

## **BU02 Over-Saturation of Underlay**

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Version 1

### **Introduction**

With changing weather patterns and building techniques, we are experiencing more cases of reported underlay “failure”.

The primary function of a roofing underlay is to hold condensation through absorption and surface tension, until ambient conditions improve. The ability of underlay to perform this function is governed by the permeability and absorption requirements of AS/NZS 4200.1: 2017. When underlay meeting this standard fails to control condensation, the problem is almost always caused by excessive internal moisture.

### **How Underlay Works**

In typical cold roof construction, it is commonly thought that water vapour passes through the underlay and condenses on the underside of the roof, then runs down the surface of the underlay to the gutter line. This is a misconception.

Water vapour is lighter than air, so in still conditions will migrate to the roof. During clear nights, the roof, and materials touching it, can be colder than the ambient atmosphere due to night sky radiation.

While the underlay is, by requirement, somewhat vapour permeable, it is a significant vapour check, and is cold at night from being in contact with the roof. Because of this, perhaps 90% of the condensation occurs in or under the underlay, where it is held until ambient conditions improve, allowing it to re-evaporate and escape. Small amounts of condensation forming on the undersurface of the roof are generally held there by surface tension and absorbed by the underlay.

This is how traditional underlays are engineered to perform. Water droplets on the underside of underlay, even small drips, are acceptable in periods of high RH, particularly during the construction and post-construction stages while water escapes from building products such as paint, timber, and concrete.

### **Construction Moisture**

Once the building envelope is closed in, it is necessary to allow construction moisture to escape. While paint and timber will reach ambient moisture levels relatively quickly, concrete releases

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moisture throughout the curing process. The rule of thumb is that on average, concrete fully cures at the rate of 25mm of depth per month.

## Building Design

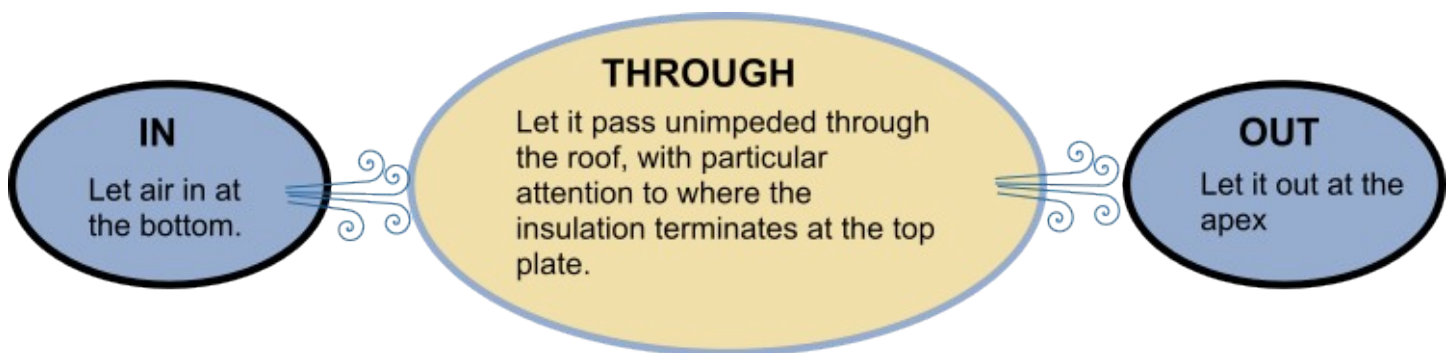
The new H1 regulations for housing increased the amount of ceiling insulation used. This will slow heat transfer into the ceiling space, which will lower temperatures in that space. Lower temperatures will increase the frequency and volume of condensation in the ceiling cavity, as relative humidity is inversely proportional to temperature.

If excessive condensation is experienced in the ceiling space after moisture levels in construction materials have stabilised, it is necessary to ensure that the amount of moisture exiting the ceiling space equals the moisture which enters.

Ventilation is sometimes necessary to achieve this and will benefit most roof assemblies. However, if the core problem is excessive ground or internal water entering the roof space, ventilation may only make it worse. The solution in such cases is to address the moisture problem at the source. Unbalanced HRV systems can also create a problem by causing a pressure imbalance between the ceiling space and dwelling areas.

## Ventilation

The rule for ventilation is: **In, Through, Out.**



That is the normal passage of water vapour on a still night. It may be reversed due to wind conditions, but the principle remains the same.

Section 10 of the *NZMRM Metal Roof and Wall Cladding Code of Practice* has more information and recommendations on the subject.



*Once all absorbent surfaces are saturated, condensation can pool on the upper surface of the roofing underlay. It is the result of a gross imbalance between water vapour entering the ceiling cavity and water vapour escaping.*



*Prolonged wetness of underlay and structure can result in mould growth. This is often initiated in the post-enclosure building stages of a contract.*

Yours Sincerely,

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