BRANZ

ISSUE561 BULLETIN

# TIMBER-FRAME PARAPETS, BALUSTRADES AND COLUMNS

May 2013

Care is required when detailing timber-framed parapets, solid framed balustrades and framed columns, to ensure the completed element will be weathertight.

Under E2/AS1, claddings (except vertical profiled steel) to framed balustrades and parapet walls must incorporate a drained and vented cavity.

This bulletin references the requirements for design and construction following acceptable solution E2/AS1 Third Edition (including Amendment 5) and replaces Bulletin 466 of the same name.

# 1.0 SCOPE

**1.0.1** This bulletin addresses ways to design and construct timber-framed parapets, balustrades and columns using E2/AS1 Third Edition (including Amendment 5) as a means of compliance.

**1.0.2** References to timber treatment requirements have assumed the use of treated *Pinus radiata* framing. Where other timber species are being used, refer to NZS 3602:2003 *Timber and wood-based products for use in building* for the required levels of treatment. Amendment 7 to B1/AS1 (the Acceptable Solution to clause B2 *Durability*) modifies NZS 3602 and must be read in conjunction with that standard.

# 2.0 CODE OVERVIEW

**2.0.1** The relevant performance requirements of Building Code clause E2 *External moisture* are:

- E2.3.2 Roofs and exterior walls must prevent the penetration of water that could cause undue dampness, damage to building elements, or both.
- 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.
- E2.3.6 Excess moisture present at the completion of construction must be capable of being dissipated without permanent damage to the building elements.

**2.0.2** Parapet walls, solid or framed balustrades and framed columns have been highlighted as historical weathertightness risk features (Figure 1) and must be carefully detailed to address the level of weathertightness risk associated with them. The design process also needs to allow construction moisture to escape the structure.

**2.0.3** Amendment 5 to E2/AS1 addresses these concerns by strengthening the weathertight design and construction requirements by:

- requiring a cavity as outlined in 3.0.1
- removing parapets and solid balcony walls that are continuous and in plane with adjacent wall surfaces from the Acceptable Solution.

# 3.0 CAVITY REQUIREMENTS

**3.0.1** Amendment 5 to E2/AS1 introduced the requirement that a drained and vented cavity must be used with all:

- parapet claddings
- enclosed balustrade claddings
- flush-finished fibre-cement claddings
- EIFS claddings
- claddings in the extra high (EH) wind zone.

**3.0.2** Direct-fixed vertical corrugated steel cladding is deemed to be cavity construction, and a cavity has been required for all stucco since 2004.

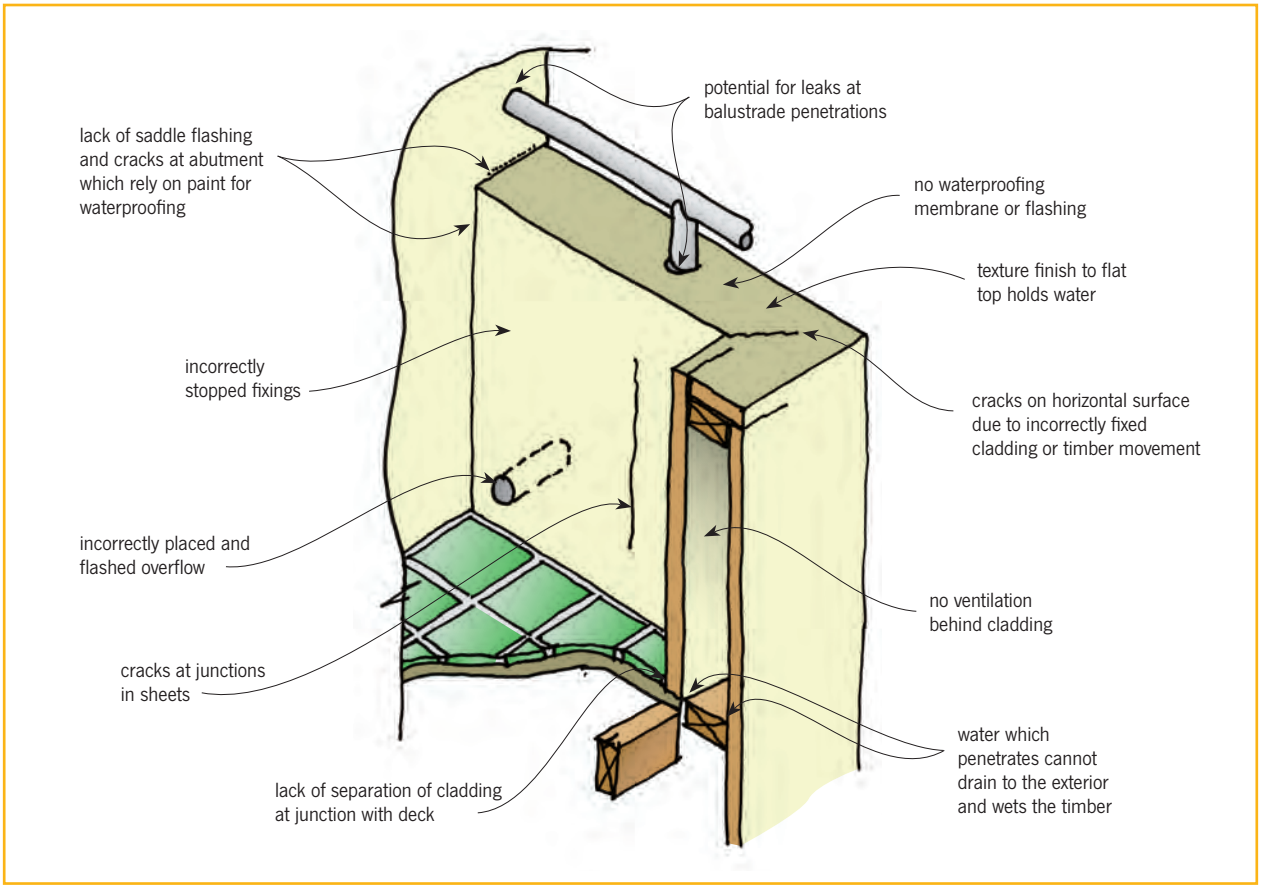



Figure 1. Deck balustrade showing factors that can cause problems in enclosed structures.

**3.0.3** Claddings to columns are treated in the same way as wall claddings and require a drained cavity where:
- Table 3 to E2/AS1 requires it, and/or
- the building is situated in an EH wind zone.

**3.0.4** Amendment 5 also introduced the requirement that, in the EH wind zone, all cladding systems must be installed over a rigid wall underlay of 7 mm H3-treated plywood or 6 mm fibre-cement sheet that is overlaid with a flexible wall underlay complying with Table 23 to E2/AS1.

**3.0.5** Proprietary plywood and fibre-cement rigid air barrier (RAB) systems that do not require the installation of a flexible wall underlay must be submitted as an alternative method as they are outside the scope of E2/AS1.

## 4.0 FRAMING TREATMENT

**4.0.1** Radiata pine timber framing requires minimum treatment of:
- H1.2 for:
  - framing and other members within enclosed (non-cantilevered) decks or balconies
  - framing and other members supporting enclosed decks or balconies
  - balustrades to both cantilevered and non-cantilevered deck or balconies
  - framing to parapets, eaves, trimmers and furring
  - framing to enclosed columns
- H3.2 for framing and other members within enclosed cantilevered deck floor structures (including joist trimmers, nogs or dwangs and blocking)
- H3.1 for cavity battens.

**4.0.2** Metal cladding installed over timber battens treated with a copper-based treatment system must be isolated from the timber to prevent corrosion by:
- an additional layer of paper-based wall underlay fixed over the batten, or
- strips of paper-based wall underlay complying with Table 23 of E2/AS1.

**4.0.3** Wall underlay must fully enclose the framing of parapets and enclosed balustrades.

## 5.0 PARAPET AND BALCONY CAPPING

**5.0.1** Cappings to balcony and parapet walls prevent water entry into the structure below.

**5.0.2** E2/AS1 requires all parapets to be finished with either a metal or membrane capping fitted over the top of the wall and down the face of the cladding.

**5.0.3** For balcony solid balustrade walls, E2/AS1 allows:
- a metal or membrane capping fitted over the top of the wall and the cladding
- for EIFS and flush-finished fibre-cement claddings, an underflashing to allow a textured finish to be applied over the top of the wall – underflashings must be either a liquid waterproof membrane bandage or a butyl/EPDM membrane
- the plastered finish is sealed before any decorative items or trims are fixed to the wall surface.

**5.0.4** The top surface is to have no penetrations. Attach any rails to the side or face of a framed balustrade (Figure 2).

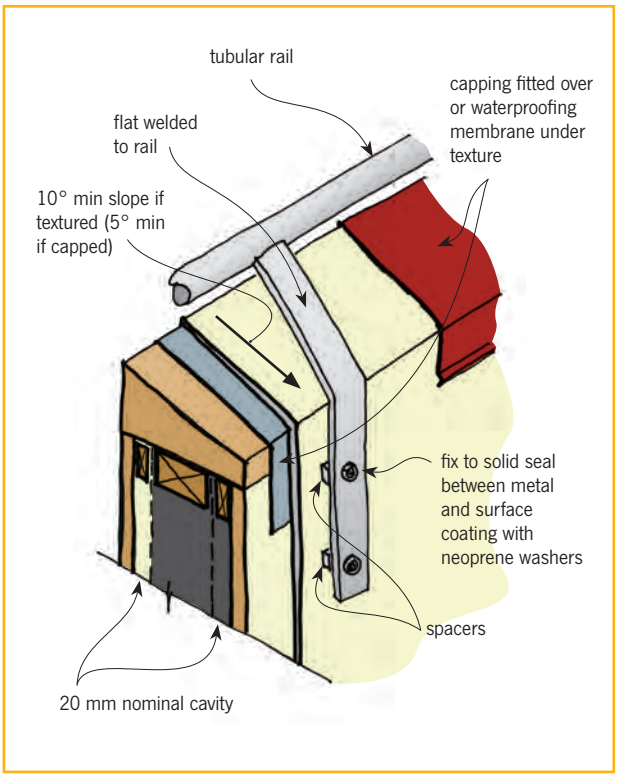



Figure 2. Fixing of metal balustrade.

### 5.1 CAPPING MATERIALS

**5.1.1** Metal, butyl or EPDM (ethylene propylene diene monomer) membrane are acceptable materials for parapets or balustrade cappings. When selecting the capping material, consider:
- its durability
- its suitability for the environment
- the specific conditions of use
- its compatibility with adjacent materials
- the cladding being used
- what it looks like
- the location and construction of joints in metal and membrane flashings (for a sheet membrane surface capping, avoiding cross joints in the membrane is recommended)
- fixing type and locations.

**5.1.2** Metal cappings for parapets and balustrades are considered relatively easy to access and replace, so they have a durability requirement of not less than 15 years. Saddle flashings installed behind the cladding and cappings installed under a plastered finish will require a not less than 50-year durability because of the difficulty in replacing them.

**5.1.3** Unpainted galvanised steel may not be compatible with a number of adjacent cladding

materials, particularly cedar and copper. Factory-coated steel is vulnerable to water run-off from and contact with unpainted green concrete, timber with copper-based treatments, copper and brass. Metal flashings should be designed to shed water because being constantly damp may compromise their durability.

**5.1.4** Butyl and EPDM are compatible with any of the materials in E2/AS1 Table 21 (in contact) and do not require further protection, but staining of downstream materials can occur where the material is left in its natural state. Run-off from both of these materials (E2/AS1 Table 22) can be detrimental and should be avoided onto:

- unpainted galvanised steel
- zinc
- unpainted aluminium/zinc alloy coated steel.

## 5.2 METAL CAPPING

**5.2.1** A metal capping must have the following:

- Sufficient thickness to resist damage.
- A minimum slope of 5° – sloping to the inside to prevent water run-off staining to the exterior surfaces.
- Exposed bottom edges folded to form a kick-out or a bird's beak (as shown in Figure 5 of E2/AS1) that is in addition to the flashing cover dimension.
- A lap over the cladding on the sides of the capping complying with Table 7 in E2/AS1:
  - 50 mm – for up to and including high wind zones (Situation 1)
  - 70 mm – for very high wind zones and low, medium and high wind zones (Situation 2)
  - 90 mm – for extra high wind zones (Situation 3).
- Upstands that are fitted behind cladding such as the saddle flashing require the following:
  - For low, medium, high and very high wind zones, flashing upstands (as shown in Table 7 and Figure 10 to E2/AS1) with either:
    - a hem or hook as shown in Figure 5 to E2/AS1, or
    - no hooks or hems and the flashing upstand increased by 25 mm beyond those shown.
  - For extra high wind zones:
    - hooks and hems must be used, and
    - the flashing upstand dimensions increased by 25 mm beyond those required by Table 7 or elsewhere in E2/AS1.
- As a means of preventing injury from the protruding sharp edge of a balustrade capping, a bird's beak is the preferred option for the inside edge. Do not allow the edge of the metal flashing to contact the cladding material.
- Sloped packers of plywood, timber or polystyrene to fully support the metal capping – isolate the metal from timber and plywood treated with copper-based solutions to prevent corrosion.

## 5.3 METAL CAPPING JOINTS

**5.3.1** Joins in the metal capping can:

- be constructed in accordance with E2/AS1 Figure 9 (b), (c), (e) and (f), which incorporate a soaker flashing with a sealant bead between the soaker flashing and each capping segment being rigidly joined
- be constructed in accordance with E2/AS1 Figure 9 (g) for movement control joints incorporating a soaker flashing
- be a rigid sealed overlap joint (E2/AS1 Figure 9 (d)) with the joint secured through the top of the flashing with blind rivets.

**5.3.2** Flashing joints may also be specifically designed as an open drained joint that incorporates a concealed soaker backflashing with side and rear upstands that is rebated into the timber packer and open on one side to drain water out over the cladding.

**5.3.3** Expansion joints are:

- required where the length of the metal capping exceeds:
  - 12 m for light-coloured steel and stainless steel
  - 8 m for dark-coloured steel or copper or aluminium
- required where both ends of a capping are constrained – such as a flashing fitted to a balcony wall that spans between two adjacent higher walls
- formed with a capping piece over the two segments of capping that is attached to only one of the capping sections.

**5.3.4** Fixings to secure the flashing to the parapet or balcony wall must be through the side downturn of the flashing.

## 5.4 CONCEALED MEMBRANE CAPPING DETAILS

**5.4.1** E2/AS1 allows the use of a monolithic finish to the top of enclosed balustrades for EIFS (E2/AS1 Figure 129) and flush-finished fibre-cement claddings (E2/AS1 Figure 117) but only if the top of the wall is capped before the textured finish is applied with an EPDM, butyl rubber or liquid-applied membrane. BRANZ recommends that a flexible sheet membrane be specified.

**5.4.2** E2/AS1 excludes the use of a concealed flashing with stucco.

**5.4.3** Design of the membrane capping needs to ensure that:

- tops are free of any penetrations
- tops have a minimum slope of 10° – BRANZ recommends 15°
- membrane downturns overlap the wall claddings as outlined in E2/AS1 Table 7
- the membrane is run parallel to the wall to avoid cross joints – where such joints are unavoidable, seam tapes must be used for EPDM and butyl rubber membranes (E2/AS1 8.5.5.2).

**5.4.4** The sloped packers on the top of the balustrade and under the capping may be either:

- a shaped polystyrene block
- a shaped timber block
- 9 mm H3 CCA-treated plywood on timber packers.

**5.4.5** A specialist membrane system applicator should install the membrane capping.

**5.4.6** Where a liquid-applied reinforced waterproof membrane approved by the textured-coating supplier

and meeting the requirements of Table 8 of AS/NZS 4858:2004 *Wet area membranes* is specified, it must be applied over the base coats for the full length of the balustrade and down each side in accordance with the requirements of E2/AS1 Table 7 (50, 70 or 90 mm depending on wind zone) before the application of the textured coating. The waterproof membrane must be applied for the whole length of the balustrade and up onto the wall at either end in the form of a saddle flashing (see section 6.1 below).

# 6.0 PARAPETS AND BALUSTRADES

**6.0.1** An offset in the wall line between the parapet/balustrade wall and adjacent walls is required by E2/AS1 Figures 11 and 12. E2/AS1 gives no minimum offset dimension, and BRANZ recommends a minimum of 200 mm to allow sufficient space for the detail to be installed as detailed in section 6.1 below (see also E2/AS1 6.1.4). E2/AS1 requires at least 150 mm between the trimming stud to a door or window adjacent to the solid balcony wall framing.

**6.0.2** Parapets and balustrades that are continuous and in plane with adjacent wall surfaces are now outside the scope of E2/AS1 and require specific flashing detailing and consenting as an alternative method.

**6.0.3** Incorporating a horizontal flashed cavity drain joint in the adjacent monolithic wall cladding at the height of the balcony wall may make detailing and construction of the junction easier.

## 6.1 E2/AS1-REQUIRED SADDLE FLASHING CONSTRUCTION SEQUENCE

**6.1.1** This section is a step-by-step description to detail the fabricated metal saddle flashing to the vulnerable junction between a solid parapet/balcony wall and an adjacent higher wall and then metal capping required by E2/AS1. It is to be read in conjunction with Figure 3 Steps 1–13.

**6.1.2** Step 1: Fix the framing for the parapet/balustrade over the underlay and directly to the wall framing of the full-height wall. Note the double studs where the balustrade wall buts onto the adjacent wall framing.

**6.1.3** Step 2: Frame up the parapet/balustrade wall.

**6.1.4** Step 3: Wrap the balcony framing in wall underlay. Take the underlay onto the underlay of the main wall.

**6.1.5** Step 4: Fit the shaped timber cap to the top of the balcony wall frame. Details in E2/AS1 also show the use of plywood and polystyrene to support the flashing.

**6.1.6** Step 5: Install cavity battens on both sides of the balustrade or parapet framing, leaving a free-draining vertical channel in the internal corners.

**6.1.7** Step 6: Apply flexible flashing tape to the junction between the parapet/balustrade and the wall. This tape is to be dressed up and firmly adhered to the wall underlay. It is also to be dressed down and taken at least 50 mm down the face of the battens on the balcony/parapet.

**6.1.8** Step 7: Fix battens to the full-height wall either side of parapet/balustrade wall.

**6.1.9** Step 8: Apply wall underlay over the sloped timber capping piece as an isolating layer.

**6.1.10** Step 9: Place internal corner back flashings on each side of the enclosed balustrade where the balustrade meets the wall. These back flashings are an L profile, 50 x 50 mm (75 x 75 mm in the EH wind zone) with a hem at each edge. Install these on top of the cavity battens, just before the cladding sheets, but over wall underlay to separate the flashings from the treated timber. It is common for corner battens to be rebated to allow the flashing to sit behind the cladding to avoid the flashing being crushed and or the edge of the cladding being forced out of plane.

**6.1.11** Step 10: Install the cladding over the drained and vented cavity to the parapet or balustrade wall.

**6.1.12** Step 11: Fit the fabricated saddle flashing at the junction of the top of the parapet or balustrade and the main wall. This saddle flashing is to go over the internal corner flashings and above the underlay over the sloped packer along the top of the parapet or balustrade.

**6.1.13** Step 12: Cut the main wall cladding around the balustrade/parapet wall and fix in position, leaving a 5 mm gap between the bottom of the cladding and the upper surface of the capping to allow any moisture that does get behind the cladding to drain from the back of the cladding.

**6.1.14** Step 13: Install the metal capping with two rows of sealant between it and the saddle flashing.

## 6.2 BASE OF ENCLOSED BALUSTRADE

**6.2.1** The cladding material is to stop short of the deck surface by a minimum of 35 mm measured at the highest point of the deck surface.

**6.2.2** Provide blocking between the jack studs of the enclosed balustrade to fully support the deck membrane's upstand.

**6.2.3** Install a triangle fillet between the deck and the balustrade so the deck membrane can be smoothly turned up with no sharp kinks.

**6.2.4** Ensure the deck membrane has an upstand of at least 150 mm (Figures 4 and 5).

**6.2.5** Stop the vertical cavity battens 10–15 mm short of the bottom of the cladding (depending on E2/AS1 requirements for the cladding used) to provide a

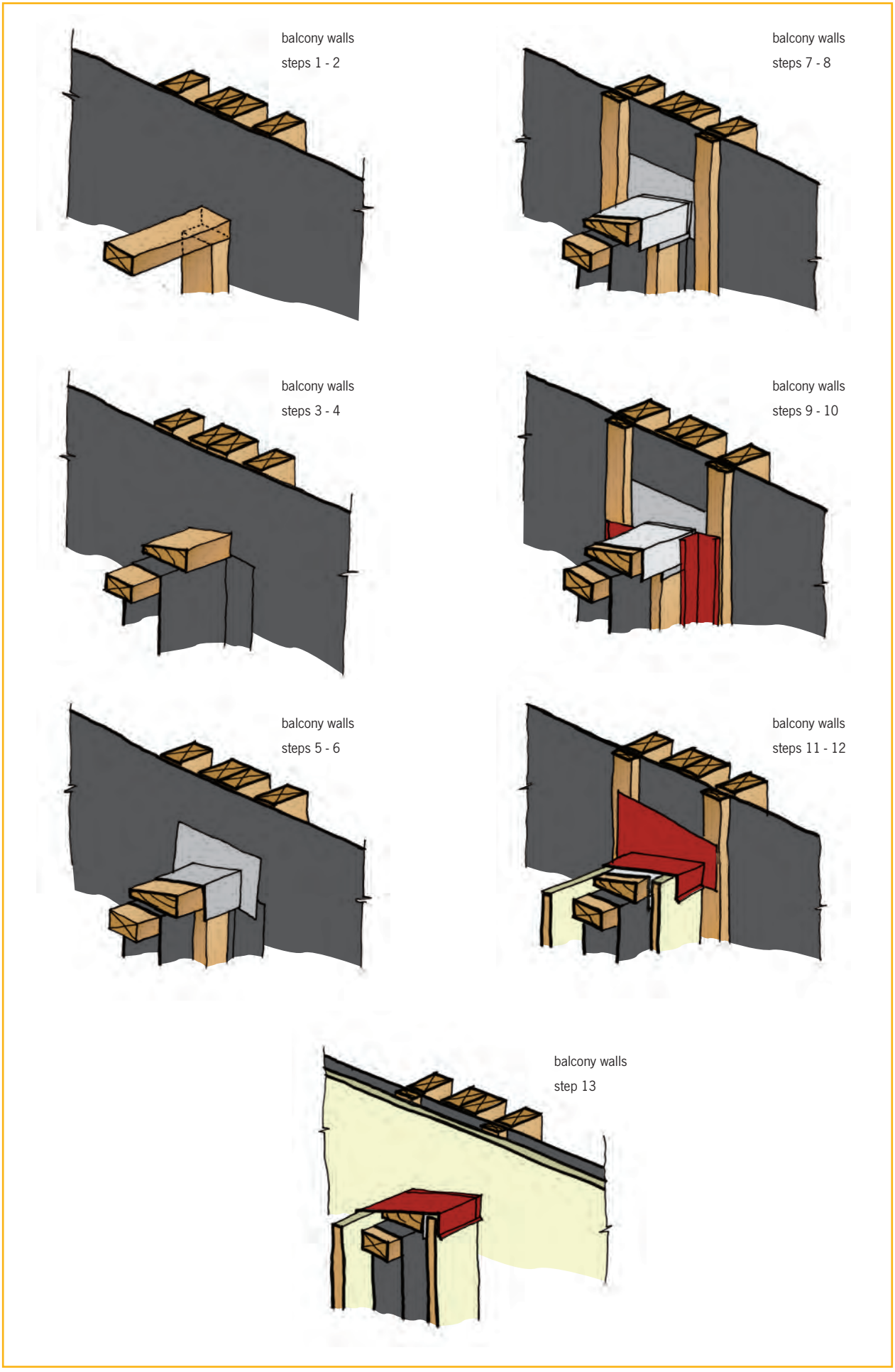



Figure 3. Saddle flashing construction sequence.

drip edge. A ventilating cavity closer is to be included to prevent vermin entering the cavity.

## 7.0 TIMBER-FRAMED COLUMNS

**7.0.1** Timber-framed columns are often an integral component of the building, usually supporting part of the roof or a deck. They must remain weathertight to retain their structural integrity.

**7.0.2** Encapsulate the timber framing with wall underlay.

### 7.1 COLUMN BASE

**7.1.1** Provide a damp-proof course (DPC) between any concrete column footing and the timber framing of the column.

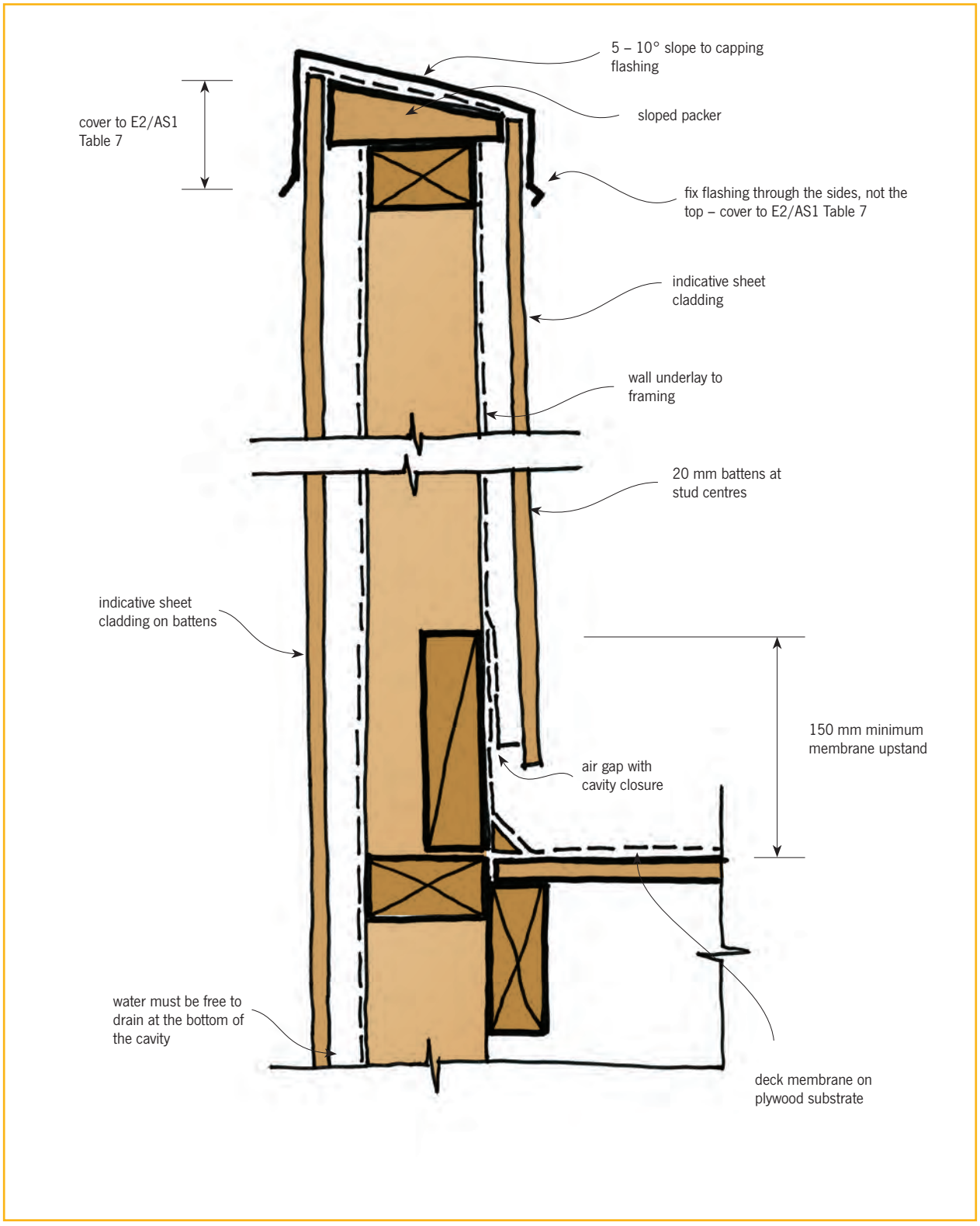


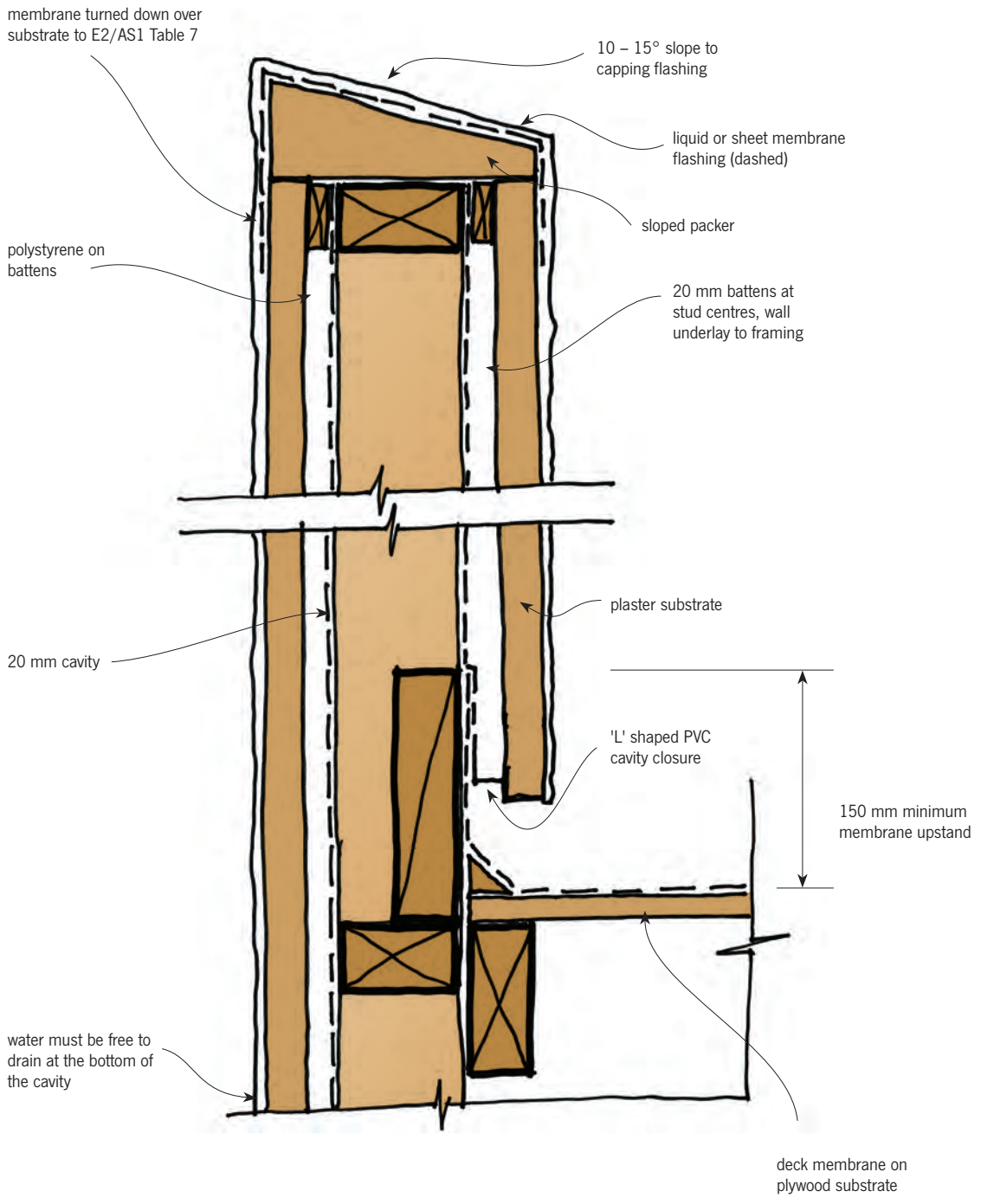

Figure 4. Solid balustrade with fibre-cement cladding.

**7.1.2** Framing timbers for columns must be a minimum height above ground level of:

- for brick or stone veneers:
  - 100 mm above paving
  - 150 mm above unprotected ground
- for all other claddings:
  - 150 mm above paving
  - 225 mm above unprotected ground.

**7.1.3** These clearances can be achieved by:

- a concrete plinth with a fully framed column with plates and studs (Figure 6)
- a post support bracket complying with section 9 of NZS 3604:2011 *Timber-framed buildings* (or proprietary alternative connection) supporting an isolated post above the ground, with the column framed out from the post. This method is only viable up to approximately 250 x 250 mm column size (including battens).




Note: A 35 mm minimum clearance is required between the bottom of the cladding and the highest point of the deck

Figure 5. Solid balustrade with EIFS cladding on cavity with membrane capping under texture.

## 7.2 COLUMN TOPS

**7.2.1** Generally the top of the column should be finished as for the building cladding/soffit junction.

**7.2.2** It is preferable that the soffit lining should finish short of the column. This enables the column cladding to be taken up and finished just below the soffit framing. This ensures any moisture that does penetrate the junction will not get into the column framing (Figure 6 ).

**7.2.3** If the top surface of the column is exposed (that is, not protected by a soffit), the top surfaces should each have a minimum slope of:

- 5° – if capped with metal
- 10° – if capped with a membrane.

## 7.3 MASONRY VENEER FACINGS

The finishing of a timber-framed column with a masonry veneer is not specifically covered by E2/AS1. To ensure the durability of the framing, it is recommended that specific engineering advice be obtained to advise on the:

- tying of the masonry back to the framing
- incorporation of a drained and vented cavity behind the veneer.

# 8.0 FURTHER READING

**Ministry of Business, Innovation and Employment Building and Housing website**
New Zealand Building Code Handbook
Compliance documents:

- E2 *External moisture* Acceptable Solution E2/AS1 Third Edition (including Amendment 5)
- B2 *Durability* Acceptable Solution B2/AS1 (including Amendment 7).

**Standards New Zealand**
NZS 3602:2003 *Timber and wood-based products for use in building*

**BRANZ Bulletins**
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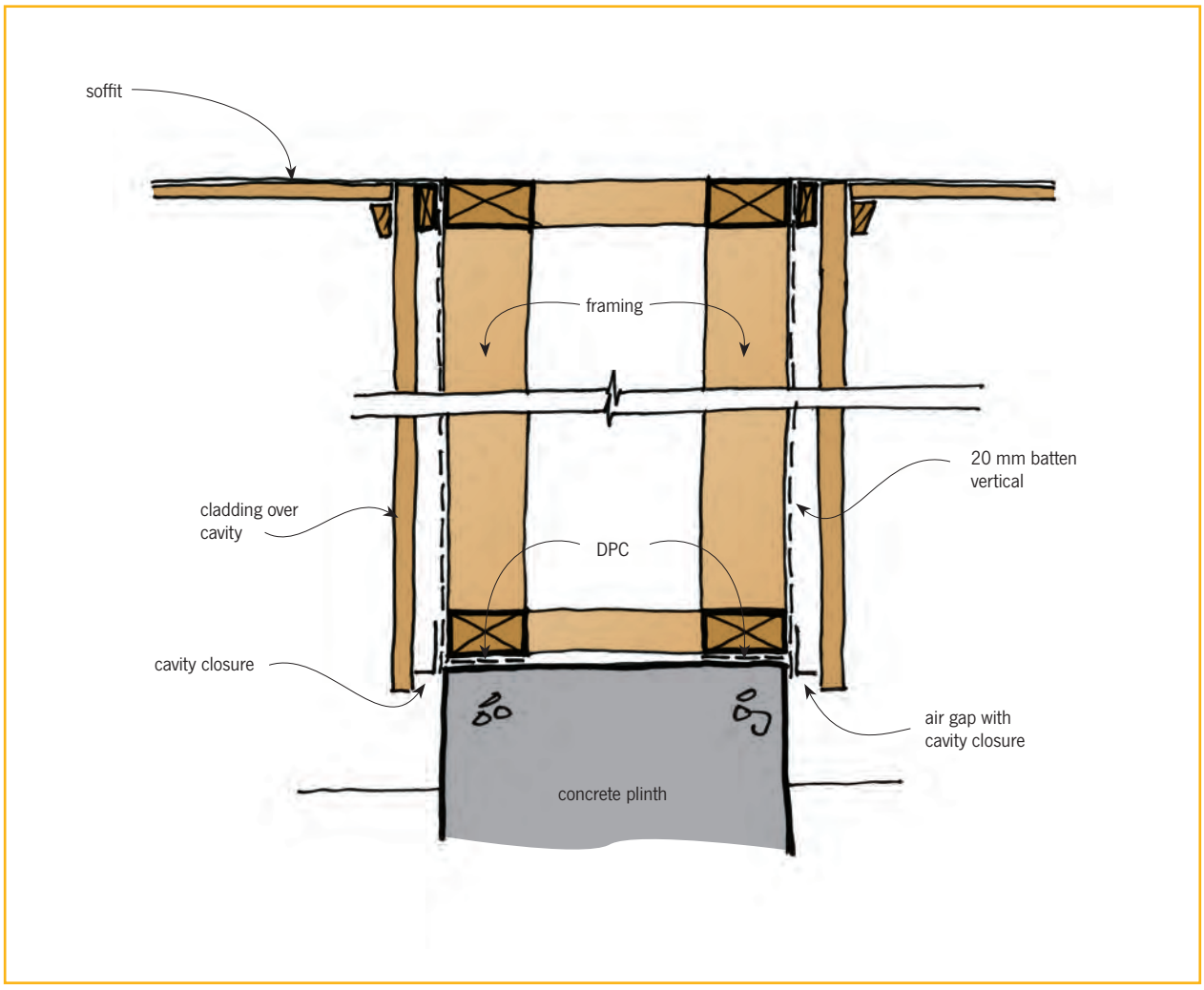


Figure 6. Column with solid capping (column under a soffit is similar).

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ISSN 1170-8395