MINISTRY OF EDUCATION
Te Tāhuhu o te Mātauranga

Weather-tightness requirements for schools

Requirements for boards of trustees, project managers, design consultants and building contractors

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Ministry of Education – April 2011

New Zealand Government

Contents

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Section 1: Introduction

1.1 Purpose of these requirements

This is an update of the Ministry of Education's requirements for building and improving school property. The focus of the requirements is reducing the risk and cost of weather-tightness failure. They add to Building Code requirements and specify stricter standards in areas where there is a high risk of weather-tightness failure.

1.2 Background

A significant number of school buildings are suffering from weather-tightness failure; some of these were only recently constructed. Weather-tightness failure creates health and safety risks for occupants and the Crown faces a significant cost in addressing these risks.

In order to identify the most common causes of weather-tightness failure in schools, Prendos reviewed surveys of 81 school buildings, equivalent in combined size to 358 modest houses, that had weather-tightness defects. This provided a basis for identifying the most common risk areas in roofs, wall claddings, external joinery, balconies, retaining walls and sub-floors.

The study revealed that, in comparison to residential buildings, there is a high incidence of roof failure in school property. Accordingly, this document focuses on addressing failures associated with the design and construction of roofs.

These requirements are an interim update while the Ministry undertakes a full review of its building standards and quality assurance processes. As such, the requirements do not attempt to address all potential causes of weather-tightness failure, but only the most common causes.

1.3 How to use this document

This document is intended for principals, boards of trustees, project managers, designers, contractors and other parties involved in the construction and renovation of school buildings. Its primary purpose is to help eliminate the risk of weather-tightness failure by providing and improving on solutions for the most common failures found in school buildings.

The following table summarises how each audience group is expected to use this document:

If you are…	You should…
Principal or board of trustee member	• have a general understanding of these requirements and how they should be used • ensure that project managers are aware of these requirements

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If you are…	You should…
Project manager	• understand the technical aspects of the requirements • ensure contractors are aware of the requirements and how to apply them • monitor contractors' work against the requirements and identify non-complying designs • where designs deviate from the requirements, notify the school and forward the design to the Ministry of Education's National Property Advisor for a determination
Designer or contractor	• understand the technical aspects of the requirements • ensure all work complies with the requirements; if it deviates, explain how the risk of weather-tightness failure will be mitigated

This document mandates Ministry requirements additional to the requirements of the Building Code and the Department of Building and Housing (DBH) Approved Documents. All such additional mandatory requirements are in bold non-underlined print.

A weather-tightness risk analysis must be undertaken by the designer at the concept design phase, checked by the project manager and presented to the school board of trustees with the concept design. The risk matrix in E2/AS1 is the required method (see section 1.7).

The project manager must recheck and verify the E2/AS1 risk score has not increased before the detailed design is completed to ensure risk-prone elements have not crept into the design. If the risk score has increased the board of trustees must be notified by the project manager in writing.

All the parties need to refer to this document at both the concept and detailed design phases of building projects. The likelihood of premature building failure is often created during the conceptual design phase.

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Principals and boards of trustees should be aware of the classic triangle illustrating the interrelated factors of cost, time and quality.

It is possible to optimise two factors, but very difficult to optimise all three. In managing building projects, boards, principals and project managers should be aware of tradeoffs between these three elements.

Complicated and challenging designs cost more and introduce greater risk, especially in terms of weather-tightness. Simple designs more easily balance cost, time and quality.

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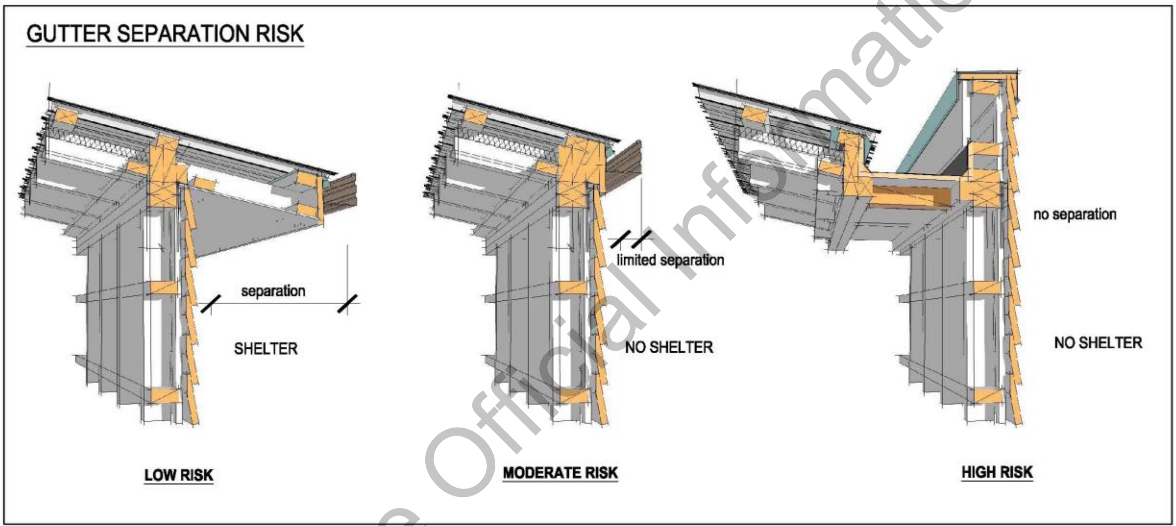
1.4 Scope

This document is to be used for typical school buildings such as classrooms, halls and administration buildings.

For specialist buildings, such as enclosed swimming pools, specific design advice from suitably qualified and experienced specialists is required. Such designs would be "non-complying" in terms of this document and need to be referred to the National Property Advisor; refer Section 1.7.

1.5 Understanding risk

Risk is comprised of the likelihood of an event happening and the consequence if it does. Good design needs to consider and address both aspects of risk.



A design that employs a sloped roof and substantial roof overhang to shed water beyond the external walls has a lower likelihood and consequence of leakage. For example, if the gutters were to overflow, water would fall harmlessly to the ground.

A roof with no eaves provides no shelter to the wall and the critical roof edge is adjacent to the wall. Both the likelihood and consequence of failure have increased.

A building designed with a parapet and an internal gutter has a much higher likelihood and consequence of leakage. The internal gutter and roof edge is directly over the internal space. The wall is now reliant on the parapet flashings for protection and the lack of shelter to the external wall remains. If the gutter were to overflow, large volumes of water would cascade into the building.

Risk-prone features are best avoided. If this is not possible, they should be limited in use and carefully managed through the design and building process.

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1.6 The 4Ds concept

Weather-tightness is best explained by the 4Ds concept of deflection, drainage, drying and durability.

Deflection

Rainwater is deflected by external surfaces and the use of features such as eaves or flashings.

Drainage

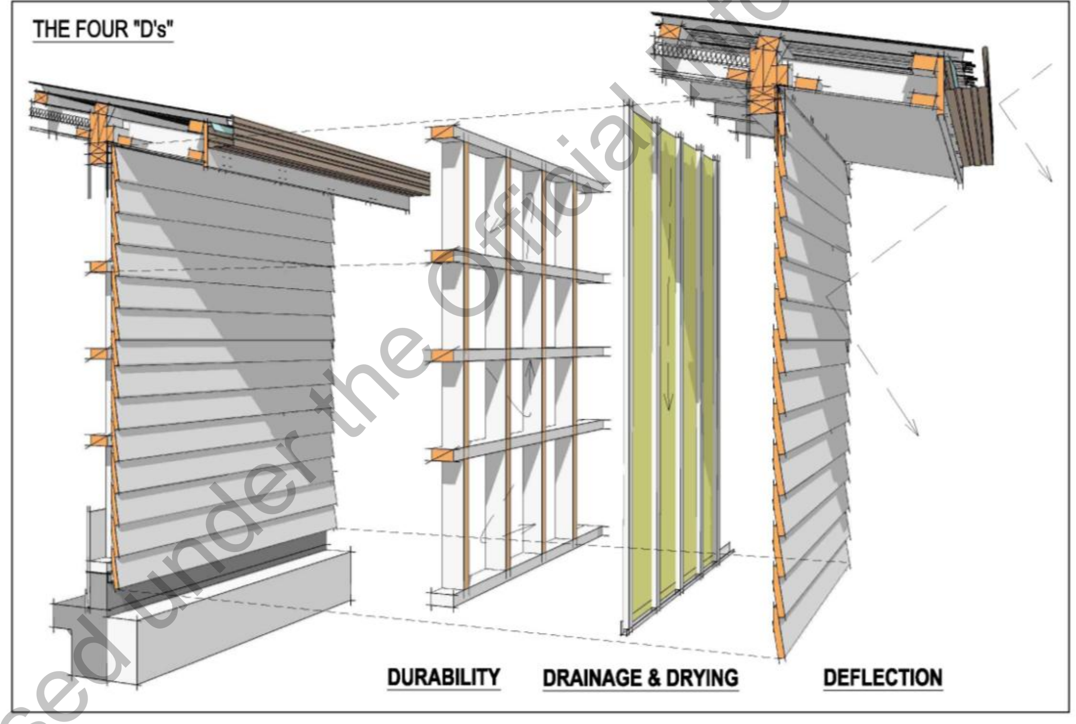
Water that penetrates cladding is allowed to drain back to the outside; a wall cavity is a good example.

Drying

Water that does not drain back to the outside is allowed to dry out; principally through ventilation.

Durability

Ensuring that building materials have sufficient durability to allow drainage and drying to occur before undue deterioration occurs.



The first three Ds relate to moisture management. It is inevitable that any building envelope system will be penetrated by some external moisture during its lifetime. Such moisture must be able to dissipate quickly through drainage and drying before damage occurs. Keeping building elements dry is the key goal.

The fourth D – Durability, relates to the intended life of the building element. If any element of the building system suffers premature failure – usually from moisture-induced deterioration – then the system has failed.

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1.7 Design requirements

Section 17 of the Building Act 2004 requires all building work to comply with the Building Code. As noted above, these weather-tightness requirements assume that the design of school buildings meets Building Code standards.

There are a number of pathways designers can follow to meet the Building Code.

Approved solutions

These include Acceptable Solutions and Verification Methods (testing or calculation methods) published by the DBH. Often these cite New Zealand or joint Australian / New Zealand Standards.

The Approved Documents can be downloaded free from: www.dbh.govt.nz/building-code-compliance-documents-downloads

The combined use of Approved Solutions with this document are deemed a “complying design” in terms of this document.

Alternative solutions

Design solutions not covered by Acceptable Solutions or Verification Methods are known as "alternative solutions". These can include cladding systems from manufacturers or one-off designs created by the designer(s).

The design must still comply with the requirements of this document **and must be peer reviewed.**

The peer review process can be in-house for larger design practices where the project manager is satisfied the peer review was undertaken by another person, suitably experienced and qualified, but with no direct involvement in the design of the building.

Non-complying design

Where a design does not comply with this document the design must be submitted to the Ministry's National Property Advisor for a technical determination on whether the design is acceptable, or what changes, if any, are required.

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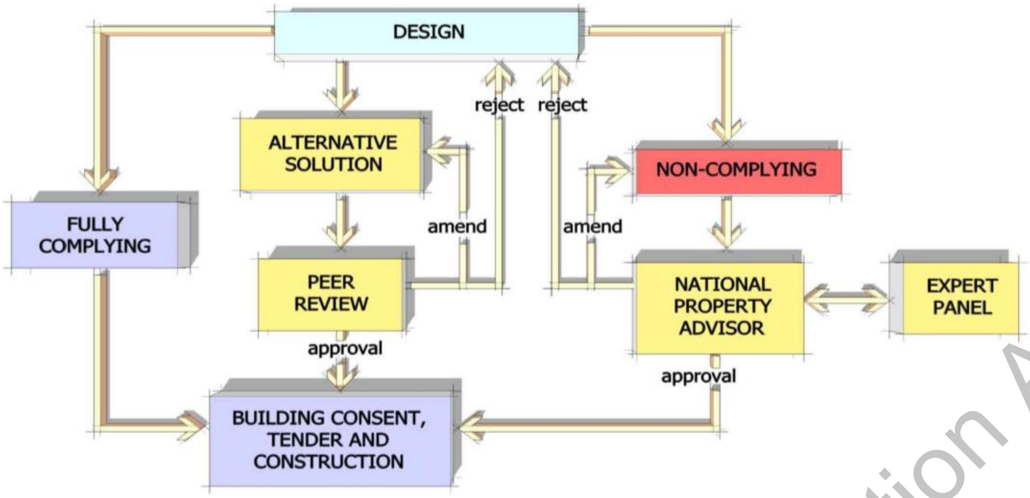
Design pathways



Building Code

Weather-tightness is governed by two clauses within the Building Code; B2 - Durability and E2 - External Moisture.

Sub-clause B2.2 requires buildings to be sufficiently robust that they can be maintained without the need for significant reconstruction. Sub-clause E2.2 requires adequate resistance to the penetration and accumulation of external moisture.

The relevant Approved Documents, such as E2/AS1, that are deemed by the DBH to satisfy the Building Code. Those 'not limited in scope' apply to all buildings, whereas those 'limited in scope' apply to a certain buildings as defined by the scope within that document.

Acceptable Solution B2/AS1 (not limited in scope)

Acceptable Solution B2/AS1 specifies the durability requirements of building elements based on the difficulty to detect or access problems e.g. it specifies minimum levels of timber treatment for timber used in different parts of buildings subject to varying at risk of decay.

Verification Method B2/VM1 (not limited in scope)

Verification Method B2/VM1 provides evaluation methods for durability by taking into account the in-service history, laboratory testing and proven performance of similar materials.

Acceptable Solution E2/AS1 (limited in scope)

E2/AS1 is limited to buildings less than three stories or less than 10 metres in height and provides a means for achieving weather-tightness of the building envelope using common materials, products and processes.

Acceptable Solution E2/AS1 is a primary reference and must be read in conjunction with this document.

Please note E2/AS1 and E2/VM1 are currently under review with new editions due to be published during 2011.

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There are design limitations on height within E2/AS1 and certain common materials, such as concrete masonry, are not included. However, E2/AS1 includes a wide range of wall and roof cladding systems commonly found in school buildings which include:

Wall claddings	**Roof claddings**
Brick veneer	Butyl/EPDM membranes
Stucco	Concrete/clay tiles
Timber weatherboards	Pressed metal tiles
Fibre cement weatherboards	Profiled metal
Profiled metal	
Fibre cement sheet	
Plywood sheet	
EIFS (Proprietary plaster on polystyrene)	

Verification Method E2/VM1 (limited in scope)

This provides a means for testing and approving the weather-tightness of various wall cladding systems other than those included in E2/AS1.

1.8 Other references

Other reference documents relevant to weather-tightness design and the procurement and use of appropriate building systems and materials include:

- Ministry of Education Property Handbook - www.minedu.govt.nz/PropertyHandbook
- NZS 3604:1999
- New Zealand Metal Roofing Manufacturers' (NZMRM) Code of Practice for Metal Roofing and Wall Cladding, Version 2 - www.metalroofing.org.nz
- Code of Practice for Torch-on Membrane Systems Roof and Decks - www.membrane.org.nz
- DBH - External Moisture - An Introduction to Weather-tightness Design Principles - www.dbh.govt.nz

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Section 2: Timber framing and plywood

2.1 Treatment

To conform to Building Code Clause B2 Durability requirements, most timber and certain wood-based products are treated with a specific type and concentration of treatment to resist various biological hazards (insects and fungal decay) associated with typical end usage. Timber treatment can be seen as a relatively inexpensive insurance against premature and destructive decay should the timber be exposed to elevated moisture levels.

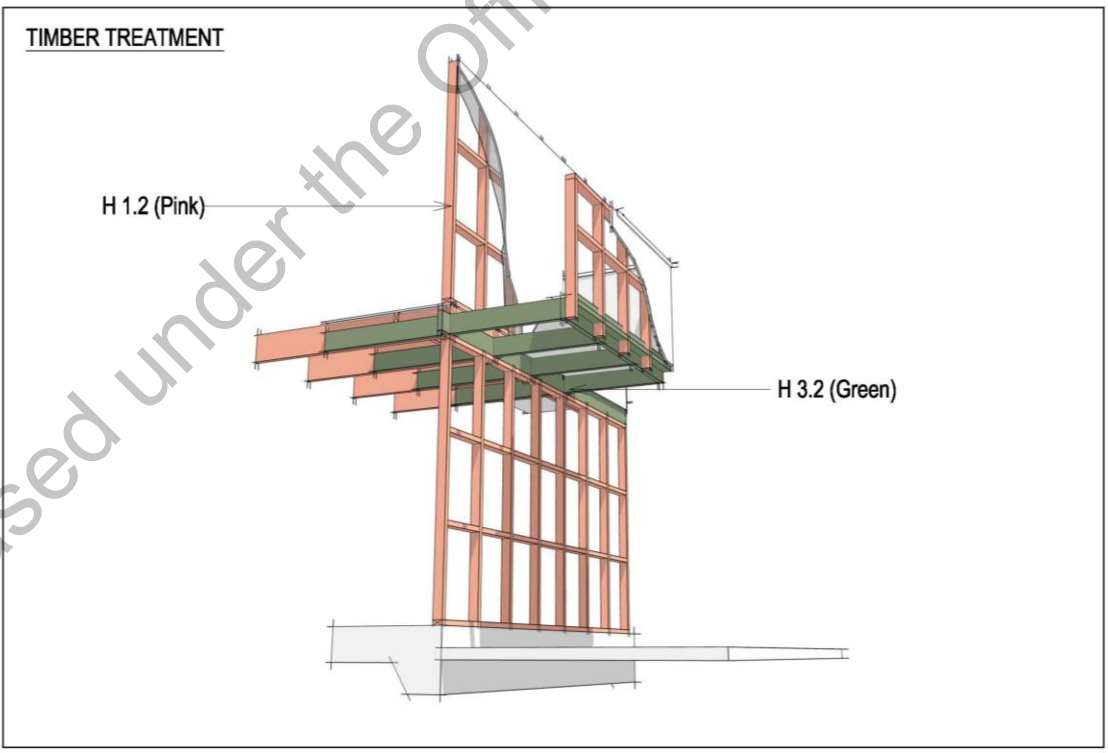
2.2 Hazard Class

Typical end-use situations are ranked according to their level of risk into one of six Hazard Classes, each identified by the letter H and a number ranging from H1 – H6. There are subclasses such as H3.1 and H3.2. Timber selected for use in any situation must contain the appropriate level of treatment for the Hazard Class associated with its end use.

The relevant Standards are NZS 3602, NZS 3640 and AS/NZS1604.3. There is also a DBH guide on the use of treated timber. *Please note the treatment of timber used in buildings is currently under review.*

2.3 Timber framing

All timber floor, wall and roof framing to be used in school buildings shall have a minimum treatment level of H1.2, except for cantilever joists to enclosed decks, which shall have a minimum treatment level of H3.2.



Cantilevered decks are seldom found in school buildings.

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2.4 Plywood

Non-complying levels of light organic solvent preservative (LOSP) based treatments in plywood have been a contributing factor to a number of cladding failures in schools.

All plywood used for cladding, roof substrates, rigid air-barriers and sheet bracing on the outside of external wall framing shall be H3.2 copper chrome arsenic (CCA) treated and fixed with stainless steel fixings. Until further information is available H3.1 LOSP is not a permitted treatment for plywood in school buildings.

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Section 3: Roofs

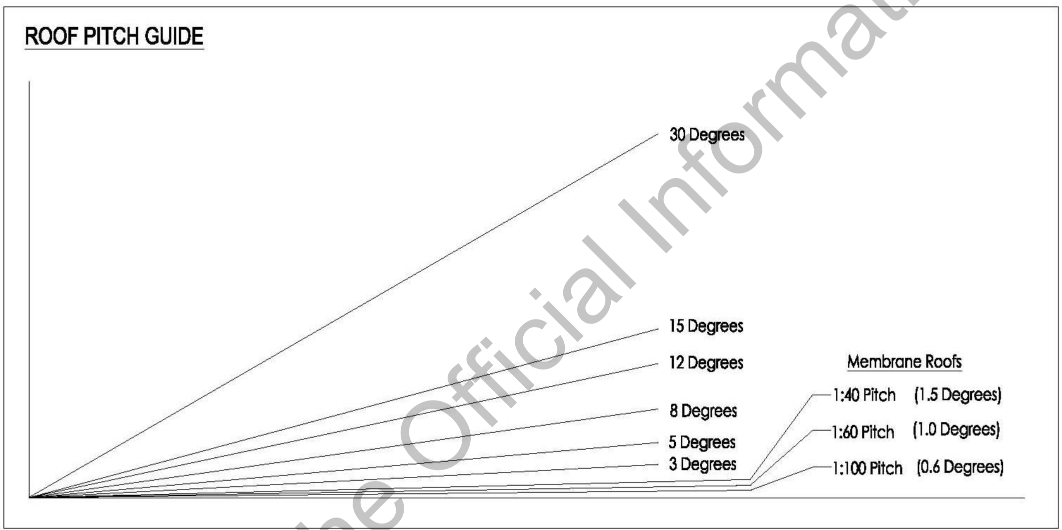
Roofs need to be designed and constructed to minimise potential leakage. Simple, uninterrupted roof shapes with a healthy slope and ample overhang are proven to work well. Complex roof shapes, low-pitch roofs, and roofs with numerous junctions and penetrations are at far greater risk of leakage.

3.1 Metal roofing

3.1.1 Roof pitch

Lack of pitch is a primary cause of roof leakage at flashing junctions and roof penetrations. Increasing roof pitch reduces the risk of leakage and prolongs roof life.

For new buildings the minimum roof pitch for trough section and trapezoidal section roofs shall be 5º and for corrugated roofs, 12º.



For replacement of existing roofs the minimum pitch shall be 3˚ for trough section and trapezoidal section roofs and 8˚ for corrugated steel roofs, except where these pitches cannot be achieved without disproportionate cost and where there has been satisfactory performance of the roof at the lower pitch.

Curved metal roofs are not recommended. Curved roof designs may be considered where there is specific guidance for installing the product in a manufacturer's literature for such design. Guidance is available in the NZMRM Code of Practice.

3.1.2 Minimum roof thickness

The minimum base metal thickness for all steel roofs shall be 0.55 mm.

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3.1.3 Roof underlays

Roof underlays are breathable membranes designed to protect the roof space and structure from the effects of moisture penetration and internal condensation. Underlay placed directly beneath the roofing material is designed to collect and contain any condensation that might form on the underside of the roofing material for later release as vapour when external temperatures rise, and to provide a secure drainage pathway for any water that might penetrate the roof cladding.

Underlays differ from vapour barriers in that underlays are designed to allow vapour to pass through.

Underlays are typically of two types:

- Bituminous or fire retardant cellulose-based
- Breathable synthetic polymer

Roof underlays shall only be absorbent breathable synthetic polymer roofing underlays with a current BRANZ Appraisal. They shall only be laid horizontally and shall be fully supported.

Cellulose-based underlays are not permitted.

Vapour barriers such as aluminium foils and non-breathable polyethylene plastics are not permitted.

3.1.4 Thermal break

[Still awaiting technical information – addendum will be added.].

3.2 Membrane roofing

Membrane roofing made of rubber, plastic, or bitumen compounds is designed for use on near-flat roofs. It is widely used in commercial applications, but has lately become popular in residential and school construction as a means of waterproofing low-pitch roofs and enclosed decks.

Membrane roofing has had a typical service life of 20 years, as opposed to metal roofing with 40-years plus. Because membrane roofs are typically low-pitch, they are more reliant on workmanship. Accordingly they present a greater degree of risk and undergo a higher incidence of failure than pitched roofs clad with conventional tile and rigid sheet roofing materials. Accordingly, membrane roofs should be avoided where possible.

3.2.1 Membrane roof design

The minimum roof pitch as per E2 / AS1 is 1.5 degrees or 1:40. To assist construction at the nominated pitch the levels of the high and low points of the roof shall be provided on the drawings. The roof shall be designed to minimise the number of joints and junctions in the roof membrane.

Internal gutters formed within a membrane roof add no real benefit and tend to compromise performance of the roof by creating extra joints and laps. The following sketch shows a simple roof design without the need for a formed gutter.

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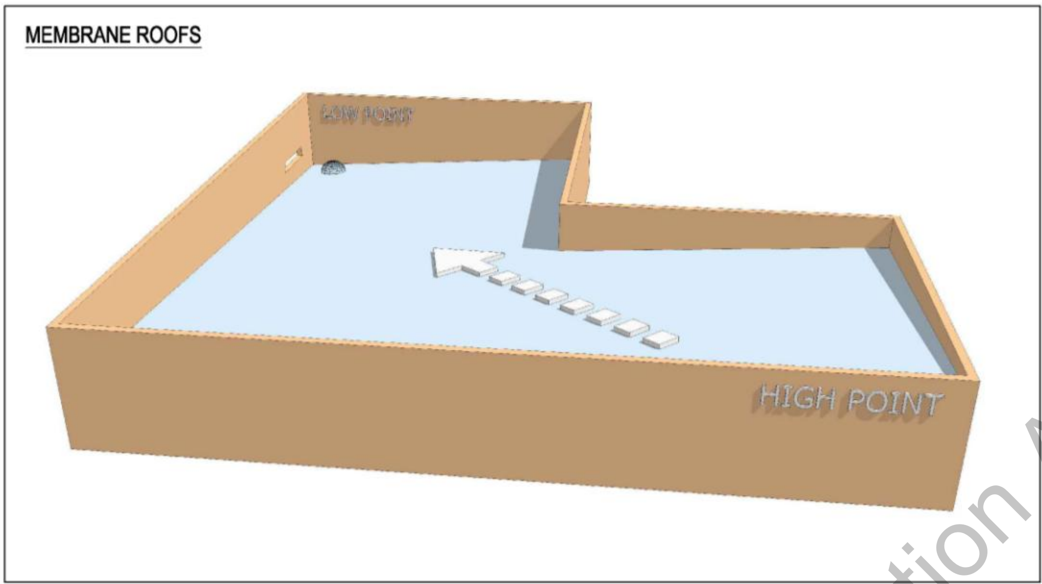

3.2.2 Membrane roof materials

Membranes shall be made of manufactured sheet material only. Liquid applied membranes are not permitted.

Approved membranes include:

- Butyl and EPDM rubber in accordance with E2/AS1
- Torch-on membranes, but only two layers fully-bonded and installed in accordance with the Code of Practice and with a material warranty for a minimum fifteen-year period and with a current BRANZ Appraisal
- Synthetic plastic sheet membranes such as thermoplastic olefins (TPOs) and PVC may be used but only with a material warranty for a minimum fifteen-year period and with a current BRANZ Appraisal

All such membranes must only be laid by applicators licensed and trained by the supplier and the applicator shall provide a five year installation warranty and a Producer Statement to the Building Consent Authority confirming the membrane has been installed in accordance with the manufacturer's recommendations.

3.2.3 Outlets

Rainwater outlets for roofs shall be comprised of a proprietary clamped metal ring and body with domed grate, or a scupper outlet in accordance with E2/AS1 draining into an external rainwater head.

Scuppers - refer 3.6 Internal Gutters

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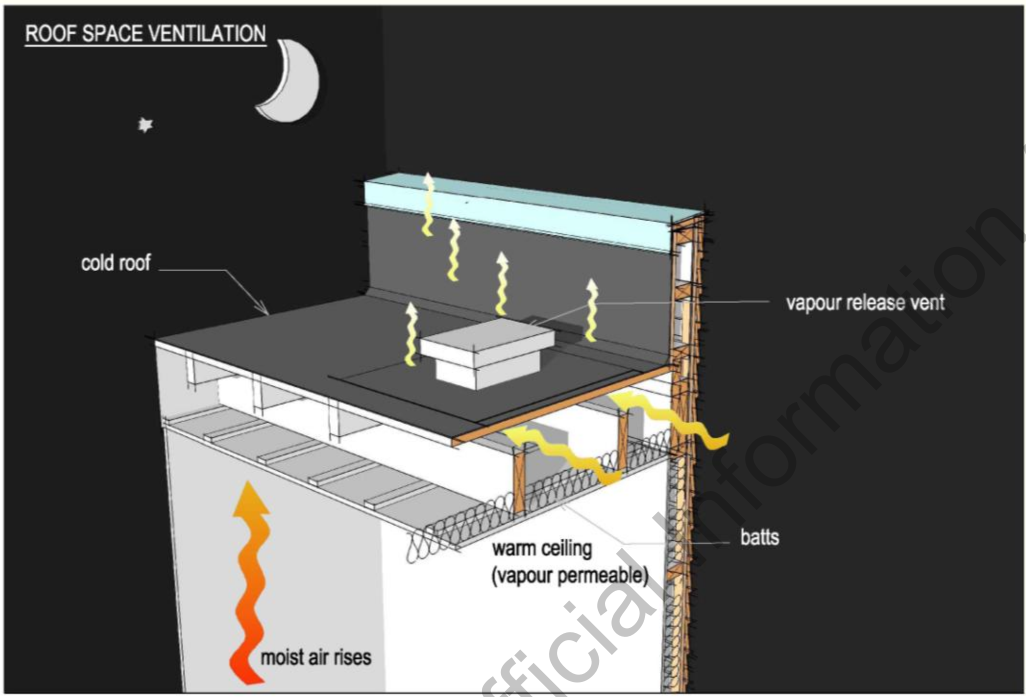
3.2.4 Roof space ventilation

Proprietary vapour vents for the roof space shall be provided at a ratio of one vent (minimum vent area of 400 mm2) per 40 m2 of roof area. Cross ventilation between the roof space voids shall be provided at, or just below the roof substrate.



3.3 Roof penetrations (metal roofs)

Roof penetrations are commonly associated with roof leaks.

It is difficult to achieve a weather-tight flashing around penetrations for vents, pipes, skylights etc when they are located in an area of metal roofing. It is preferable to locate roof penetrations close to the ridgeline, or top of the roof, to minimise the length of back flashing needed to protect the junction between the fixture or penetration and the high point above it.

The maximum practical length of back flashing from the penetration to the ridgeline or high point is 6m.

A typical roof-pipe penetration and skylight flashing detail are:

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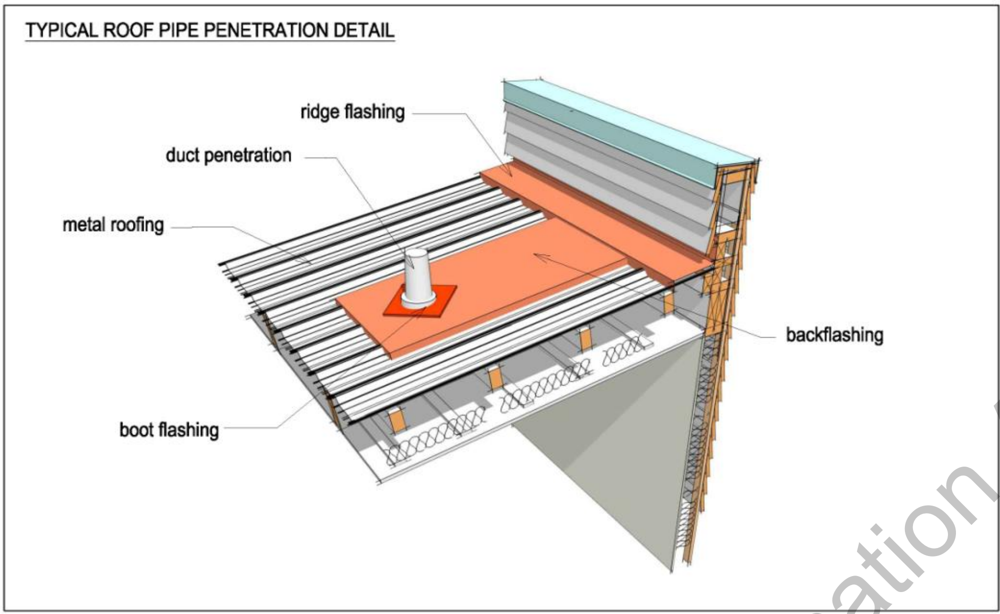

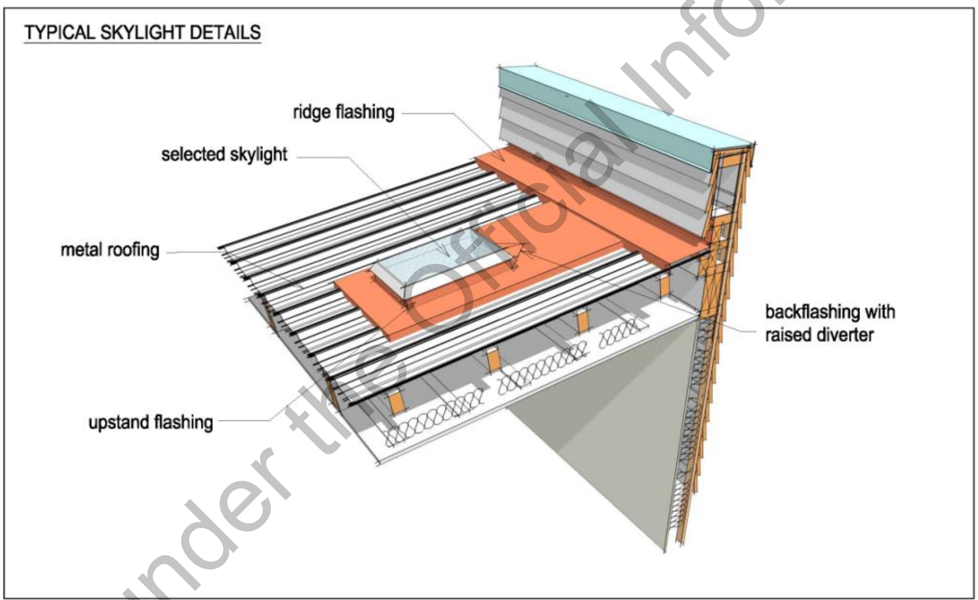

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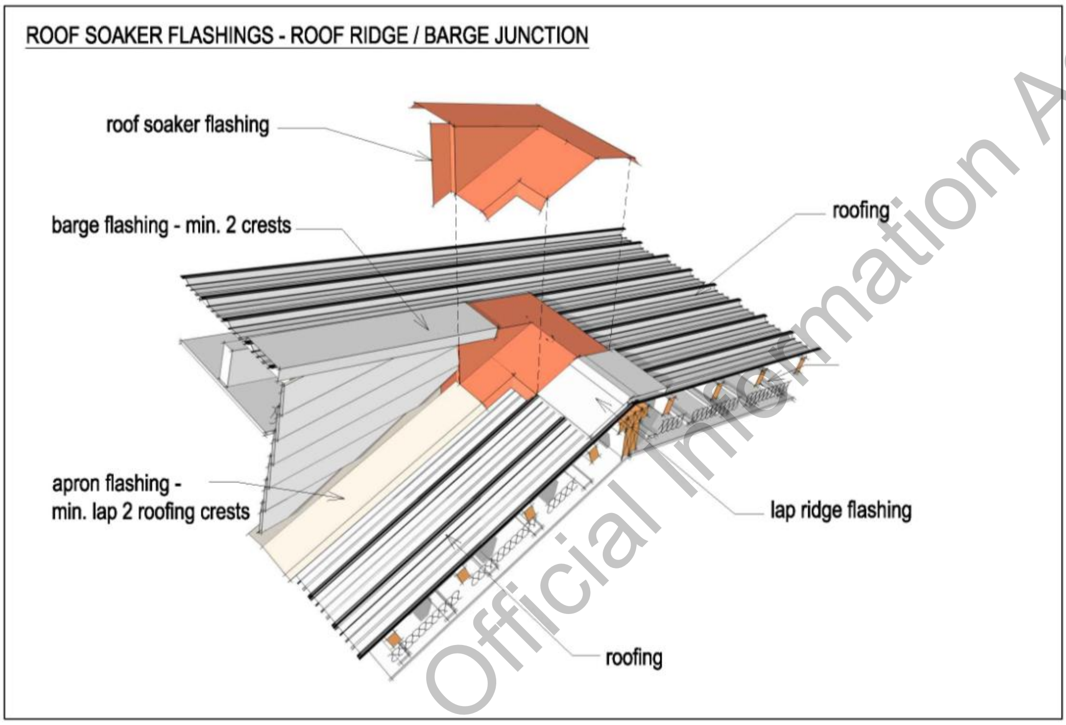
3.4 Roof junctions (metal roofs and flashings)

Poorly designed roof junctions and inadequate and poorly installed flashings are a prime cause of leakage.

Where complex roof junctions occur, compound junction flashings are required. These shall be constructed from welded aluminium (normally 1.6mm).



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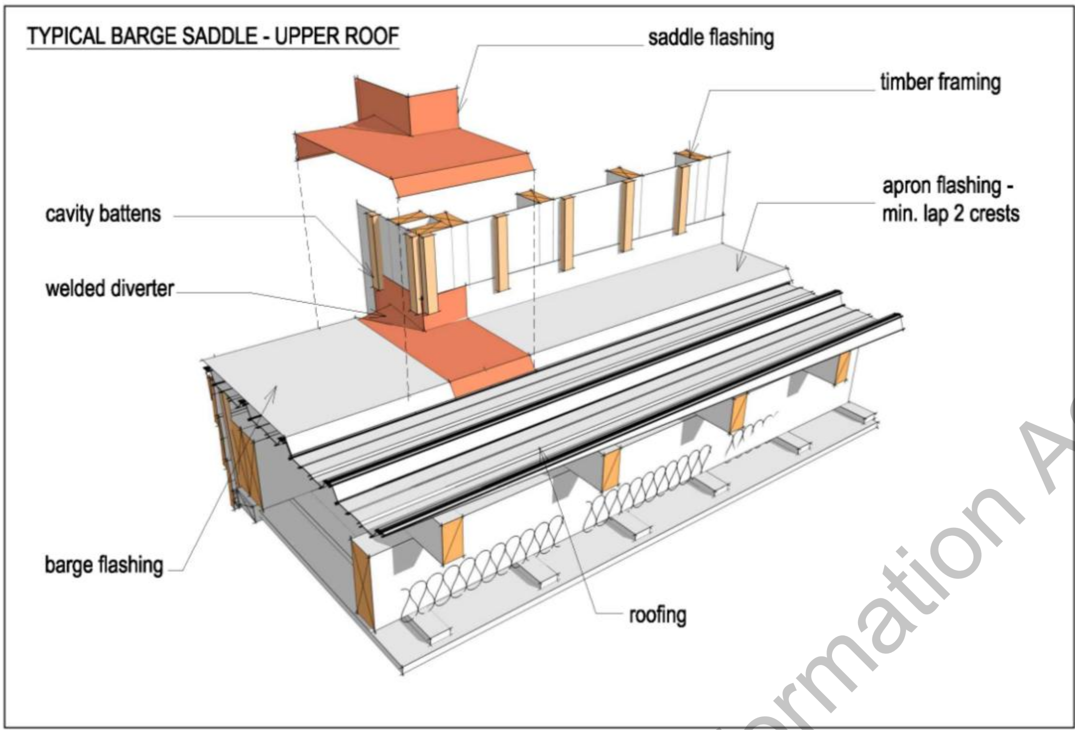

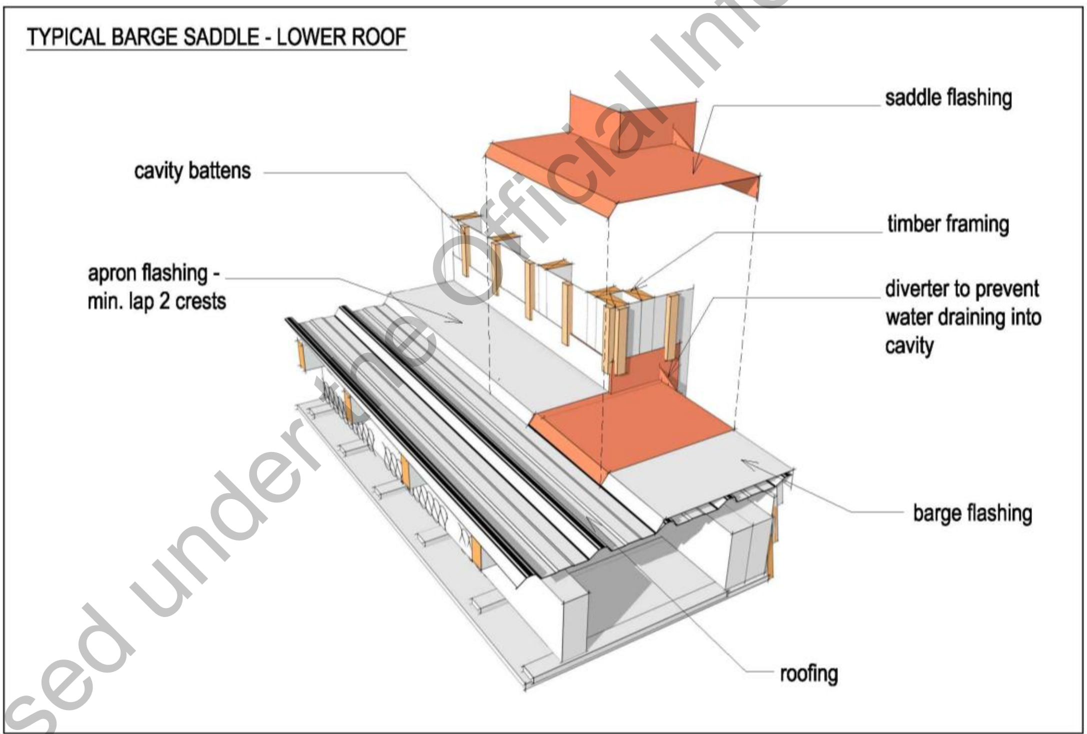

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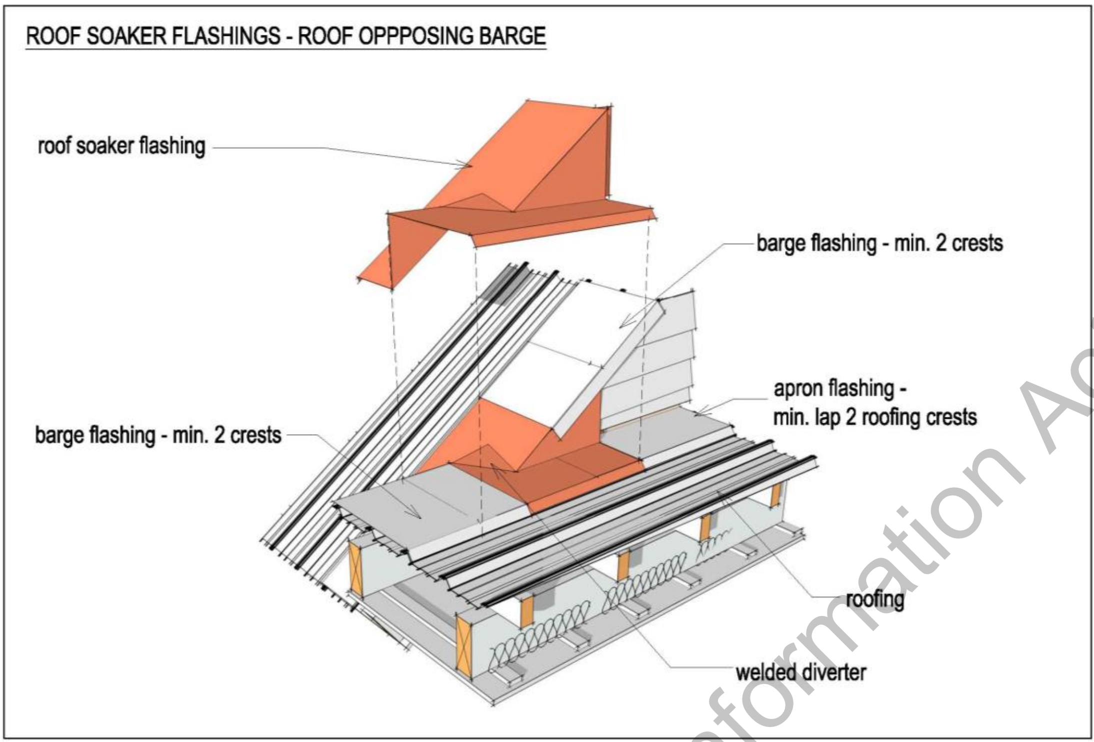

All flashing joints shall be correctly lapped and shall not rely on sealant as a sole means of weather-tightness.

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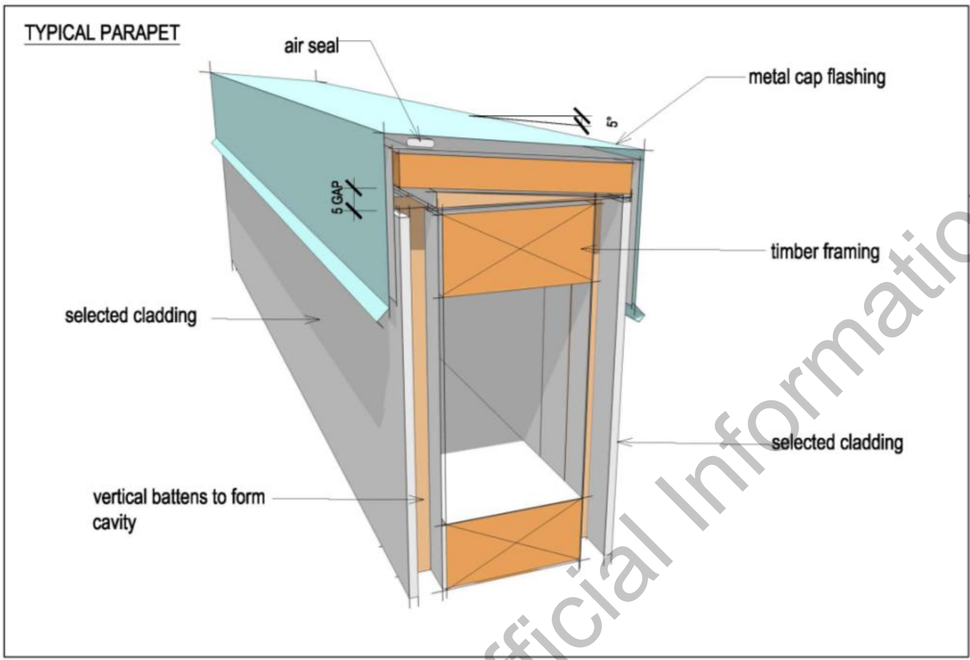
3.5 Parapets and barge flashings

A roof parapet often serves as aesthetic adornment, yet the risk associated with its use is considerable. For a parapet to remain weather-tight it must be sloped and rely on designed and installed junction flashings. Because roof parapets are inherently high-risk, their use should be avoided wherever possible.

Roof parapet flashings shall be metal only with appropriate durability.



To prevent the ponding of water, level parapet tops shall be sloped to give a minimum 5º crossfall. All joins and junctions of the cap-flashing and saddle junctions shall be under flashed with welded aluminium flashings (normally 1.6mm), which are rebated into the plywood substrate.

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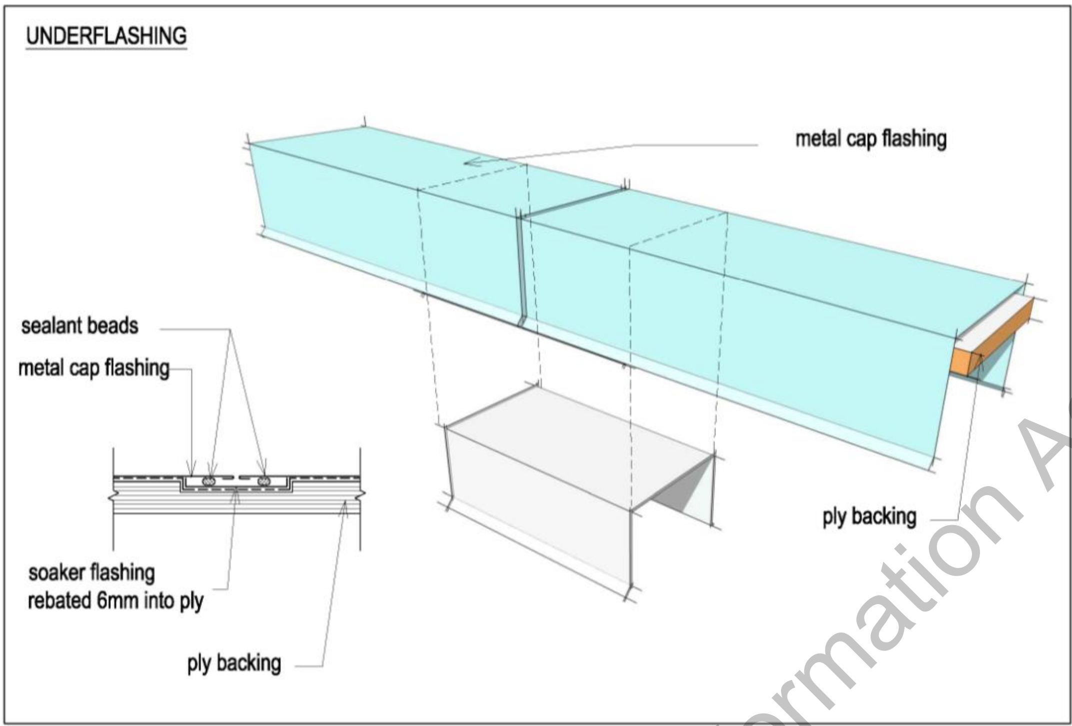

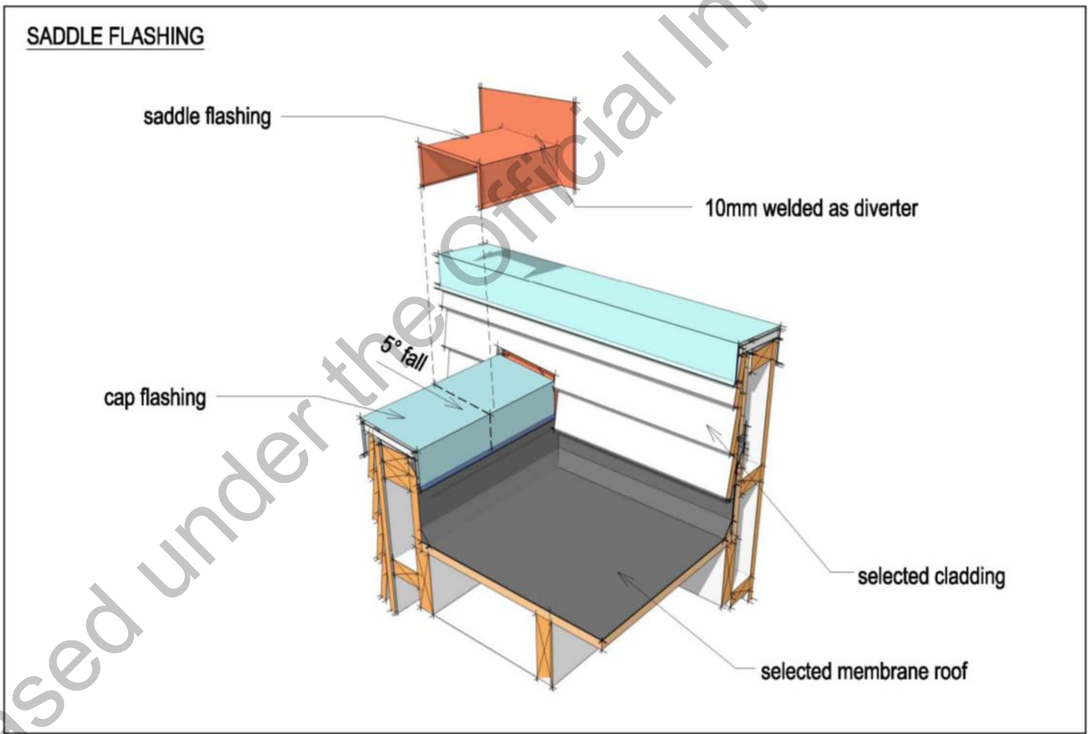

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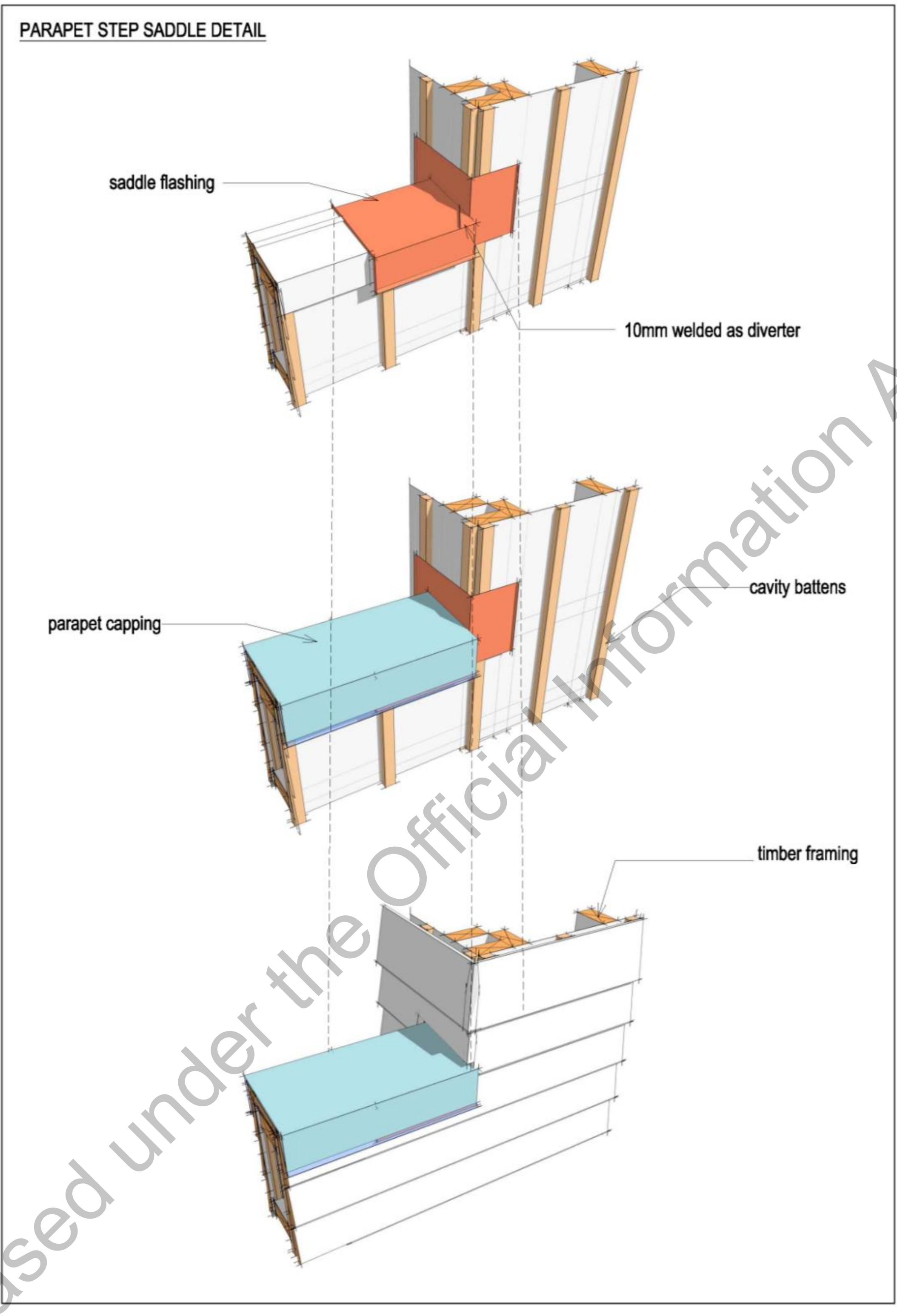

There shall be no reliance on sealant alone for weatherproofing. All parapet flashings are to be fully supported and top fixings are not permitted. Only side fixings or concealed clips shall be used.

Lapped flashing joints and top fixings are permitted only on raking barge flashings.

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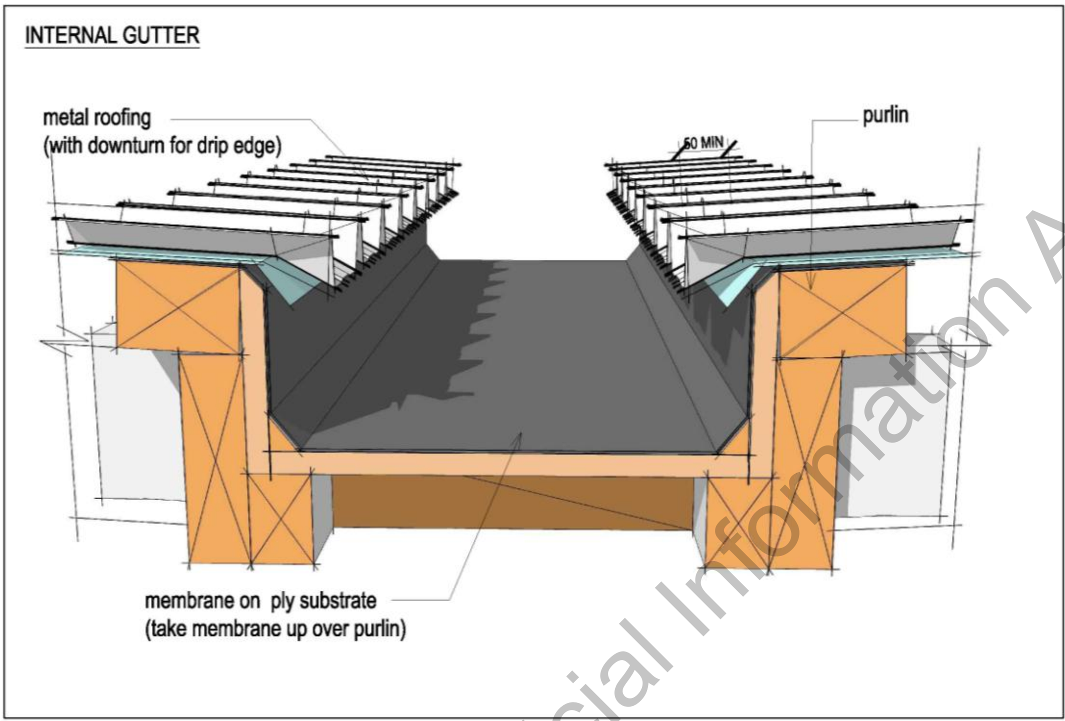
3.6 Internal gutters

Internal gutters shall have a minimum 1:100 fall with the high and low ends of the gutters specified on the drawings.



Where gutters penetrate external walls to discharge into rainwater heads, the full width of the gutter shall extend through the parapet into the rainwater head and terminate with an end drip-edge.

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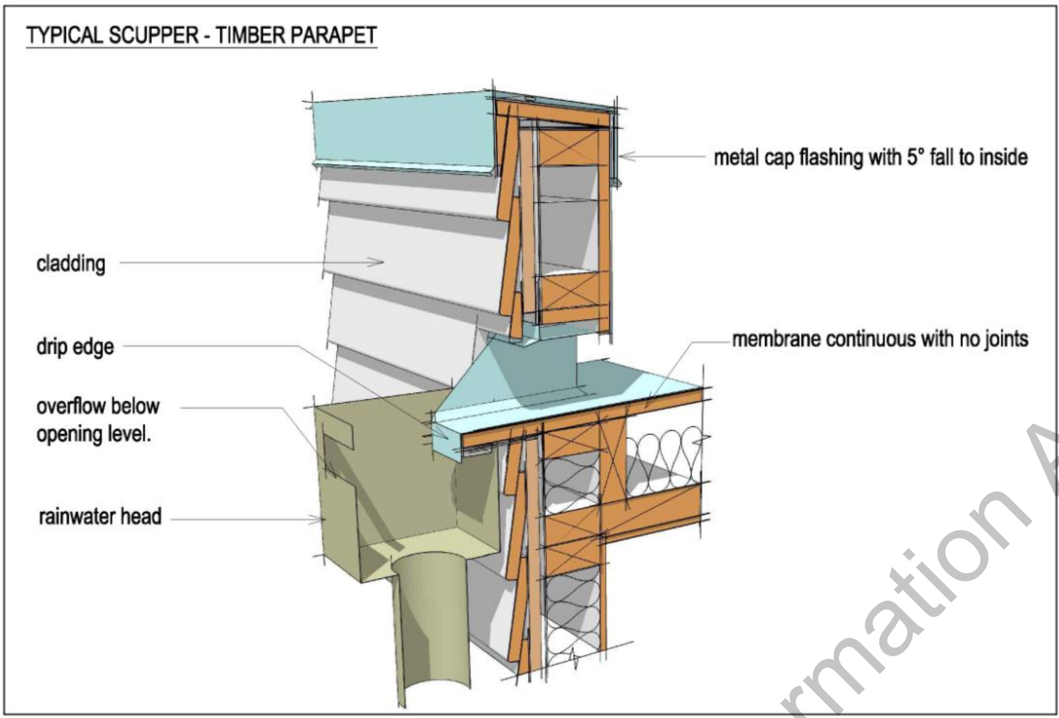

All roof gutters and downpipes shall be designed to meet the requirements of the Building Code, Clause E1 – Surface Water.

Internal gutters shall be designed for twice the "one in 50-year" rainfall intensity.

Suitable design methods are provided in E1 / AS1 and BRANZ Bulletin 509.

Where overflows are provided as a separate scupper or as an opening within a rainwater head, the cross sectional area of the overflow shall be 1.5 times the area of the downpipe. To prevent internal flooding, overflows shall be set at a height to enable them to be fully functional should the downpipe or outlet become blocked.

Blocking the downpipe and flood-testing to check the integrity of the gutter, outlet, downpipe, their connections and the operation of the overflow is recommended before adjacent linings are installed.

3.7 Roof eaves

Exposed undersides of roofing are 'unwashed' areas and as such are prone to premature corrosion. Exposed rafters and beams can also inadvertently transport condensation and rainwater to the inside.

All roof eaves must be enclosed and lined. Reverse-slope eaves must be fitted with a flashing to prevent moisture penetration.

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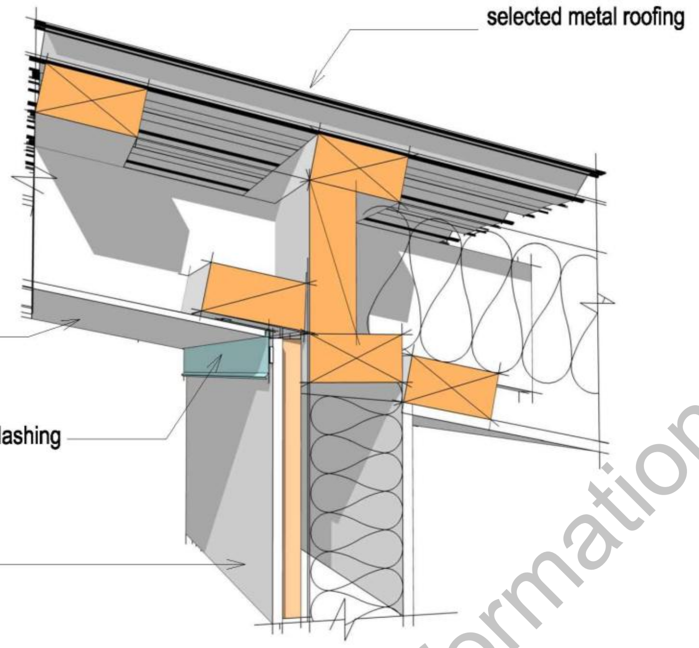
REVERSE EAVES FLASHING



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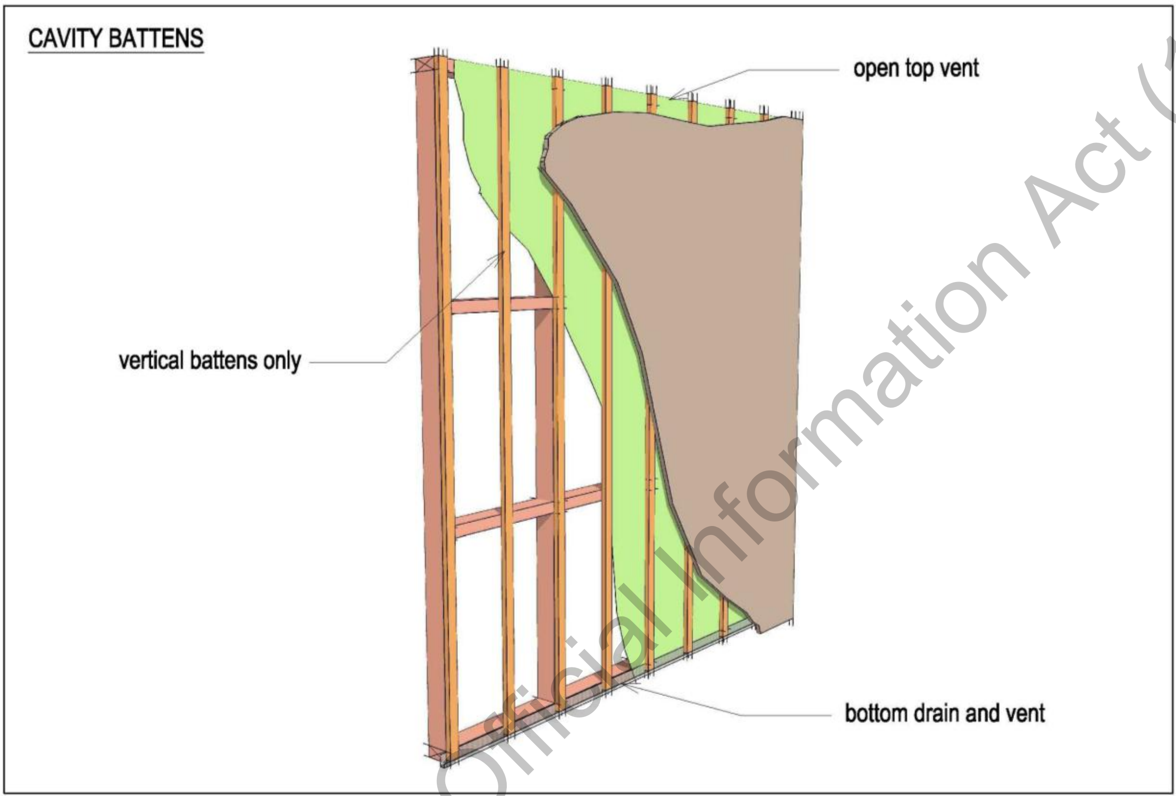
Section 4: Wall cladding

All wall claddings shall be installed over a drained and ventilated cavity.

4.1 Wall cavity



All cavities shall be constructed with vertical battens only. Where horizontal support is required for cladding, flashings or wall penetrations, short vertical battens shall be installed and the tops of the battens bevelled to shed water towards the outside of the cavity.

Top ventilation of the wall cavity is required. Where the top of a cavity coincides with a parapet, airflow from one side of the parapet cavity to the other side of the parapet cavity shall be prevented by an airseal placed beneath the parapet capping.

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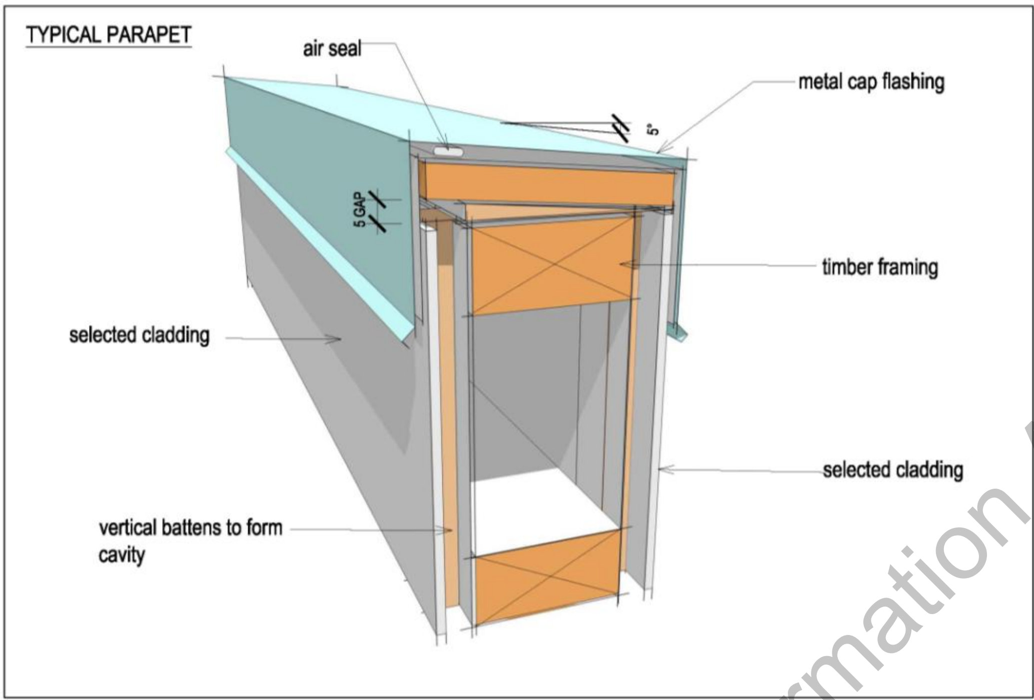

Wall cavities should be separated from adjacent walls and compartmentalised to avoid undue wind pressure differentials to allow pressure equalisation or moderation to occur.

Wall cavities must be separated from roof, subfloor and sub-deck areas to allow pressure equalisation, or moderation to occur and to avoid the transfer of undue moisture.

Battens shall be installed to enhance the openness of the wall cavity and shall be positioned to both adequately support the cladding and provide drainage and ventilation behind junctions.

4.2 Cladding as bracing

No cladding shall be used as a sheet wall bracing.

When cladding is used as a wall brace, horizontal battens are required, which inhibit the performance of the cavity.

4.3 Wind barrier

Generally the external cladding should be 20 times more air-permeable than the internal air barrier. For example, with weatherboards the gaps that naturally occur at laps provide air permeability without moisture ingress.

For low, moderate and high wind areas the internal plasterboard linings provide an adequate air barrier, but where there are gable ends, or other areas where no internal linings are present, then an air barrier in these locations is required. Certain building wraps are deemed to be an air barrier; refer to E2/AS1.

When the ultimate wind pressure (UWP) for any part of the wall cladding exceeds +1,000 Pa, allowing for local pressure coefficients, then a rigid air

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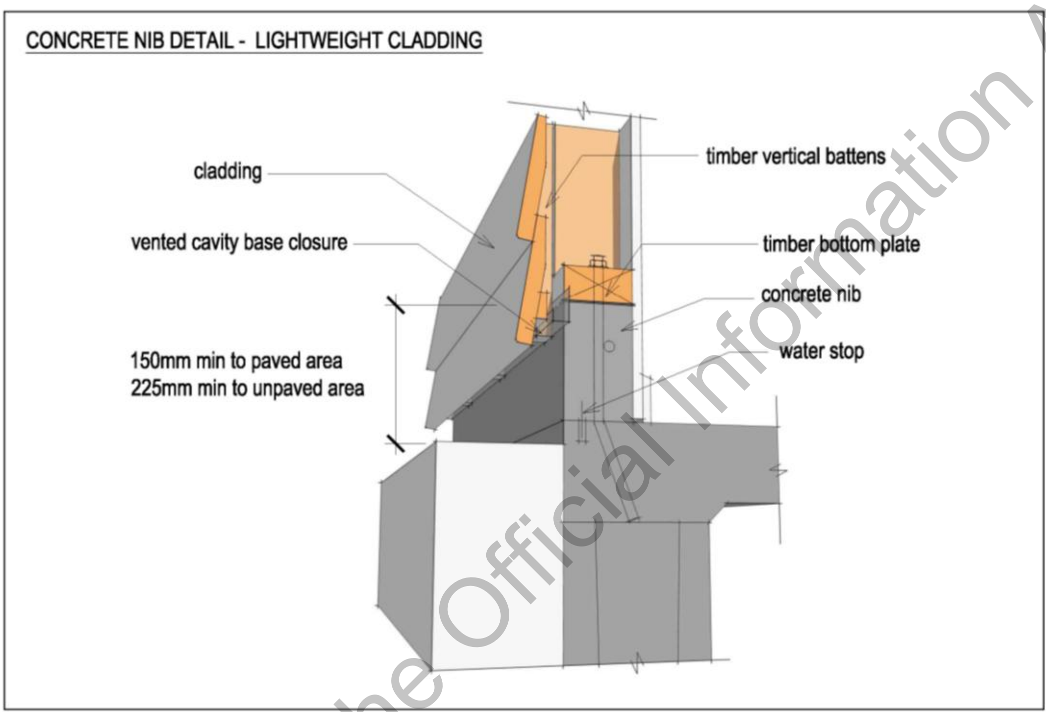
barrier such as fibre cement or plywood shall be included and designed by the structural engineer.

A rigid air barrier may also be used for wall bracing and/or for fire rating.

4.4 Ground clearance

All cladding to ground clearances shall meet or exceed the requirements of E2/AS1. Where this cannot be achieved e.g. adjacent to level thresholds, concrete nibs must be provided.



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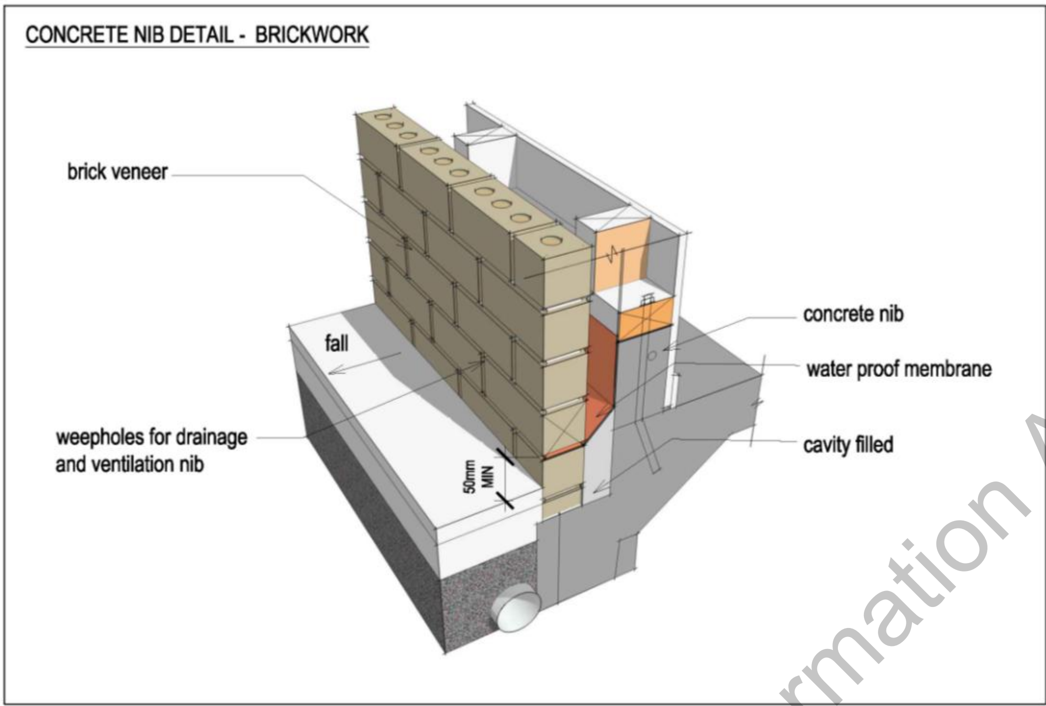

Strip drains can be used for level thresholds, but are not considered suitable for use at the base of external walls given they can raise the humidity at the base of wall cavities.

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4.5 Impact damage

Cladding damage from impact is common, especially in secondary schools. The cladding needs to be fit for purpose, which includes resistance to impact damage. In addition, the need to replace cladding if impact damage occurs should be considered during design.

In the case of fibre cement sheet cladding, some form of bottom edge protection is desirable. External corner protection using metal angles may also be sensible.

4.6 Junction design

The term 'junction' is used to describe the intersection between two or more different cladding systems, including where windows and doors meet the wall cladding. There are a number of acceptable methods shown in E2/AS1 for constructing weather-tight junctions at these locations, depending on the materials and the cladding systems being used.

The three necessary components of a successful weather-tight junction are:

1. **Rainscreen** – provides an external rain shield to deflect water entry to the drained cavity
2. **Drained cavity** – allows any moisture that penetrates past the rain screen to drain away
3. **Air seal** – reduces the air pressure differential between the drained cavity and exterior, which would otherwise drive moisture into the building through any gaps and cracks. Without a significant pressure differential, gravity takes over and water drains out of the cavity.

An example of a successful, everyday, weather-tight junction is a car door: The outer surfaces of the car provides the rainscreen; there is an interior rubber air seal against which the door closes and an open drainage channel between the door and the body to allow any water that penetrates to drain away.

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All wall cladding junctions shall be designed using the three-stage principle of internal air seal, drained cavity and external rainscreen.

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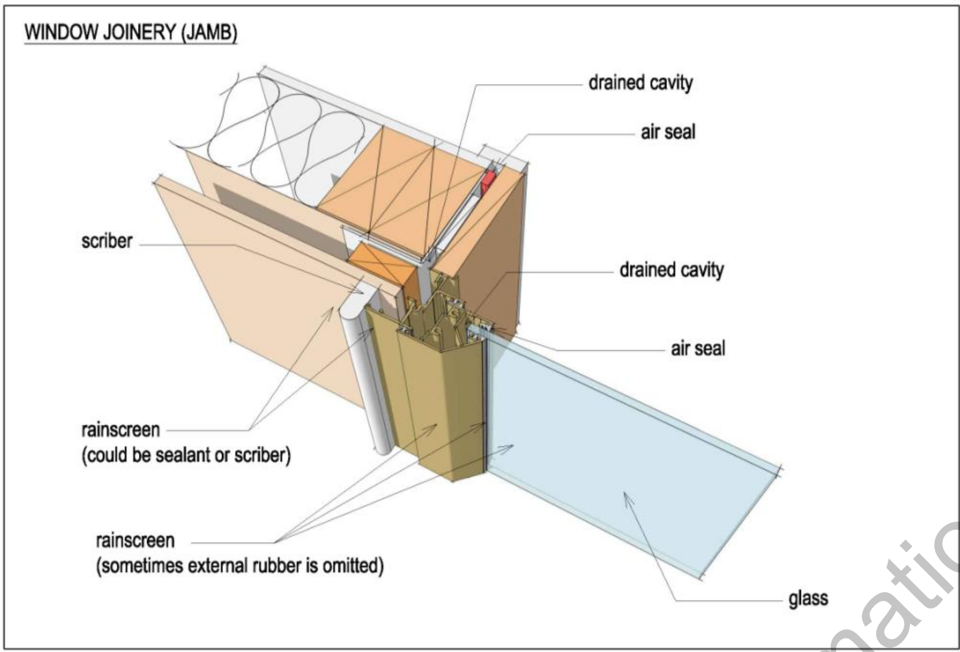

This illustrates the 3 stages of a successful weather-tight junction, both for the window to cladding junction and the glass to window frame junction.

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Section 5: External joinery

5.1 Complex shapes

Windows with complex shapes, raking or curved heads, or circular windows should be avoided. Recessing of windows, other than that provided for in E2/AS1 should be avoided as recessed sill flashings tend to accumulate rather than shield and drip water away from opening between the window frame and the sill flashing.

Section 6: Balconies

6.1 Balconies over internal spaces

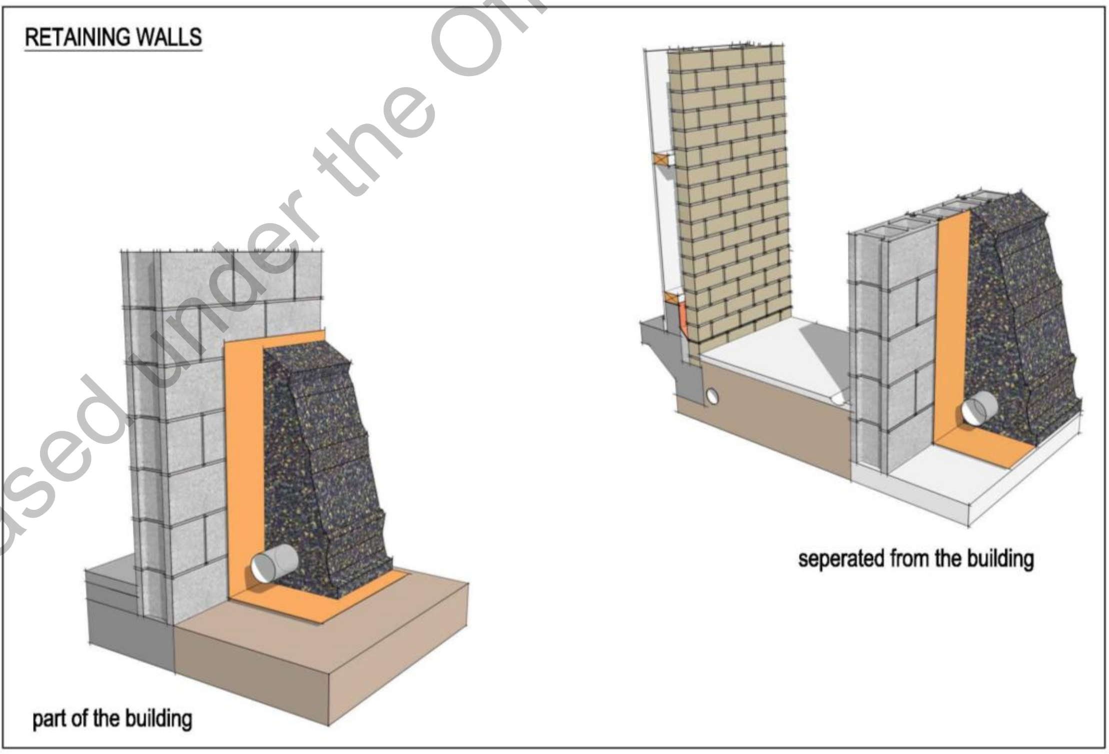
Balconies, especially over internal spaces should be avoided, as they are inherently high risk. If they cannot be avoided, the addition of a roof over the balcony to provide partial cover should be considered.

Where a solid balustrade is used with a balcony, the tops of the balustrade shall be flashed and constructed the same way as a roof parapet.

Section 7: Ground

7.1 Retaining Walls

Where the level of adjacent ground is above the internal floor level, an external retaining wall, separated from the building by a minimum distance of 1.5 metres, is the preferred option.



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Where this cannot be provided and the external building wall provides the retaining, then the wall shall be constructed as follows:

(i) **A perforated subsoil drain shall be provided with its invert at the highest point a minimum of 150 mm below floor level and sloping to an outlet, (cesspit or silt trap) with a minimum 1:200 fall.**

(ii) **Maintenance access shall be provided to allow this subsoil drain to be cleaned by water jet.**

(iii) **The drain and the interface between the ground and the free draining backfill material shall be separated with suitable geotextile filter cloth;**

(iv) **If top soil is placed over the free draining backfill, this must also be separated with geotextile filter cloth.**

(v) **The wall shall be waterproofed with a sheet membrane, fit for purpose, from a major supplier of tanking materials.**

(vi) **The top of the membrane shall be sealed to the wall with a fixed pressure bar or properly sealed and chased-in flashing.**

(vii) **The membrane shall be protected from puncture with a suitable material such as plastic drainage mat, polystyrene sheet or fibre cement.**

(viii) **The backfill material shall be a clean free drainage media, fit for purpose.**

(ix) **Surface water shall be directed away from the wall and if necessary intercepted by a surface drain.** Subsoil drains are not intended to cope with copious amounts of surface water and tend to silt up in that instance.

Liquid applied waterproofing products shall not to be used as a means of waterproofing retaining walls that form part of the building envelope.

7.2 Subfloors

Subfloors shall be provided with surface and subsoil drains to prevent flooding and must not be excavated or set below adjacent ground unless an impervious retaining wall is used.

In all subfloor areas the ground shall be overlaid with 250 micron black polyethylene dampcourse with all joints lapped and taped, and fitted snugly around piles and to outside walls.

Cross ventilation i.e. from opposite walls, is required. In at-risk locations, a fireproof vent cover should be installed over the vent openings.

No subfloor ventilation is allowed from damp areas below timber slated decks. Damp air below timber slatted decks is likely to increase subfloor moisture levels. A barrier wall to separate the sub-deck and subfloor areas without any subfloor vents is necessary.

Where there is subfloor ventilation on all four sides of a building and there are regularly spaced vents fully compliant with requirements of NZS3604 the dampcourse may be omitted.

Generally this will only occur with small isolated buildings such as prefabs.

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