

TECHNICAL NOTE 8

NCC Compliance: Roofspace Ventilation and Timber Sheathing Boards



Background

Historically, around the world it was common to see roofs that use timber sheathing boards. Using individual timber sheathing boards has become quite rare in modern construction, making up only a small fraction of new roofs.

The use of individual planks or boards is still used in historic restorations. Spaced sheathing, which leaves gaps between wooden boards, is also used where specialist roofing materials like wooden shingles, natural slate and some metal roof cladding benefit from airflow underneath the roof cladding to dry out moisture. On some high-end custom projects traditional solid wood planks still get used for their durability against moisture, or the aesthetic appeal in exposed vaulted ceilings.



More recently, by far more common, is the use of larger manufactured sheets of engineered timber like plywood, Oriented Strand Board (OSB) and moisture resistant medium density fibreboard (MDF). These are preferred for reasons of;



(i) wind resistance with large boards acting as a structural diaphragm;

(ii) cost efficiency, requiring less labour to install than fixing down individual boards;

(iii) strength, with engineered panels having consistent thickness and strength; and

(iv) providing perfectly flat, solid surfaces that support roofing underlays and roof claddings.

In Australia, the use of full cover sheathing boards has largely been limited to the use under standing seam roofing where a continuous solid substrate is required to support the standing seam roofing.

More recently we see the increased use of sheathing boards to provide for a safe working deck for installing the roof cladding

or insulation as part of a warm roof. Adoption of high-performance building envelopes, approaches from overseas, and a marketing drive by related building materials manufacturers and their distributors, is also leading to increased use of timber sheathing boards.

There is a strong trend towards low pitch metal roofs under 10 degrees, which in most parts of the world would be treated as a flat roof deck. Low pitch roofs by their nature are more prone to moisture issues. Although high quality vapour permeable roofing underlays like ProctorWrap HTR, HTS & ProctorPassive RS-IT are extremely water resistant, on low pitched roofs, condensate will not readily drain to the gutter and may pond in drapes between battens. Although the water won't pass through the membrane, it may still drain back into the building at poorly sealed overlaps and penetrations.

There are clear advantages in using sheathing boards to support roof underlays (sarking) on low pitched roofs, including the option to use highly vapour permeable Class 4 fully adhered underlays such as Wraptite SA and UV-SA. Designers, builders and roofers need to be aware that the addition of rigid sheathing boards has a significant impact on the hygrothermal behavior of the roof system.

Although the NCC Condensation Management provisions introduced in 2022 have addressed these risks and provided for deemed to satisfy pathways to compliance, many well intentioned builders have fallen foul to Instagram trends, misinformation about the compliance of above sheathing ventilation (ASV), and product promotion driven training. As such they have been left exposed to the need to seek retrospective performance solutions to comply with the NCC.

Sometimes it can be more affordable and less complicated from a hygrothermal perspective to utilise strapping or safety mesh to support roof underlays of lower pitch roofs.

The lack of tested and published data on vapour permeability of boards, has led to a poor level of understanding, confusion and myths about the relative vapour permeability of different engineered timber sheathing boards.

The chart below illustrates some of the published data that is available. We have also tested a moisture resistant MDF used in roof, floor and wall applications overseas.



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

(a) is located—

- (i) immediately above the primary insulation layer; or
- (ii) immediately above sarking with a vapour permeance of not less than $1.14 \mu\text{g/N.s}$, which is immediately above the primary insulation layer; or
- (iii) immediately above ceiling insulation that meets the requirements of 13.2.3(3) and 13.2.3(4); and

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

(c) is either—

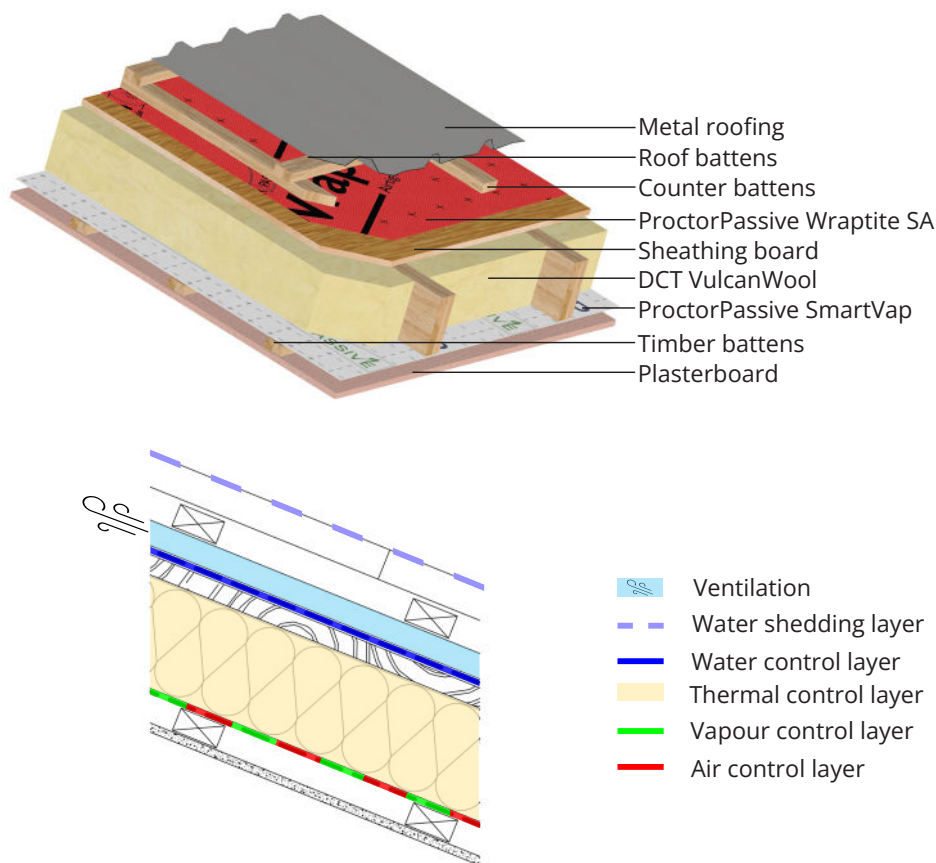
- (i) ventilated to outdoor air through evenly distributed openings in accordance with Table 10.8.3; or
- (ii) located immediately underneath roof tiles of an unsarked tiled roof.

Where a Performance Solution is proposed, the relevant performance requirements must be determined in accordance with A2G2(3) and A2G4(3) as applicable

the interior surface of the water control layer; or
the surfaces of building fabric components interior to the water control layer.

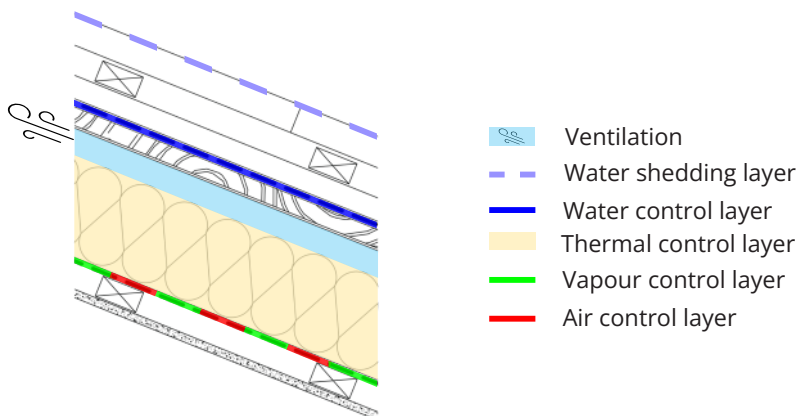
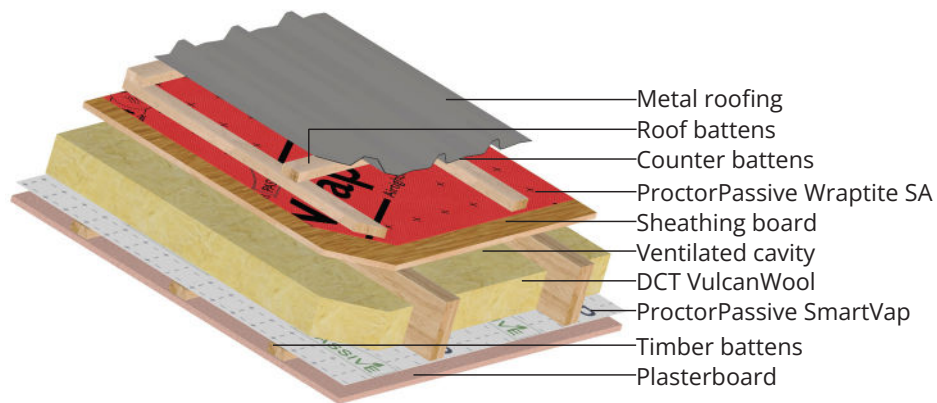
input assumptions in accordance with AIRAH DA07; and
the intermediate method for calculating indoor design humidity in Section 4.3.2 of AIRAH DA07.

Ventilation above the sheathing and the sarking



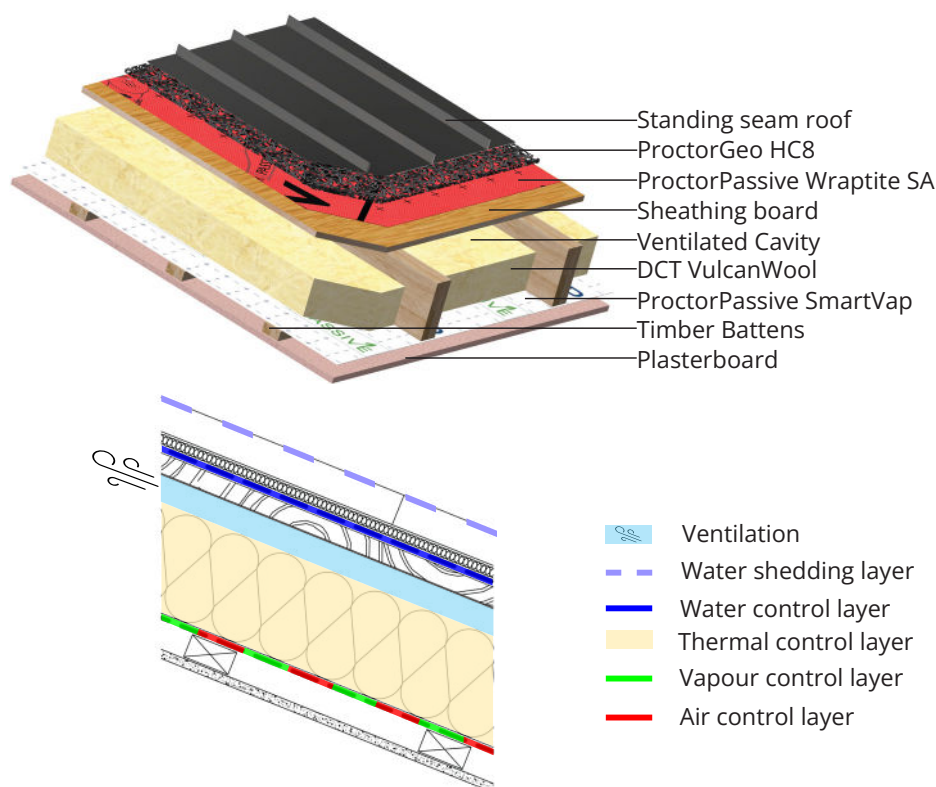
Requirements for a ventilated roof space (NCC 2022)	Commentary	Deemed to Satisfy
(a) is located (i) immediately above the primary insulation layer ; or	The primary insulation is defined in the NCC as the <i>most interior insulation layer of a wall or roof construction</i> . In this case there is no ventilated air space immediately above the primary insulation layer because the sheathing board is immediately above the primary insulation.	✗
is located— (ii) immediately above sarking with a vapour permeance of not less than 1.14 µg/N.s,	ProctorWrap HTS, HTR, ProctorPassive RS-IT, Wraptite SA and Wraptite UV-SA have a vapour permeance of not less than 1.14 µg/N.s (Class 4 Vapour Permeable) If the sarking is not Class 4; or the product label does not disclose the vapour permeability as required by AS 4200.1:2017, a performance solution is required.	✓ ✗
which is immediately above the primary insulation layer ;	Although the ventilated roof space created by the battens or other means is immediately above the sarking, because of the location of the sheathing board, the sarking is not immediately above the primary insulation layer.	✗
AS4200.1,2 Duty Classification requirements	ProctorWrap HTS, HTR, ProctorPassive RS-IT, Wraptite SA and Wraptite UV-SA are all MEDIUM or LIGHT DUTY so can be used as a sarking in metal roof applications. ProctorWrap HTS and HTR are MEDIUM duty so can also be used as a sarking in roof tile applications. See the section on page 10 below if duty classification is not disclosed.	✓
SUMMARY	This design does not meet the DTS requirements because the ventilated roof space is not immediately above the primary insulation layer and the Class 4 Vapour permeable sarking is not immediately above the primary insulation layer.	✗

Ventilation below the sheathing



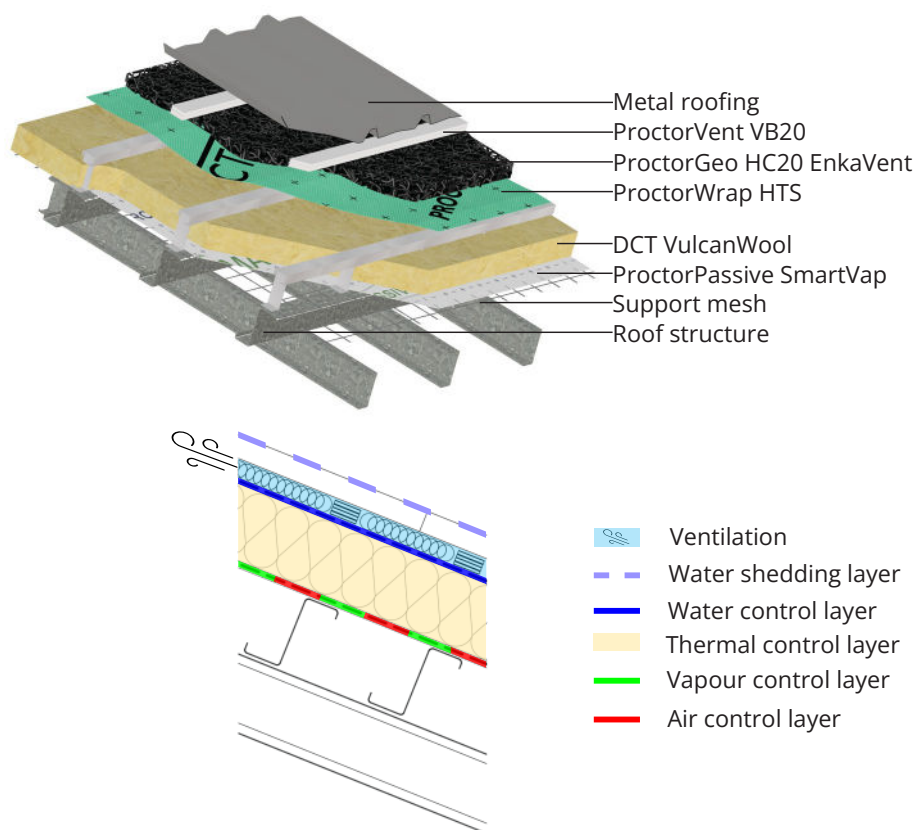
Requirements for a ventilated roof space (NCC 2022)	Commentary	Deemed to Satisfy
(a) is located (i) immediately above the primary insulation layer ;	Provided there is ventilated air space no less than 20mm in height, immediately above the primary insulation layer, (defined in the NCC as <i>the most interior insulation layer of a wall or roof construction</i>) this meets the DTS requirements. Care must be taken to ensure that the insulation does not block the ventilation path.	✓
AS4200.1 and AS4200.2 Duty Classification requirements	ProctorWrap HTS, HTR, ProctorPassive RS-IT, Wraptite SA and Wraptite UV-SA are all MEDIUM or LIGHT DUTY so can be used as a sarking in metal roof applications. ProctorWrap HTS and HTR are MEDIUM duty so can also be used as a sarking in roof tile applications. See the section on page 10 below if duty classification is not disclosed.	✓
SUMMARY	This design meets the DTS requirements because the ventilated roof space is immediately above the primary insulation layer. We suggest using ProctorWrap HTS, HTR, ProctorPassive RS-IT, Wraptite SA and Wraptite UV-SA – All are vapour permeable Class 4 and no less than LIGHT duty classification. For low pitched roofs where ventilation is likely to be inadequate, or in cooler climates, we would still recommend either ProctorPassive SmartVap or DCT PIR Silver is installed at the ceiling as a continuous air and vapour control layer to prevent the transport of vapour by air leakage or diffusion into the roof space. See DCT-R08-1 and DCT-R08-2 for suggested options.	✓

Standing Seam - Ventilation below the sheathing



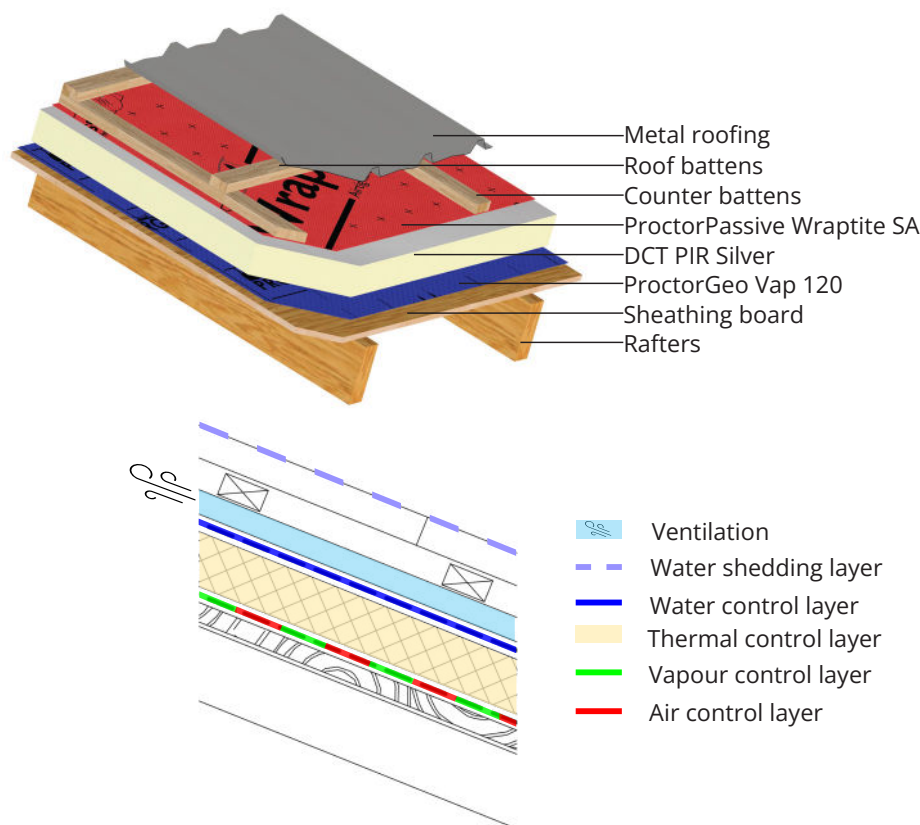
Requirements for a ventilated roof space	Commentary	Deemed to Satisfy
(a) is located (i) immediately above the primary insulation layer ; or	Provided there is ventilated air space no less than 20mm in height, immediately above the primary insulation layer, (defined in the NCC as <i>the most interior insulation layer of a wall or roof construction</i>) this meets the DTS requirements. Care must be taken to ensure that the insulation does not block the ventilation path.	✓
AS4200.1 and AS4200.2 Duty Classification requirements	ProctorWrap HTS, HTR, ProctorPassive RS-IT, Wraptite SA and Wraptite UV-SA are all MEDIUM or LIGHT DUTY so can be used as a sarking in metal roof applications. ProctorWrap HTS and HTR are MEDIUM duty so can also be used as a sarking in roof tile applications. See the section on page 10 below if duty classification is not disclosed.	✓
SUMMARY	This design meets the DTS requirements because the ventilated roof space is immediately above the primary insulation layer. We suggest using ProctorWrap HTS, HTR, ProctorPassive RS-IT, Wraptite SA and Wraptite UV-SA – All are vapour permeable CLASS 4 and no less than LIGHT duty classification. For low pitched roofs where ventilation is likely to be inadequate, or in cooler climates, we would still recommend either ProctorPassive SmartVap or DCT PIR Silver is installed at the ceiling as a continuous air and vapour control layer to prevent the transport of vapour by air leakage or diffusion into the roof space. See DCT-R08-1 and DCT-R08-2 for suggested options. To assist in the removal of moisture, with standing seam roofing we also recommend the use of the ProctorGeo HC8 EnkaVent polyamide spacer mat which provides a permanent drainage and air movement pathway between the roof sheeting and the water-resistant Proctor sarking. For the avoidance of any doubt, the space created by the spacer mat is unrelated to the NCC roof space ventilation requirements. ProctorGeo HC8 EnkaVent also offers significant sound reduction from rain impact noise and can be used in direct contact with dark-coloured roofs that can reach temperatures up to 100°C.	✓

Ventilation above a Class 4 Vapour Permeable Sarking



Requirements for a ventilated roof space	Commentary	Deemed to Satisfy
(a) is located (i) immediately above the primary insulation layer ; or	There is no ventilated air space no less than 20mm immediately above the primary insulation layer defined in the NCC as <i>the most interior insulation layer of a wall or roof construction</i> .	✗
is located— (ii) immediately above sarking with a vapour permeance of not less than 1.14 $\mu\text{g}/\text{N.s}$,	ProctorWrap HTS, HTR and ProctorPassive RS-IT have a vapour permeance of not less than 1.14 $\mu\text{g}/\text{N.s}$ (Class 4 Vapour Permeable) A continuous ventilated roof space is created by the VB20 Vented Batten and ProctorGeo HC20 EnkaVent located immediately above the Class 4 vapour permeable sarking. If the sarking is not Class 4, or the product label does not disclose either the vapour permeability or duty classification (as required by AS 4200.1), a performance solution is required.	✓
which is immediately above the primary insulation layer ;	The sarking with a vapour permeance of not less than 1.14 $\mu\text{g}/\text{N.s}$ (Class 4) is located immediately above the primary insulation layer.	✓
AS4200.1 and AS4200.2 Duty Classification requirements.	ProctorWrap HTS, HTR, ProctorPassive RS-IT, Wraptite SA and Wraptite UV-SA are all MEDIUM or LIGHT DUTY so can be used as a sarking in metal roof applications. ProctorWrap HTS and HTR are MEDIUM duty so can also be used as a sarking in roof tile applications. See the section on page 10 below if duty classification is not disclosed.	✓
SUMMARY	This design meets the DTS requirements because the ventilated roof space is located immediately above a Class 4 vapour permeable sarking that is located immediately above the primary insulation layer. We suggest using ProctorWrap HTS, HTR, or ProctorPassive RS-IT. All are vapour permeable Class 4 and no less than LIGHT duty classification. For low pitched roofs where ventilation alone is likely to be inadequate, or in cooler climates, we would still recommend either ProctorPassive SmartVap, DCT PIR Silver, or vapour barrier faced insulation is installed as a continuous air and vapour control layer to prevent the transport of vapour by air leakage or diffusion in the roof space.	✓

Deemed to Satisfy Warm Roof with Class 4 Vapour Permeable Sarking



Requirements for a ventilated roof space	Commentary	Deemed to Satisfy
(a) is located (i) immediately above the primary insulation layer ; or	The primary insulation is defined in the NCC as the most interior insulation layer of a wall or roof construction . There is no ventilated 20mm air space immediately above the primary insulation layer.	✗
is located— (ii) immediately above sarking with a vapour permeance of not less than 1.14 µg/N.s,	ProctorWrap HTS, HTR, ProctorPassive RS-IT, Wraptite SA and Wraptite UV-SA have a vapour permeance of not less than 1.14 µg/N.s (Class 4 Vapour Permeable) A continuous ventilated roof space is created by the counter batten located immediately above the Class 4 vapour permeable sarking. If the sarking is not Class 4, or the product label does not disclose either the vapour permeability or duty classification (as required by AS 4200.1), a performance solution is required.	✓
which is immediately above the primary insulation layer ; or	The sarking with a vapour permeance of not less than 1.14 µg/N.s (Class 4) is located immediately above the primary insulation layer.	✓
AS4200.1 and AS4200.2 Duty Classification requirements	ProctorWrap HTS, HTR, ProctorPassive RS-IT, Wraptite SA and Wraptite UV-SA are all MEDIUM or LIGHT DUTY so can be used as a sarking in metal roof applications. ProctorWrap HTS and HTR are MEDIUM duty so can also be used as a sarking in roof tile applications. See the section on page 10 below if duty classification is not disclosed.	✓
SUMMARY	This design meets the DTS requirements because the ventilated roof space is located immediately above a Class 4 vapour permeable sarking that is located immediately above the primary insulation layer. We suggest using ProctorWrap HTS, HTR, or ProctorPassive RS-IT. All are vapour permeable CLASS 4 and no less than LIGHT duty classification.	✓

NCC 2025 Deemed to Satisfy Provisions for Ventilation of Roof Spaces

(1) In climate zones 6, 7 and 8, a roof system with the primary insulation layer installed parallel to the roof plane must have a roof space that—

- (a) is located immediately above—
 - (i) the primary insulation layer; or
 - (ii) any control layer installed immediately above the primary insulation layer; and
- (b) is not obstructed by insulation; and
- (c) has a height not less than 18 mm, as measured perpendicular to the plane of the roof; and
- (d) for roofs less than 10 m², is ventilated to outdoor air through openings not less than—
 - (i) 7,000 mm²/m provided at eaves or low level; and
 - (ii) 5,000 mm²/m at the high level or ridge; and
- (e) for all other roofs, is ventilated to outdoor air through openings not less than—
 - (i) 20,000 mm²/m provided at the eaves or low level; and
 - (ii) 5,000 mm²/m provided at the high level or ridge.

(2) Where a control layer is installed immediately above the primary insulation layer in climate zones 6, 7 and 8, it must have a vapour permeance of not less than 1.14 µg/N.s.

What are the key changes from NCC 2022 to NCC 2025

(1) The opportunity to use ventilation above a Class 4 vapour permeable sarking as per NCC 2025 is restricted to roof systems where the **primary insulation layer is installed parallel to the roof plane**.

In the case where the primary insulation layer is not parallel to the roof plane such as a truss roof with ceiling insulation, the roof space above the primary insulation must be ventilated.

(2) The roof space is now defined in NCC2022 as **having a height not less than 18 mm**, as measured perpendicular to the plane of the roof, compared to **20 mm** in NCC 2022.

(3) There are also changes to the minimum required ventilation opening sizes, but this does not impact on the use of sheathing boards.

(4) Where NCC 2022 referred to a **sarking with a vapour permeance of not less than 1.14 µg/N.s**, NCC 2025 refers to **any control layer installed immediately above the primary insulation layer**. Where the control layer is installed immediately above the primary insulation layer in climate zones 6, 7 and 8, it must have a vapour permeance of not less than 1.14 µg/N.s.

Does this make it any easier to use a sheathing board and meet the DTS provisions?

The short answer is no. For a longer answer, please read on.

A control layer is defined by the NCC as:

“Any continuous layer that is installed for one or more of the purposes of air, water, vapour or thermal control, including pliable building membrane and sarking-type material but excluding waterproofing membranes or the like complying with AS/NZS 4858.”

If the **control layer** is a Class 4 vapour permeable sarking then the changes from NCC 2022 to NCC 2025 are neutral with respect to the relative placement of the sarking; the sheathing board; and the ventilated roofspace.

If you are able to persuade your certifier that a timber sheathing board is a **control layer** as defined by the NCC 2025 then it could be used immediately above the primary insulation;

- (i) If it has a vapour permeance of not less than 1.14 µg/N.s.; and
- (ii) the 18mm ventilated roof space is located immediately above the timber sheathing board.

We interpret this to mean any sarking used would need to be separated from the timber sheathing board by a minimum 18mm batten or vented batten creating a ventilated roofspace between the sheathing board and sarking. This does not seem desirable, practical or advantageous in any way.

In order to use a sarking (self-adhered or mechanically fixed) directly on a sheathing board, we suggest either a performance solution, or finding a certifier that accepts that;

- (i) the combination sheathing board and sarking as a single layer, meets the definition of a control layer; and
- (ii) there is a 18mm ventilated roof space immediately above this combined product; and
- (iii) the combined sheathing board and sarking control layer must be tested with evidence to show it has a vapour permeance of not less than 1.14 µg/N.s.

The alternative as with NCC 2022 is for the ventilated roofspace to be located between the primary insulation and sheathing board.

Weatherproofing of roofs and AS4200.1 Classifications

For roofs there are requirements where the AS4200.1 standard for pliable building membranes is referenced.

In NCC Volume 2 Part F3 Roof and wall cladding

F3D3 Sarking: Sarking-type material used for weatherproofing of roofs and walls **must comply with AS 4200.1 and AS 4200.2.**

In Volume 1 Part 7.3 Roof tiles and shingles

7.3.4 Sarking

Sarking must—

- (a) be provided in accordance with Table 7.3.4; and
- (b) **comply with AS 4200.1** and be installed with—
 - (i) each adjoining sheet or roll being—
 - (A) overlapped not less than 150 mm; or
 - (B) taped together; and
 - (ii) sarking fixed to supporting members at not more than 300 mm centres; and
 - (iii) no sags more than 40 mm in the sarking.

For a sarking to comply with AS4200.1 there are normative requirements for the labeling of products which includes the disclosure of duty, vapour classification and vapour permeability.

It has come to our attention that some suppliers of self-adhered pliable building membranes include this information on their product labels or data sheets for some products, but not on others. Instead, the values and classifications have been omitted and replaced with “Dependent on substrate” or “Depends on substrate.” Although there may be some limited validity in the argument, the same applies to mechanically fixed membranes and the standard is unambiguous about requiring these values and classifications to be declared.

THIS PRODUCT MEETS THE REQUIREMENTS OF AS/NZS 4200.1.

<u>PRODUCT IDENTIFIER</u>	Unique product identifier	
<u>DUTY</u>	Extra light duty, Light duty, Light wall, Medium duty, Heavy duty, Extra heavy duty	
<u>VAPOUR CLASSIFICATION</u>	Class 1-4	Vapour barrier/vapour permeable
<u>VAPOUR PERMEABILITY (4 decimal places)</u>	µg/N.s	
<u>WATER CONTROL CLASSIFICATION</u>	Water barrier/Non-water barrier	
<u>FLAMMABILITY INDEX</u>	HIGH (>5)/LOW (≤5)	
<u>ELECTRICAL CONDUCTIVITY</u>	Non-conductive/conductive	

<u>EMITTANCE</u>	<u>Value</u>	<u>Classification</u>	<u>CATEGORY</u>

Classifications in accordance with AS/NZS 4200.1. This product should be installed in accordance with AS 4200.2

Roll label format from AS4200.1:2017 Appendix B (Normative) Figure B1

This Appendix specifies the minimum information required for each roll of pliable building membrane, in accordance with Clause 6 of AS4200.1.

FIGURE B1 ROLL LABEL

Check with your supplier, designer, engineer, builder and roofer that products meet the requirements of the NCC

Non-conforming building products and materials:

- *claim to be something they are not*
- *do not meet required standards for their intended use, or*
- *are marketed or supplied with the intent to deceive those who use them.*

Non-complying building products and materials are those that are used in situations where they do not comply with the requirements of the National Construction Code (NCC), other laws and Australian Standards.

Everyone in the supply chain has a responsibility to be involved and make sure the right products and materials are used in the right way.

Your place in the supply chain can also mean you have specific obligations or duties to check and assure that the right products and materials are used, and are used correctly.

Depending on your place in the supply chain you can face specific risks and liabilities if products and materials are non-complying or non-conforming.

Source: NSW Government⁶

There may very well be evidence to verify that a product conforms, and or complies with the NCC, so we suggest that all members of the supply chain check to ensure they have the evidence, and that it is used as appropriate for either a DTS or performance solution.

Self adhered pliable building membranes are complex products. As such we have both **Wraptite SA and Wraptite UV-SA Codemark Certified.**

National Construction Code 2025 Defined Terms

Control layer

Any continuous layer that is installed for one or more of the purposes of air, water, vapour or thermal control, including pliable building membrane and sarking-type material but excluding waterproofing membranes or the like complying with AS/NZS 4858.

Deemed-to-Satisfy Solution

A method of satisfying the Deemed-to-Satisfy Provisions.

Performance Solution

A method of complying with the Performance Requirements other than by a Deemed-to-Satisfy Solution.

Primary insulation layer

The most interior insulation layer of a wall or roof construction.

Vapour permeance

The degree that water vapour is able to diffuse through a material, measured in $\mu\text{g}/\text{N.s}$ and tested in accordance with the ASTM-E96 Procedure B – Water Method at 23°C 50% relative humidity.

Notes

Vapour Resistance Data Sources

1. Range of 13 plywood products listed in the WUFI materials database
2. Egger product data sheet TDEBP735EN (March 2022)
3. WUFI materials database and European Data Sheet - value is not reported on Australian data sheet
4. ASTM E95 wet cup test report AWTA 24-005020
5. ASTM E95 wet cup test report & WUFI materials database
6. <https://www.nsw.gov.au/housing-and-construction/compliance-and-regulation/bans-and-safety-notice-for-building-products/non-conforming>

Proctor Group Australia

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