

Airtightness and Moisture Management

... and the insulation is perfect

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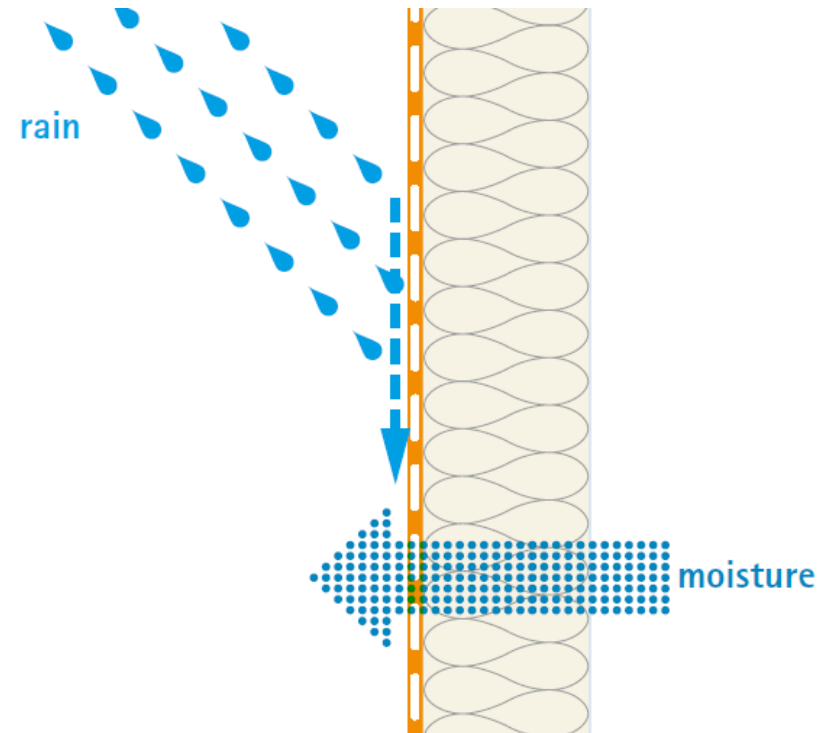
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Discussion

1. NCC - Mould Growth Index (MGI)
2. What's my external wall doing?
3. Why should I seal the external envelope?
4. Internal Air Barriers – are they needed?
5. How do we know if the system works?



Why should you seal your building envelope?



Source: Dr Mark Dewsbury, UTAS, AIRAH Building Physics Forum, Wollongong, 2018



Emerging Issue



“the creation of highly energy-efficient and fireproof homes over recent years may have had the unintended consequence of increasing the incidence of condensation, and consequently increasing the risk of dampness and mould build-up.”

Dr Law



Why is all this important?

Scopio
Resid

Final
23 September

Research fund
Australian Bu
Department o
Commonweal

Dr Mark Dew
Dr Tim Law
Johann Potgi
Dr Desmond I
Dr Bennet Mc
Thomas Chan
Abdel Soudan

(1) School of
(2) School of

University of

PARLIA
Rep
Biol
Aus

House o
Sport

Health and amenity	
Part F6	Con
Performance Requi	
FP6.1 Condensation	Part F8 Condensation management
Introduction to this Part	
Notes	
Objectives	
F801	Objective
Applications	
Functional Statements	
F8F1	Condensation
Applications	
Performance Requirements	
TAS F8P1	F8P1
Risks associated with water vapour and condensation must be mana	

Verification Methods

F8V1 Condensation management

[2019: FV6]

- (1) Compliance with *Performance Requirement F8P1* is verified for a roof or *external wall* assembly when it is determined that a **mould** index of greater than 3, as defined by Section 6 of AIRAH DA07, does not occur on—
 - (a) the interior surface of the *water control layer*; or
 - (b) the surfaces of building *fabric* components interior to the *water control layer*.
- (2) The calculation method for (1) must use—
 - (a) input assumptions in accordance with AIRAH DA07; and
 - (b) the intermediate method for calculating indoor design humidity in Section 4.3.2 of AIRAH DA07.

Deemed-to-Satisfy Provisions

F8D1 Deemed-to-Satisfy Provisions

[2019: F6.0]

- (1) Compliance with *Performance Requirement F8P1* is satisfied by complying with *Deemed-to-Satisfy Provisions F8D2* to *F8D5*.
- (2) Where a *Performance Solution* is proposed, the relevant *Performance Requirements* must be determined in accordance with A2G2(3) and A2G4(3) as applicable.

Explanatory Information

The intent of these requirements is to assist in the mitigation of *condensation* within a building. The implementation of a *condensation* management strategy may not prevent *condensation* from occurring.

F8D2 Application of Part

[2019: F6.1]

The *Deemed-to-Satisfy Provisions* of this Part only apply to a *sole-occupancy unit* of a Class 2 building and a Class 4 part of a building.

F8D3 External wall construction

[2019: F6.2]

- (1) Where a *pliable building membrane* is installed in an *external wall*, it must—
 - (a) comply with AS 4200.1; and
 - (b) be installed in accordance with AS 4200.2; and
 - (c) be located on the exterior side of the *primary insulation layer* of wall assemblies that form the external envelope of a building.
- (2) Where a *pliable building membrane*, *sarking-type material* or *insulation layer* is installed on the exterior side of the *primary insulation layer* of an *external wall* it must have a *vapour permeance* of not less than—

mould



Condensation Management NCC 2022 - MGI

MI = 0

No mould growth – Best Outcome



MI = 3

Visual findings of mould on surface, < 10 % coverage, or < 50 % coverage of mould (microscope)



MI = 6

Heavy and tight growth, coverage about 100 %



MGI - 6 Point Scale

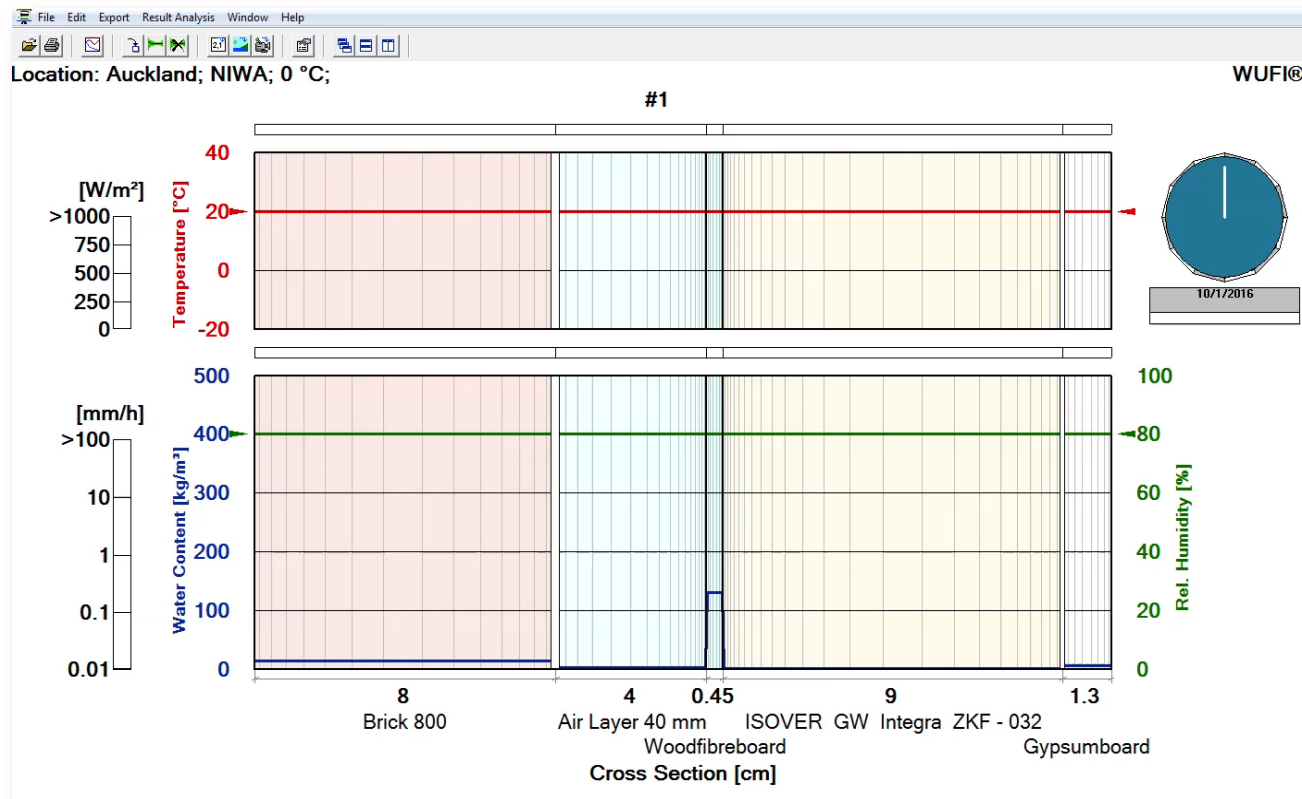
Index	Description of the growth rate
0	No growth
1	Small amounts of mould on surface (microscope), initial stages of local growth
2	Several local mould growth colonies on surface (microscope)
3	Visual findings of mould on surface, < 10 % coverage, or < 50 % coverage of mould (microscope)
4	Visual findings of mould on surface, 10 - 50 % coverage, or > 50 % coverage of mould (microscope)
5	Plenty of growth on surface, > 50 % coverage (visual)
6	Heavy and tight growth, coverage about 100 %

– H407 Condensation and water vapour management

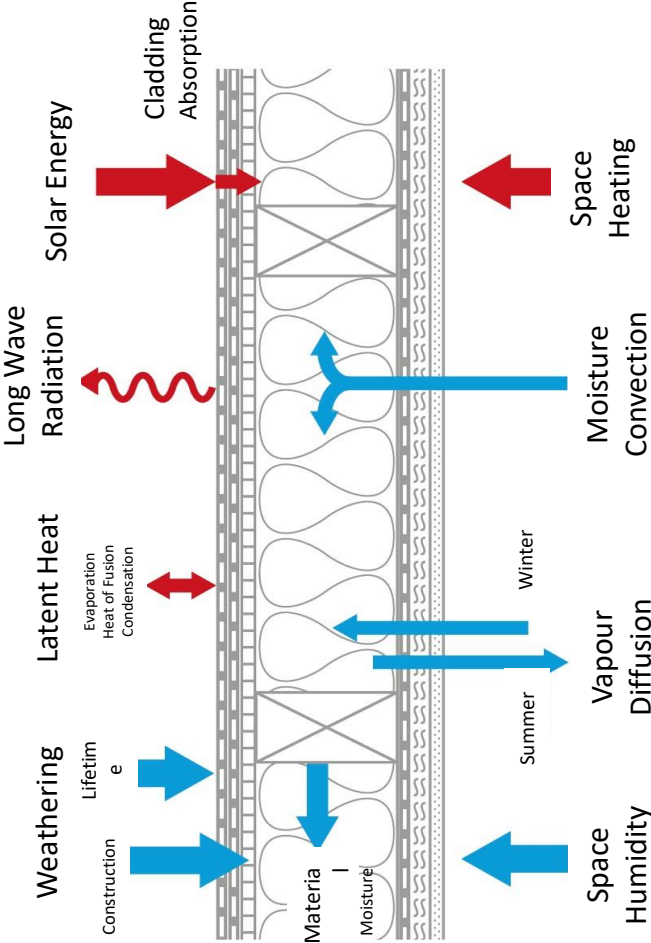
The Objective is to reduce the likelihood of condensation or water vapour build-up causing illness, injury or loss of amenity for building occupants.



WUFI® Hygrothermal Modelling Software

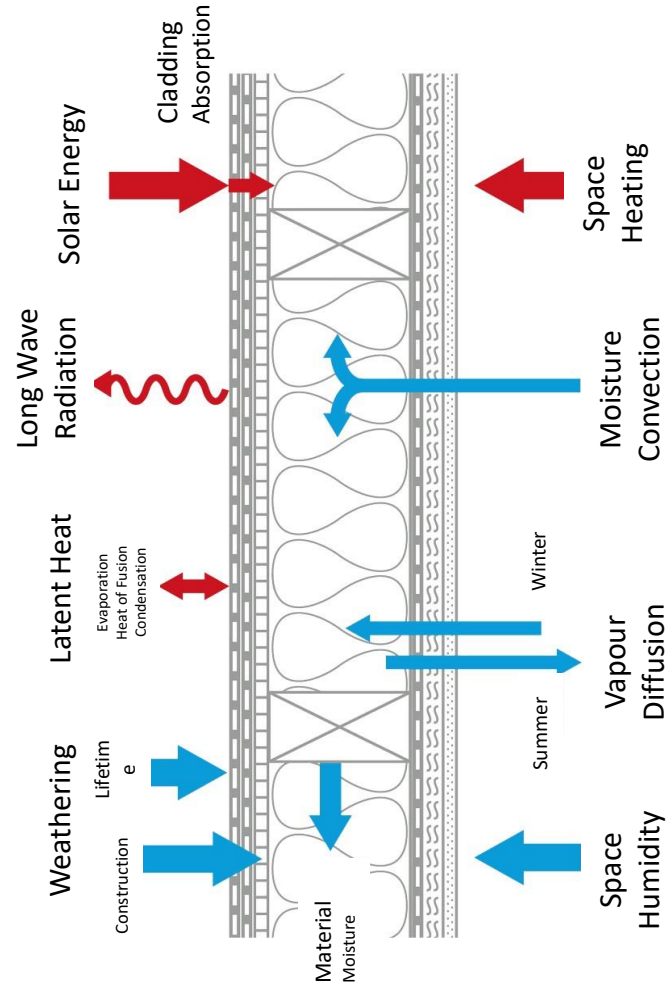


What's Happening



What's Happening

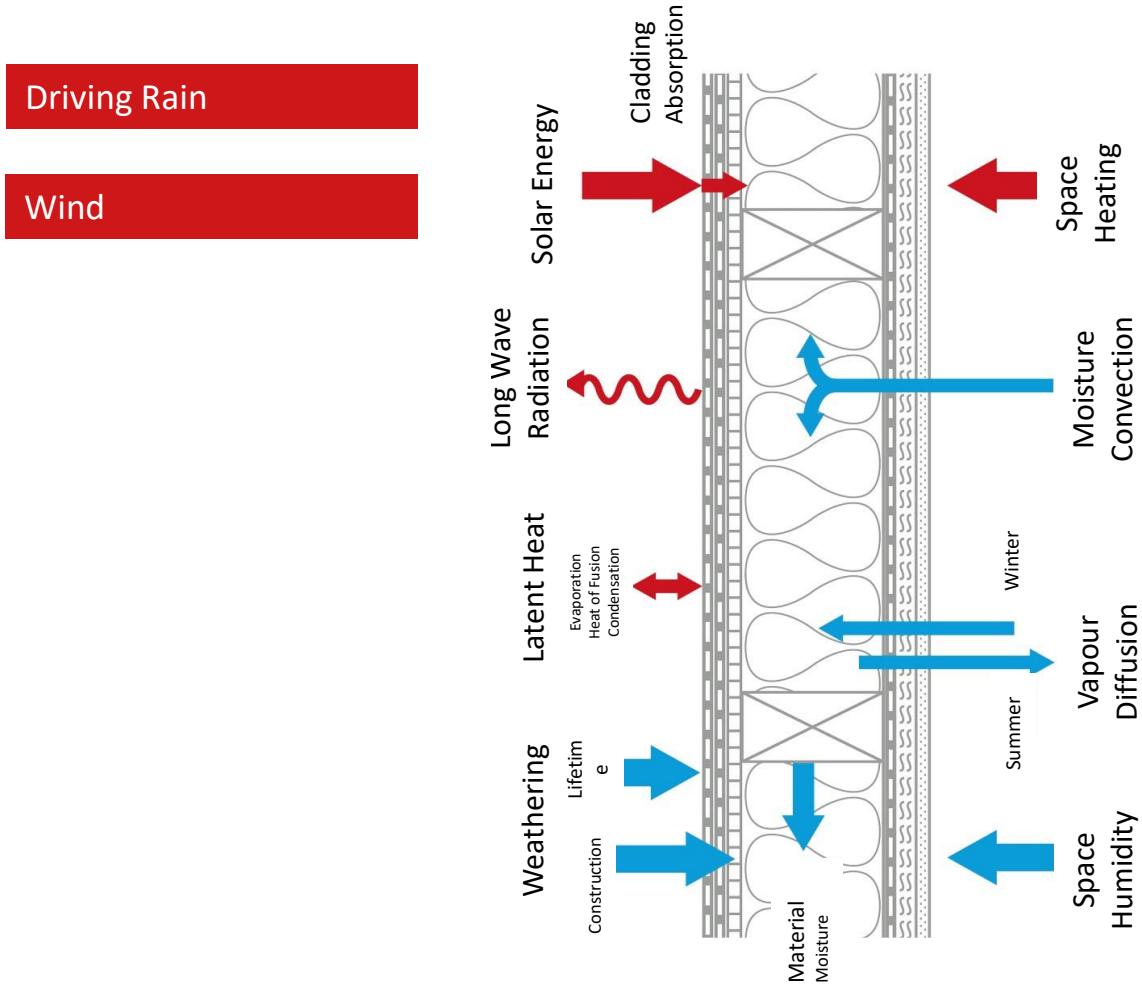
Driving Rain



... and the insulation is perfect / slide 12



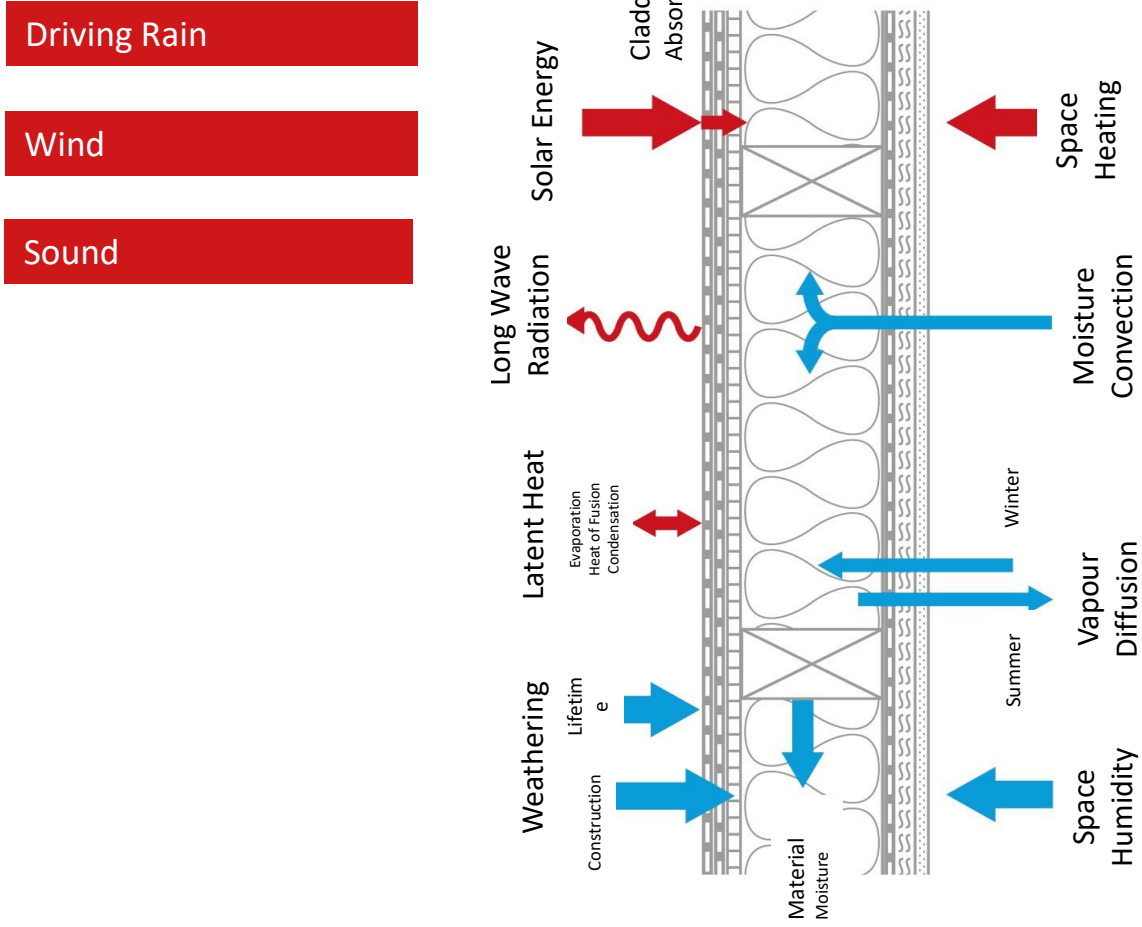
What's Happening



... and the insulation is perfect / slide 13



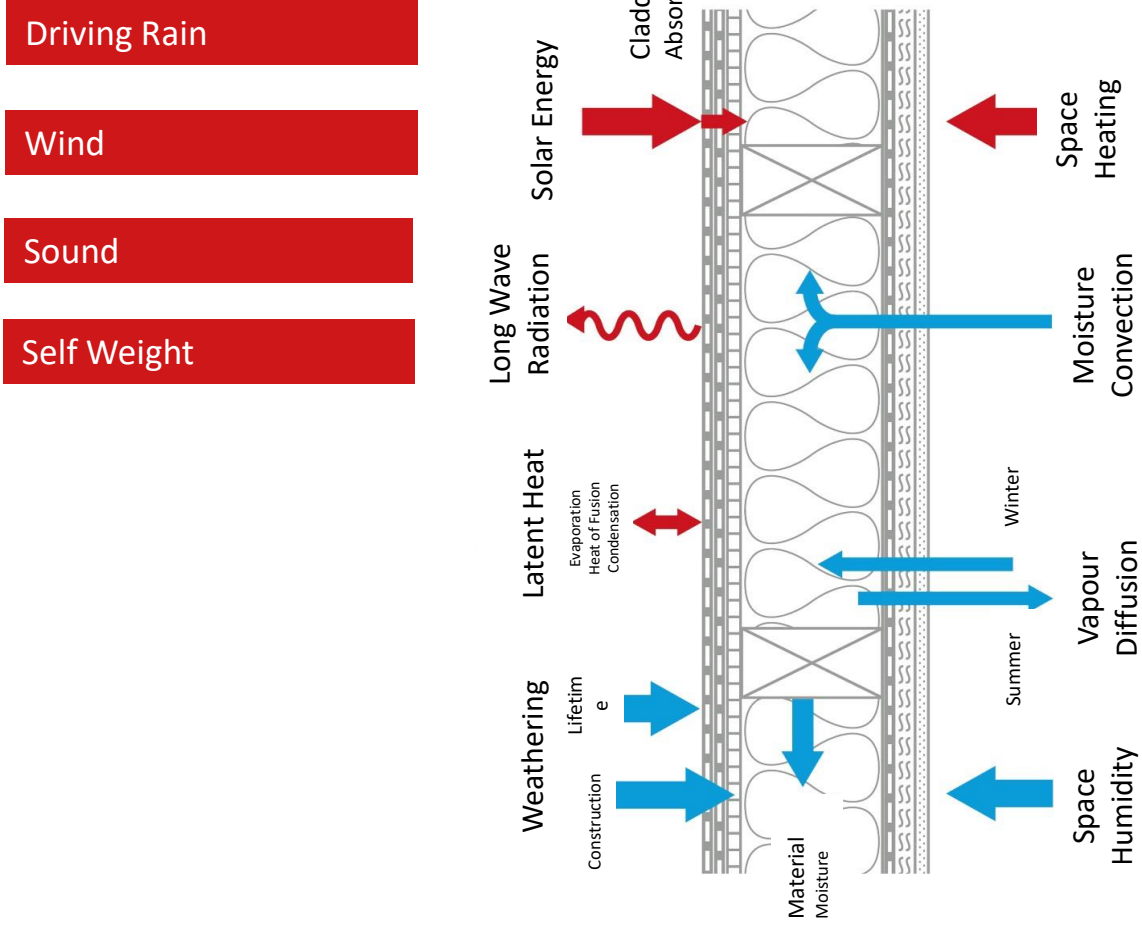
What's Happening



... and the insulation is perfect / slide 14



What's Happening

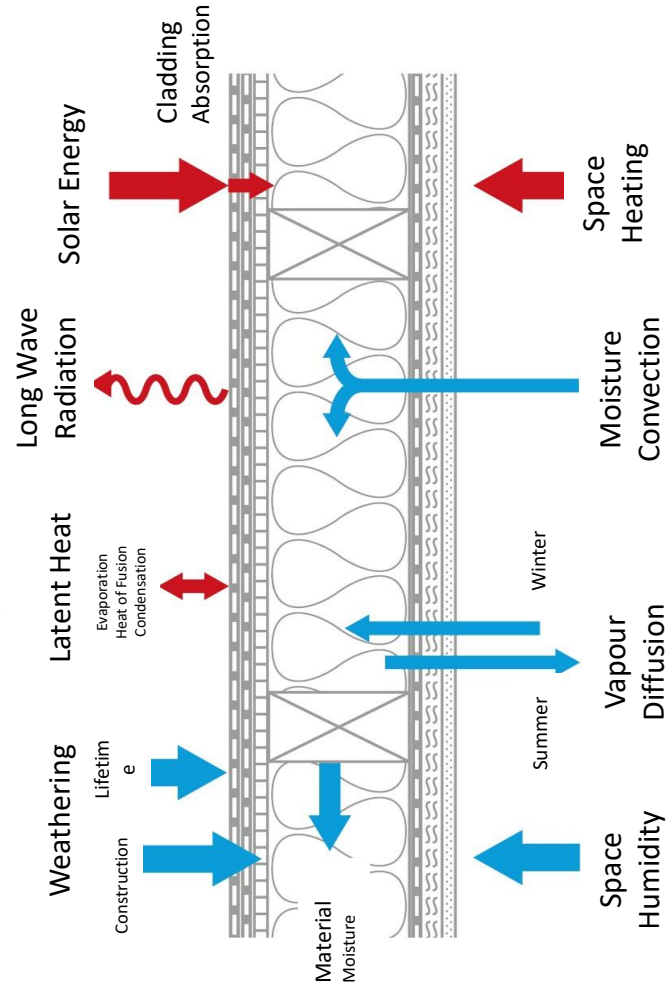


... and the insulation is perfect / slide 15



What's Happening

- Driving Rain
- Wind
- Sound
- Self Weight
- Large Temperature Difference

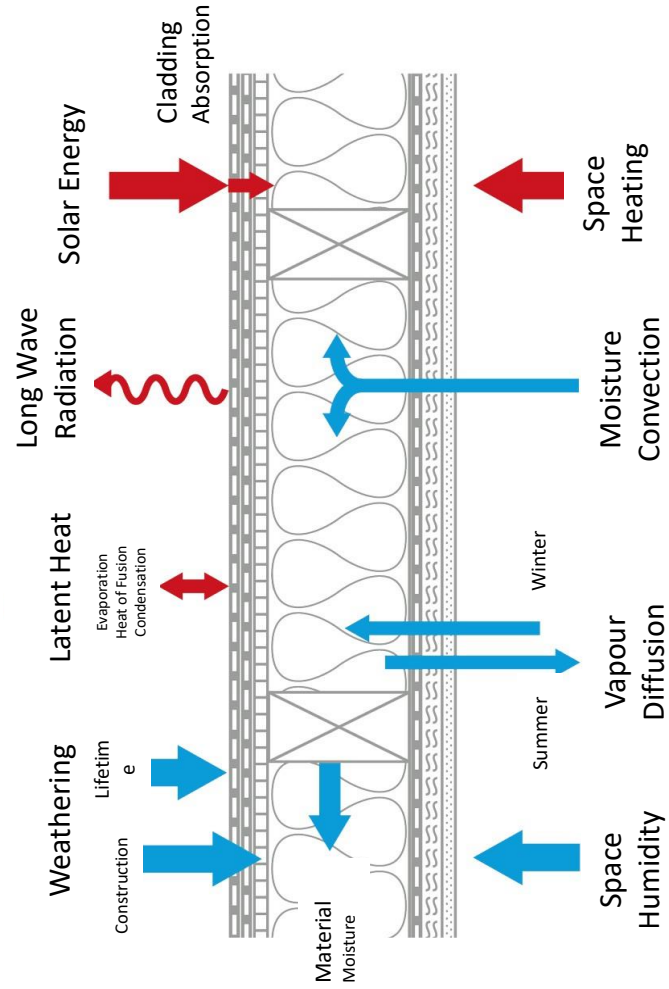


... and the insulation is perfect / slide 16



What's Happening

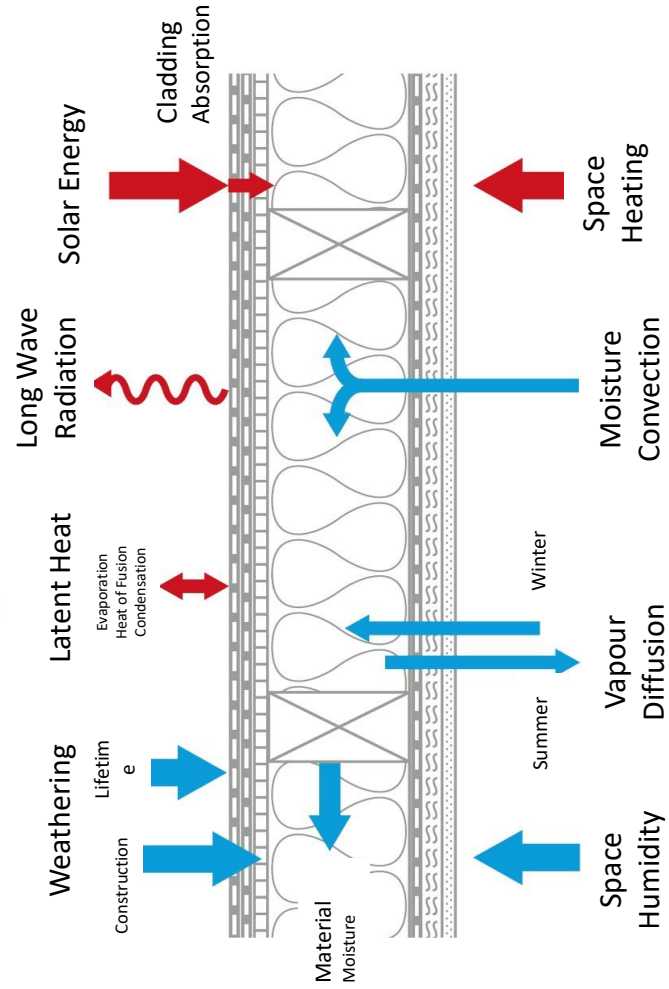
- Driving Rain
- Wind
- Sound
- Self Weight
- Large Temperature Difference



Fire

What's Happening

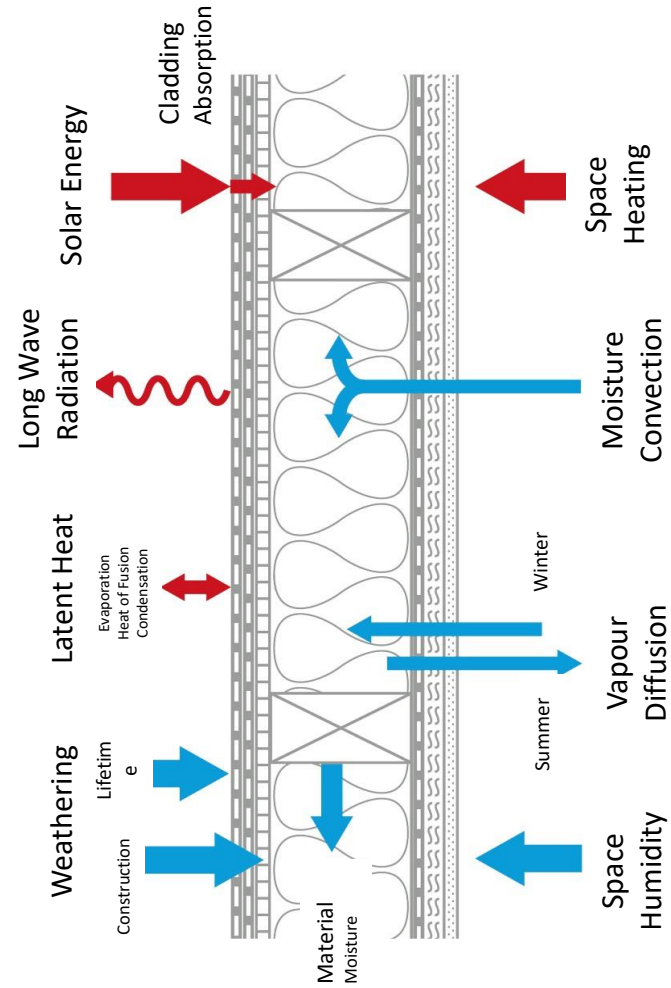
- Driving Rain
- Wind
- Sound
- Self Weight
- Large Temperature Difference



- Fire
- Air Infiltration

What's Happening

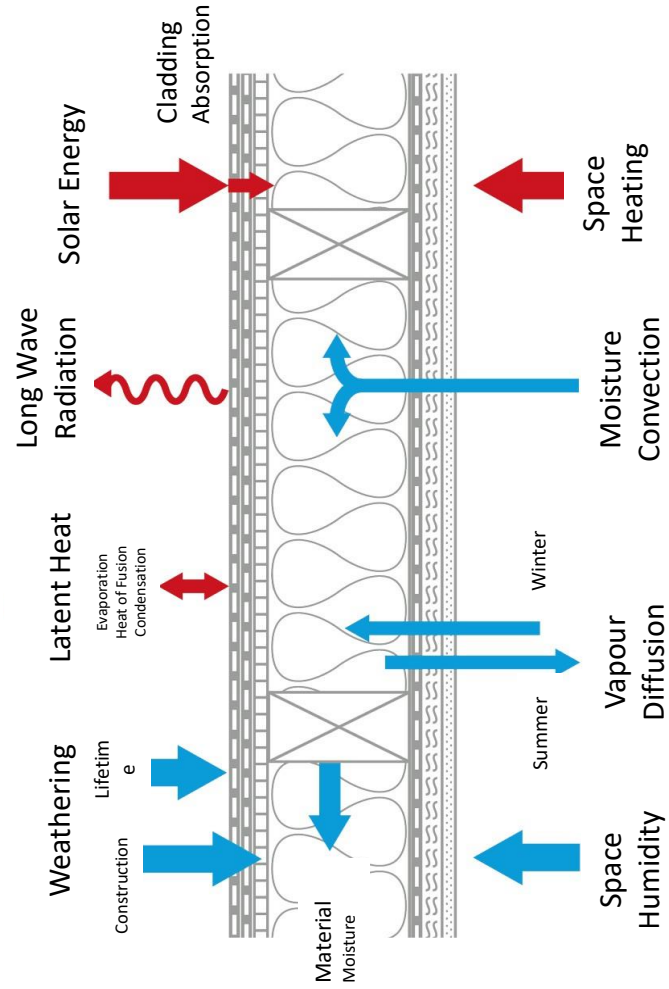
- Driving Rain
- Wind
- Sound
- Self Weight
- Large Temperature Difference



- Fire
- Air Infiltration
- Movement of the Frame

What's Happening

- Driving Rain
- Wind
- Sound
- Self Weight
- Large Temperature Difference

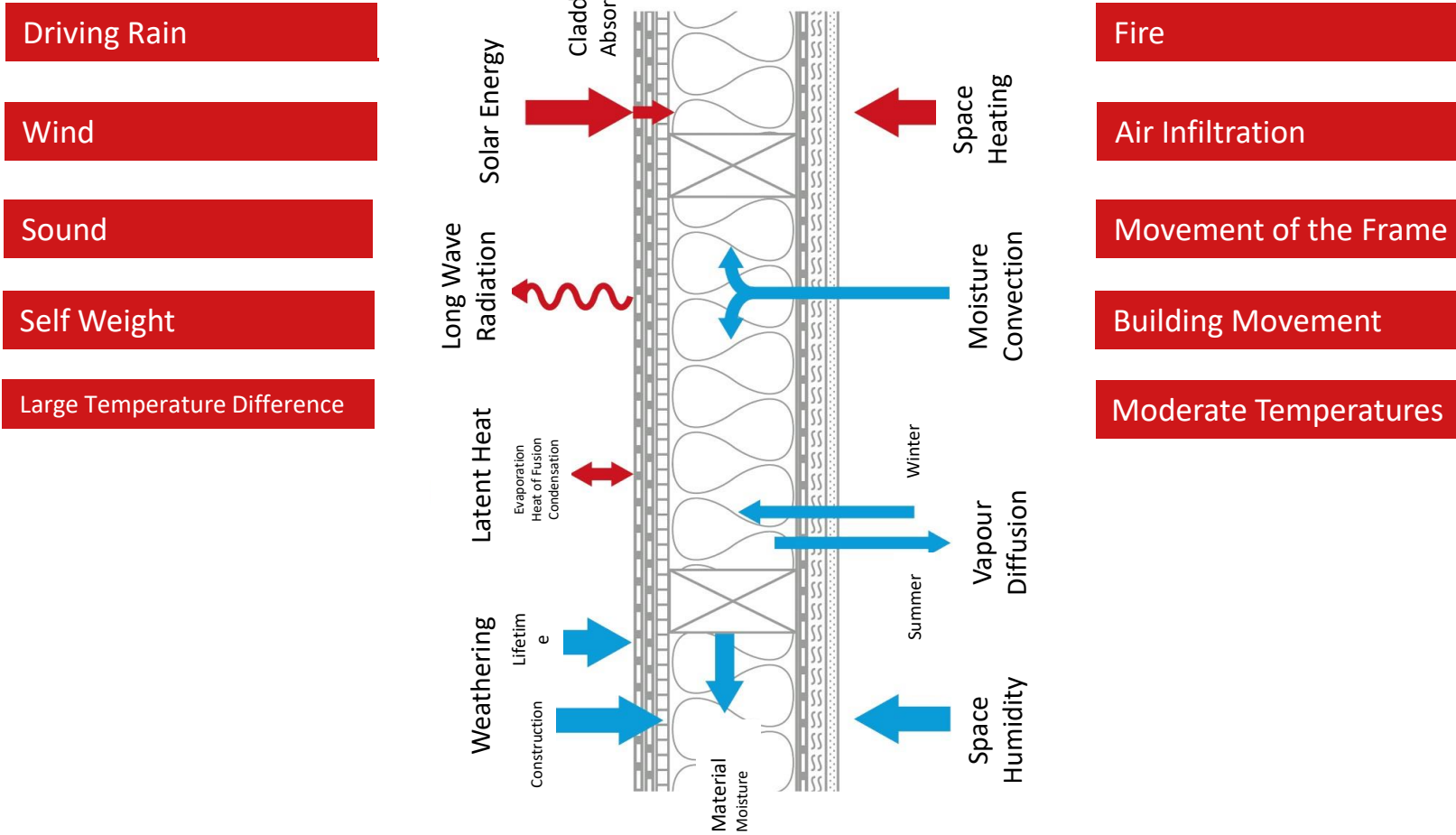


- Fire
- Air Infiltration
- Movement of the Frame
- Building Movement

... and the insulation is perfect / slide 20



What's Happening

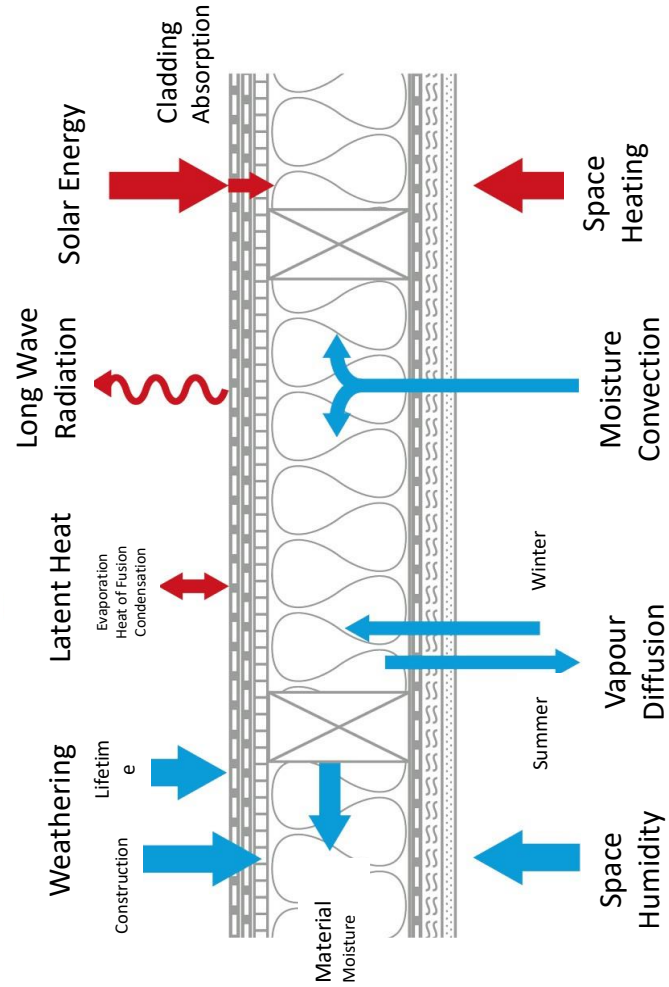


... and the insulation is perfect / slide 21



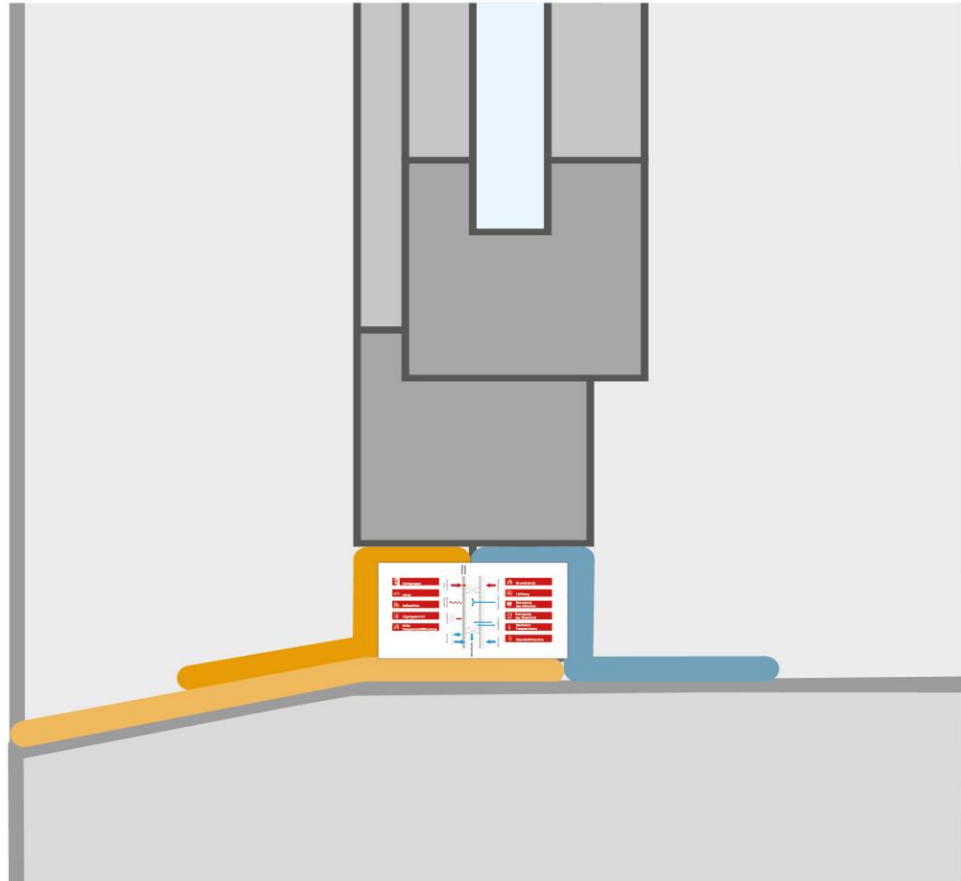
What's Happening

- Driving Rain
- Wind
- Sound
- Self Weight
- Large Temperature Difference



- Fire
- Air Infiltration
- Movement of the Frame
- Building Movement
- Moderate Temperatures
- Water Vapour

Connection details critical



High performance windows require high performance installation!

Weatherproof your windows

Gap filler between joinery and reveal

TESCON EXTORA® &/OR TESCON EXTORA® PROFIL should be adhered a minimum of 12mm onto the window frame to create a continuous Primary air seal

(OPTIONAL) 45mm fibrous Insulation

(OPTIONAL) 45mm service cavity vertical or horizontal battens

Structurally Insulated Panel (SIP) Wall

Selected Timber joinery profile

pro clima CONTEGA® EXO Weather seal is taped to underside of joinery and to the fully adhered TESCON EXTORSEAL®

pro clima TESCON EXTORSEAL® wrapped into opening per the TESCON EXTORSEAL® application guide over pro clima SOLITEX EXTASANA®.



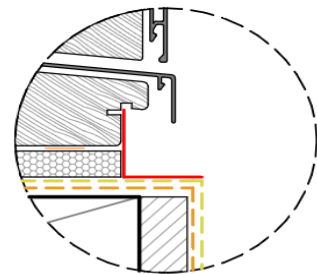
CONTEGA® EXO



TESCON EXTORA® PROFIL



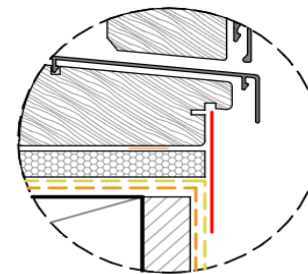
TESCON EXTORA®



TESCON EXTORA® PROFIL



EXTORSEAL®



TESCON EXTORA® (Flush Finish detail)



What's the best way to improve thermal efficiency and reduce mould in a building?

Monitor and minimise air leakage through the building envelope.

- Service penetrations (electrical/plumbing)
- Install the WRB correctly (AS4200.2 minimum)
- Effective window sealing
- Doors
- Skylights
- Ducting

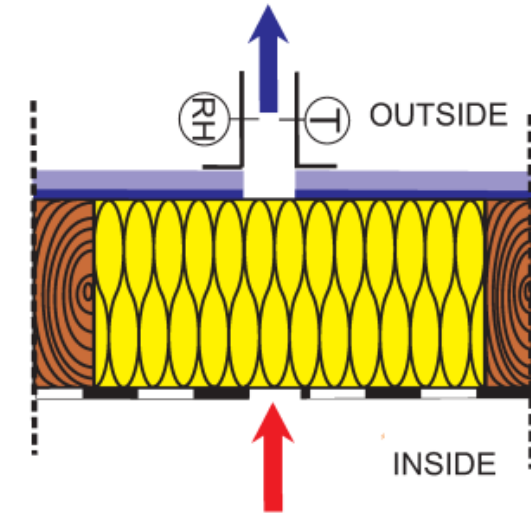


Hygrothermal Design Principles – Air transported water vapour

Warm Side



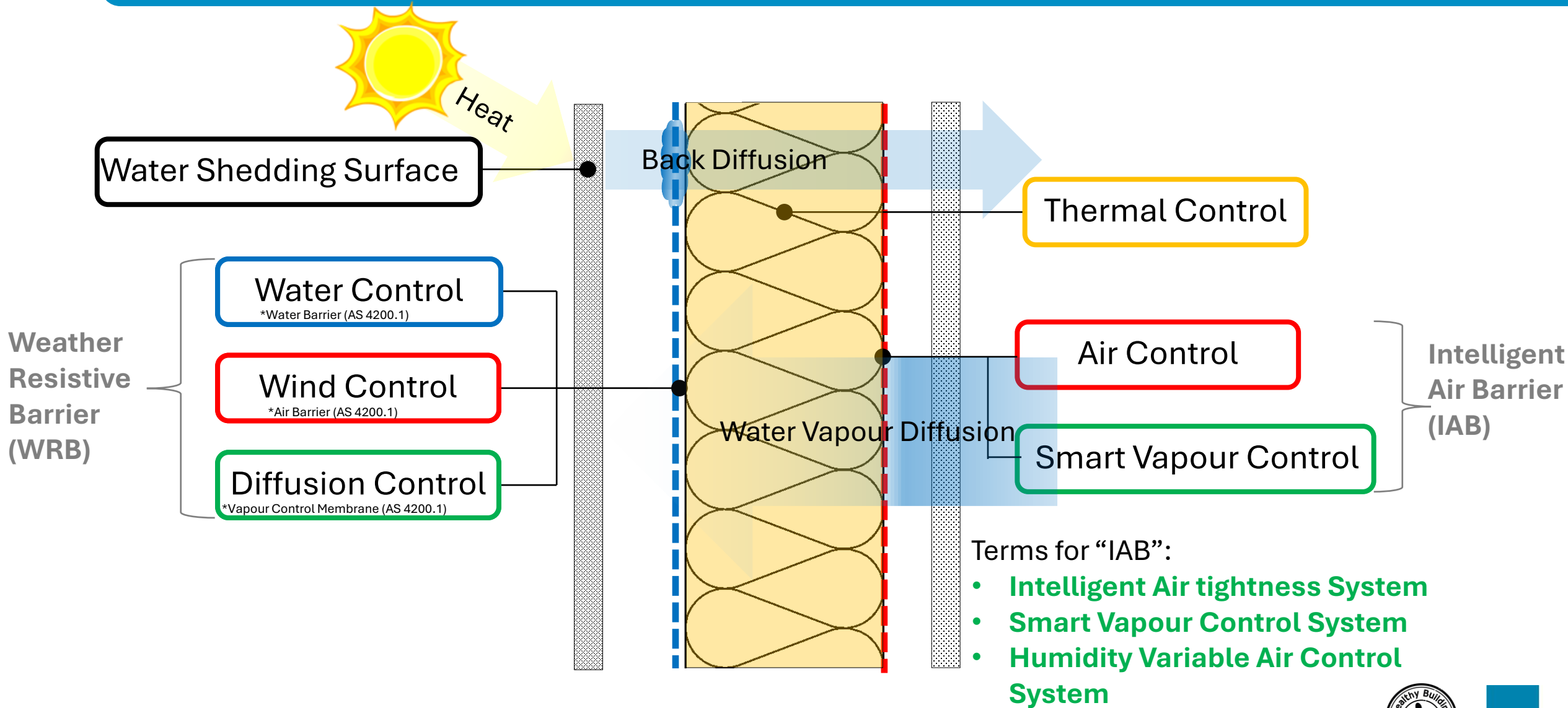
Cold Side



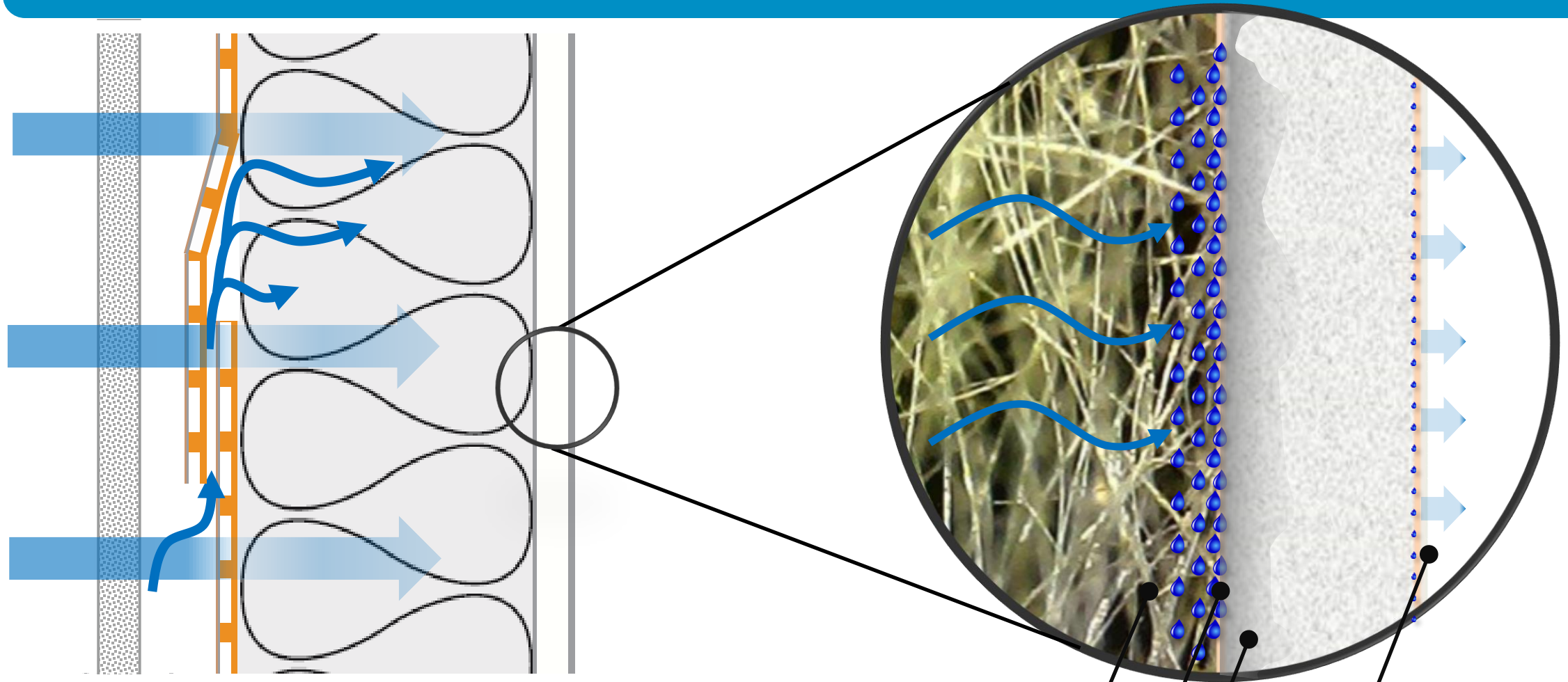
One 5 mm hole in the middle of the warm side, air extraction at the bottom of cold side (5 Pa)

Kolsch, Ph., Zirkelbach, D., Nusser, B., Wagner, R., Zegowitz, A., Kunzel, H.M.: Air-flow through Lightweight Wall Assemblies - Influence of Size and Location of Leakages. Buildings XIII Conference, ASHRAE 2016, pp. 459-484

Building Envelope Science – Science and Engineering



Poorly sealed WRB



Humid conditions in the 1mm glasswool layer

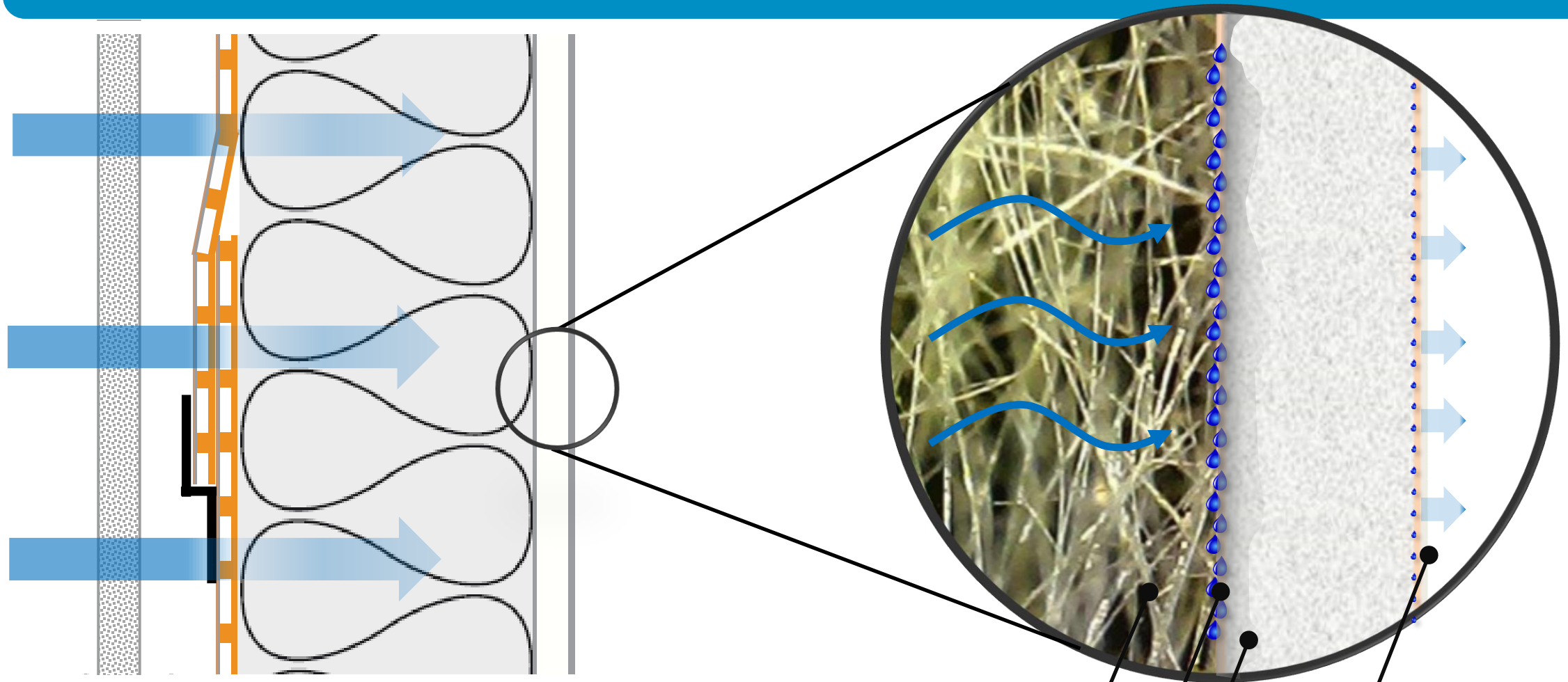
Gypsum paper facing (food for mould)

Mould growth risk on paper face and within gypsum

Semi-gloss paint finish (3.5 MN.s/g) resists drying



Sealed WRB



Humid conditions in the 1mm glasswool layer

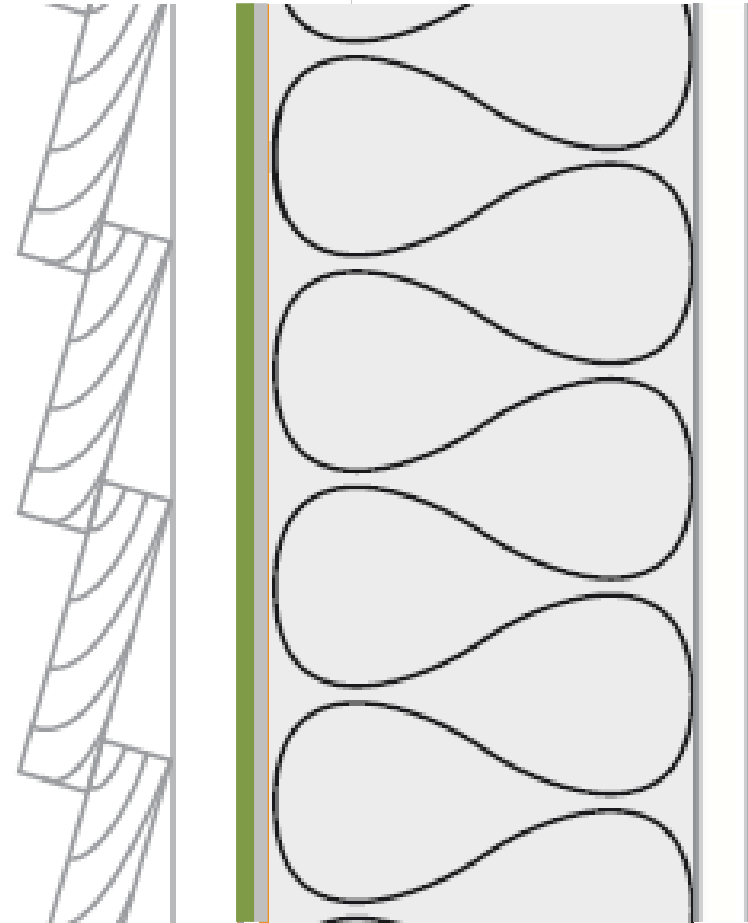
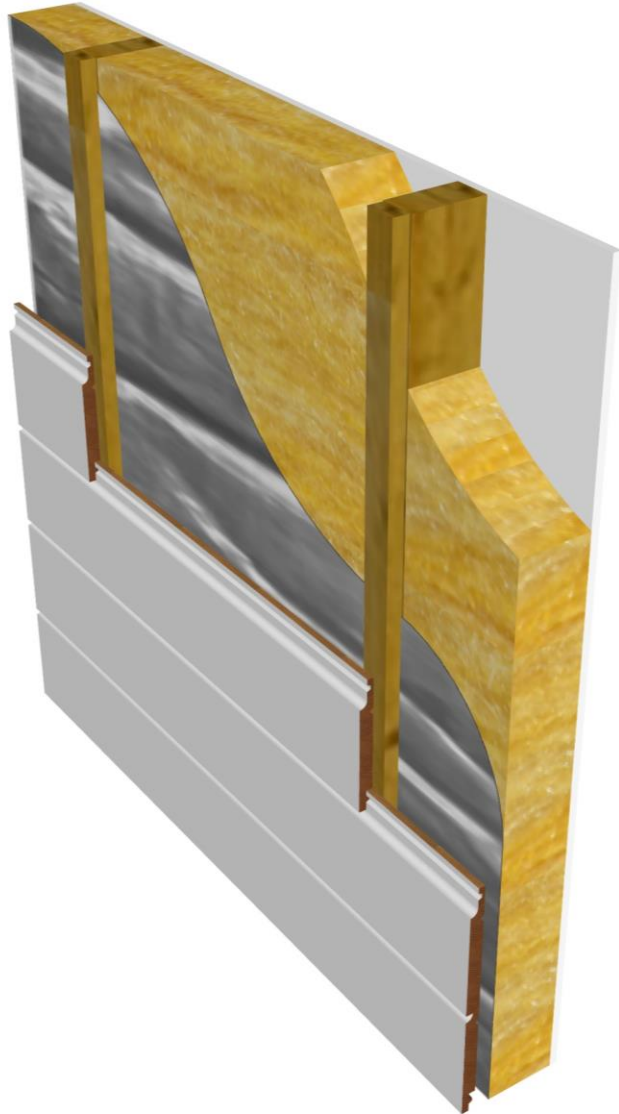
Gypsum paper facing (food for mould)

Mould growth risk on paper face and within gypsum

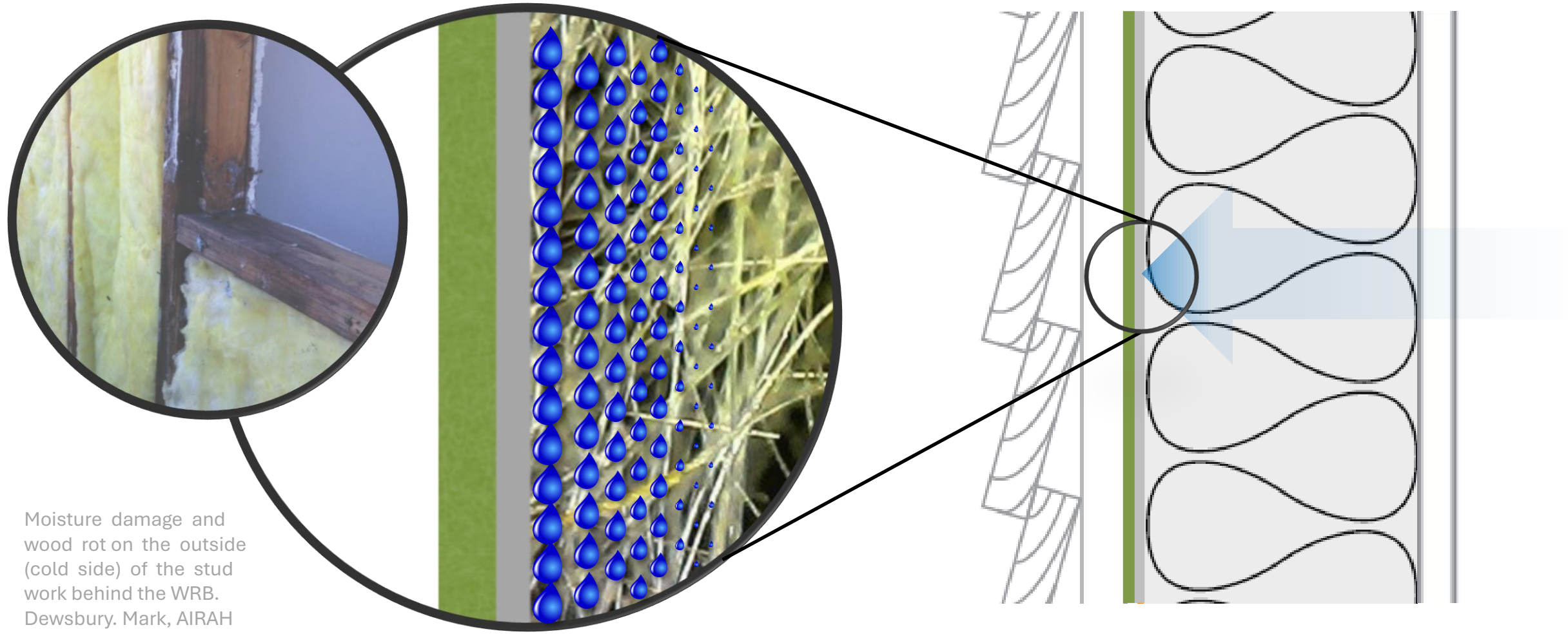
Semi-gloss paint finish (3.5 MN.s/g) resists drying



Vapour Barriers (Foil)



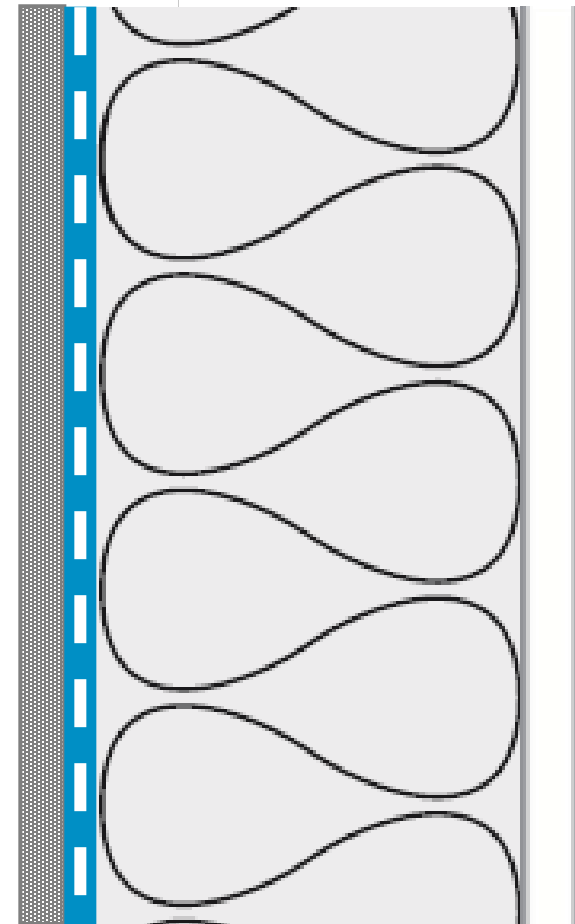
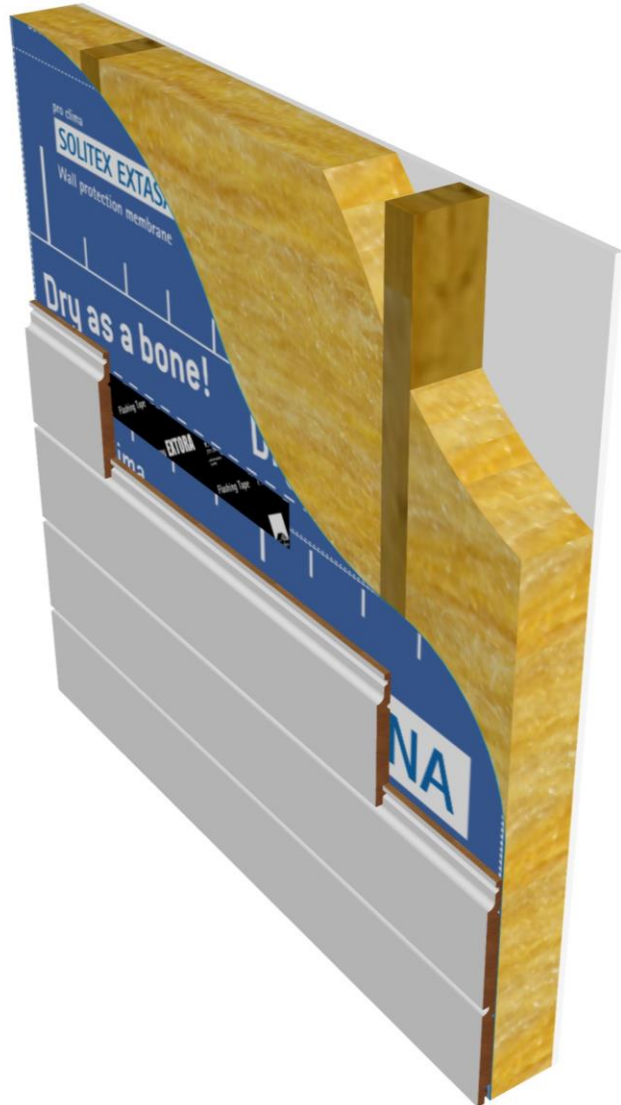
Vapour Barriers (Foil)



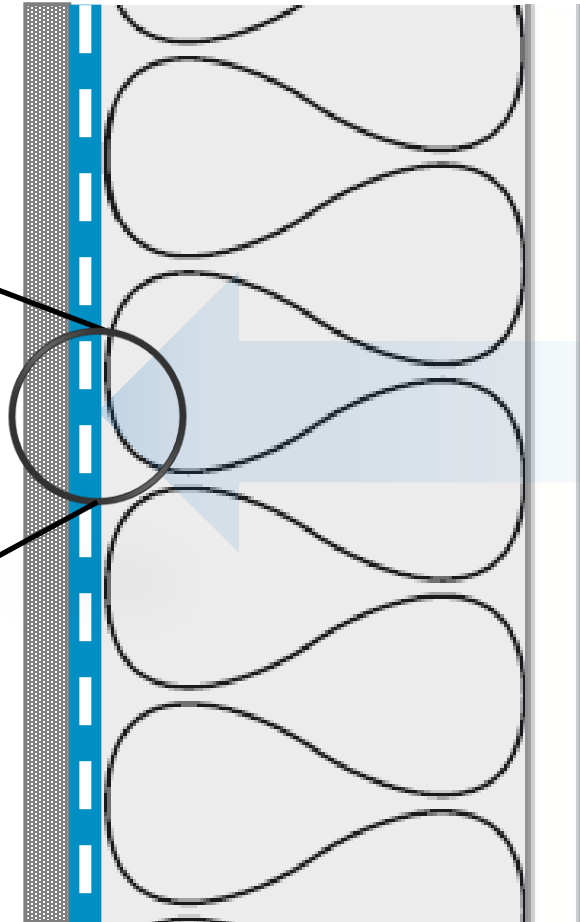
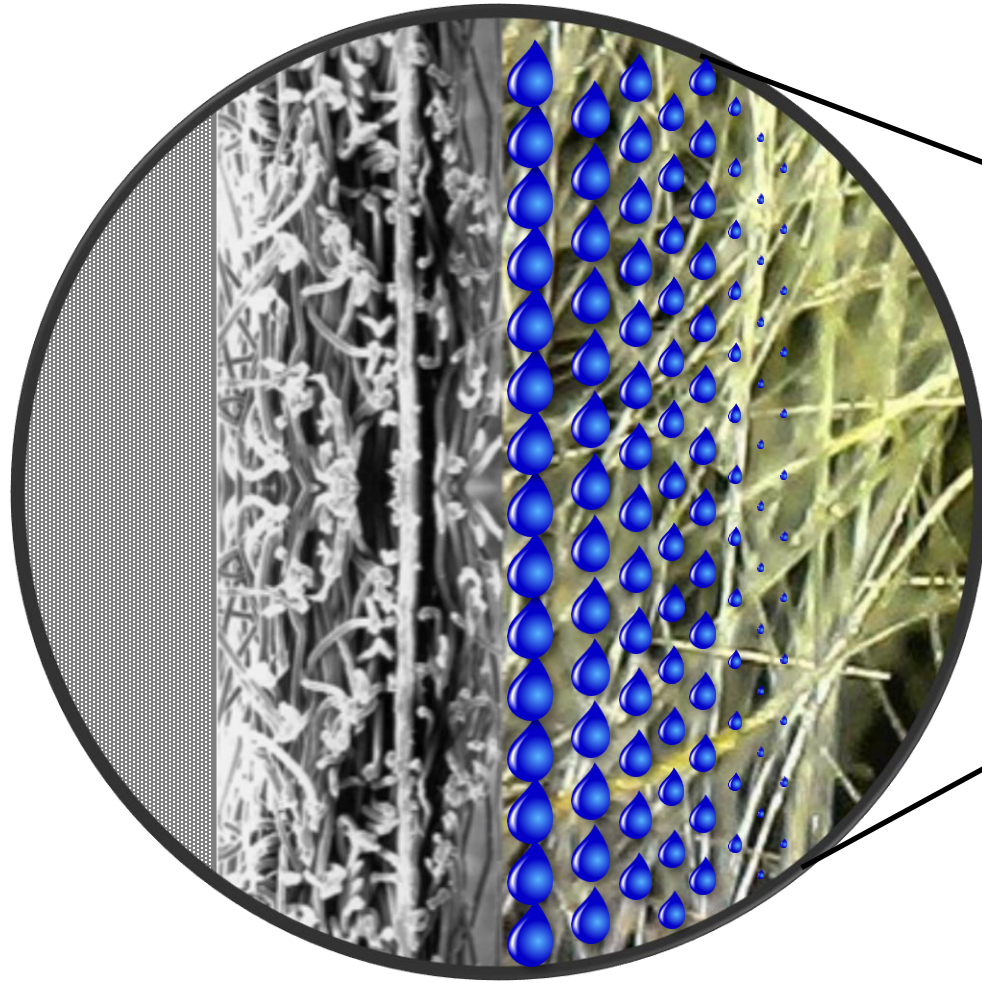
Moisture damage and wood rot on the outside (cold side) of the stud work behind the WRB. Dewsbury. Mark, AIRAH Building Physics Forum, 2021, Wollongong Australia.



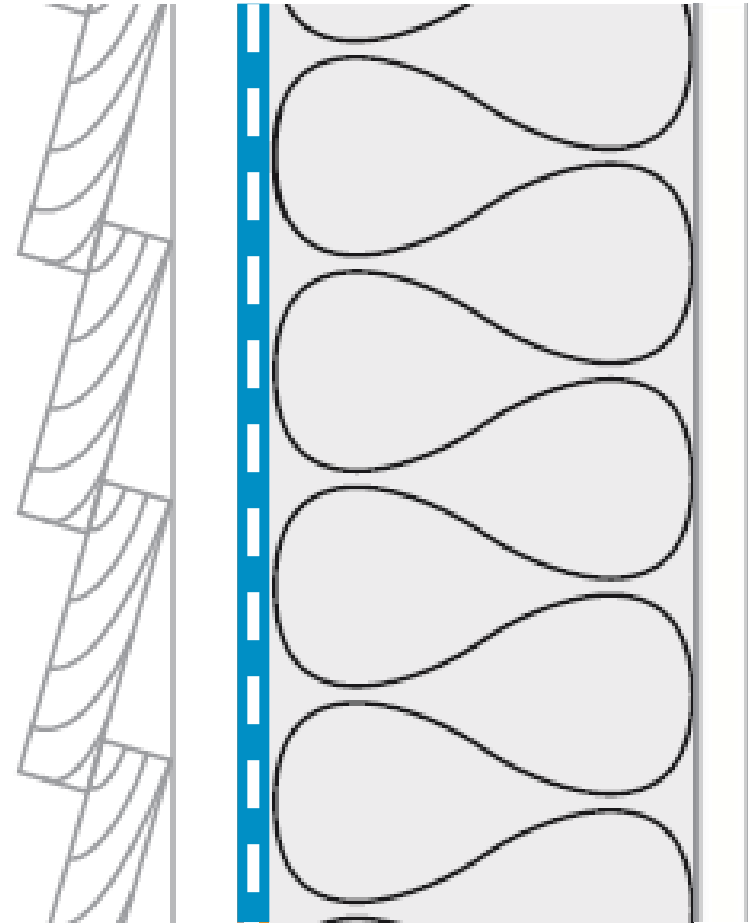
Vapour Permeable (No cavity)



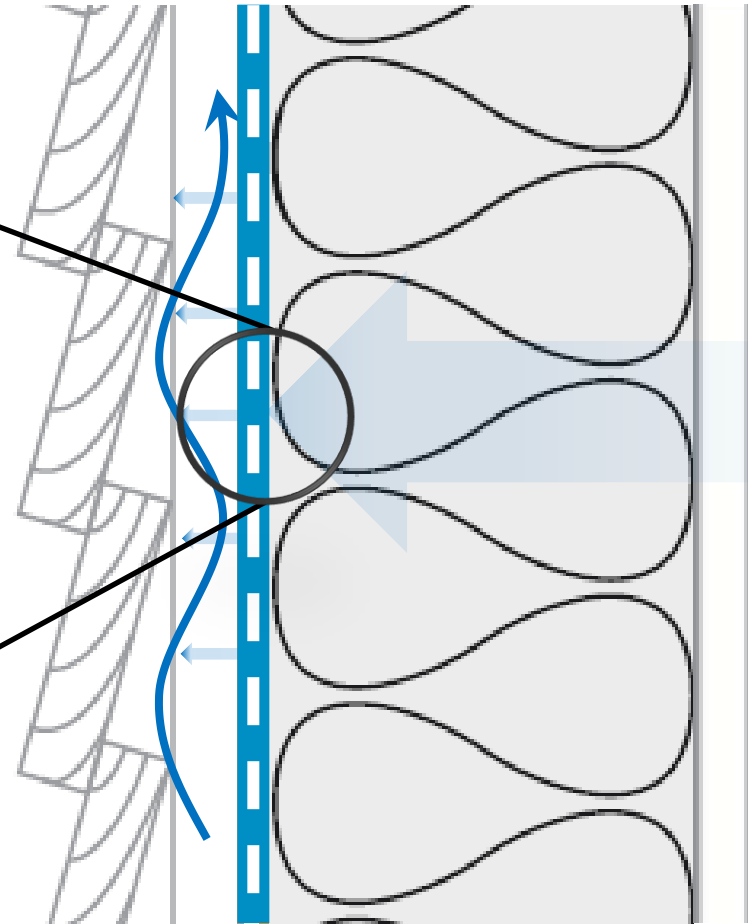
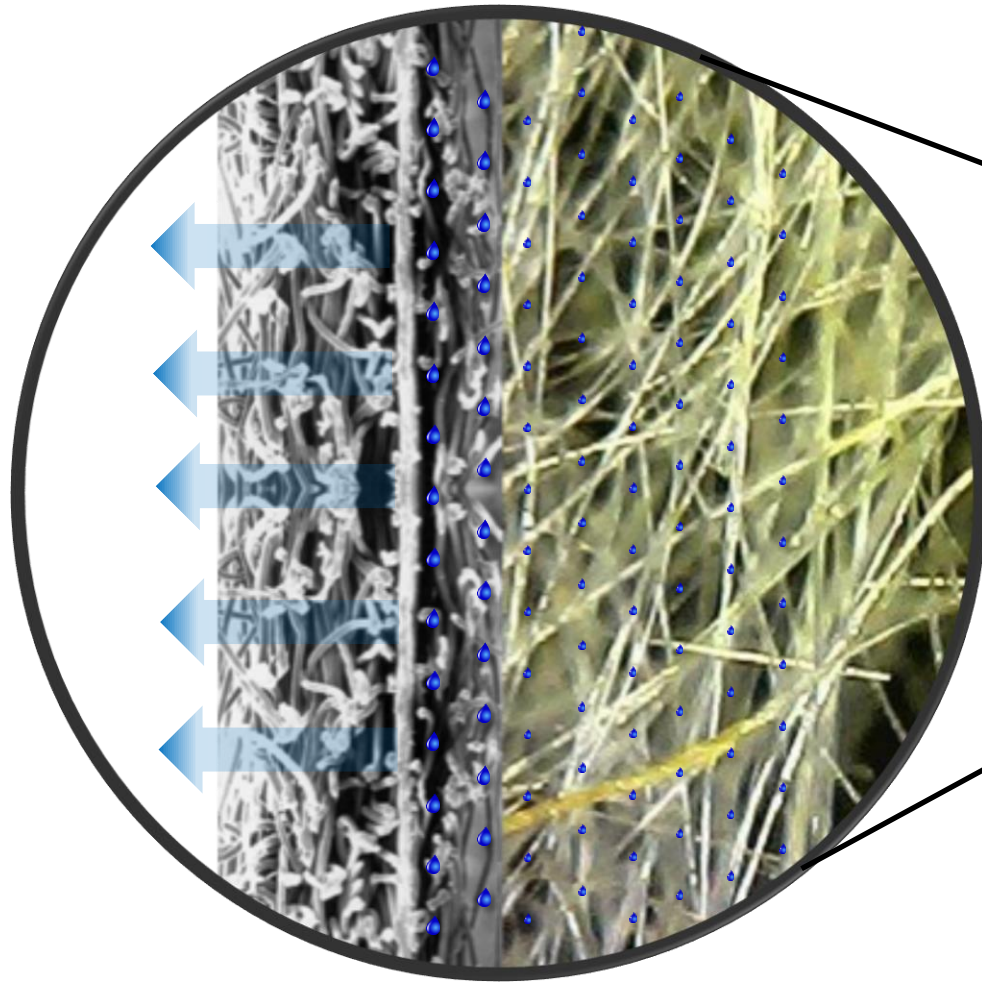
Vapour Permeable (No cavity)



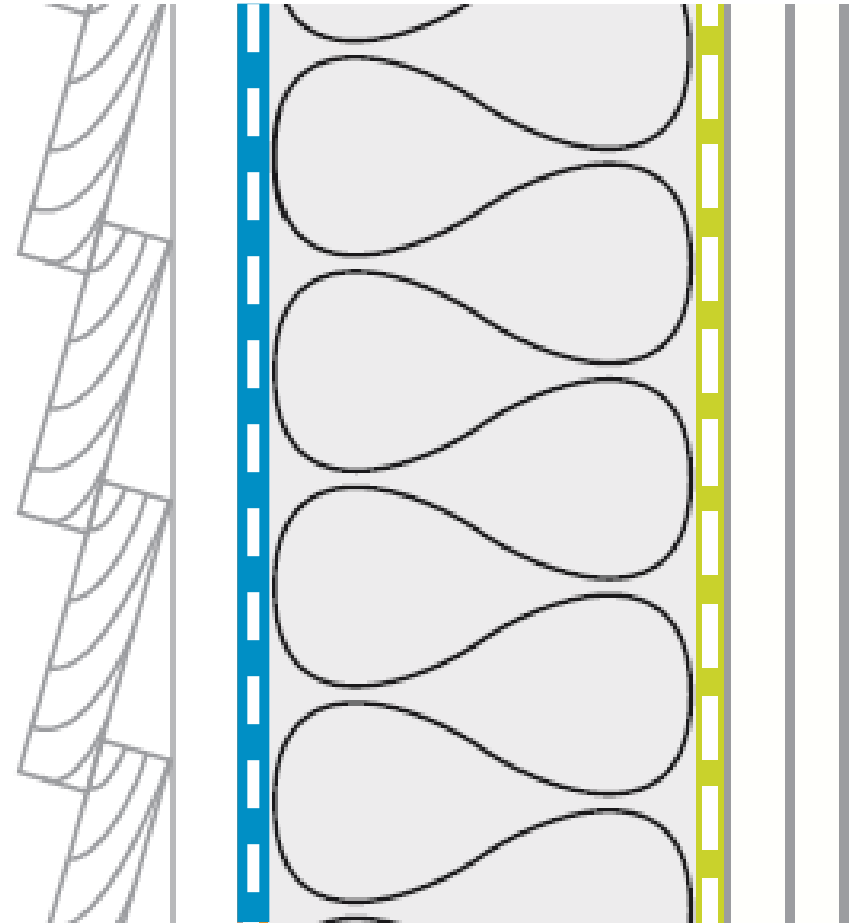
Vapour Permeable (With cavity)



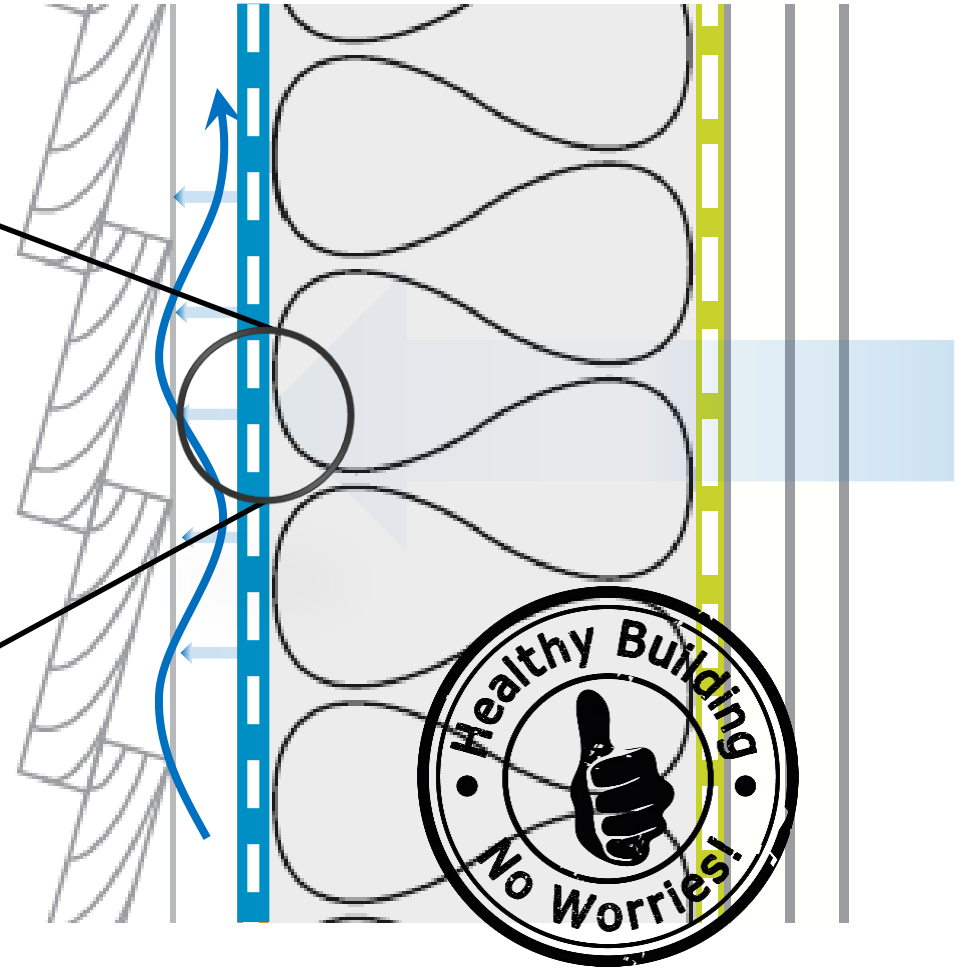
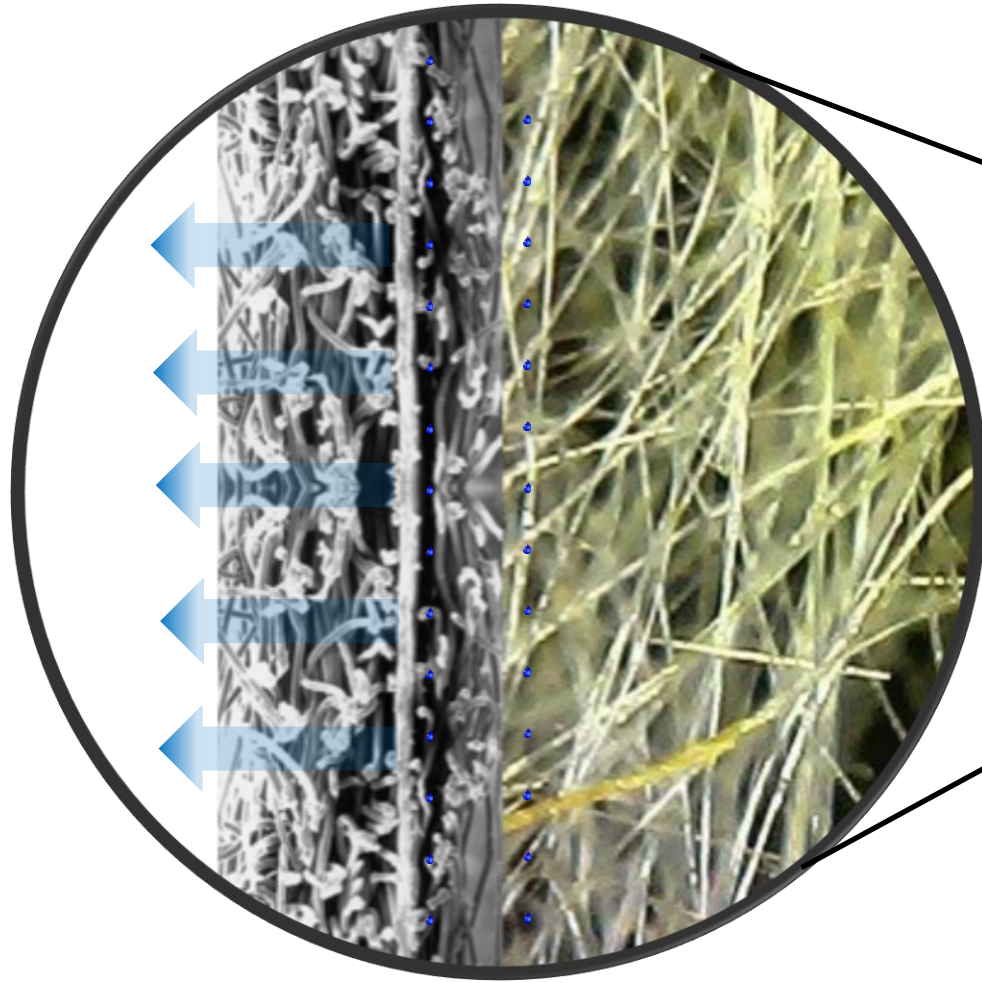
Vapour Permeable (With cavity)



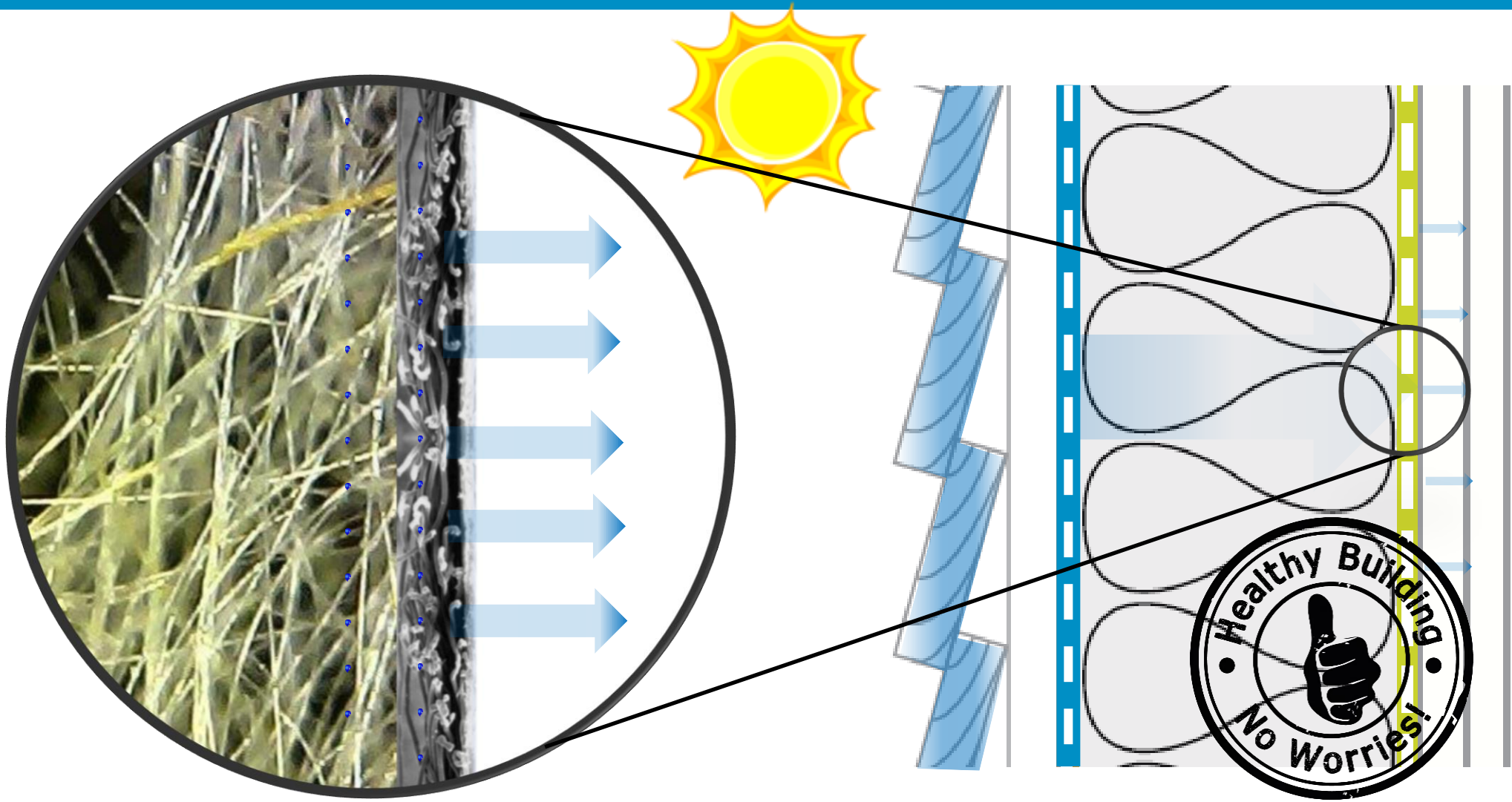
Vapour Permeable (With cavity) & Intelligent Air Barrier



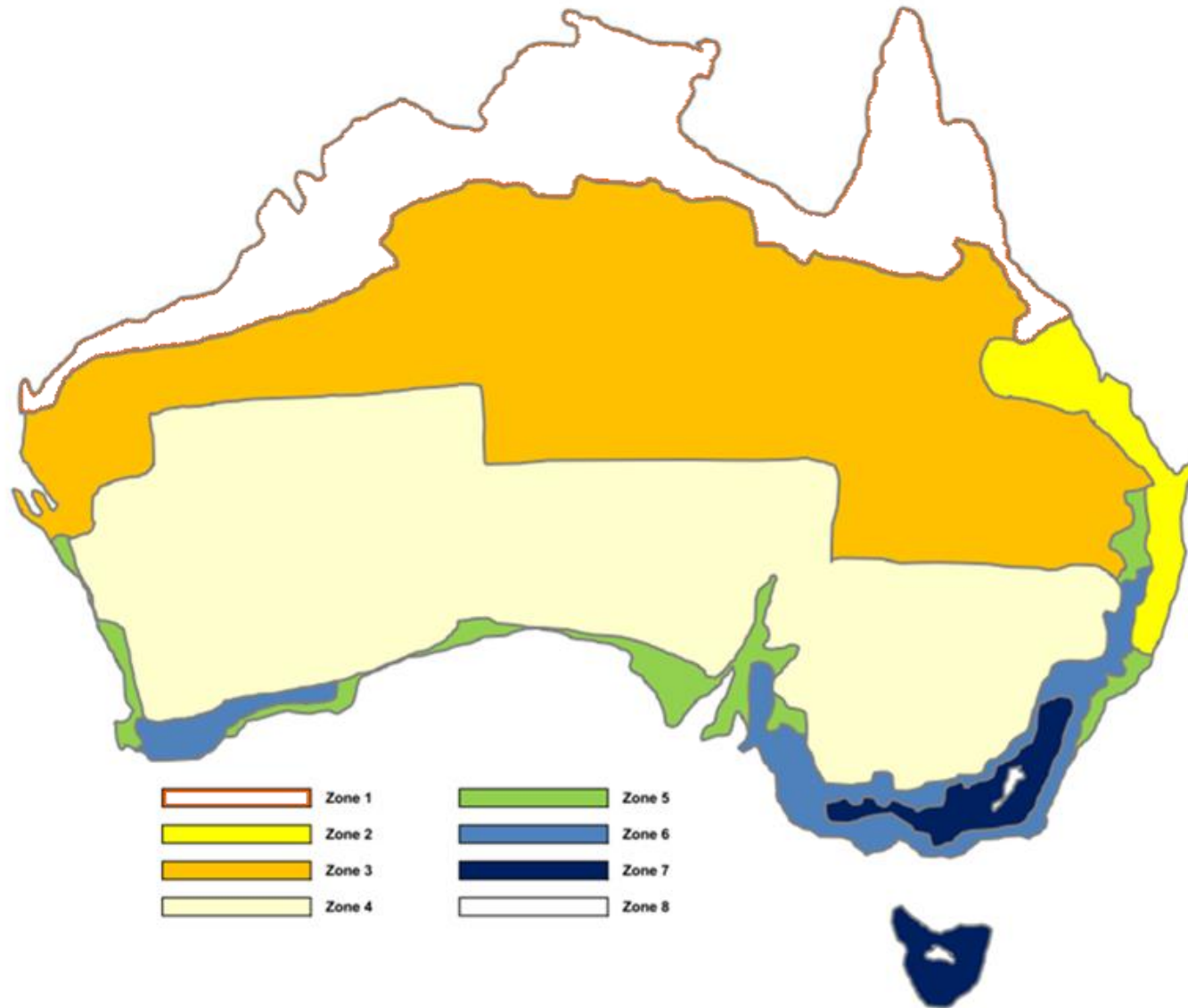
Vapour Permeable (With cavity) & Intelligent Air Barrier



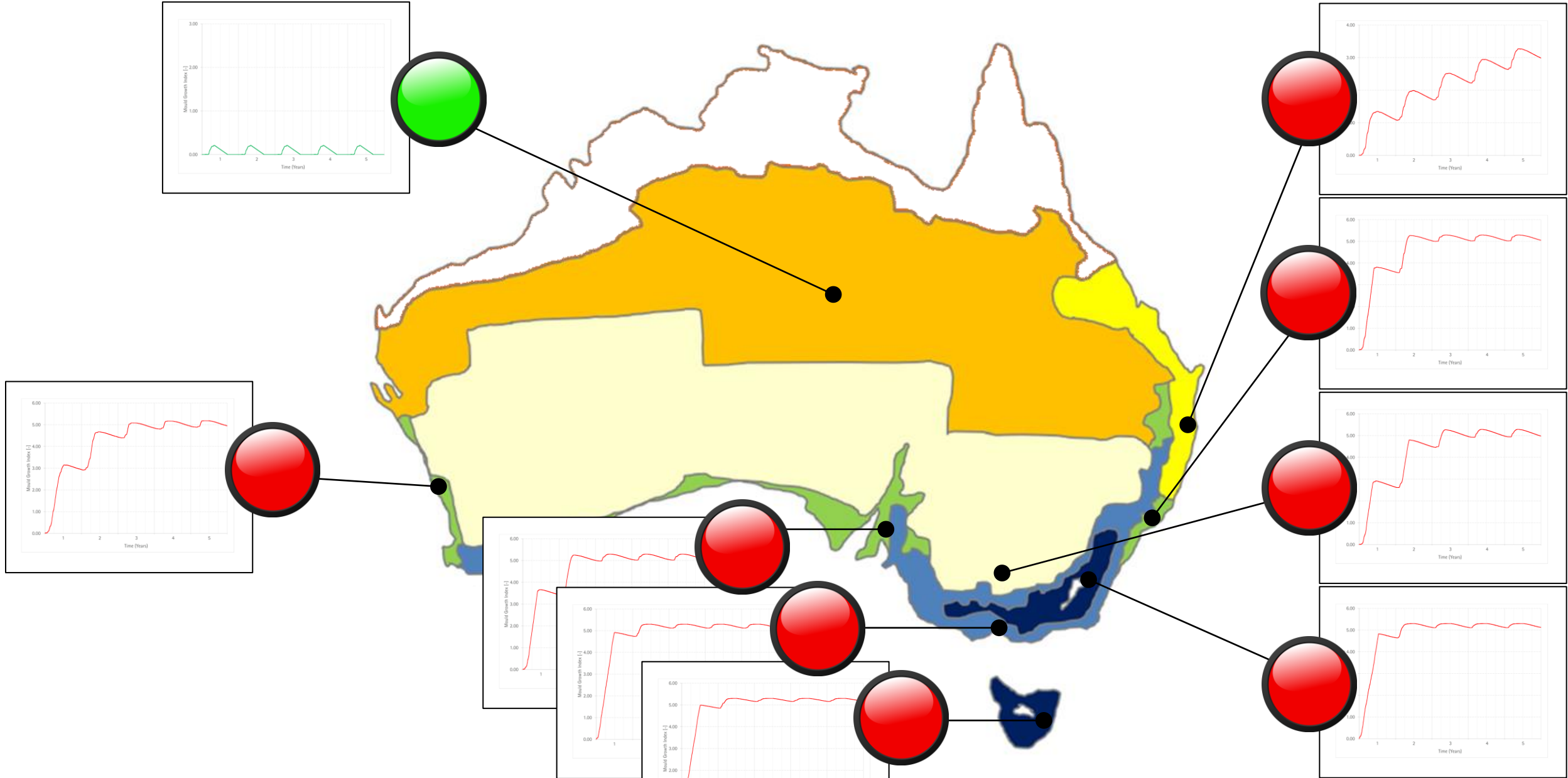
Vapour Permeable (With cavity) & Intelligent Air Barrier



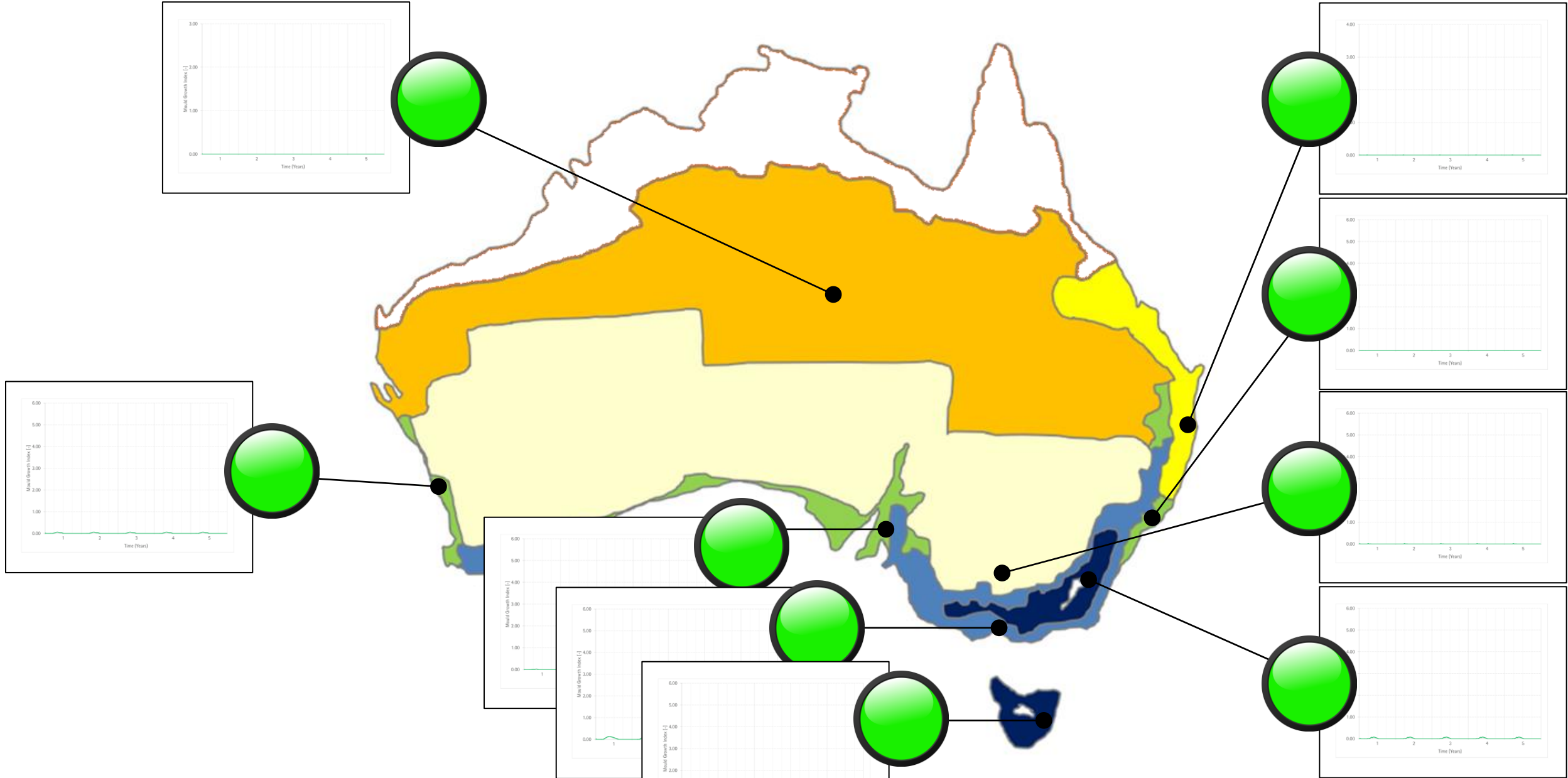
We've all seen this before



Map Without INTELLO PLUS

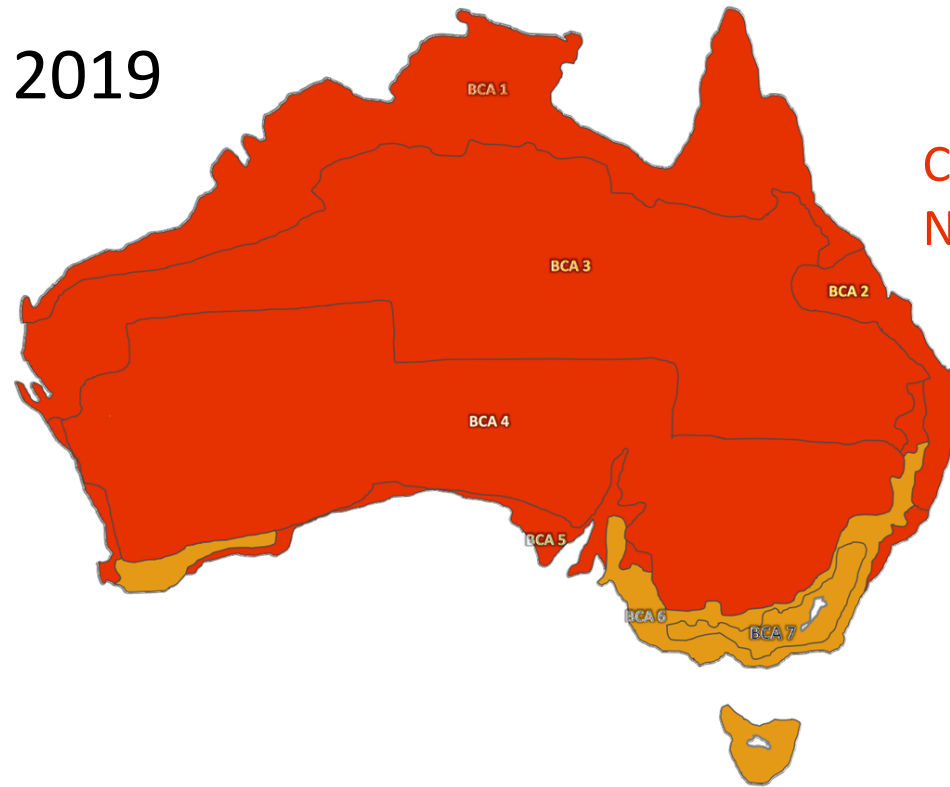


Map With INTELLO PLUS



NCC 2019 DtS Vapour Permeability

2019



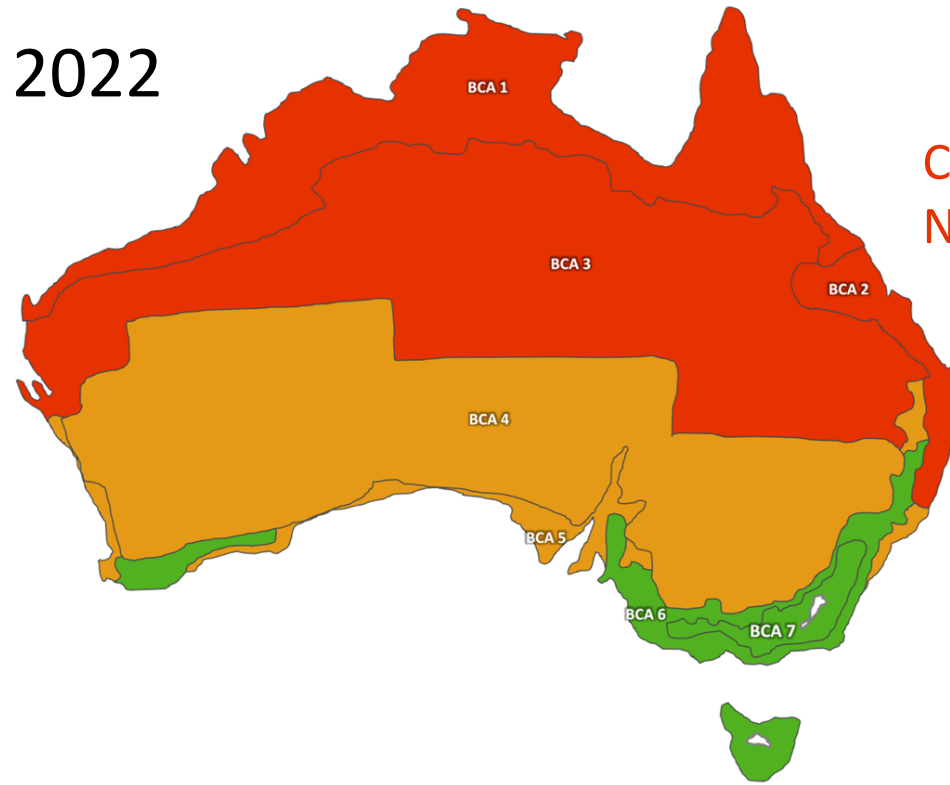
Climate zones 1-5
No Requirement

Climate zones 6, 7 and 8
Class 3 or Class 4 vapour permeable



NCC 2022 DtS Vapour Permeability

2022



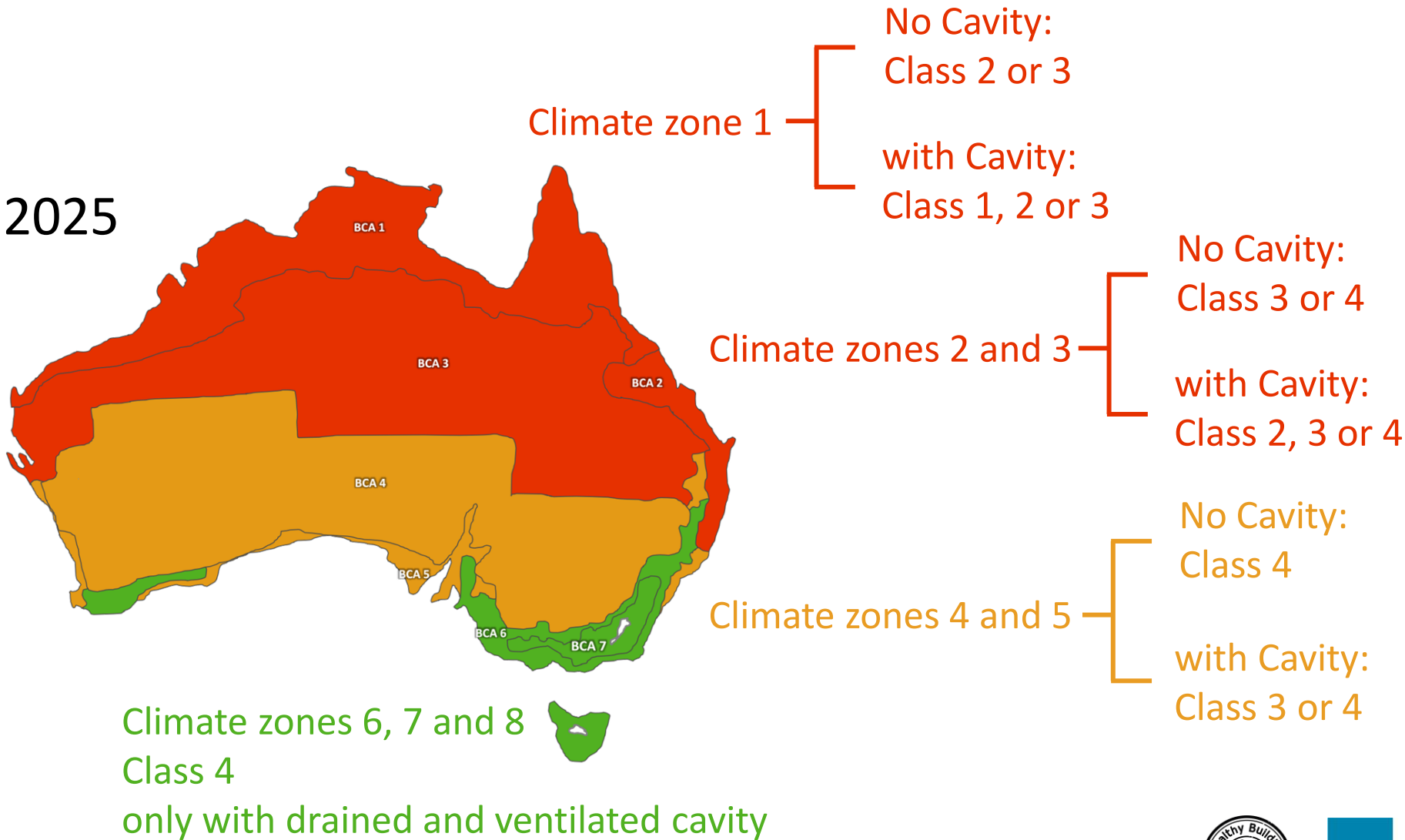
Climate zones 1-3
No Requirement

Climate zones 4 and 5
Class 3 or Class 4 vapour permeable

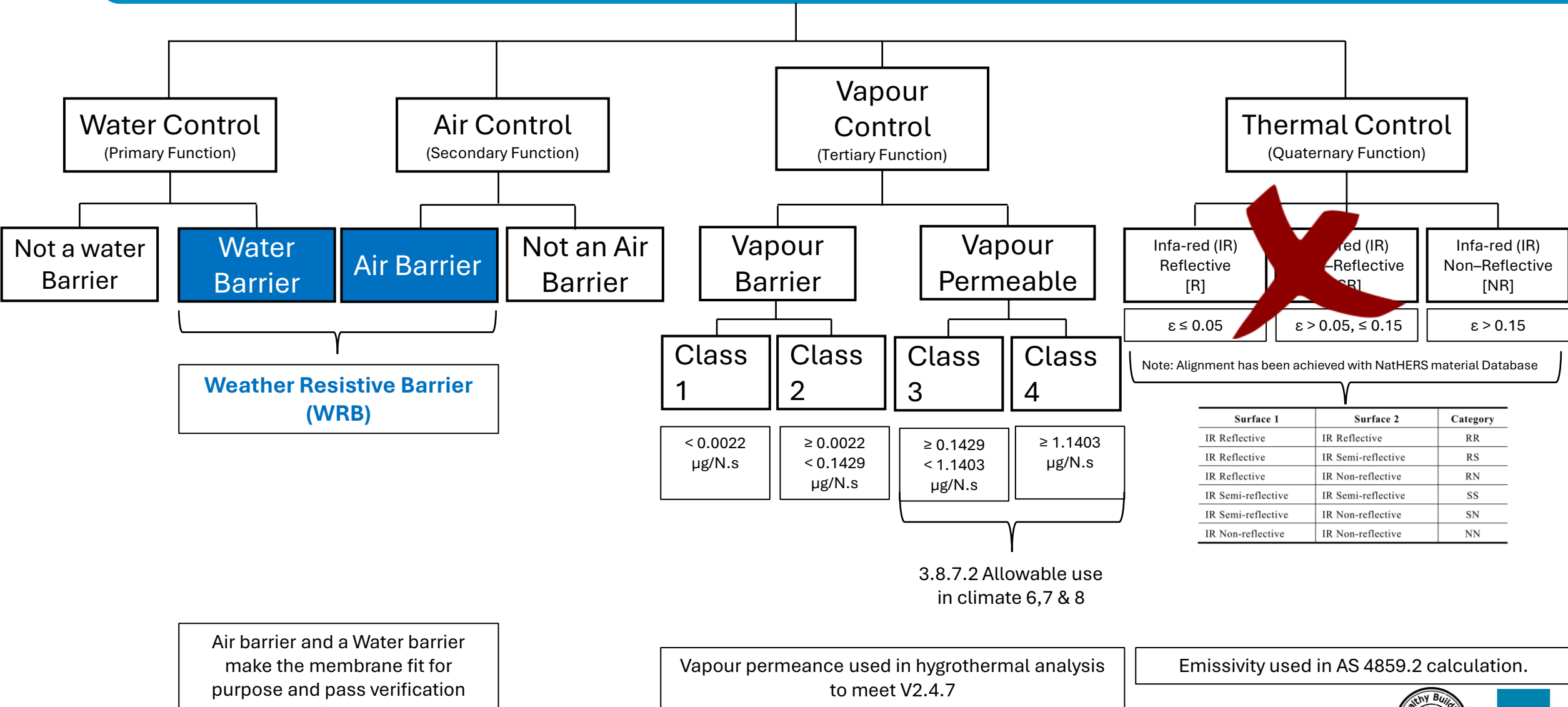
Climate zones 6, 7 and 8
Class 4 vapour permeable



NCC 2025 DtS Vapour Permeability



AS/NZS 4200.1-2017



Air barrier and a Water barrier make the membrane fit for purpose and pass verification
V2.2.1

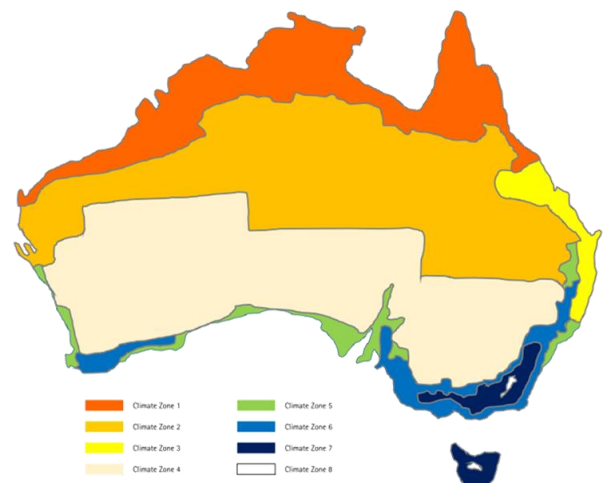
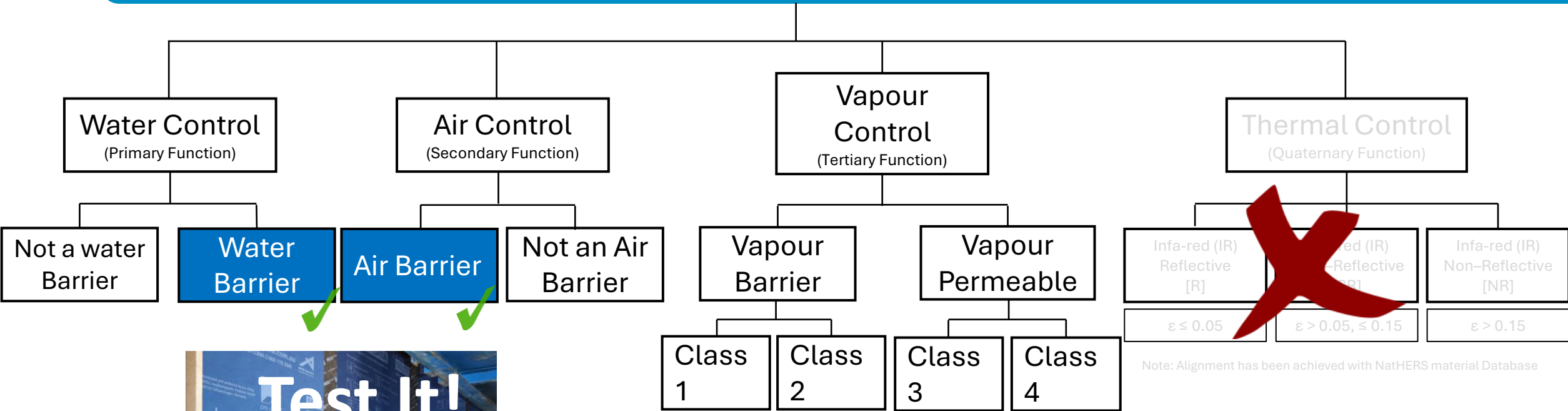
Vapour permeance used in hygrothermal analysis to meet V2.4.7

3.8.7.2 Allowable use in climate 6,7 & 8

Emissivity used in AS 4859.2 calculation.



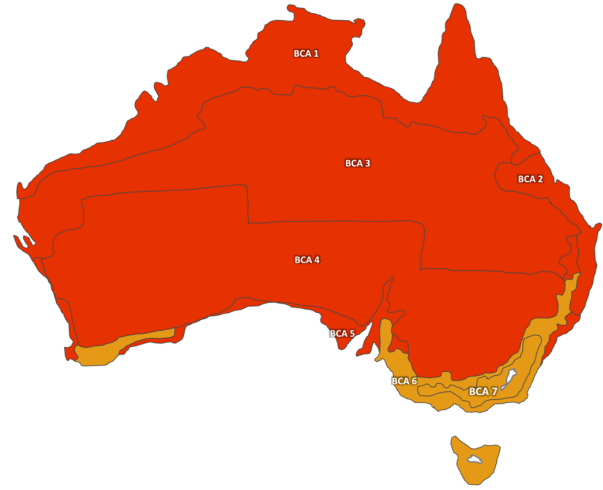
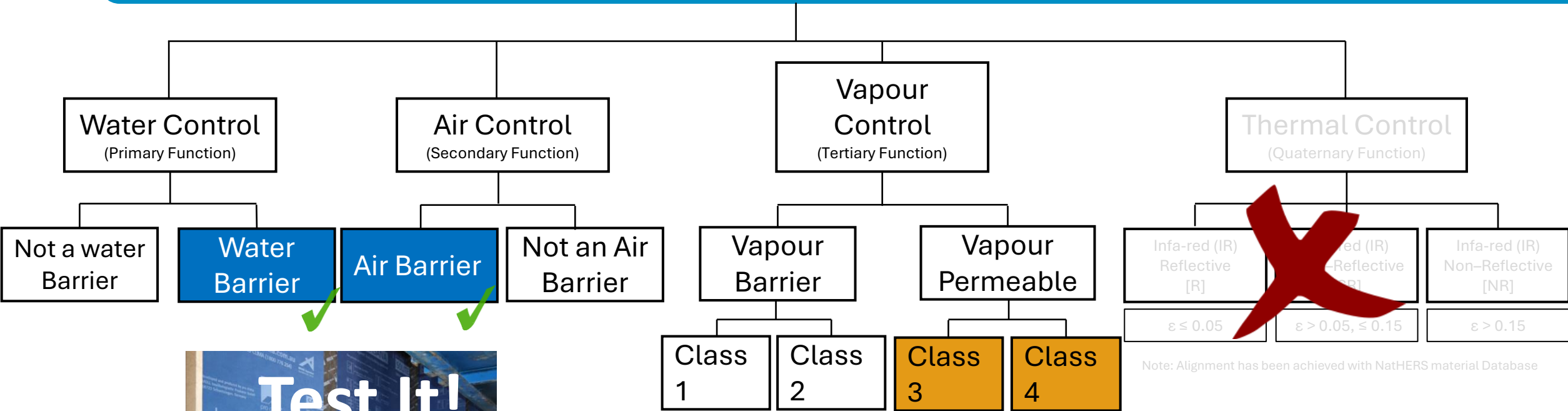
AS/NZS 4200.1-2017



Note: Alignment has been achieved with NatHERS material Database



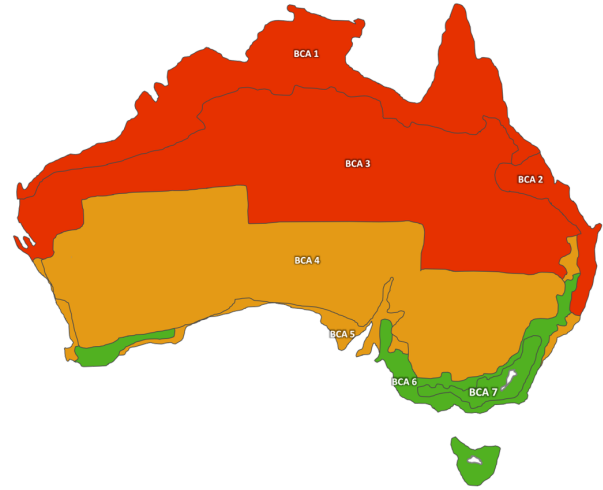
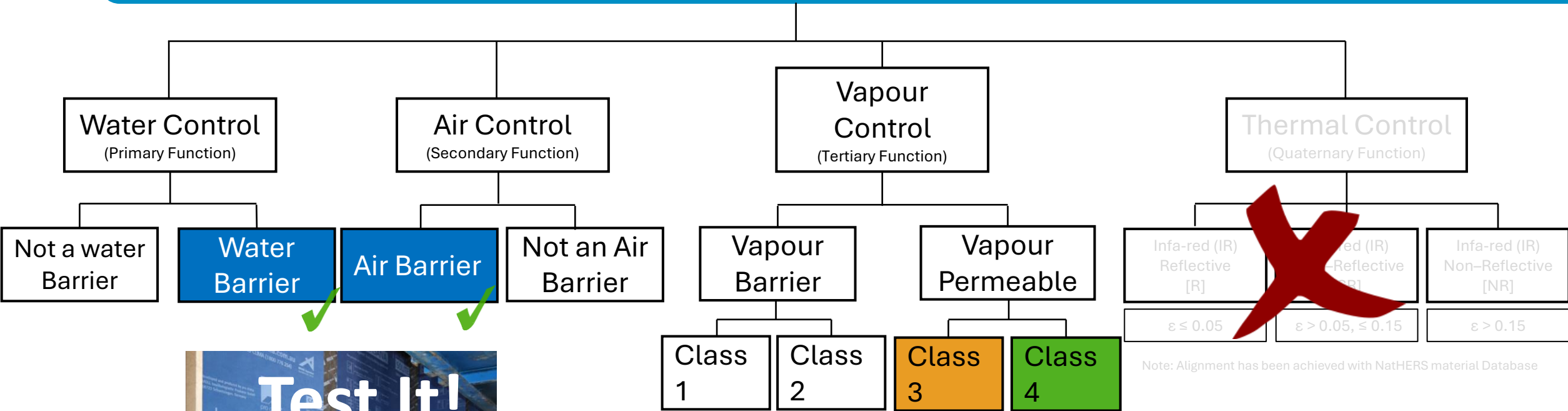
AS/NZS 4200.1-2017



Note: Alignment has been achieved with NatHERS material Database

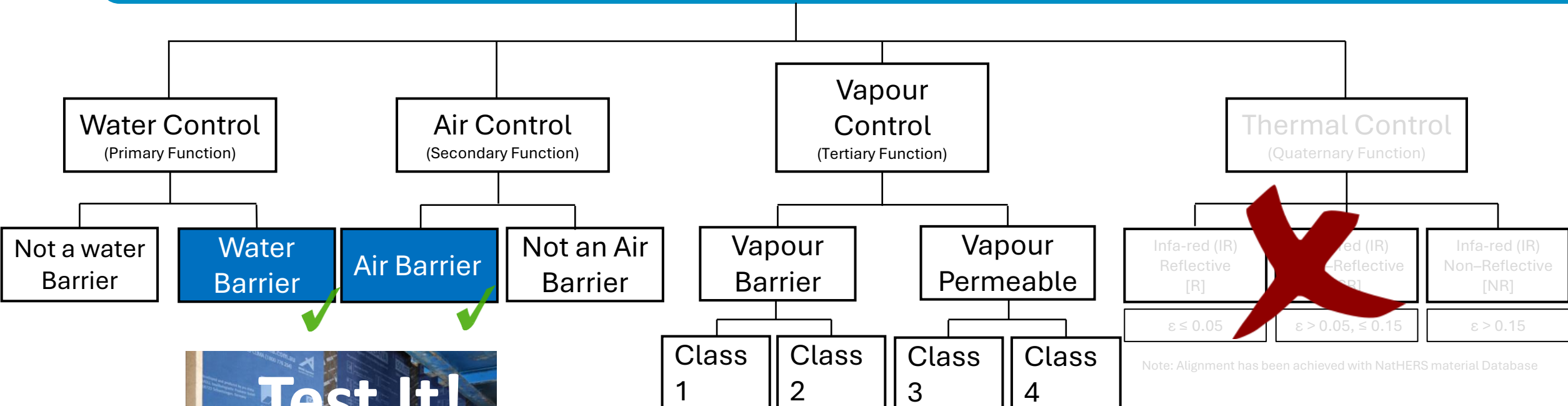


AS/NZS 4200.1-2017

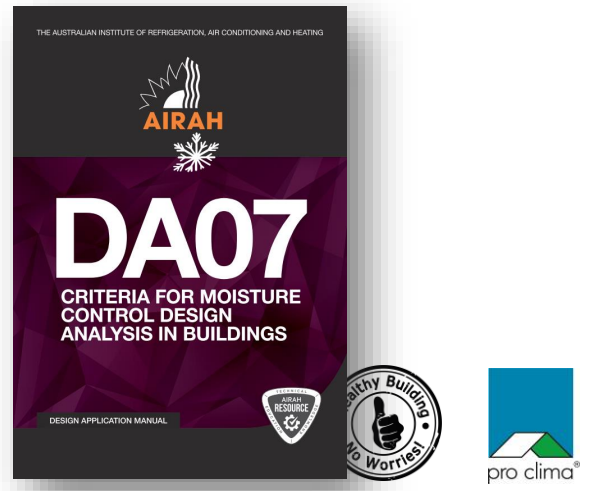
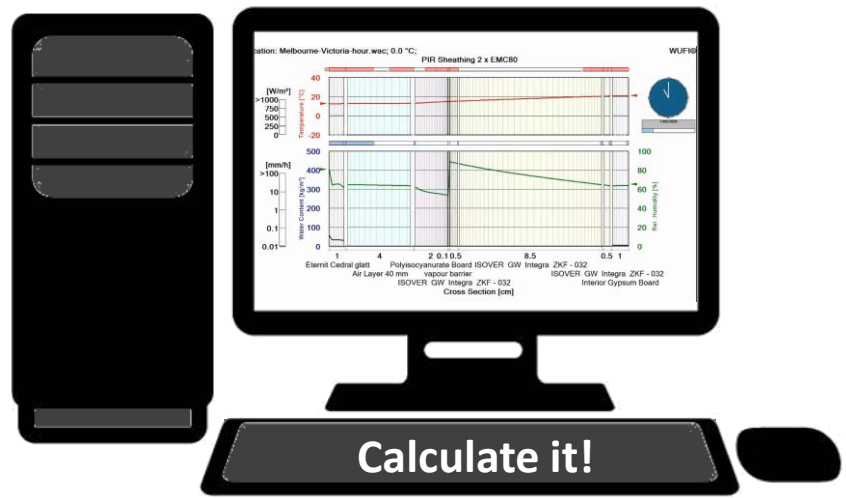


Note: Alignment has been achieved with NatHERS material Database

AS/NZS 4200.1-2017

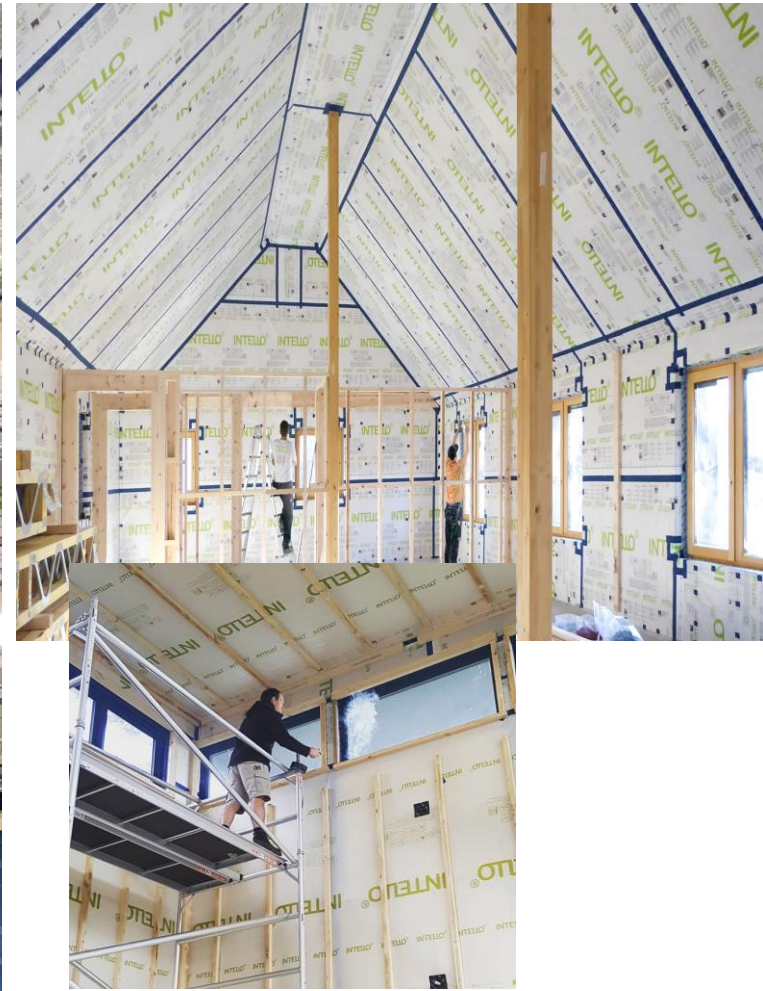


Note: Alignment has been achieved with NatHERS material Database



Intelligent Air Barriers (IAB)

Performance Membranes P/L
Training Centre in Knoxfield Vic



Thank you!

Pro Clima Australia

Airtightness and Moisture Management

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E: Ryan.Worthington@proclima.com.au



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