

# Condensation Control
## (NCC 2022 Edition)

### In Australian buildings constructed with Fielders® claddings

**For Compliance with NCC 2022**

Published 06 September 2024
supersedes all previous versions.

FIELDERS

| This Document | |
|---|---|
| **Date Published:** | 06 September 2024 |
| **Summary of Updates:** | • New publication |

**Ensure you have the most up-to-date version at fielders.com.au**

# Contents


**1.0 Introduction and General Notes 4**
1.1 Introduction 4
1.2 Scope 4
1.3 Conditions of Use 4
1.4 Use of Genuine Materials 4
1.5 Check Delivery 4
1.6 Warranties 4
1.7 General Notes to Read Before You Use This Guide 5
1.8 Professional Advice 5
1.9 Further Information on Products and Services 5

**2.0 Designer Preliminaries 6**
2.1 What is Condensation? 6
2.2 Effect of Condensation (Moisture) in Buildings 6
2.3 Main Causes of Condensation In Roof Spaces 6
2.4 Key Ways to Minimise Condensation In Roof Spaces 6
2.5 Ventilation of Roof Spaces 6
2.6 Roof Ventilation Options 7
2.7 Condensation Management Detailing Examples For Fielders® Claddings 7

**3.0 Moisture Management Solutions 9**
3.1 Steps to Develop Project Based Moisture Management Solutions 9

**4.0 Fielders moisture management solution details 10**
4.1 Trussed Roofs with Self-Supported Metal Claddings 10
4.2 Skillion Roofs with Self-Supported Metal Claddings 15
4.3 Trussed Roofs with Supported Metal Claddings 18
4.4 Skillion Roofs with Supported Metal Claddings 21

**5.0 Condensation Control in Walls 24**
5.1. Walls with Self - Supported Metal Claddings – Installed Horizontally or Vertically 25
5.2 Walls with Supported Metal Claddings – Installed Horizontally or Vertically 30
5.3 Walls with Self-Supported Metal Rain screen or Panelised Claddings – Installed Horizontally or Vertically 33

**6.0 Appendix 36**
6.1 Definitions 37

# 1.0 Introduction and General Notes

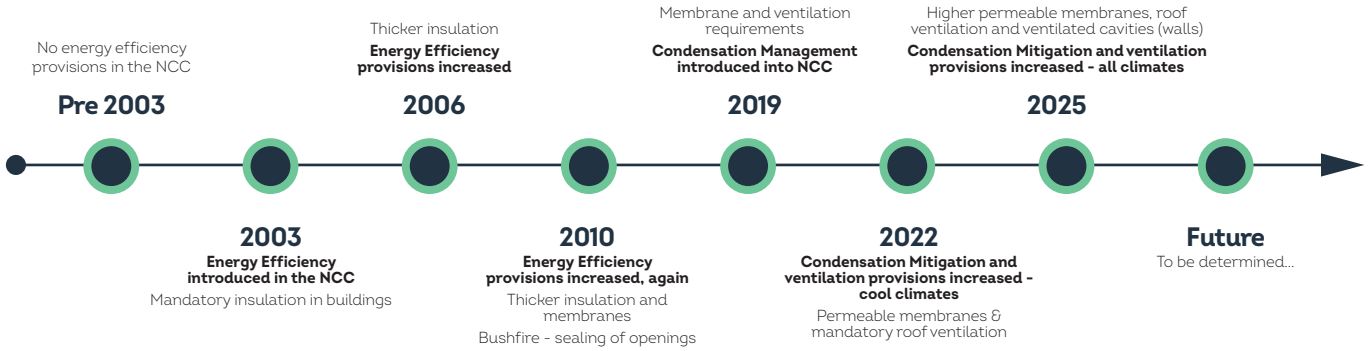
## 1.1 Introduction

Traditional residential construction practices provided buildings that were not tightly sealed and allowed moisture to escape.

In recognition that evolving construction practices, driven by NCC requirements for increased energy efficiency (see ***Figure 1.1***) and bushfire detailing, was leading to tighter sealing of buildings.

Further measures have been incorporated for NCC 2022.

***Figure 1.1***




## 1.2 Scope

This manual is a guide to the design and installation of steel roofing and walling manufactured by Fielders. We intend that it be used by all trades and professions involved with specifying and applying the wide range of our products.

We refer only to genuine steel roofing and walling manufactured by us and marketed under our brand names. Our recommendations should only be used for our products because they are based on comprehensive testing of our profiles, Base Metal Thicknesses (BMT) and material finishes.

## 1.3 Conditions of Use

If you use this Manual, you acknowledge and agree that your use is subject to the terms and conditions in this manual. Fielders, its agents, officers, employees, sub-contractors or consultants make no representations, either expressed or implied, as to the suitability of the information and data in this Manual for your particular purposes. It's your responsibility to ensure the design you use is appropriate for your needs, the products you have purchased, your site and structural limitations and your building and construction capabilities.

This manual endeavours to present information on products, details, installation and practices in a clearly prescribed manner and it is the user's responsibility to apply the information in the way intended. If there is any uncertainty then it is the user's responsibility to seek clarification. Where we recommend use of third party materials, ensure you check the qualities and capabilities of those products with the relevant manufacturer before use.

## 1.4 Use of Genuine Materials

Structures in this Manual should only be built or constructed using genuine Fielders® products or recommended third party products. Except as otherwise provided in these terms, any warranties only apply to you (if at all) if you use the recommended genuine Fielders® products or third party products and method of construction.

## 1.5 Check Delivery

It is important that you check all materials delivered to site against your invoice before you use them in your building or construction to ensure all components have arrived, are of the appropriate quality and are ready for installation.

## 1.6 Warranties

For over 150 years we have consistently manufactured high quality building products. The Fielders® brand is synonymous with Australian building. Our continuing confidence in our products is shown in the warranties we offer.

Our products are engineered to perform according to our specifications only if they are used in the appropriate conditions and installed to the recommendations in this manual and our other publications.

Naturally, the warranties require specifiers and installers to exercise due care in how the products are applied and installed and are subject to final use and installation. Also, owners need to maintain the finished work.

We invite you to ask about the warranties applicable to your proposed purchase, at your supplier of Fielders® products.

## 1.7 General Notes to Read Before You Use This Guide

This manual has been prepared for a range of roofing and walling applications including water drainage systems, using products manufactured or supplied by Fielders.

## 1.8 Professional Advice

All erection and connection details are to be made in accordance with the relevant standard connection details drawing contained in this Manual.

We recommend you get professional advice to ensure your particular needs are adequately met.

Before you commence construction:

a. you should check with your local government authority to see if any form of prior permission or approval is required;

b. if you want to build or construct any attached structure, you should seek advice from a suitably qualified engineer to verify the capacity of your existing structure to withstand any additional load arising from the attached structure. You should also check with your local government authority to determine any specific requirements for the attachment to existing structures;

c. you should check with your local workplace health and safety authority to see what safety measures you need to put in place prior to and during construction. It is the responsibility of the installer/erector to ensure all local safe work practices are adhered to and the safety of the whole site is maintained at all times.

To ensure maximum lifespan of your building, consult your nearest Fielders branch for information regarding maintenance, handling, storage and any other technical assistance you may require.

## 1.9 Further Information on Products and Services

fielders.com.au - Your supplier of Fielders® products

Fielders® Information Service on 1800 182 255

# 2.0 Designer Preliminaries

## 2.1 What is Condensation?

When a surface temperature falls below the dew point of its surrounding air, condensation in the form of water vapour from the humid air will take place on the colder surface. In order to avoid condensation, the surface temperature must be increased and/or the moisture in the surrounding air must be reduced.

Condensation within a building can form as visible surface condensation or can form within the building fabric or layers, referred to as interstitial condensation. Generally small quantities of condensation in a building are tolerable provided it can dry. However, if the environment remains wet or humid for a substantial period of time materials may degrade and mould growth may occur that can have an effect to the health of the occupants in the building.

Increasing levels of energy efficiency provisions in buildings has resulted in greater levels of insulation and buildings being built to be more air tight. Consequently this has led to potential for increased humidity in living spaces and greater risk of problematic condensation.

It is important to note that the new provisions are seeking to minimise the health impact through the management of condensation. It does not look at eradication of condensation as it acknowledges that dealing with condensation in buildings is a complex matter and is as much about how the building is used, as it is about how it is built.

This is reflected in the NCC 2022 Performance Requirement which states:

> At Vol-1 F8P1 / Vol-2 H4P7 risks associated with water vapour and condensation must be managed to minimise their impact on the health of occupants.

## 2.2 Effect of Condensation (Moisture) in Buildings

In extreme circumstances, it has been documented that moisture in buildings may be associated with a range of adverse health and wellness issues. Moisture may cause damage to building materials and components.

## 2.3 Main Causes of Condensation In Roof Spaces

There are two main causes of condensation in roof cavities;

1. High levels of internal water vapour passing into roof spaces through the ceiling or through exhaust fans which are not externally ducted. This is a particular problem in areas of the home where moisture is generated such as laundries, kitchens and bathrooms. For homes constructed to NCC 2022, exhaust from these areas must be externally ducted.
2. Insufficient ability for the roof space to dry due to lack of ventilation to remove unwanted water vapour. Once high levels of moisture exist in a roof space the consequence of poor installation, inappropriate materials and or poor construction details further increase issues associated with condensation.

## 2.4 Key Ways to Minimise Condensation In Roof Spaces

1. Maintaining the natural ventilation of the roof space by ensuring insulation and membranes do not block ventilation paths.
2. Extraction systems which duct moist air outside the building.
3. Installing passive ventilation devices (eave and ridge vents) and active ventilation devices (mechanical/smart vents) as required.
4. Providing roof level insulation, such as blanket and foil, particularly in cooler climates.

## 2.5 Ventilation of Roof Spaces

Ventilation requirements in NCC 2022, Clause F8D5 - Table F8D5 (NCC Volume One) and 10.8.2 - 10.8.3 - Table 10.8.3 (NCC Volume Two Housing Provisions) outline the minimum requirements of an adequately ventilated roof space. These amendments remove ambiguity around what constitutes an adequately ventilated roof space, providing detailed information regarding

1. the amount of ventilation required and
2. their locations.

NCC 2022 NCC Housing Provisions clause 10.8.2 (2) outlines that *"Exhaust from a kitchen, kitchen range hood, bathroom, sanitary compartment or laundry must discharge directly or via a shaft or duct to outdoor air."*

Clause F8D5 (Vol 1) 10.8.3 (Housing Provisions) Ventilation of roof spaces further outlines that:

(1) In climate zones 6, 7 and 8, a roof must have a roof space that is located:

(a) immediately above the primary insulation layer; or

(i) immediately above sarking with a vapour permeance of not less than 1.14 µg/N.s, (Class 4) which is immediately

(ii) above the primary insulation layer; or immediately above ceiling insulation that meets the requirements of 13.2.3(3) and 13.2.3(4); and

(iii) has a height of not less than 20 mm; and

(b) is either

(c) ventilated to outdoor air through evenly distributed openings in accordance with ***Table F8D5 / 10.8.3***; or

(i) located immediately underneath the roof tiles of an unsarked tiled roof.

(2) The requirements of (1) do not apply to a:

(a) concrete roof; or

(b) roof that is made of structural insulated panels; or

(c) roof that is subject to Bushfire Attack Level FZ requirements in accordance with AS 3959.

***Table 2.5:*** *Roof space ventilation requirements*

| Roof Pitch | Ventilation Openings |
|---|---|
| < 10° | 25,000 mm²/m provided at each of two opposing ends |
| ≥ 10° and < 15° | 25,000 mm²/m provided at the eaves and 5,000 mm²/m at high level |
| ≥ 15° and < 75° | 7,000 mm²/m provided at the eaves and 5,000 mm²/m at high level, plus an additional 18,000 mm²/m at the eaves if the roof has a cathedral ceiling |

**Notes:**

1. Ventilation openings are specified as a minimum free open area per metre length of the longest horizontal dimension of the roof.
2. For the purposes of this Table, high level openings are openings provided at the ridge or not more than 900 mm below the ridge or highest point of the roof space, measured vertically.

## 2.6 Roof Ventilation Options

There are a number of rooftop ventilations options available that can be used in conjunction with eaves level ventilation to meet the requirements of NCC 2022.

These include:

- **Turbine style ventilators** – these are also known as 'whirlybirds' and are a semi-mechanical vent comprising a cylindrical dome with fins that spin in the wind creating a vacuum, drawing out air from the roof cavity. Various brand names are readily available and also supplied by Fielders.
- **'Ridge Vent' systems** – ridge vents have been widely used throughout Europe for many years and comprise an integrated addition under the ridge cap that utilises natural upward air flow facilitated by air intake via soffit vents that draws air through the roof cavity an out the (slightly) raised ridge. VENT-A-ROOF® is a leading example of this technology, providing up to 19,008mm²/m of ventilation, and is available from Fielders.
- **Roof fan systems** – a wide variety of solar and mains powered ventilation fans systems are available.

## 2.7 Condensation Management Detailing Examples For Fielders® Claddings

The following 'moisture management' diagrams outline typical passive ventilation and moisture paths for metal cladding systems to best control building cavity moisture. The resulting specific construction details are based on these moisture management principles.

All materials and products used should be fit for purpose including suitable durability, compatibility and account for movement when exposed to temperature, moisture and corrosivity of the installed micro-environment.

For specific information on using any product and for details outside of the following, such as for low pitch and bushfire or marine requirements, refer to Fielders for specialist advice.

The three key principles for moisture management for roofs and walls are:

1. Keep moisture out. This involves keeping the rain out and controlling internal moisture.
2. Allow moisture that enters building cavities to escape. Moisture will get in, and when it does it must be able to escape without consequential damage.

3. Minimise condensate from forming within. The third principle involves using insulation products to create a greater thermal buffer between the external temperature and roof space temperature. Insulation products such as reflective pliable membranes or blanket and foil products achieve this by inherently inhibiting the movement of heat energy while also providing separation from the cold roof sheet. This difference significantly reduces the risk of the condensation by ensuring the temperature of the roof attic does not fall below dew point.

Ensuring a roof or external wall is designed to both keep moisture out and provide for escape of any moisture that enters, is key to reducing moisture related issues. Installing your metal cladding in accordance with these typical construction details will maximise the lifespan of the cladding and building.

As a general rule the following minimum gaps for ventilation and drainage have been adopted:

- For walling:
    - Unobstructed ventilation area of a minimum 5,000mm$^2$/lm of wall run at both the top and bottom of the wall.
- For roof cavities, NCC 2022 provisions will apply i.e:
    - Roof pitches below 10°:
        - 25,000 mm$^2$/m provided at each of two opposing ends
    - Roof pitches between 10° and 15°:
        - 25,000 mm$^2$/m provided at the eaves and 5,000 mm$^2$/m at high level
    - Roof pitches between 15° and 75°:
        - 7,000 mm$^2$/m provided at the eaves and 5,000 mm$^2$/m at high level, plus an additional 18,000 mm$^2$/m at the eaves if the roof has a cathedral ceiling.

# 3.0 Moisture Management Solutions

### Moisture Management Solution - Selection Criteria Flow Chart

| NCC Climate Zone | Supported or Unsupported (or self-supported) cladding profile | Open or Closed or Panelised (Rain Screen) Profile | Determine if the Cladding is for Wall or Roof | Refer Moisture Management Solution |
|---|---|---|---|---|
| Refer National Construction Code to determine the Climate Zone the project is in. | Has the cladding been tested to span between supports (Unsupported), or does it require a rigid continuous support behind (Supported). | Is the cladding type open, closed or panelised. Refer typical cladding type legend. | | Is the cladding type open, closed or panelised. Refer typical cladding type legend. |

## 3.1 Steps to Develop Project Based Moisture Management Solutions

### Step 1 – Determine the application climate zones as per the National Construction Code (NCC).

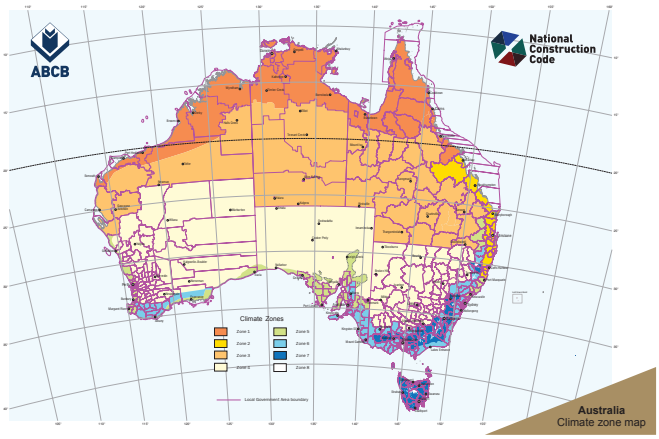
The NCC outline 8 climate zones for Australia as follows;

| Climate Zone # | Climate Zone Characteristics |
|---|---|
| Zone 1 | High humidity summer, warm winter |
| Zone 2 | Warm humid summer, mild winter |
| Zone 3 | Hot dry summer, warm winter |
| Zone 4 | Hot dry summer, cool winter |
| Zone 5 | Warm temperate |
| Zone 6 | Mild temperate |
| Zone 7 | Cool temperate |
| Zone 8 | Alpine |

The applicable geographic regions are outlined at ***Figure 3.1*** which is available from https://www.abcb.gov.au/resources/climate-zone-map.

The details provided are generally applicable for Climate Zones 1-6. For Climate Zones 7 and 8 i.e. Alpine, specialist advise should be sought.

***Figure 3.1***




### Step 2 – Determine if the cladding to be used is supported or unsupported.

Supported claddings require a rigid continuous support such as plywood or similar. Unsupported cladding free span between batten or purlin supports. The majority of Fielders® cladding profiles are unsupported, with the exceptions being;

- Grandeur® over 325mm wide
- Prominence® over 265mm wide
- Cadence™ over 265mm wide
- Neo Roman™

### Step 3 – Determine if the cladding to be used is open or closed.

Open profile claddings are those with open ribs that will allow airflow. Examples of these profiles include S-Rib™ Corrugated, TL-5™, Spanform™ and KingKlip®.

Closed profiles claddings are those with closed ribs that do not allow easy airflow. Examples of these profiles include Grandeur®, Prominence® and Cadence™.

### Step 4 – Determine if the cladding is for wall or roof.

Additional considerations include; assessment of Project Bush Fire Attack rating (BAL) to ensure that ventilation solutions comply to BAL requirements assessment of the marine or corrosive influence for the project to ensure that ventilations solutions are sufficiently durable to mitigate aerosol (salt and contaminates) entering building cavities. The control of embers and aerosols migration into buildings can be achieved with the use of mesh covers with typical aperture of max~2mm. When mesh screens are incorporated will require inspection and maintenance to maintain good ventilation.

### Step 5 – Refer to the Fielders Moisture Management Solution details.

Refer to the appropriate solution detail for the project.

© Commonwealth of Australia and the States and Territories of Australia 2019, published by the Australian Building Codes Board.

The material in this publication is licensed under a Creative Commons Attribution-No Derivatives—4.0 International licence, with the exception of third party materials and any trade marks. It is provided for general information only and without warranties of any kind. You may not make derivatives of this publication, but may only use a verbatim copy. More information on this CC BY ND licence is set out at the Creative Commons Website. For information regarding this publication, see www.abcb.gov.au.

Release Date: Sep 2019
Last amended: Aug 2015
Version: VC00031.3
Developed from a map from the Bureau of Meteorology

# 4.0 Fielders moisture management solution details

## 4.1 Trussed Roofs with Self-Supported Metal Claddings

Trussed roofs comprise of a pitched roof, roof space and flat ceiling. Moisture entering the roof space must be removed by either passive or mechanical ventilation to reduce condensation risk. The following diagrams are relative to passive ventilation paths.

For roof cavities, NCC 2022 provisions will apply i.e:

- Roof pitches below 10°:
  - 25,000 $mm^2/m$ provided at each of two opposing ends
- Roof pitches between 10° and 15°:
  - 25,000 $mm^2/m$ provided at the eaves and 5,000 $mm^2/m$ at high level
- Roof pitches between 15° and 75°:
  - 7,000 $mm^2/m$ provided at the eaves and 5,000 $mm^2/m$ at high level, plus an additional 18,000 $mm^2/m$ at the eaves if the roof has a cathedral ceiling

For S-Rib™ Corrugated roofing 5,000$mm^2/m$ may be achieved at a traditional ridge arrangement by introducing a 5mm gap as shown at ***Figure 4.1***.

Passive vents must prevent water penetration, vermin or pests from entering the roof space.

When mechanical ventilation is used, it must be substituted for and not used in combination with passive venting at the ridge as this may short circuit the eave to ridge ventilation creating stagnant areas within the roof space. Mechanical vents are best used in combination with passive eave or low-level vents to create air exchange throughout the roof space.

Impermeable membranes limit internal moisture between roof cladding and membrane. Metal roof claddings have a low risk of external water penetration. As a consequence, the membrane does not need to act as a drainage plane and may be terminated prior to the gutter. Terminating the membrane can allow open profiles to provide similar ventilation to 10,000$mm^2/m$ in Australian climates (our S-Rib™ Corrugated profile provides approx 8,000$mm^2/m$) at eaves and at ridges where flashings have not been scribed.

***Figure 4.1:*** *Ventilation Paths*

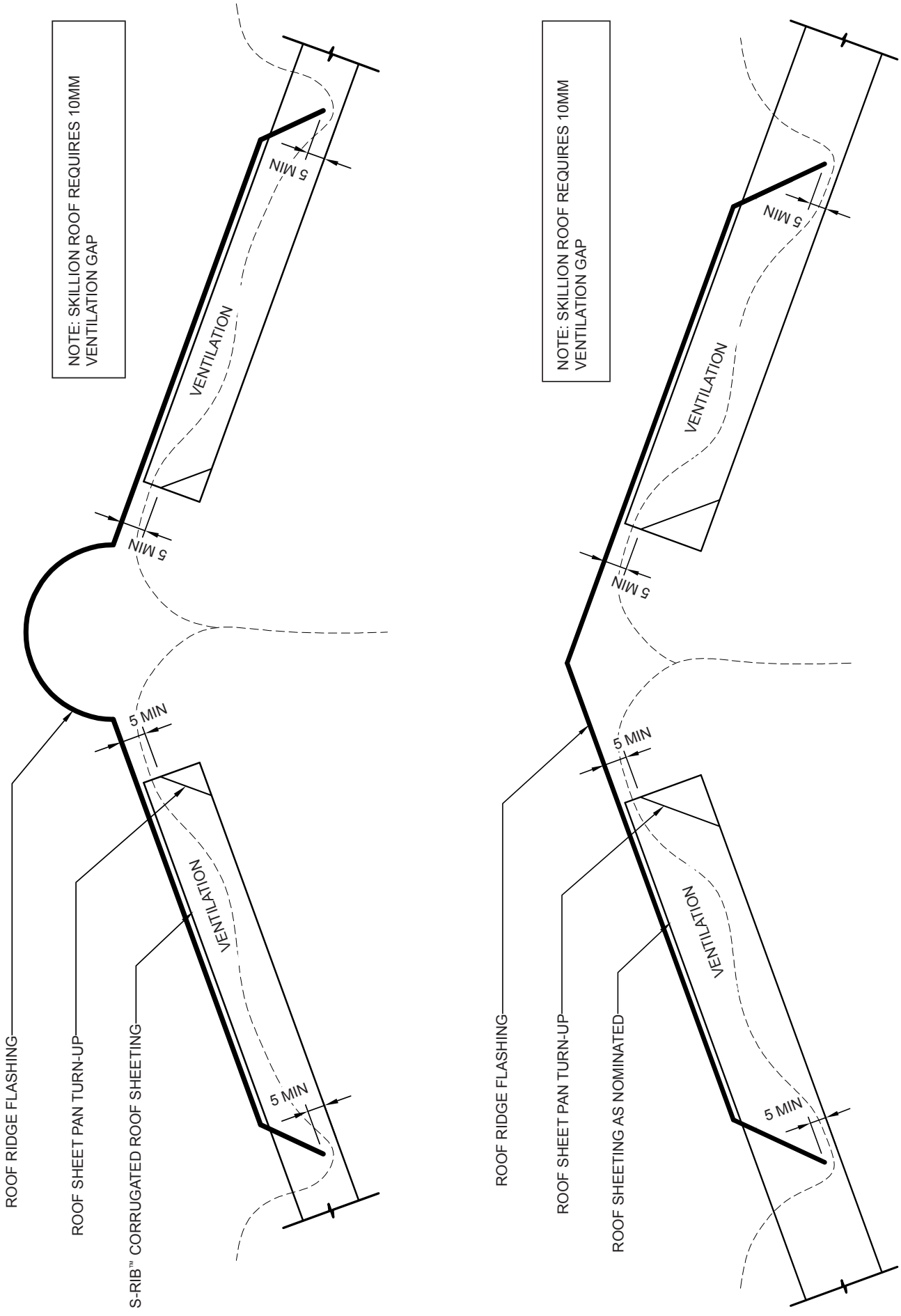


***Figure 4.2**: a) Detail – Trussed Roof - No Insulation or Membrane at Roof Level*

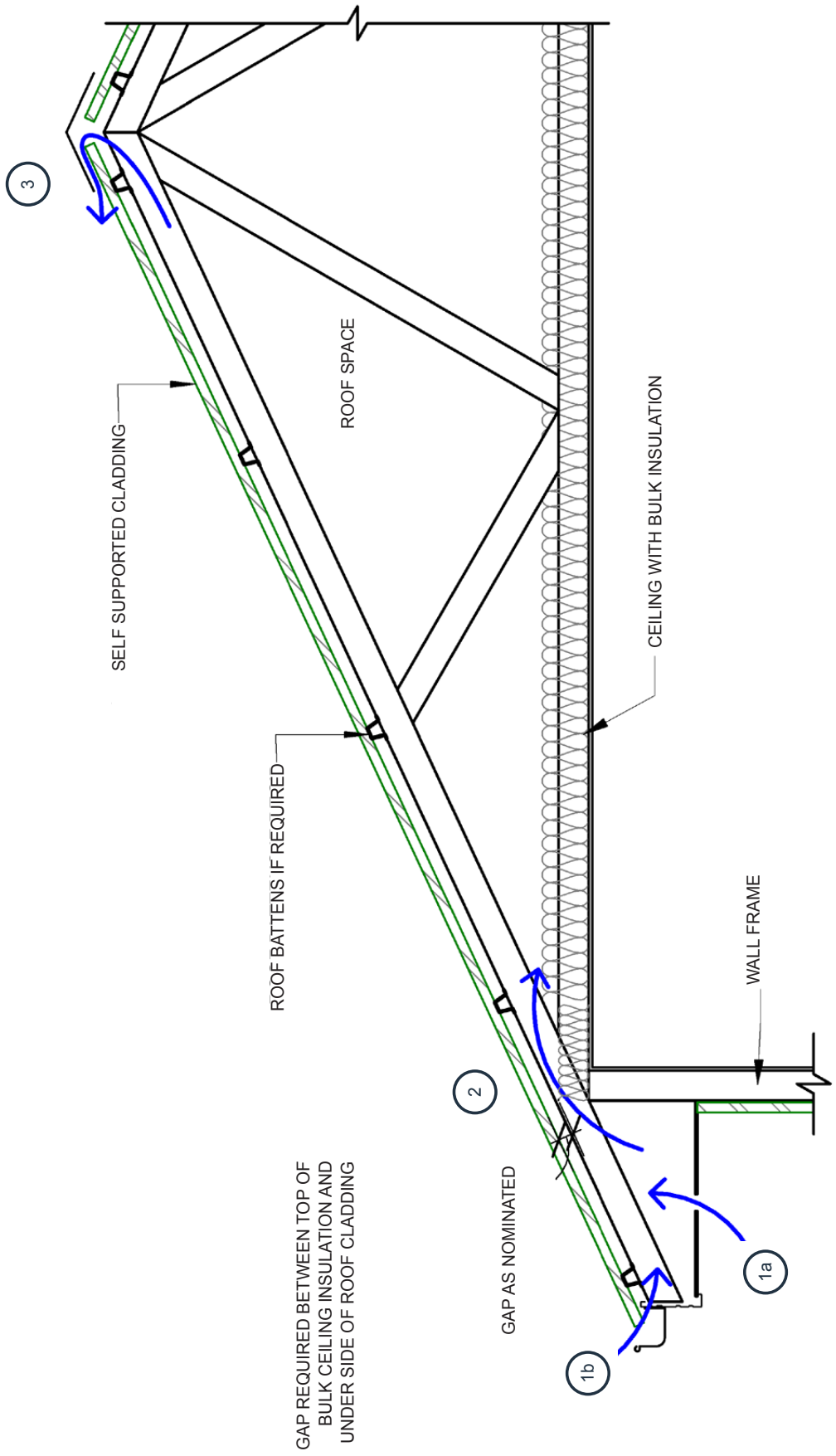


***Figure 4.3:*** *b) Trussed Roof - Draped Impermeable Thermal Membrane at Roof Level*

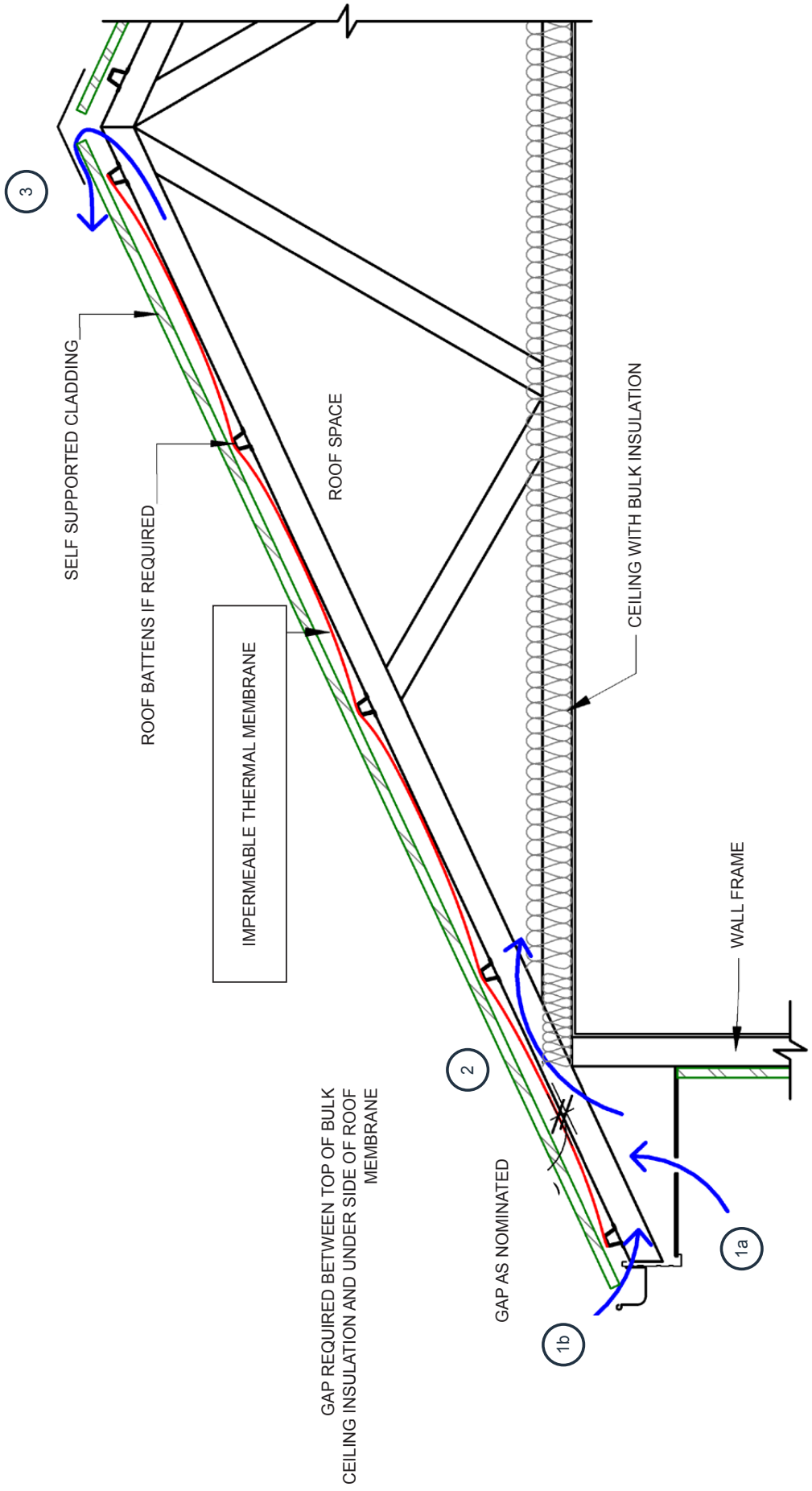
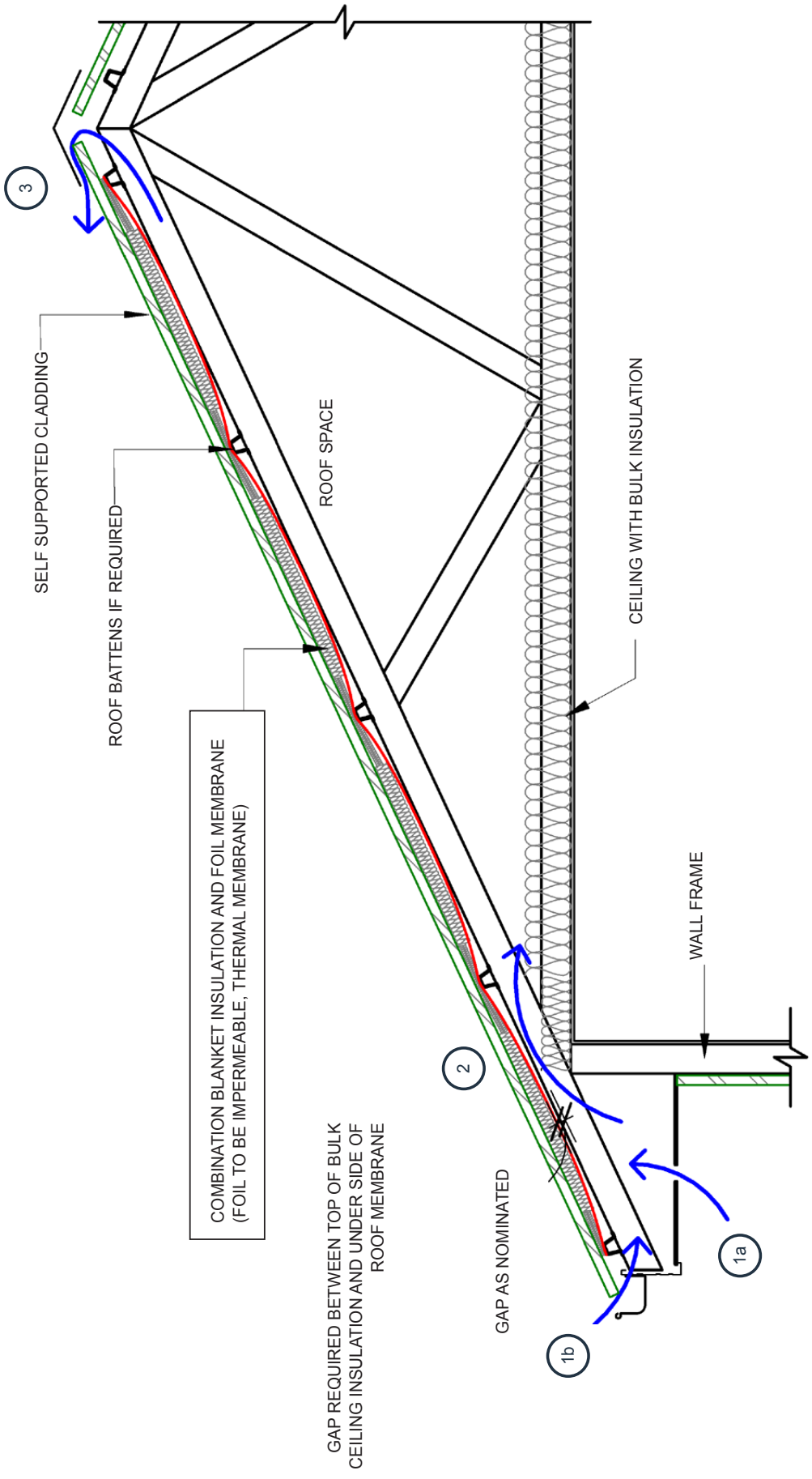


***Figure 4.4:*** *c) Trussed Roof - Blanket Insulation with Impermeable Foil at Roof Level*



## 4.2 Skillion Roofs with Self-Supported Metal Claddings

Skillion roofs comprise of a pitched roof that incorporates a small cavity with ceiling lining that follows the pitch of the roof. Skillion roofs are more prone to moisture due to a smaller cavity that may be restricted. This coupled with their frequent use at low pitches reduces ventilation and drying potential. Therefore it is recommended that slopes on skillion roofs should be 3°.

For roof pitches < 3° powered roof fan solutions combined with eave ventilation will need to be considered.

Diagrams below are relative to passive ventilation paths. Passive vents must prevent water penetration, animals and limit Insects from entering the space.

For roof cavities, NCC 2022 provisions will apply i.e:

- Roof pitches below
  - 25,000 $mm^2$/m provided at each of two opposing ends
- Roof pitches between 10° and 15°
  - 25,000 $mm^2$/m provided at the eaves and 5,000 $mm^2$/m at high level
- Roof pitches between 15° and 75°
  - 7,000 $mm^2$/m provided at the eaves and 5,000 $mm^2$/m at high level, plus an additional 18,000 $mm^2$/m at the eaves if the roof has a cathedral ceiling

There is to be a minimum clearance of 20mm at the centre of the underlay of the drape of the impermeable membrane to the insulation.

Impermeable membrane to be Class 1 as per AS 4200.1. It is typically installed above the supporting battens/purlins and as such should be draped to create a thermal barrier and minimise contact with the cladding above.

Impermeable membranes limit internal moisture between cladding and membrane. Metal roof claddings have a low risk of external water penetration. As a consequence, the membrane does not need to act as a drainage plane and may be terminated prior to the gutter.

When mechanical ventilation is used it must be substituted for and not used in combination with passive venting at the ridge as this may short circuit the eave to ridge ventilation creating stagnant areas within the roof space. Mechanical vents are best used in combination with Passive eave or low-level vents to create air exchange throughout the roof space.

***Figure 4.5:*** *Skillion Roof - Draped Impermeable Thermal Membrane*

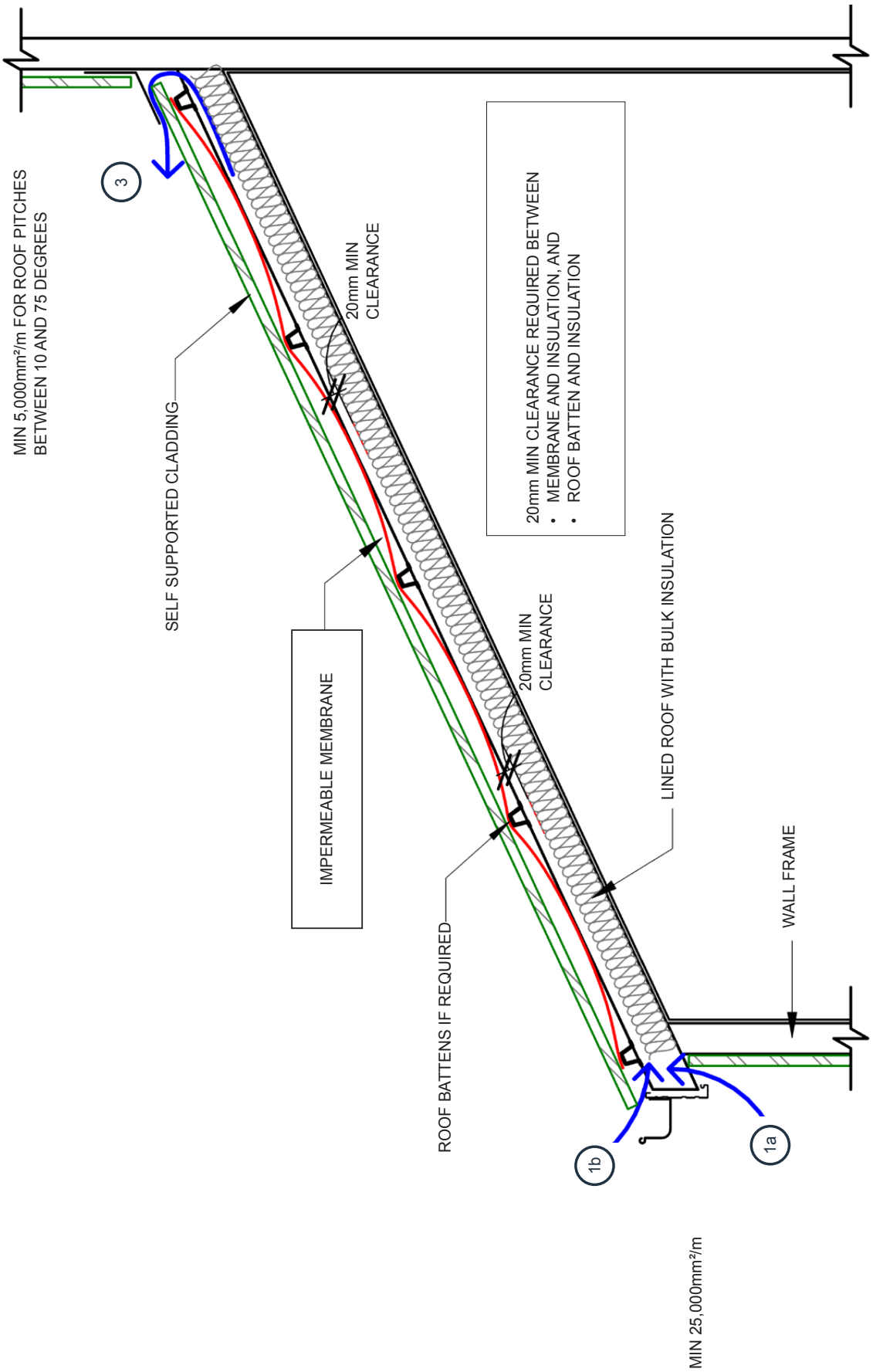
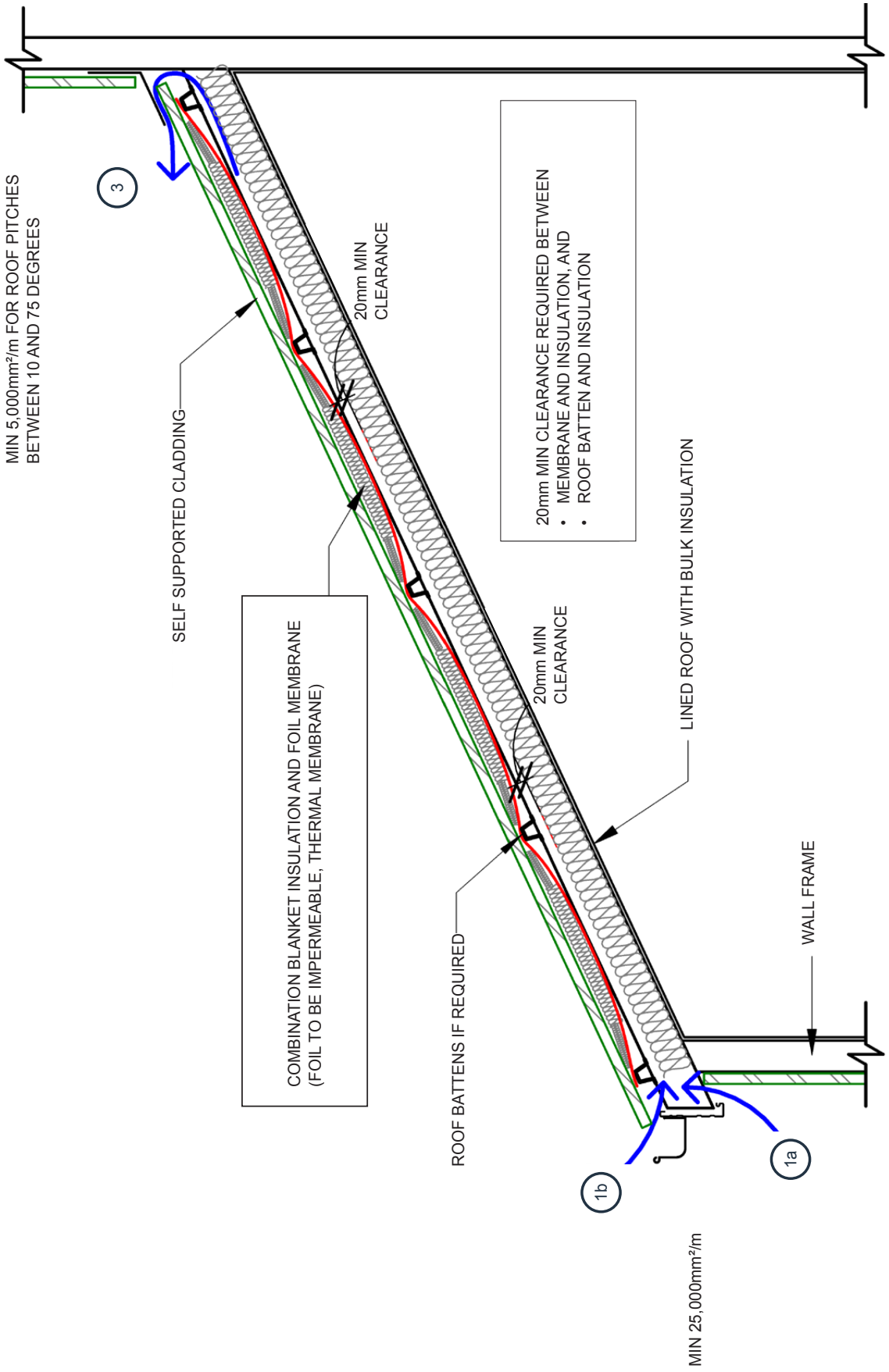


***Figure 4.6:*** *Skillion Roof - Blanket Insulation and Impermeable Foil Membrane*



## 4.3 Trussed Roofs with Supported Metal Claddings

Trussed roofs comprise of a pitched roof, roof space and flat ceiling. For supported claddings the system incorporates a rigid support over the top of trusses/battens to which the cladding is attached. Moisture entering the roof space must be removed by either passive or mechanical ventilation to avoid moisture build-up (condensation) and consequential damage. The following diagrams are relative to passive ventilation paths.

Passive ventilation should have the following flow path:

For roof cavities, NCC 2022 provisions will apply i.e:

- Roof pitches below 10°
  - 25,000 $mm^2/m$ provided at each of two opposing ends
- Roof pitches between 10° and 15°
  - 25,000 $mm^2/m$ provided at the eaves and 5,000 $mm^2/m$ at high level
- Roof pitches between 15° and 75°
  - 7,000 $mm^2/m$ provided at the eaves and 5,000 $mm^2/m$ at high level, plus an additional 18,000 $mm^2/m$ at the eaves if the roof has a cathedral ceiling.

Passive vents must prevent water penetration, animals and limit insects from entering the space.

A pliable building membrane is usually installed between the cladding and rigid support as described below as appropriate;

i. Impermeable membranes
   a) Installed as a vapour barrier when installed <10° pitch.
   b) Membrane shall be self-healing, anti-abrasive and stable at temperatures consistent with metal roof sheet temperatures.

ii. Permeable membranes
   a) Permeable membrane shall be class 4 and water barrier to ensure drainage of condensate out of the cavity
   b) Rigid support to also be permeable to ensure moisture within the roof space can escape via vapour transmitting through to the cladding. Cladding will require venting and draining above the membrane.
   c) Membrane must have the following properties:
      a. for open profile cladding,
         i. Membrane Class 4 as per AS 4200.1, anti-abrasive, water barrier and have absorbency of 150g/$m^2$ and drainage capability;
      b. for all closed profile cladding,
         i. Membrane Class 4 as per AS 4200.1, anti-abrasive and is capable of ventilation and drainage (3D mesh types).
      c. Membrane shall be stable at temperatures consistent with metal roof sheet temperatures.
   d) Supported roof cladding on permeable membranes is not recommended in climate zones 7 & 8 as defined by NCC 2022.
   e) Permeable Membranes are not recommended for roof pitches below 10° as they will not facilitate above membrane drainage at low pitches. Impermeable membranes must be used for roof pitches ⩽10°.

***Figure 4.7:*** *Trussed Roof - Impermeable Membrane at Roof Level*

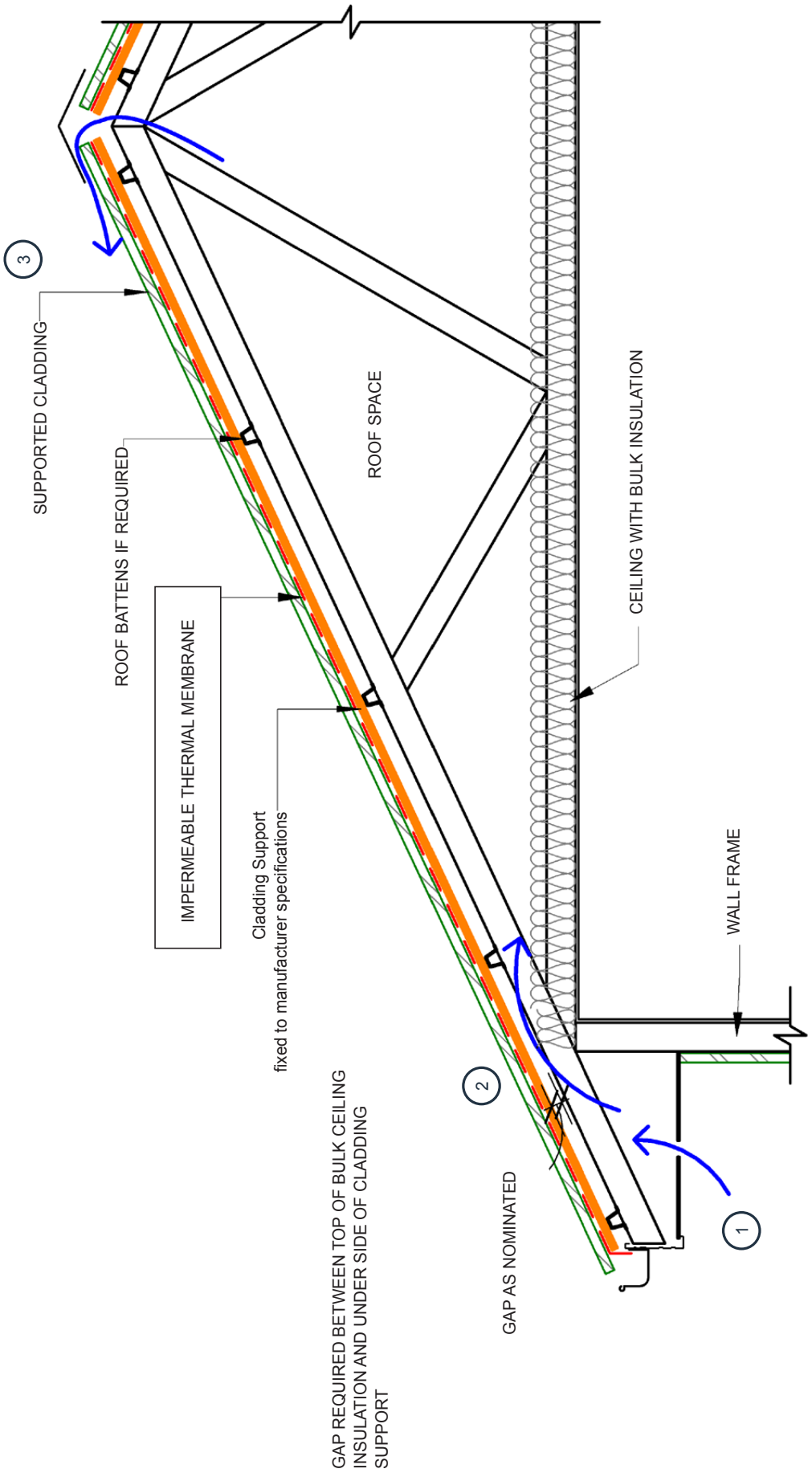
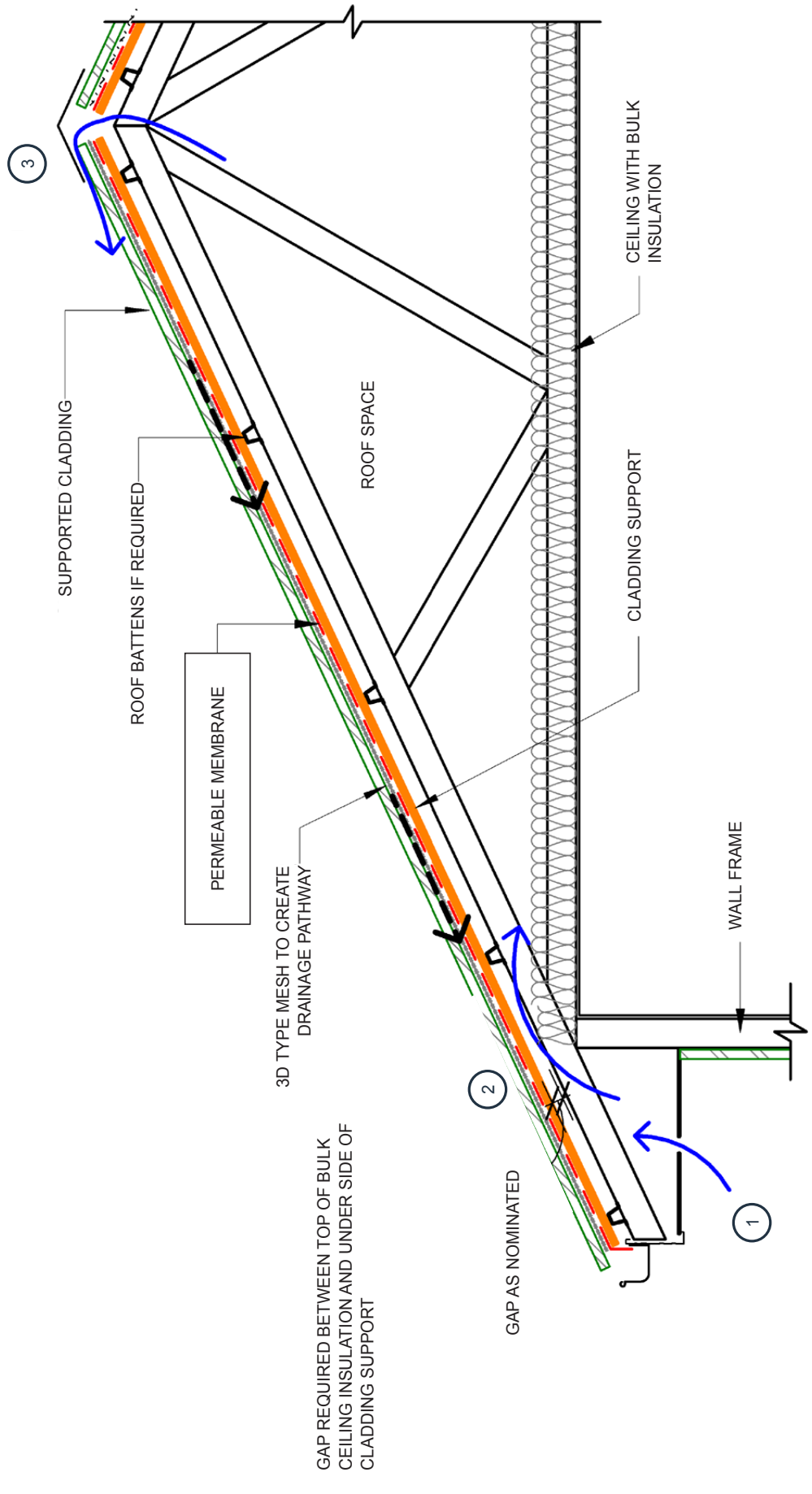


***Figure 4.8:*** *Trussed Roof - Permeable Membrane at Roof Level*



## 4.4 Skillion Roofs with Supported Metal Claddings

Skillion roofs with supported claddings comprise a pitched roof that incorporates a small cavity with ceiling lining that follows the pitch of the roof. The system further incorporates a rigid support over the top of trusses/battens to which the cladding is attached.

Skillion roofs are more prone to moisture due to a smaller cavity that may be restricted. This coupled with their frequent use at low pitches reduces ventilation and drying potential. Therefore, it is recommended that slopes on skillion roofs should be min 3°. For roof pitches < 3° powered roof fan solutions combined with eave ventilation will need to be considered.

Moisture entering the cavity must be removed by either passive or mechanical ventilation to avoid moisture build-up (condensation) and consequential damage.

The following diagrams are relative to passive ventilation paths. Passive vents must prevent water penetration, animals and limit insects from entering the space.

A membrane is usually installed between the cladding and the cladding support.

For roof cavities, NCC 2022 provisions apply and passive ventilation must be provided via the shown pathways 1a or 1b and 3.

Ventilation requirements are determined from the roof pitch i.e.

- Roof pitches below 10°
  - 25,000 $mm^2/m$ provided at each of two opposing ends
- Roof pitches between 10° and 15°
  - 25,000 $mm^2/m$ provided at the eaves and 5,000 $mm^2/m$ at high level
- Roof pitches between 15° and 75°
  - 7,000 $mm^2/m$ provided at the eaves and 5,000 $mm^2/m$ at high level, plus an additional 18,000 $mm^2/m$ at the eaves if the roof has a cathedral ceiling

    i. Impermeable membrane

    a) Membrane to be installed as a vapour barrier when installed <10°.

    b) Membrane to be vapour control Class 1 as per AS 4200.1, self-healing, anti-abrasive and stable at Temperatures consistent with metal roof sheet temperatures.

    ii. Permeable membrane

    a) Permeable membrane shall be class 4 and water barrier to ensure drainage of condensate out of the cavity

    b) Rigid support to also be permeable to ensure moisture within the roof space can escape via vapour transmitting through to the cladding. Cladding will require venting and draining above the membrane.

    c) Membrane must have the following properties:

    i. for open profile cladding,

    1. Membrane Class 4 as per AS 4200.1, anti-abrasive, have absorbency of 150g/$m^2$ and drainage capability;

    ii. for all closed profile cladding,

    1. Membrane Class 4 as per AS 4200.1, anti-abrasive and is capable of ventilation & drainage (3D mesh types).

    iii. Membrane shall be stable at temperatures consistent with metal roof sheet temperatures.

    iv. Supported roof cladding, on permeable membranes, is not recommended in NCC climate zones 7 & 8.

    d) Permeable Membranes are not recommended for roof pitches below 10° as they will not facilitate above membrane drainage at low pitches. Impermeable membranes must be used for roof pitches ≤10°.

***Figure 4.9:*** *Skillion Roof - Impermeable Thermal Membrane*

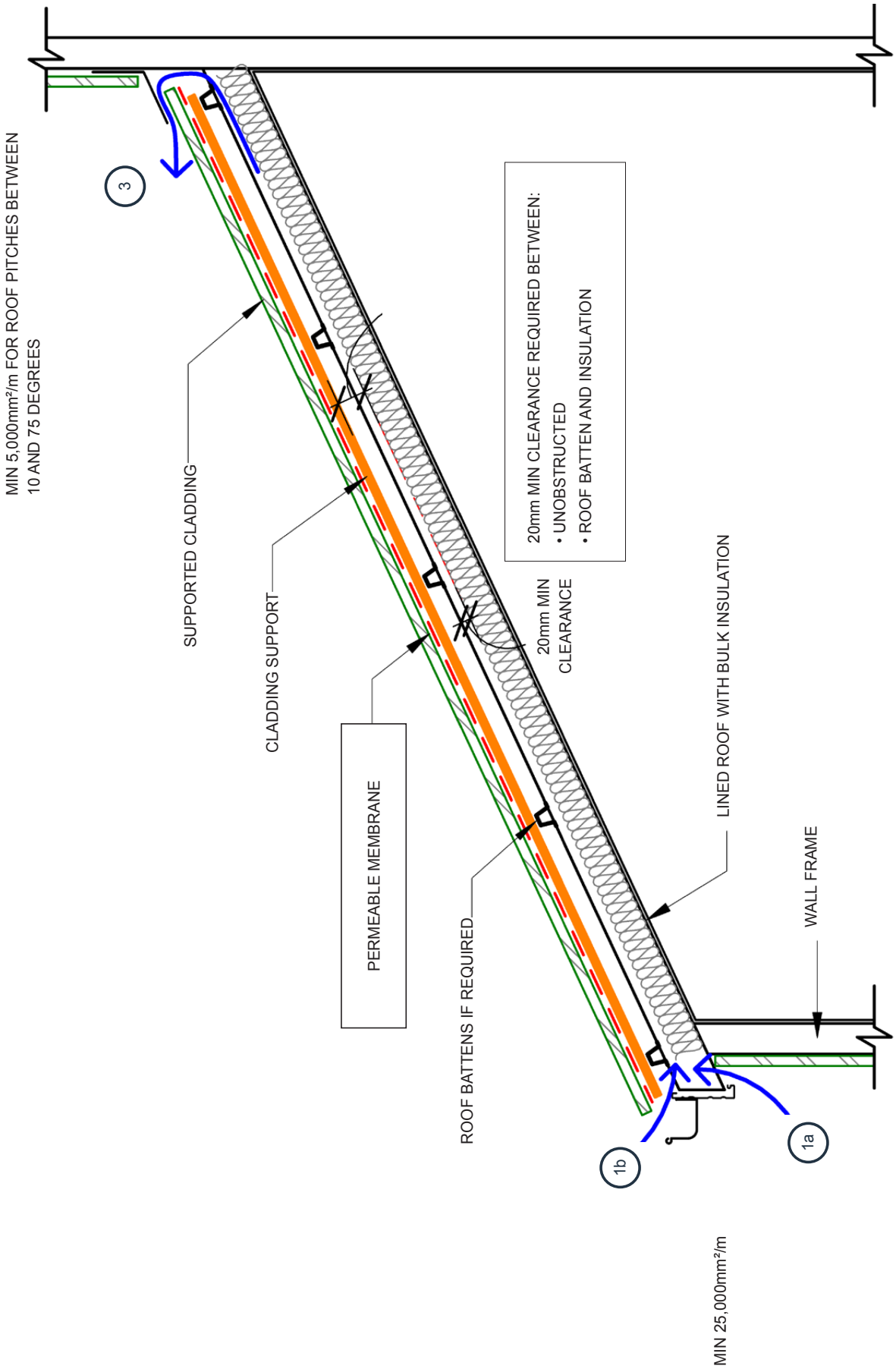
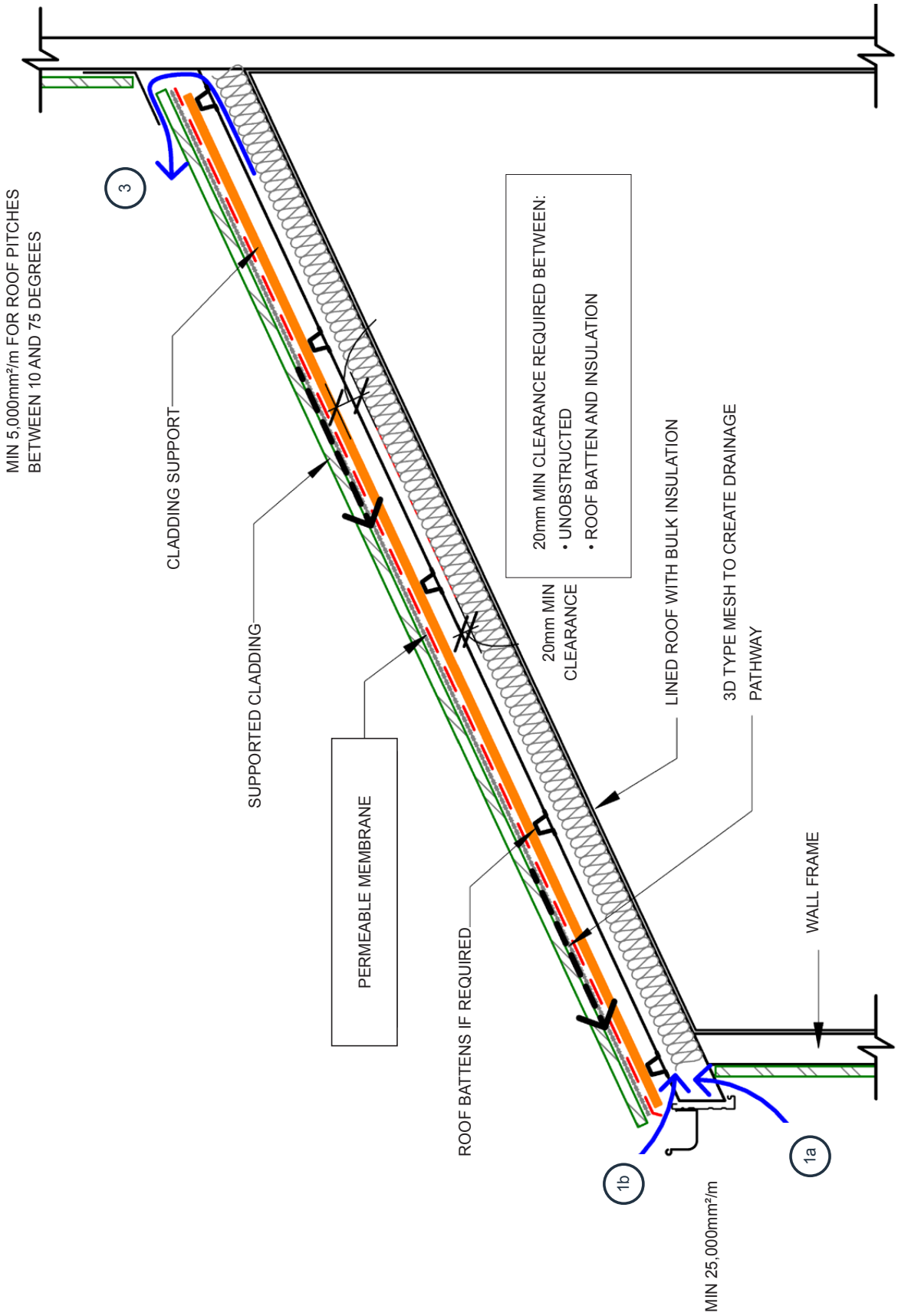


***Figure 4.10:*** *Skillion Roof - Permeable Membrane*



# 5.0 Condensation Control in Walls

NCC 2022 condensation management principles apply to walling as well as roof cavities.

NCC 2022 Deemed to Satisfy (DTS) Provisions are outlined in Figure 5.1 which presents a flow chart of the DTS Provisions for condensation management using pliable building membranes.

When using a pliable building membrane, there are two key points to consider:

1. Is a pliable building membrane required?
2. Does the pliable building membrane need to be vapour permeable?

***Figure 5.1:***

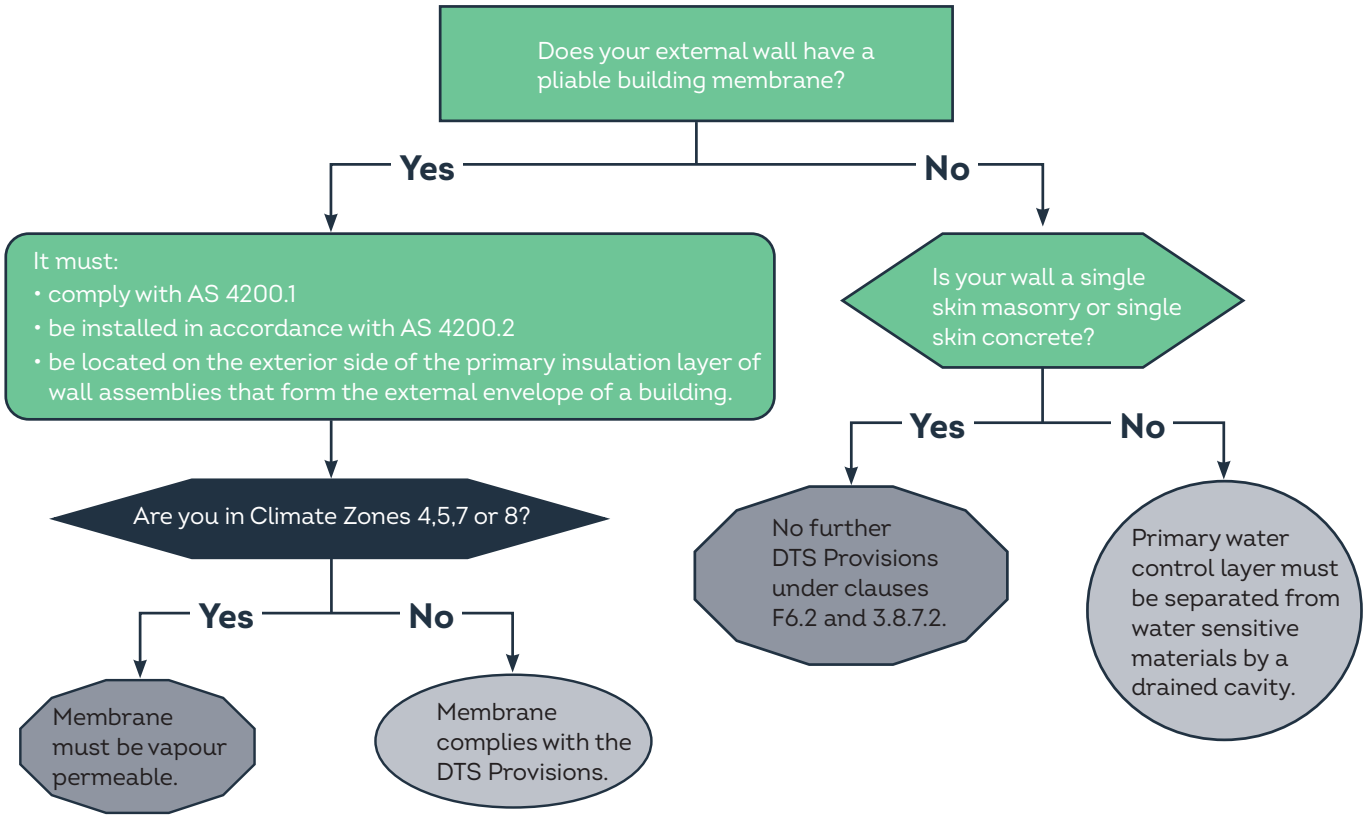



***Table 5:***

| Recommended best practice application of pliable membrane in walling | | | | |
|---|---|---|---|---|
| Climate Zone | Warm Humid | Temperate | | Cold |
| Pliable wall membrane as per AS 4200.1 | Climate Zone 1-3 | Climate Zone 4-5 | Climate Zone 6 | Climate Zone 7-8 |
| Impermeable wall membrane | ✓ | × | × | × |
| Class 3 permeable wall membrane | ✓ | ✓ | × | × |
| Class 4 permeable wall membrane | ✓ | ✓ | ✓ | ✓ |

NCC 2022 Housing Provisions 10.8.1

A pliable building membrane may be required for different reasons such as weatherproofing purposes, energy efficiency (i.e. part of the total R Value of the envelope) or managing condensation. In some instances, it's also common practice to install a pliable building membrane where it's not strictly required. As an example, a builder or designer might include a pliable building membrane as an extra layer of weatherproofing/insulation or to protect water sensitive materials. In this situation, whilst well-intentioned, it might inadvertently create a risk associated with water vapour and condensation.

When thinking about whether a pliable building membrane needs to be vapour permeable or not, how the water vapour moves through the building envelope needs to be considered. A pliable building membrane is often placed on the external side of water sensitive materials. This may prevent water vapour from escaping the building envelope, creating a situation where condensation accumulates on the internal side of the pliable building membrane (where

the water sensitive materials are located). NCC 2022 addresses this issue by requiring that pliable building membranes installed in climate zones i.e. 4, 5, 7 and 8 be vapour permeable membranes regardless of why they have been installed.

## 5.1. Walls with Self - Supported Metal Claddings – Installed Horizontally or Vertically

Internal linings of all wall systems (timber or steel framed) should be tightly sealed to minimise the risk of internally generated moisture moving into the wall. Insulation placed within the wall should be adequately contained so that it will not move, be subject to moisture or restrict ventilation of a cavity.

The membrane outside the frame should be suitable to the applicable climate zone as per table 1 and be stable at temperatures consistent with metal wall sheet temperatures.

Whilst minimum ventilation areas are not nominated for walling in NCC 2022 we recommend open mesh, screen or similar with an open area of min 5,000mm$^2$/m be provided at the bottom and/or top of the profile.

Open profile claddings – Installed Vertically

- Cladding maybe fixed to battens or directly to framing. Direct fixing is suitable as open Profiles provide sufficient ventilation and drainage. Direct fixed cladding to steel frame requires inclusion of a thermal break between the cladding and the steel framing in accordance with NCC 2022 requirements.
- The profile flashings should not seal the cladding so as to allow ventilation and drainage from behind the cladding profile.

Open profile claddings - Installed Horizontally

- Fix to vertically installed battens so as to allow suitable ventilation drainage from behind the cladding profile.

Closed profile claddings - Installed Vertically or Horizontally

- Cladding must be fixed to battens to create a drained and ventilated cavity behind the cladding. Batten installation shall be designed to avoid pondage of water. When the profile is installed vertically with horizontal battens we recommend a packing piece, typically between the batten and the frame at each fixing point.

***Figure 5.2:*** *Side Elevation - Closed Profile - Horizontal Fix*

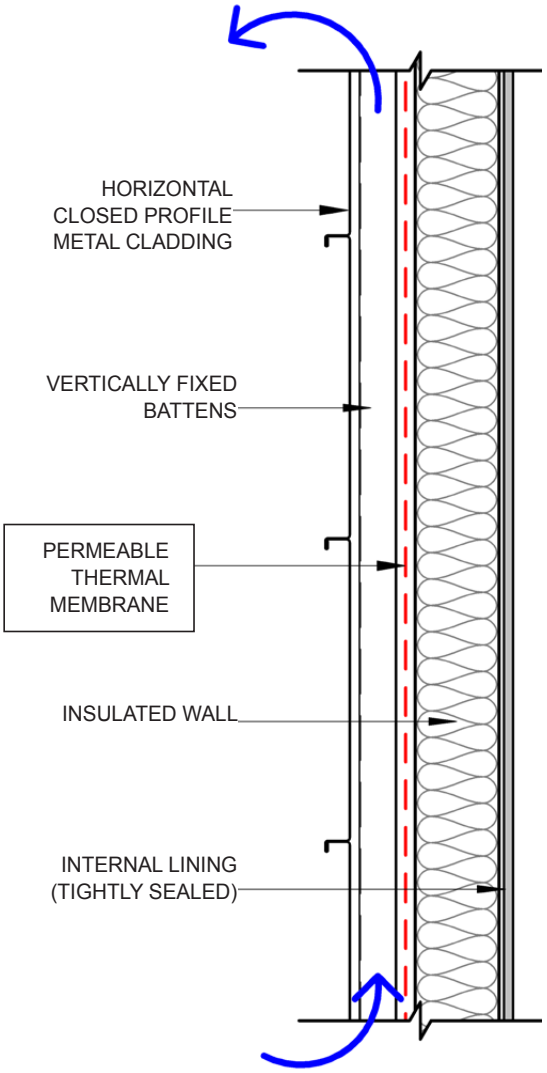



***Figure 5.3:*** *Plan View - Closed Profile - Horizontal Fix*

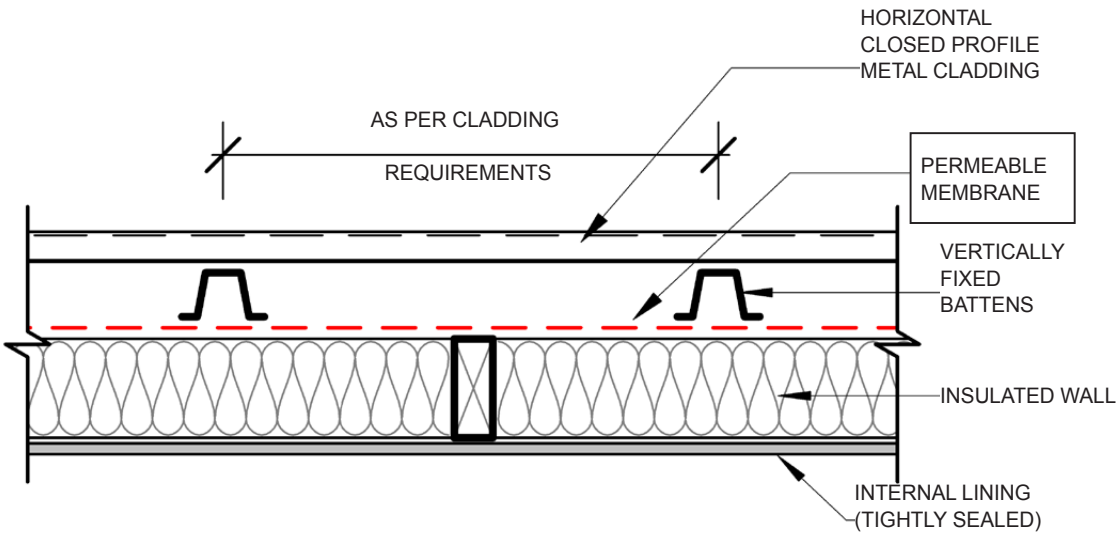


***Figure 5.4:*** *Side Elevation - Open Profile - Horizontal Fix*

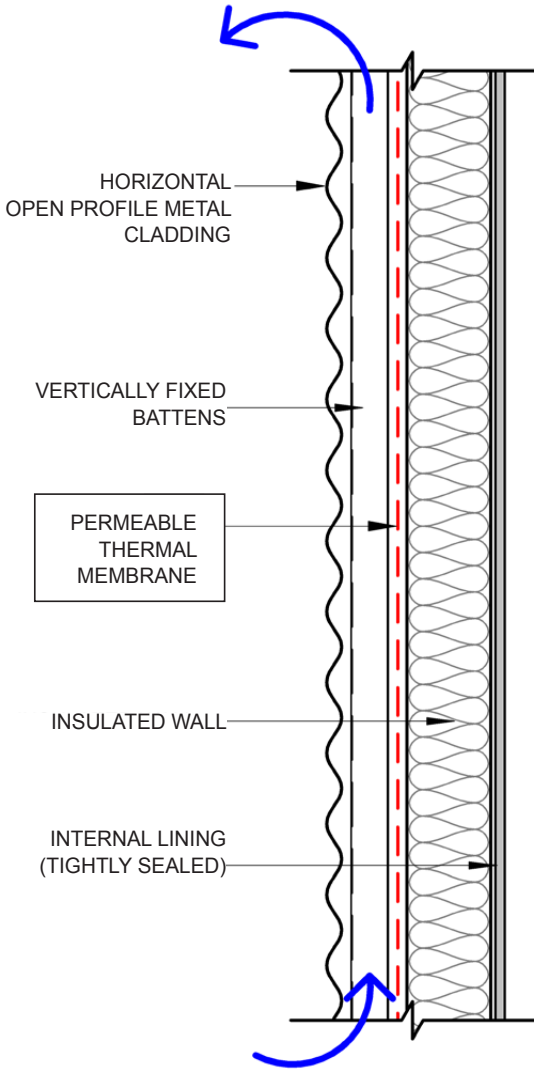



***Figure 5.5:*** *Plan View - Open Profile - Horizontal Fix*

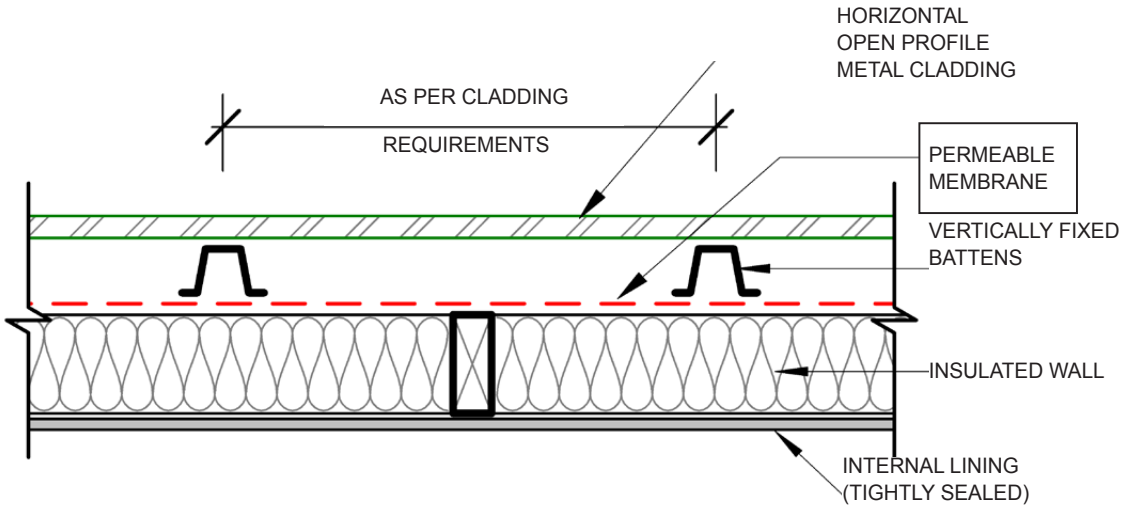


***Figure 5.6:*** *Side Elevation - Closed Profile - Vertical Fix*

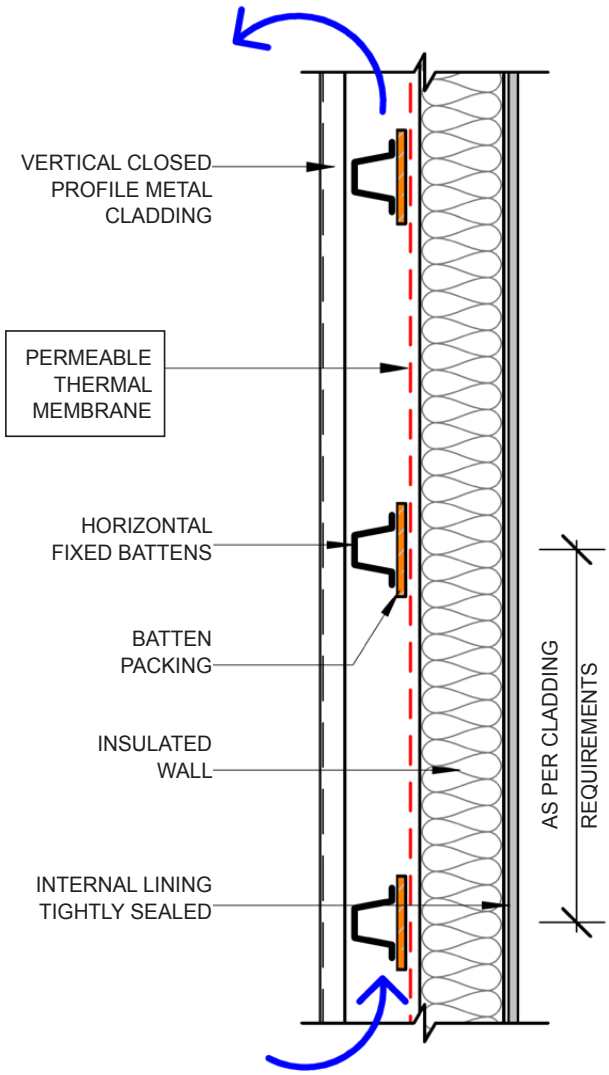



***Figure 5.7:*** *Plan View - Closed Profile - Vertical Fix*

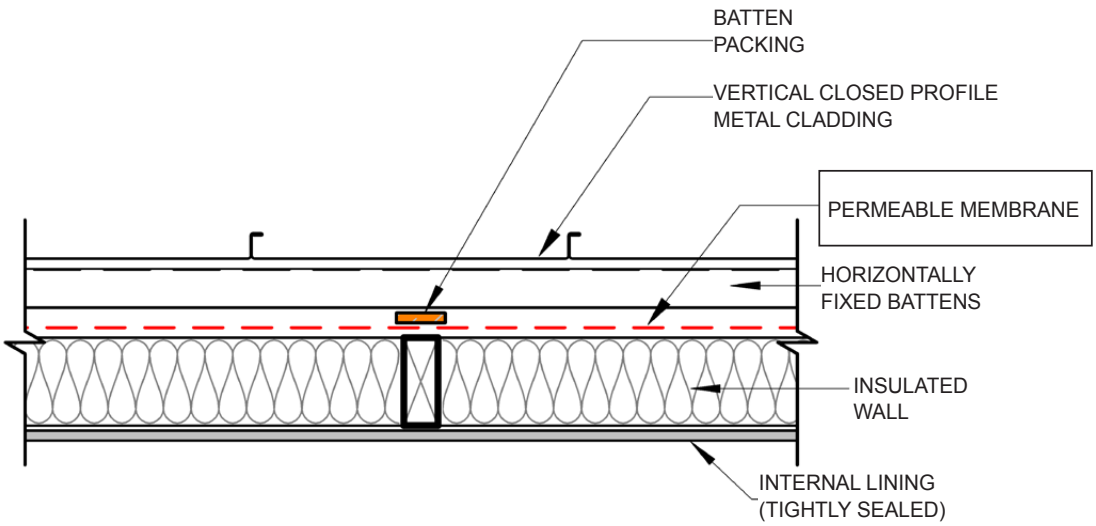


***Figure 5.8:*** *Side Elevation - Open Profile - Vertical Fix*

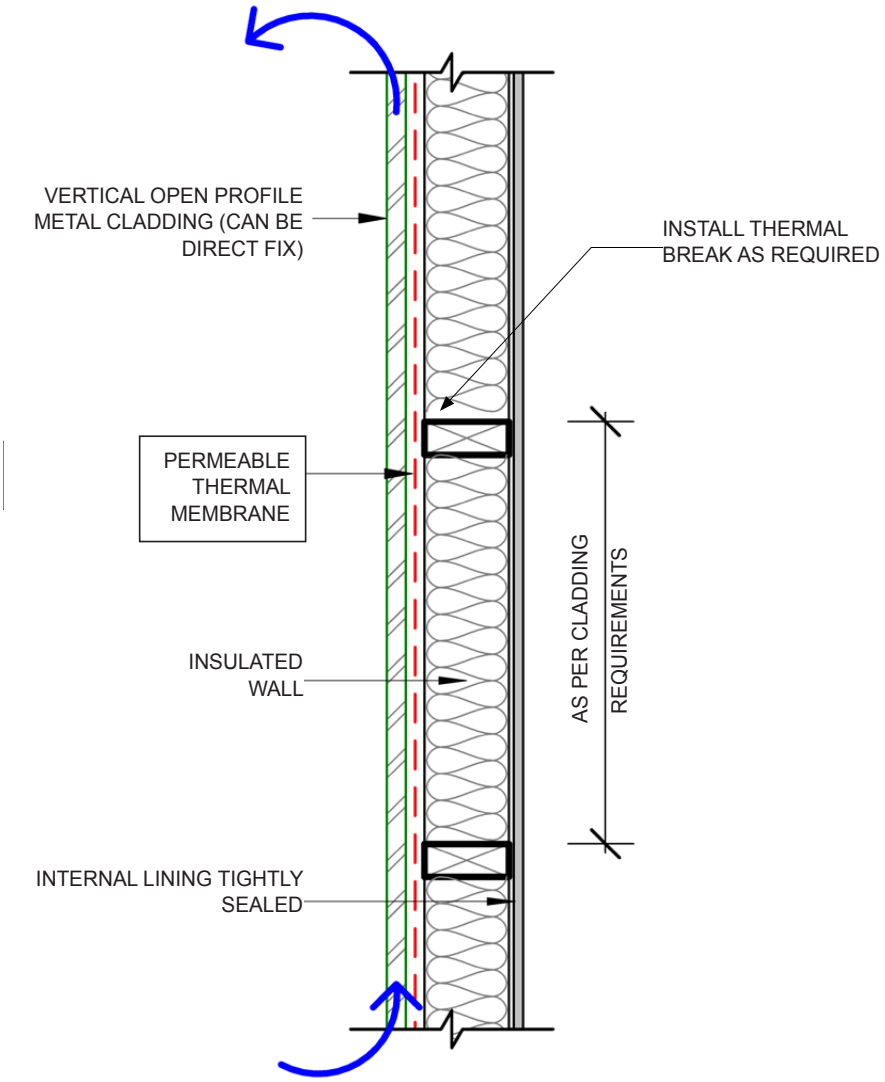
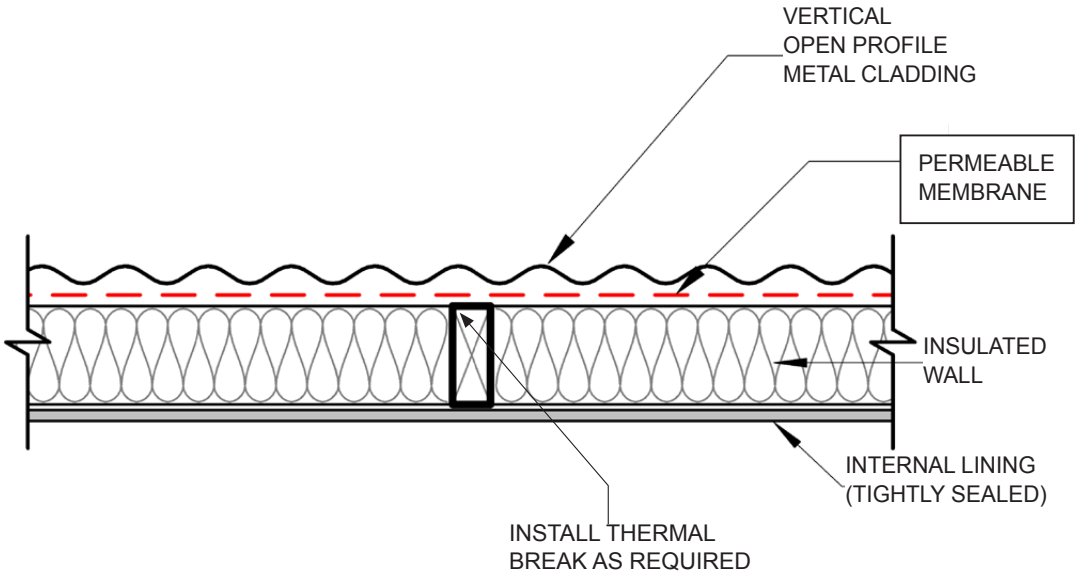



***Figure 5.9:*** *Plan View - Open Profile - Vertical Fix*



## 5.2 Walls with Supported Metal Claddings – Installed Horizontally or Vertically

Information outlined herein assumes that supported metal wall claddings are Closed profiles. (Open profiles are generally self-supporting).

Internal linings of all wall systems (timber or steel framed) should be tightly sealed to minimise the risk of internally generated moisture moving into the wall. Insulation placed within the wall should be adequately contained so that it will not move, be subject to moisture or restrict ventilation of a cavity.

Membranes are to be installed between the cladding and the rigid support. The following considerations are applicable to Impermeable and Permeable membranes.

i. Impermeable membrane
    a. Passive ventilation of the cavity behind the rigid support must be provided to remove internal moisture. This is achieved by installing battens behind the rigid support to create a drained and ventilated cavity.
    b. The batten installation shall be designed to avoid pondage of water.
    c. The impermeable membrane to be vapour control Class 1 as per AS 4200.1, self-healing, anti-abrasive and stable at temperatures consistent with metal wall sheet temperatures.

ii. Permeable membrane
    a. The rigid support should also be permeable to ensure moisture within the wall space can escape via vapour transmitting through to the cladding. The cladding must be designed to be vented and draining at the membrane.
    b. The Permeable membrane must have the following properties:
        i. Suitable to the applicable climate zone as per table 1, anti-abrasive and is capable of ventilation and drainage (3D mesh types).
        ii. Membrane shall be stable at temperatures consistent with metal sheet temperatures.

***Figure 5.10:*** *Side Elevation - Closed Profile - Horizontal & Vertical Fix*

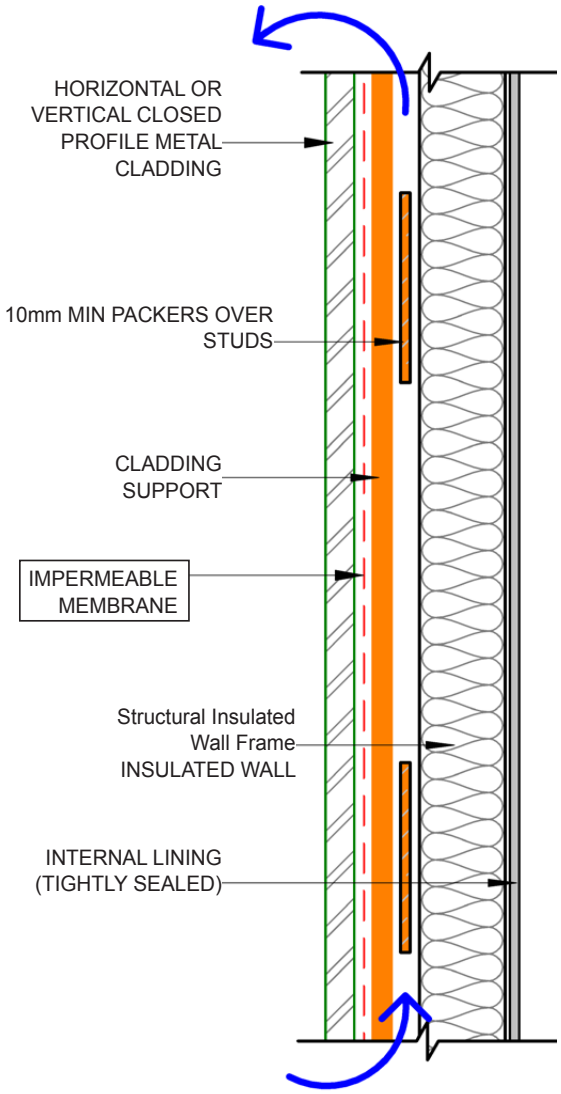



***Figure 5.11:*** *Plan View - Closed Profile - Horizontal & Vertical Fix*

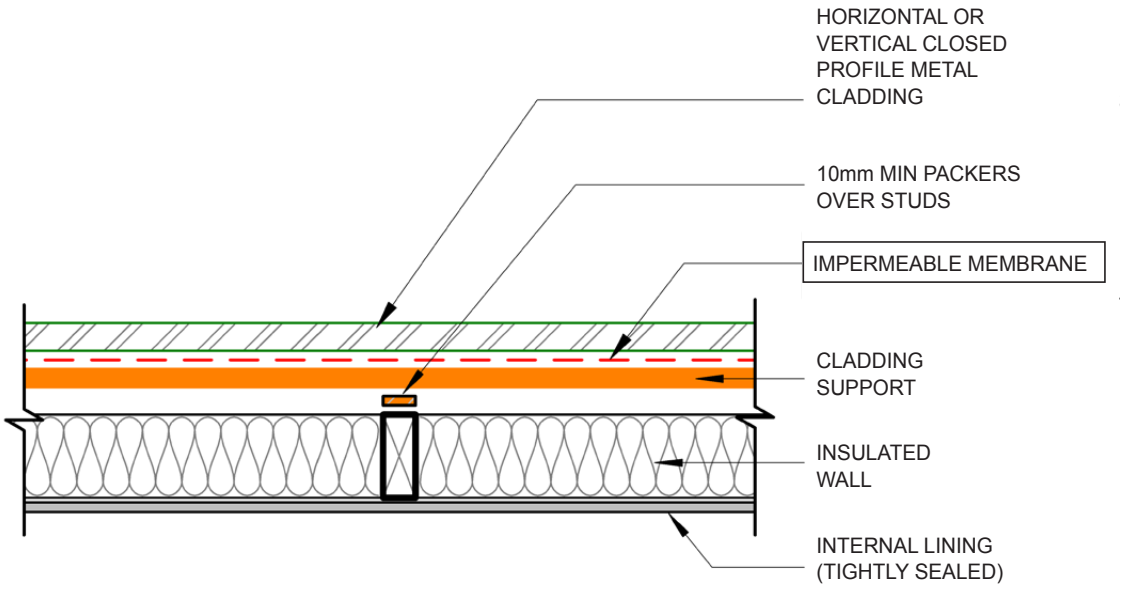


***Figure 5.12:*** *Side Elevation - Closed Profile -Horizontal & Vertical Fix*

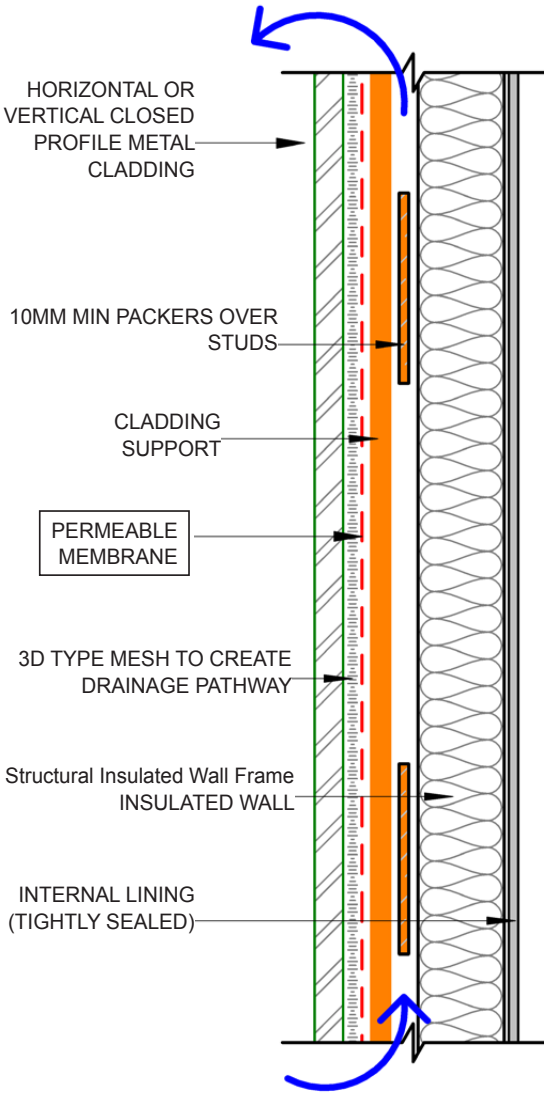
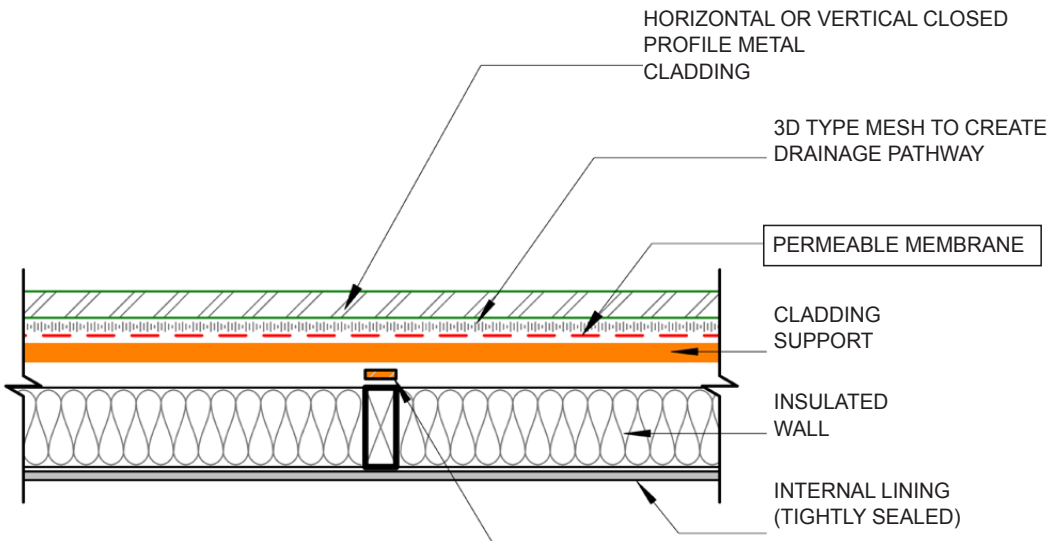



***Figure 5.13:*** *Plan View - Closed Profile - Horizontal & Vertical Fix*



## 5.3 Walls with Self-Supported Metal Rain screen or Panelised Claddings – Installed Horizontally or Vertically

Metal rain screen/panelised wall systems require a secondary weather protection layer (membrane) behind to provide both drainage of the rain that penetrates to outer metal skin, and ventilation to dry the cavity behind.

Internal linings of all wall systems (timber or steel framed) should be tightly sealed to minimise the risk of internally generated moisture moving into the wall. Insulation placed within the wall should be adequately contained so that it will not move, be subject to moisture or restrict ventilation of a cavity.

Battens and membrane installation should be designed to avoid pondage of water and protection from capillary action at joints and laps.

i. Impermeable membrane

   a) When impermeable membrane is selected, it must be installed to allow Internal moisture to escape and protect internal framing and insulation. As this method is hard to achieve, we recommend the use of Permeable membranes only with self-supporting panelised metal cladding.

ii. Permeable membrane

   b) Membrane must have the following properties:

      a. Membrane shall be suitable to the applicable climate zone as per table 1 and anti-abrasive,

      b. Have absorbency of 150g/m$^2$ and drainage capability

      c. Membrane shall be stable at temperatures consistent with metal cladding temperatures

***Figure 5.14:*** *Side Elevation - Panelised Profile - Vertical Fix*

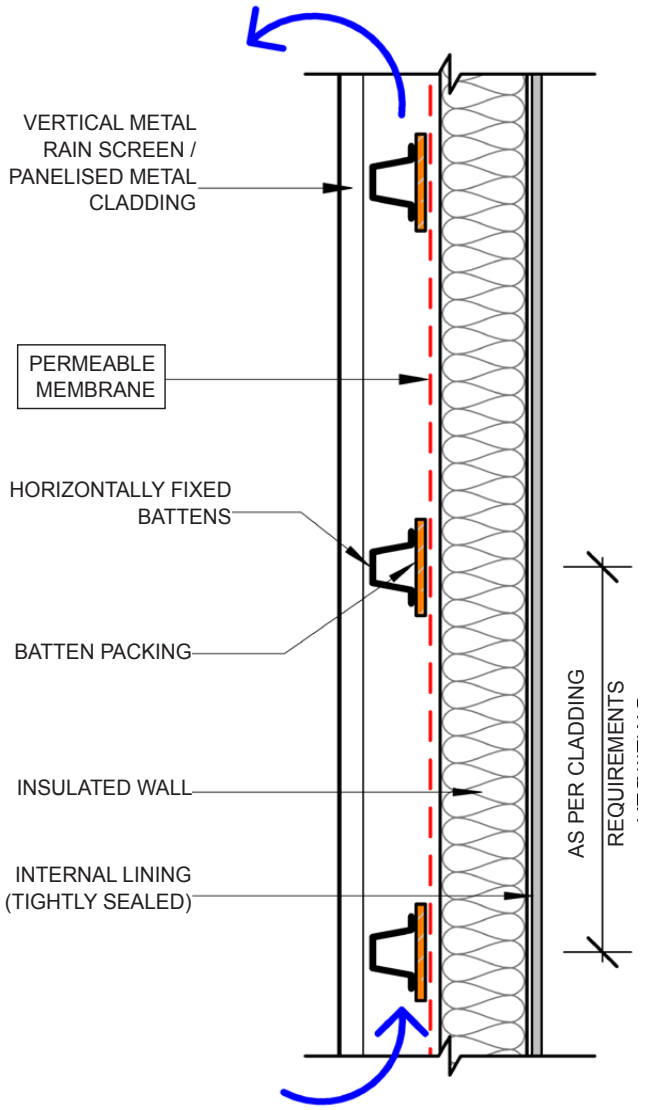



***Figure 5.15:*** *Plan View - Panelised Profile - Vertical Fix*

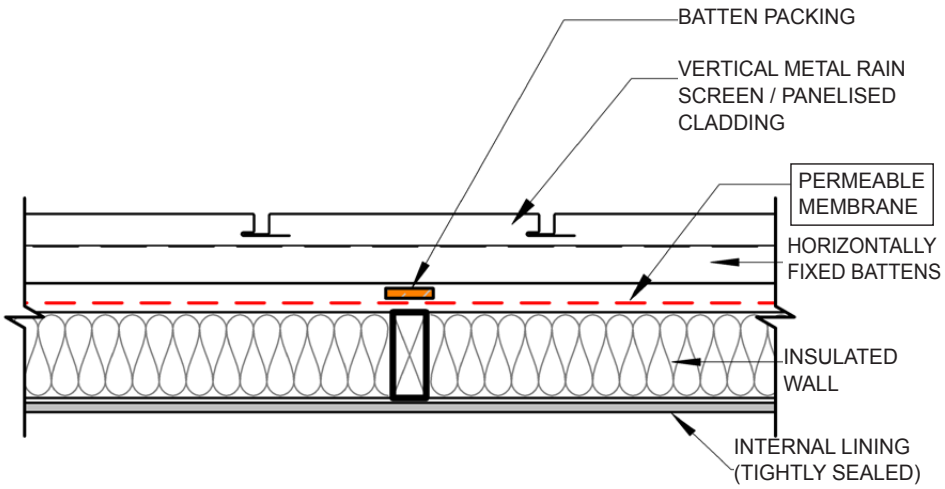


***Figure 5.16:*** *Side Elevation - Panelised Profile - Horizontal Fix*

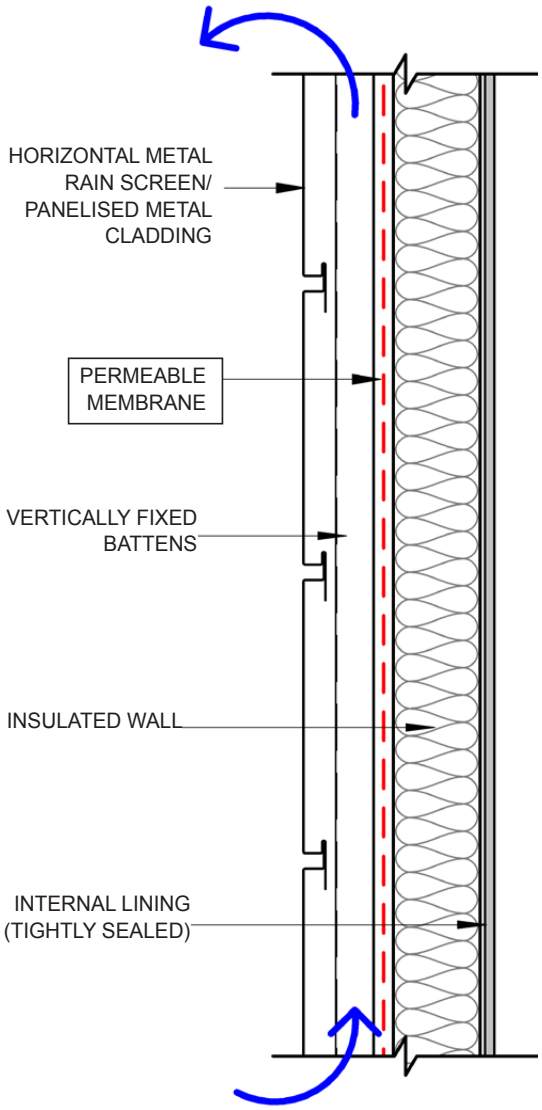
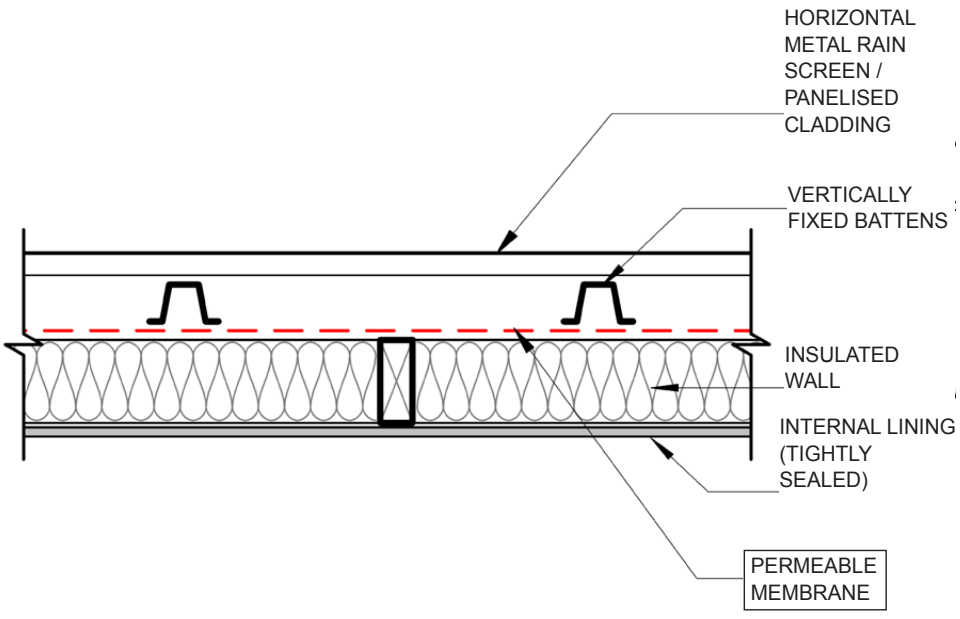



***Figure 5.17:*** *Plan View - Panelised Profile - Horizontal Fix*



# 6.0 Appendix

a. AS 4200.1 - Table 4 Vapour Control Membrane classification

***Table 1:*** *Vapour Control Membrane (VCM) Classification*

| Vapour Permeance (see note) µg/N.s | | | |
|---|---|---|---|
| Class | VCM category | Min.(≥) | Max. (<) |
| Class 1 | Vapour barrier | 0.0000 | 0.0022 |
| Class 2 | | 0.0022 | 0.1429 |
| Class 3 | Vapour permeable | 0.1429 | 1.1403 |
| Class 4 | | 1.1403 | No max. |
| | ASTM-E96 Method B Wet Cup–23°C 50%RH | | |

**Note:**

1. Vapour permeance is the inverse of vapour resistance. It shall be calculated as follows:
   Vapour permeance µg/N.s = 1/ (Vapour resistance MN.s/g)

## 6.1 Definitions

- 3D type mesh - mesh-like mat used to provide a small air gap under cladding to facilitate drainage and drying (ventilation) Note: 3D mesh may assist with oil canning minimisation in wide pan profiles.
- Air control membrane - a membrane installed to prevent air transfer between each side of the membrane. Note: Air control membranes are classified as air barriers by AS 4200.1
- Blanket & foil - insulation product installed under cladding (typically roofs) consisting of a layer of bulk insulation adhered to a vapour impermeable reflective membrane.
- Capping - flashing that fully covers the top of a parapet wall, ridge or similar upstand (or "feature")
- Cavity - a hollow space/void created between two building elements typically the outer metal wall cladding and frame.
- Cavity ventilation - is the process of allowing outside air into a cavity to facilitate drying.
- Cavity wall - a wall that incorporates a drained cavity.
- Closed profile cladding - are those with closed ribs that will not allow easy airflow.
- Concealed fixed (clip fixed) - claddings that are installed and secured using clips. The clip are installed and secured to the underlying support and then the cladding is engaged to the clips. There are no visible fixings once the cladding is installed.
- Drainage path - path behind cladding where water drains out to exterior of the building.
- Flashing - a strip or sleeve of impervious material dressed, fitted or built-in to provide a barrier to water movement, or to divert the travel of water, or to cover a joint where water would otherwise penetrate to the interior of a building. Impermeable membrane - a pliable building membrane that does not allow the transfer of water vapour across the membrane (Class 1 or 2).
- Oil canning - visible rippling effect that can occur on the surface of metal panels, particularly flat or lightly profiled metal roofs or metal wall claddings.
- Open profiles claddings - are those with open ribs that will allow airflow.
- Permeable (breathable) membrane - a pliable building membrane, including reflective (perforated foil) or non-reflective membrane that does allow the transfer of water vapour across the membrane (Class 3 or 4).
- Pierce fixed (screw fixed) - claddings flashings that are installed and secured using screws. The screws pierce the cladding and/or structural support. Screw head is generally visible on the surface of the cladding.
- Pliable building membrane - a material that can be folded back on itself without causing structural damage to the product that affects its material properties.
- Reflective foil laminate (RFL) - a building membrane with a reflective surface such as a reflective foil laminate, reflective barrier, foil batt or the like capable of reducing radiant heat flow.
- Reflective space - where a reflective air space is required for energy efficiency cavity shall be 20mm min.
- Self-healing membrane - a pliable building membrane that maintains its properties (water and air control) when penetrated by fixings.
- Thermal Control Membrane - a membrane with a surface emissivity and/or material R-value intended to reduce heat transfer.
- Trickle ventilation - inherent gaps in construction that provide a baseline level of natural ventilation sufficient for drying of wall cavities and roof spaces.
- Water Control Membrane (Sarking) - a membrane classified as a water barrier according to AS 4200.1, intended to collect and discharge any water that may penetrate a building envelope or cladding, excluding damp-proofing and flashing materials. Note: Water control membranes are commonly referred to as "sarking".
- Vapour barrier - AS 4200.2 (part 2.2) - Where a pliable building membrane is installed as a vapour barrier, class 1 or class 2, it shall be continuously sealed at all discontinuities, end laps, joints and penetrations.
- Vapour control membrane - a pliable building membrane designed to either allow or restrict the transfer of water vapour across the membrane, as classified in Table 1 of AS 4200.1

This page left intentionally blank

This page left intentionally blank

## Product Descriptions

All descriptions, specifications, illustrations, drawings, data, dimensions, and weights contained in this publication and websites containing information from Fielders are approximations only. They are intended by Fielders to be a general description for information and identification purposes and do not create a sale by description. Fielders reserves the right at any time to:

a) Supply goods with such minor modifications from its drawings and specifications as it sees fit, and

b) Alter specifications shown in its publications and websites to reflect changes made after the date of publication.

## Disclaimer, Warranties and Limitations Of Liability

- This publication is intended to be an aid for all trades and professionals involved with specifying and installing Fielders® products and not be a substitute for professional judgement.
- Terms and conditions of sale are available at fielders.com.au/legals/
- Except to the extent to which liability may not lawfully be excluded or limited, BlueScope Steel Limited will not be under or incur any liability to you for any direct or indirect loss or damage (including, without limitation, consequential loss or damage such as loss of profit or anticipated profit, loss of use, damage to goodwill and loss due to delay) however caused (including, without limitation, breach of contract, negligence and/or breach of statute), which you may suffer or incur in connection with this publication.

# Australian Standards

| Australian Standard | Title |
|---|---|
| AS 3959:2018 | Construction of buildings in bushfire-prone areas |
| AS 4200.1:2017 | Pliable building membranes and underlays Materials |
| AS 4200.2:2017 | Pliable building membranes and underlays Installation |

FIET0048 - 06/09/24

**For detailed product information, manuals and project case studies visit:**

**fielders.com.au**

Fielders® and ® product names are registered trademarks of BlueScope Steel Limited and ™ product names are trademarks of BlueScope Steel Limited.
© 2024 BlueScope Steel Limited. ABN 16 000 011 058. All rights reserved.

FIELDERS