penetrations must be formed with:

- a suitably sized PEF foam rod installed as a backing rod to the gap between the wall framing and the window, door reveal or meter box on the inside face of the penetration (Figure 1)
- an expanding foam air seal applied to the backing rod to completely seal the gap around the perimeter of the penetration but that does not fill the trim cavity around the window.

2.1.5 Air seals to pipes and other penetrations in the wall cladding can be formed by dressing a compatible flexible flashing tape around the pipe, with the tape adhering to the outside face of the wall underlay to form an air seal. The tape will also facilitate drainage down the face of the wall underlay around the penetration, should any water reach the underlay in extreme circumstances. All pipes and similar penetrations such as wires or heat pump pipework should be pre-installed through the wall underlay and adequately sealed before the installation of the exterior cladding. It is also important to ensure these penetrations slope away from the underlay and towards the cladding.

2.2 FLEXIBLE WALL UNDERLAY

2.2.1 The specified wall underlay or rigid air barrier must be installed to the face of the wall framing so that it forms a vertical drainage path that will allow any water that may come into contact with it to drain down and out.

2.2.2 To ensure an effective, impervious drainage path is achieved, flexible wall underlay must:

- be turned into any opening in the wall (such as windows) to protect the wall framing forming the opening
- be continuous around internal and external corners so joints do not occur at corners
- be securely fastened to studs and nogs (dwangs), with full height vertical plastic tape at mid-stud locations where stud or batten spacing exceed 450 mm – this is to ensure that the underlay is not pushed outwards to bridge the cavity when bulk insulation is installed into the frame cavity
- have minimum laps (from E2/AS1) of 150 mm for vertical or end laps, which must be located over a stud, and 75 mm for horizontal laps
- have any tears or minor penetrations (such as pipes) taped with a compatible flexible flashing tape
- when used as an air barrier, comply with the specific requirements of Table 23 of E2/AS1.

2.3 RIGID AIR BARRIERS

2.3.1 Rigid sheathing such as plywood or fibre-cement may be installed to the outside face of the framing as an air barrier. Rigid air barriers fixed to the outer face of the framing:

- hold the wall insulation in place – bowing of the insulation into the cavity space can occur with flexible underlay that is not well installed
- can provide structural bracing.
- **2.3.2** An air barrier may also be provided by flush-stopped internal sheet linings.

2.3.3 Rigid air barriers must:

- meet the airtightness requirements of E2/AS1
- be installed in accordance with the manufacturer's instructions for use as an air barrier, for example, fibre cement air barriers are typically a proprietary system incorporating specific jointing details
- have any damaged sheets repaired or replaced before the cladding is installed.

2.3.4 Where a rigid air barrier is used without a flexible wall underlay over the top, any joints in the rigid air barrier must be flashed so that water can drain freely down the face.

2.4 FLEXIBLE FLASHING TAPE

2.4.1 Flexible flashing tape that is compatible with the wall underlay must also be installed on the external face of the wall underlay to protect the vulnerable wall framing where it is not completely covered.

2.4.2 Tape is required at:

- the sill of any window or door penetration to protect the full width of the sill trimmer for the depth of the framing and continued 100 mm minimum up each jamb – the tape must also be carried 50 mm minimum out over the face of the wall underlay
- the head to jamb corner junction of any window or door penetration, where it should be installed at the junction 100 mm minimum across the head and down each jamb to lap over the wall underlay and protect the area of framing not covered by the installed wall underlay – the tape must also be carried 50 mm out over the face of the wall underlay
- around pipes such as wastes and heat pump services, cabling, meter boxes and other penetrations.

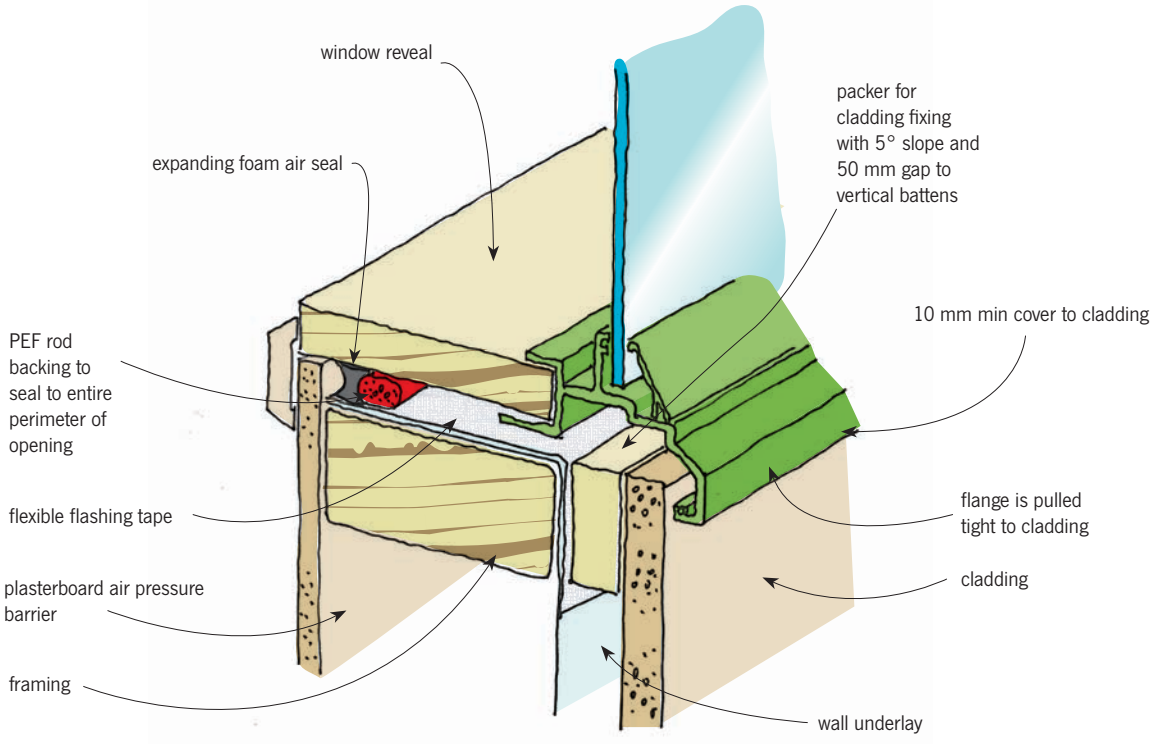

Figure 1. Air seal to cladding penetration (window example) with drained cavity.

2.5 DRAINAGE AND VENTILATION OPENINGS

2.5.1 Drainage and ventilation openings incorporating a drip edge to the cladding and a cavity closure must be provided at the base of the wall.

2.5.2 Flashed drainage and ventilation openings from the cavity to the cladding exterior are required at the head of significant cladding penetrations (such as windows and doors), interstorey junctions and at the termination of the cladding at the junction above a lower floor roof. These openings allow any water that has entered the cavity to drain off the back of the wall cladding to the building exterior and also allow air to enter and circulate within the cavity to dry out any moisture that has been absorbed by components of the wall assembly.

2.5.3 Window and door head flashings must:

- have an upstand of sufficient height to allow an exterior cladding cover of 35 mm and a 5 mm drainage and ventilation gap from the bottom edge of the cladding to the sloped section of the flashing
- be fixed to the wall underlay through the upstand – the junction between the upstand and the underlay must be protected with flexible flashing tape (Figure 2) or another layer of wall underlay dropped down from the underlay joint above and lapped over the upstand
- have a 15° sloped section that spans the depth of the cavity out over the window or door flange that is then turned down 10 mm over the flange and finished with a drip edge
- incorporate 10 mm high stop-ends at each end of the flashing to prevent water being driven off the flashing into the cavity – the stop-ends must terminate at the back of the cladding.

2.5.4 Interstorey flashings are similar to head flashings but the sloped section must span the depth of the cavity out over the cladding and then turn down to provide 35 mm cover to the cladding and be finished with a drip edge. The flashing must be fixed and sealed like a head flashing, and it must also have an upstand of sufficient height to allow an exterior cladding cover of 35 mm minimum and a 5 mm drainage and ventilation gap from the bottom edge of the cladding to the sloped section of the flashing (Figure 3).

2.5.5 At the termination of the cladding above an apron flashing to a lower storey roof, the requirements are to:

- have an upstand of sufficient height to allow an exterior cladding cover of 75 mm minimum
- locate the cavity closure 10–15 mm up behind the bottom of the cladding so a drip edge is formed at the bottom of the cladding
- have at least 35 mm clearance between the bottom of the cladding and the flashing
- have a stop-end where the flashing follows the slope of the roof and terminates within a wall area (see Figure 8 of E2/AS1)
- provide cover to the roofing in accordance with Table 7 of E2/AS1 following the roof manufacturer's requirements and to suit the relevant exposure.

2.6 CAVITY CLOSURE DEVICES

2.6.1 Cavity closure devices that facilitate drainage and ventilation but restrict vermin entry are required at all cavity openings such as at window and door heads, interstorey junctions, lower roof junctions and at the bottom of the cladding.

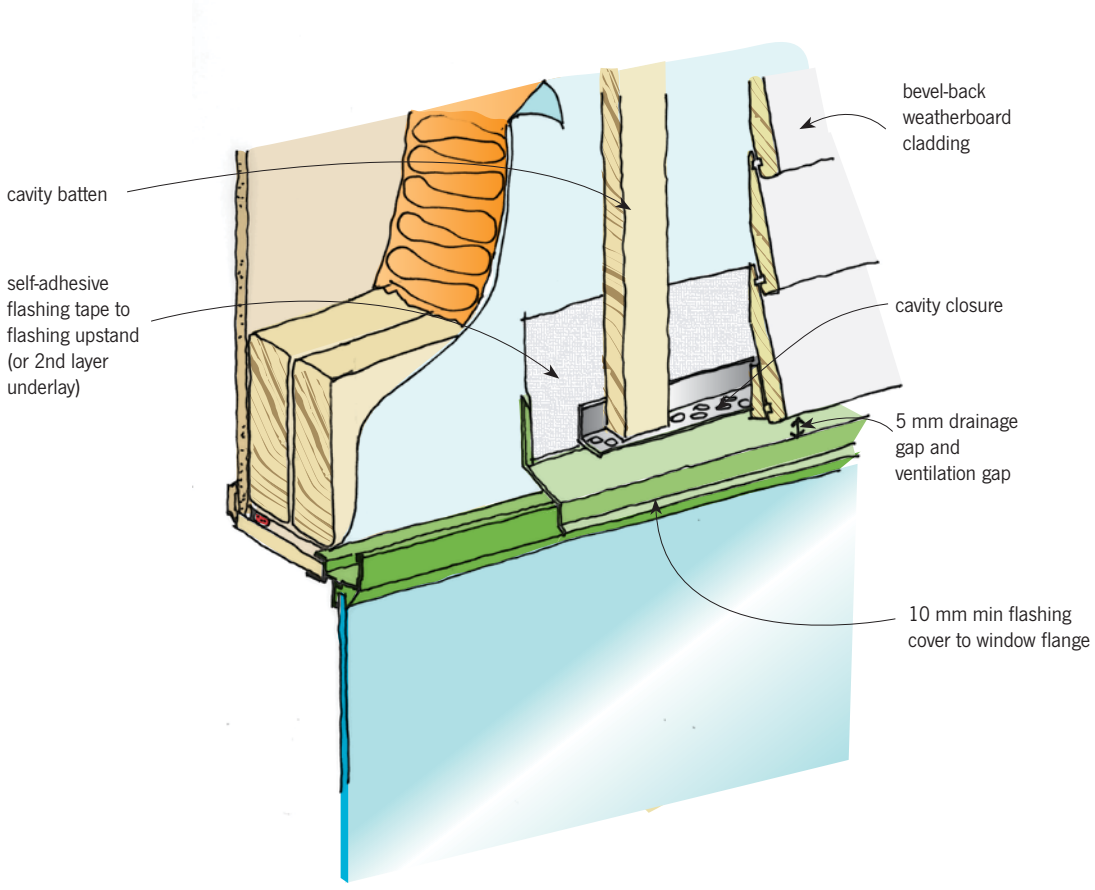

Figure 2. Window head – typical drained and vented cavity cladding.

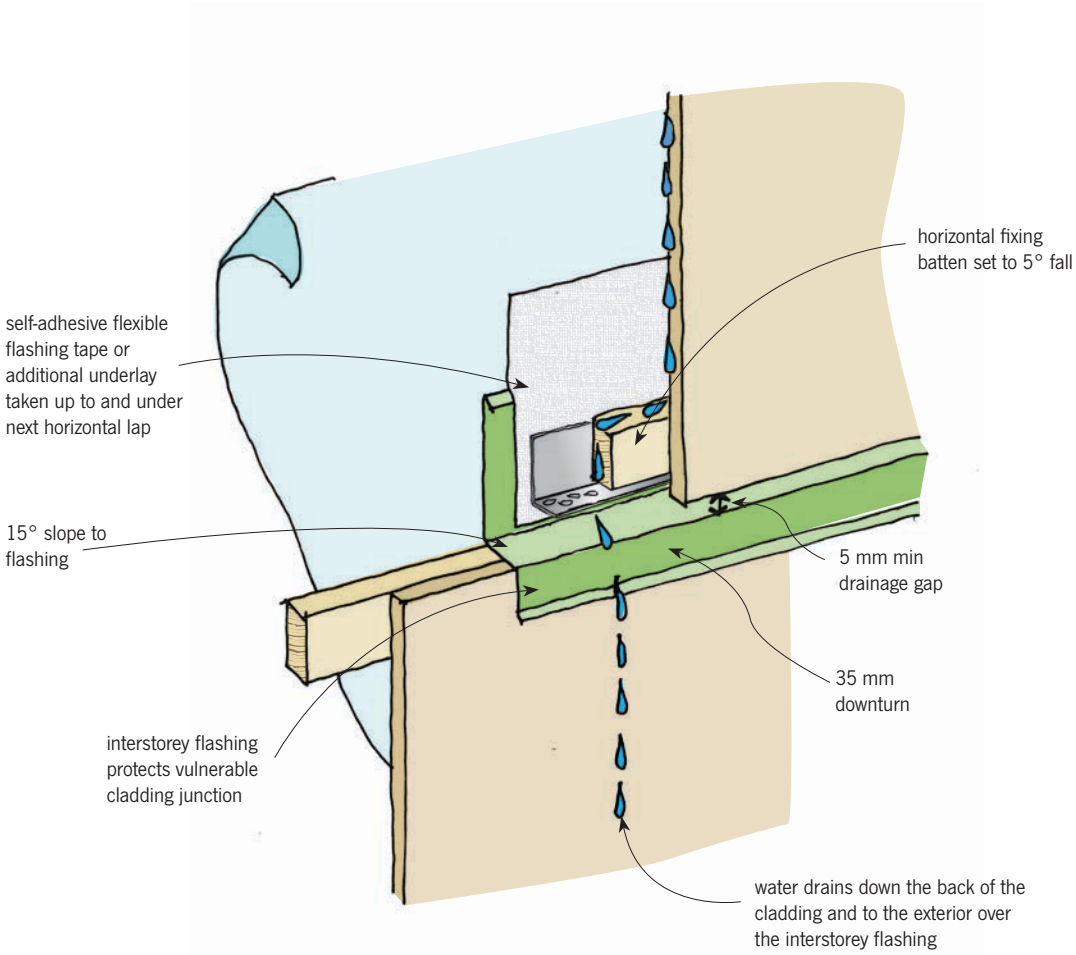

Figure 3. Interstorey drainage is required for cavities over two storeys high.

2.6.2 The cavity closure must:

- be manufactured from aluminium, stainless steel or uPVC with an upstand to suit and 20 mm depth to suit the cavity depth
- have 3–5 mm wide drainage and ventilation slots or holes to the exterior that will prevent vermin entry but also provide ventilation openings of 1000 mm^2 per lineal metre of wall
- be fixed to the frame on the face of the wall underlay in a position to allow a minimum drip edge to the exterior cladding of 10 mm at the base of walls and 15 mm above window and door head flashings.

2.7 CAVITY BATTENS

2.7.1 The drained and vented cavity behind the cladding is formed by the installation of nominal 20 mm cavity battens of at least the same width of the wall stud.

2.7.2 Cavity battens must be:

- of a material that meets the durability requirements of B2/AS1, that is not less than 15 years for 20 mm nominal cavity cladding installations
- fixed to the face of each wall stud with adequate temporary fixings – when the wall cladding is fixed to the battens, the cladding fixings will need to be 20 mm longer to adequately fix both the cladding and the battens to the wall frame (see Table 24 of E2/AS1).

2.7.3 If the design has incorporated structurally fixed battens, this is an Alternative Solution and the consented details will need to be strictly followed. Guidance is given in BRANZ Bulletin 475 *Structurally fixed cavity battens.*

2.7.4 Where the exterior cladding requires horizontal fixings, cavity spacers should be used. Spacers are short lengths of batten that are installed between vertical battens on a 5° slope with 50 mm of clear space at each end (Figure 4) to allow drainage and drying to occur.

2.7.5 The top of the cavity needs to have a continuous horizontal batten to ensure that moist air from within the cavity cannot enter the roof or eaves spaces of the building.

2.7.6 At external and internal corners, the battens need to be fixed back from the corners to ensure that vertical drainage paths down the back of the cladding are maintained (Figure 5).

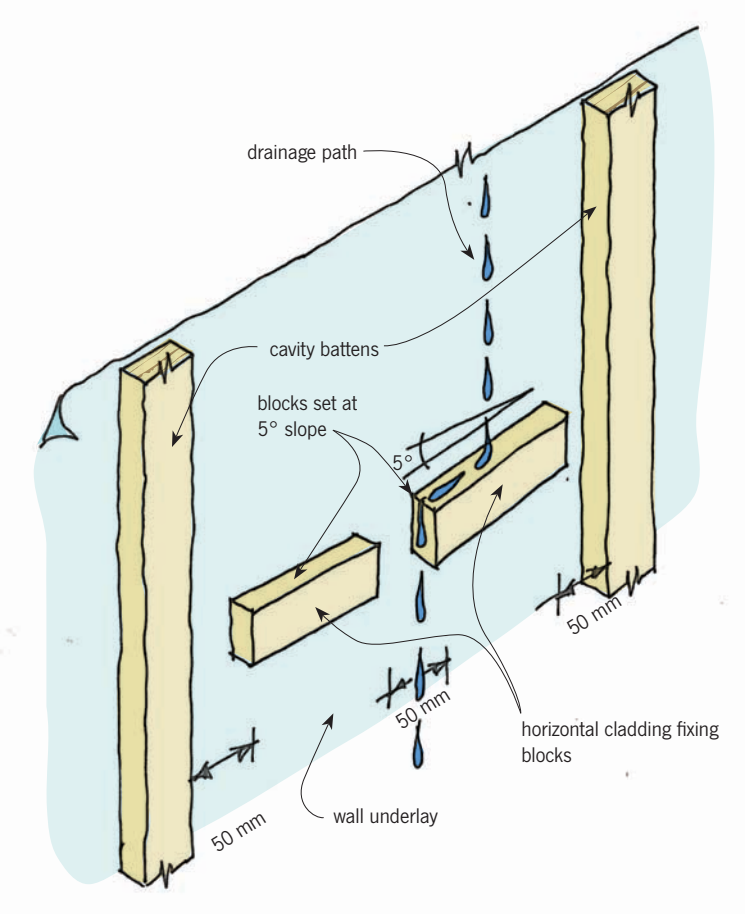

Figure 4. Cavity cladding fixing blocks to allow drainage and venting.

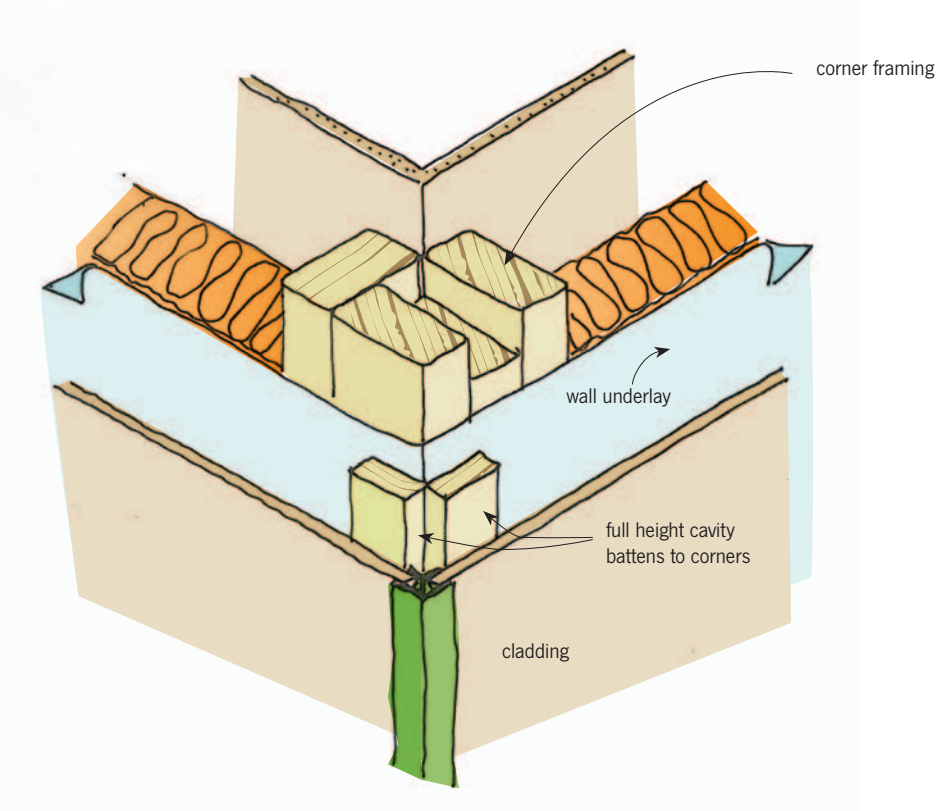

Figure 5. Cavity battens at external corners.

3.0 CAVITY MAINTENANCE

3.0.1 It is important that homeowners are made aware of the aspects of maintenance that need to be carried out to ensure that the drained and vented cavity continues to function effectively.

3.1 GROUND CLEARANCE

3.1.1 At the bottom of the cladding adjacent to the ground, the required clearance between the ground and the cavity opening must be maintained to ensure that drainage and ventilation can occur. Often blockages occur as a result of gardens being built up too high, or ventilation is reduced because plants grow up against the cladding.

3.2 CAVITY CLOSURE BLOCKAGE

3.2.1 In some situations, the drainage and ventilation slots in cavity closure devices can become blocked. This may be as a result of insect infestation on the exterior (nests or webs) that must be cleared. In extreme situations, sand can be blown up into the cavity where it accumulates and blocks drainage and ventilation. In these cases, some cladding may need to be removed to clear the cavity, the difficulty of doing this depends on the cladding type.

Typical example of timber weatherboards being installed over an E2/AS1 20 mm cavity.

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