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Keeping skillion roofs dry

For most skillion roofs the amount of air movement in the roof cavity, although limited, is sufficient to remove small amounts of vapour. The trick is to keep those amounts of water vapour small.

Skillion roofs are where the roof cladding and the ceiling lining are within 300 mm of each other and both are usually directly attached to the roof structure. Examples are:

- chapel or cathedral style roofs
- roofs with internally exposed rafters
- roofs with the ceiling lining attached to the underside of the rafters.

Skillion roofs differ from roofs with an undeveloped attic or ceiling space (close-couple roofs) in that:

- roof spaces or cavities are inaccessible
- air spaces between the ceiling lining and roof cladding are small
- natural ventilation in the roof space is low
- they are less tolerant of poor workmanship
- faults are difficult to locate and expensive to repair.

All roofs must have a positive fall to effectively drain water from the roof. A significant number of 'low slope' roofs (less than 10° pitch) constructed in New Zealand are skillion roofs. When using a continuous impervious membrane for 'low slope' roofs, the minimum slope under E2/AS1 is 1.5°. But the ponding risk is greater where membrane roofs are built to the minimum slope so, wherever possible, increase the fall to 3° to ensure satisfactory drainage. For other roofing materials, the manufacturer's recommended lowest pitch must be considered the absolute minimum.

Skillion roof ventilation

Skillion roofs are commonly thought to pose more of a problem because their tight construction and narrow framing cavities provide little opportunity for air entry and movement. In fact, research has shown that most skillion roofs in New Zealand have no problems, even those that are not deliberately ventilated. Where problems do exist they can usually be traced to solar-driven moisture, leaks or construction moisture (wet framing).

A surprising amount of air does move through a skillion roof, except perhaps for very airtight roofs, such as those clad with long-run trough-section metal roofing, asphalt shingles, timber shingles with an interleavement (to prevent solar driven moisture), and membrane on plywood roofs.

No amount of ventilation will dry out skillion roofs that have moisture built into them as a result of enclosing wet framing, or have moisture entering from rain and plumbing leaks or from interior spaces.

Keep skillion roof framing dry

Use kiln-dried timber for as much of the skillion roof framing as possible and make sure it is kept dry during construction. Exposure of framing and plywood to rain and dew during construction will make them too wet to allow application of the membrane and the closing in of the framing – where framing gets wet it must be allowed to dry before work proceeds.

Internal linings should not be fixed until the timber has dried to an average moisture content of 20% or

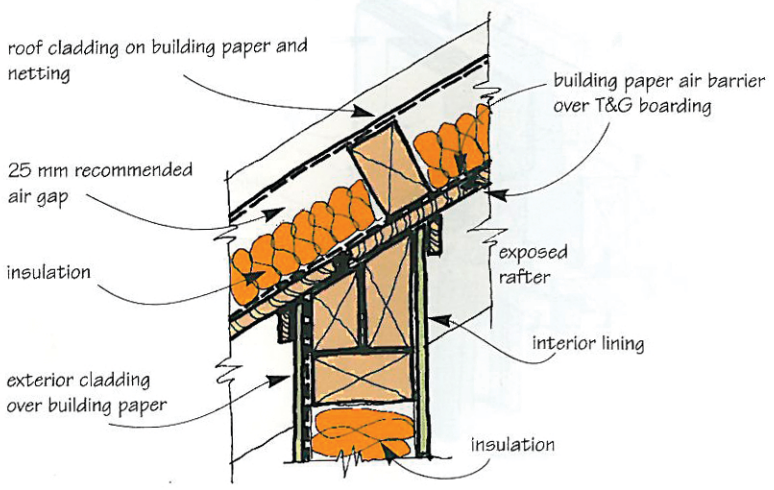

Figure 1: Air barrier over a boarded ceiling lining in a skillion roof.

less – remember some lining manufacturers require a 12–16% framing moisture content.

Prevent moisture entry from spaces below

Once a skillion roof is completed and the building occupied, moisture from spaces below must not be allowed to get into the roof framing cavities.

In an occupied building the air inside is usually warmer and more moist than the air outside because human activities, such as breathing, heating and cooking, generate moisture and heat. Research has shown that this moisture can be transported by airflows through gaps, cracks, penetrations and open downlights into skillion roof cavities. It is therefore important that a skillion roof design incorporates ways of preventing this moisture-carrying airflow.

Moist air not removed by air leakage, ventilation or diffusion, remains within the skillion roof structure. On contact with a cold part of the structure, such as the underside of the roof covering, the moisture can condense to form water, which can wet insulation and damage materials and finishes or, for membrane roofs, form as bubbles under the membrane.

Stopping airflow by the use of a vapour-permeable air barrier between the interior and the roof spaces will prevent moisture accumulation. Options for an air barrier include flush-stopped plasterboard or a wall underlay material installed above an air-leaky ceiling (such as T&G boarding) that is suitable for use as an air barrier (refer to Table 23 of E2/AS1). Air barriers must be installed without openings, i.e. there should be no open downlights and all penetrations for wires must be sealed.

Research and experience has shown that in New Zealand vapour barriers are not necessary in skillion roofs except in very cold climates, e.g. ski lodges, or where there is a wet process in the room below, e.g. a spa pool. In these cases a vapour barrier installed immediately behind the internal lining materials must be used.

Case studies have shown that the installation of a vapour barrier (except in the situations outlined above) can be counterproductive because any moisture that does find its way into the roof spaces (from residual construction moisture or some solar-driven moisture transfer) is prevented from diffusing through the ceiling into the spaces below. When the moisture remains trapped, significant water damage within the roof can occur.

4 key points to remember

1. Skillion roof materials must be dry when closed in.
2. Providing ventilation is not a cure-all for wet skillion roofs irrespective of the cause of the moisture.
3. Airflow from interior spaces (including subfloor spaces) into skillion roofs must be prevented.
4. Vapour barriers are not generally needed although an air barrier is.