Speaking from experience

Ventilation of cold roof designs in New Zealand doesn't always go smoothly. Here, BRANZ physicists hand over to a couple of professional builders who have long been at the coalface dealing with roof moisture issues on their projects.

BRANZ HAS WORKED with Roland Alderton and Mike Way for some time, and their experience is worth a read as roof ventilation is a complex topic and there is no silver bullet that provides the answers for all the eventualities.

Passive vents often add resilience

Last year, Tasmania published some guidelines on the benefits of ventilating roof spaces. Conversely, the Scottish Building Standards Technical Handbook recommends staying away from ventilated cold, flat roofs in the Scottish climate.

While we generally recommend using passive vent elements in New Zealand to add resilience against the accumulation of moisture in the roof space (see Bulletin 630 *Roof space ventilation*), *A school lesson* on pages 69-70 of this *Build* illustrates how problems can still arise. But enough from us - over to Roland and Mike.

Roland Alderton of RJ Alderton Builders, Hamilton

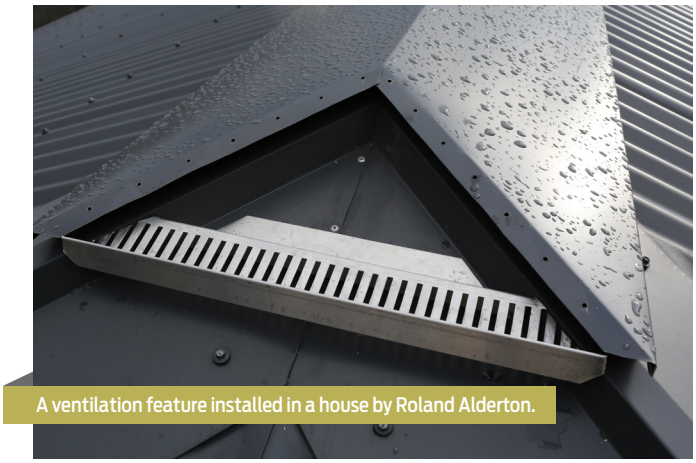
WE BEGAN VENTILATING roofs 20 years ago. In the beginning, this was ventilating asphalt shingle roofs at the fascia and ridge or, if the wall cladding allowed it, custom timber louvre gable vents such as in old buildings.

At that time, we were only ventilating to control the roof space temperature. Venting seemed a good idea - we had no idea that it was potentially so important to overall home health.

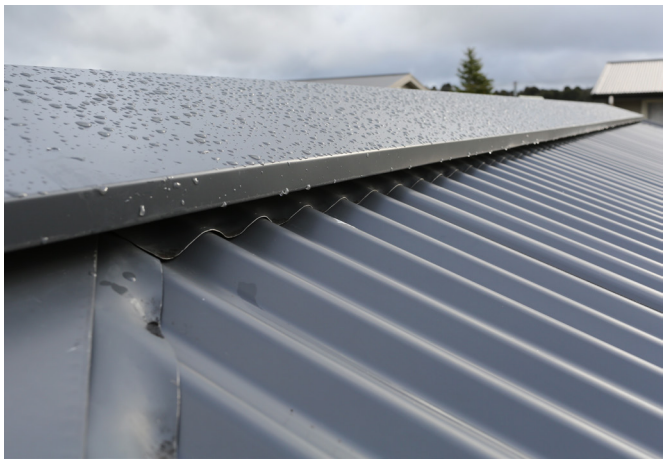
Bach in a high wind zone

In 2009, we built a bach in National Park village by Mt Ruapehu. It is 825 m above sea level and in a very high wind zone. Our main focus for the build was a basic weathertight design with insulation well above Building Code requirements.

We were interested in how the building was performing, and during an inspection, we noted ice forming in the roof on the underlay. After speaking with locals, it became apparent that this was common in this region, so we did some homework on how to best combat the problem.



A ventilation feature installed in a house by Roland Alderton.



Roof needed to be ventilated

On reflection, we realised this house, which we didn't ventilate, was the one house where roof space ventilation was most crucial. It was a small home with a low volume of air, high occupancy, high moisture load and a cold climate - it ticked all the boxes.

After discussions with BRANZ physicists Stephan Rupp and Manfred Plagmann and discovering they were also working on this problem, we took some ratios and figures from Canada and carried out an experiment on the house. This included adding eave vents around the soffit perimeter and installing custom ridge ventilation.

This solved the problem of ice forming and approximately halved the condensation on the aluminium joinery. It showed that not having the stack effect of trapped moisture in the roof space had allowed our building to lower the relative humidity in the habitable space as well.

Stephan and Manfred were excited about the success - as any building physicist would be - and a couple of weeks later visited to begin some of their own testing.

Since then, we have been in regular contact and continued to develop our understanding of roof ventilation, applying the principles and practices to every house roof we have worked on.

Interest grows in roof space ventilation

In reality, not every home is going to have this condensation issue. However, as there are so many contributing factors involved, particularly around how an occupant uses the home, the inclusion of roof space ventilation is a cost-effective way to mitigate roof space moisture issues to safeguard every home.

While roof space ventilation doesn't appear to be a hot topic or a high priority in the building industry, some tradespeople are taking an interest.

For example, another builder I have contact with noticed excessive moisture on the underside of the roofing underlay while working at a dwelling he had previously completed.

He did some research and realised roof space ventilation was going to be the solution. After some experimentation on this home and more research, he now also makes roof space ventilation standard practice.

Should be a Building Code requirement

With our improved knowledge and success with roof space ventilation, we believe it should be included as a minimum Building Code requirement. To ensure designers, builders and other trades install it, we need to legislate as it is an extra cost.

It will be like scaffolding rule changes - once everyone is used to it, it will become the new normal and we will expect to see some type of ventilation on every job.

The big-picture savings will be hard to quantify but they will be from dry insulation performing at its best, eliminating premature failure of the roof structure in severe cases and the health benefits of warmer, drier homes with fewer mould issues. This is not to forget that reducing heating demand will save money and our precious natural resources.

Easy-to-follow guidance needed

Roof space ventilation certainly doesn't negate the need to ventilate homes, but it makes a difference in building performance thermally and durability-wise.

If some basic easy-to-use parameters, rules and details are put in place, designers and trades can follow these to provide successful roof space ventilation.

Because of all the contributing factors, it isn't an exact science. Maybe another matrix is needed to assist with finding the appropriate ventilation ratios and requirements, like the E2 risk matrix.

Mike Way of Way Builders, Tauranga

WE WERE IN in the final stages of building a new 2-storey house in Tauranga when the painters rang on a Friday afternoon to say that the roof space had water everywhere.

I called the roofer who was able to visit later that day. He phoned to report back, and said, 'This is bad. I've never seen anything as bad as this before.'

On site first thing Monday morning, I put my head into the roof space, and it smelt like an old damp basement. The roof underlay was dripping, the trusses and purlins were wet with mould growing on the H1.2 timber and the top of the insulation was wet. I went to the separate roof space and was faced with the same ugly mess.

Immediate solution for serious problem

The homeowners were understandably distressed - their brand-new house was leaking from the inside and they hadn't even moved in.

We had a serious problem - how are we going to solve the issue?

The next few hours were spent on the phone to the designer, roofing underlay manufacturer, roofer, a building surveyor and the BRANZ helpline. All were very concerned.

First, we put industrial dehumidifiers on site and fans and heaters in the roof spaces. After 3 days, all visible condensation to both roof spaces was gone. We continued this process for a total of 12 days to make sure it was dry.

The consensus was, now that we had it dry, condensation to this degree was unlikely to reoccur. Excellent!

Two days later, the problem was back as bad as ever and we had a very unhappy homeowner.

House design exceeded Building Code

This house is 2-storey with a low volume, monopitched, trussed roof with parapets to three sides. The concrete floor slab was poured in late January, and the condensation issue occurred in late July.

The building design and construction exceeded the Code in all areas. It had passed its frame moisture content inspection before wall and ceiling linings commenced. The paint was brushed and rolled so there had been no need to have windows and doors covered with plastic. As a result, the dwelling had plenty of ventilation during the painting to allow the drying paint moisture to escape.

Finding a permanent solution

The owners understandably wanted answers! I was reluctant to start some type of permanent solution without truly understanding what was causing the condensation.

There is no point thinking you are solving an issue by creating a new one. We had a meeting on site with a BRANZ building physicist, the designer, roofer, underlay manufacturer and an independent building surveyor to work out what was going on.

BRANZ monitored the dwelling, and after some time, we came up with a solution. We installed a solar-powered fan and introduced soffit vents to the non-parapet elevation. This dwelling is now going through its second winter since the fan and vents were installed, and there doesn't seem to be any condensation issues.

Looking at the facts

Although I had read articles on roof space condensation, it appeared to me this type of issue only occurred at high altitude and in cold climates or when occupants didn't allow their home to air.

This house was brand new, still under construction, took 9 months to build and was on the outskirts of Tauranga at an elevation of 180 m. It was hardly a recipe for disaster.

Tauranga isn't considered cold, the build wasn't a quick build, it had plenty of time for the worst of the moisture to come out of the building products and it had plenty of ventilation during plasterboard stopping and painting.

Why was there an issue?

It appeared that lots of little things added up:

- There was a lack of air movement due to parapets.
- There was residual construction moisture.
- There was a lack of heat loss through the ceiling due to high insulation levels so the roof spaces were colder.
- The dwelling was in a bush setting, creating additional moisture.
- There were cold winter nights.

We have a wider problem

After reading studies from New Zealand, England, British Columbia, Canada and US and talking to others in the industry, this wasn't a one-off problem.

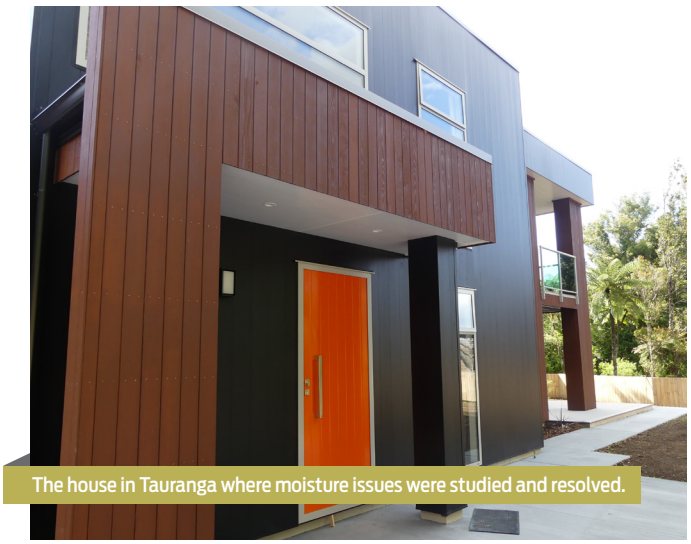
Last winter, we were doing maintenance on a brick veneer house with a skillion roof (mostly) built in the 1980s. We had to lift one sheet of the roofing iron. The roofing underlay had condensation on the underside and the insulation was also wet.

More guidance needed

I believe we have a problem. Will this be the next big failure in New Zealand construction, and are we building buildings that leak from the inside?

Our situation was only discovered because the manhole covers were pulled out for the painters to paint. Now we insist on passive roof ventilation in low volume or

Roof space condensation in the new house.



The house in Tauranga where moisture issues were studied and resolved.

PHOTO – COURTESY OF MIKE WAY BUILDERS

skillion roofs and have been educating and working with designers and homeowners.

I believe there should be more guidance on this issue, and it should form part of the Building Code as many designers and builders won't do anything unless they are made to. However, it is hard to design something when we don't fully understand the how, why and when. In addition, the question remains. What category does this fit under - E3 *Internal moisture* or G4 *Ventilation*?