ISSUE 29

SCOPE

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NZ METAL ROOFING MANUFACTURERS INC.

Below is a brief introduction to the 2012 executive of The Metal Roofing Manufacturers Inc.
It is intended that Scope be representative of the industry and therefore material of interest is welcomed from all sectors of the building industry be it design, research, manufacture or construction.

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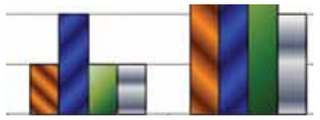

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Scope is the official publication of
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Executive Officer: Peter Atkinson
Private Bag 92 066, Auckland.
DDI Ph: 09 367 0934,
Ph: 09 367 0913

BEST OF BOTH WORLDS

When owners Lyn McLean and Melanie Wakeman made the decision to build their dream it encompassed much more than a home. Their plans included provisions for the future from planting an avocado orchard to wiring the entire house and entry with surveillance cameras, broadband and sound systems. There is provision for a future lift and remote controlled lighting on the interior and exterior...and more.

Lyn and Melanie's exploration into building options began by meeting with several architects and designers before they engaged Andre Laurent from Creative Space Architectural Solutions.
"We had done considerable work on the design of our proposed new home," says Melanie, "and Andre's approach impressed us from the outset. He had an intuitive understanding of our plans, needs and direction and we both felt he was someone we could work alongside to achieve our goals."

The property is quite unique and covers 2.4 hectares of undulating pasture and has extensive views of both countryside and the Mt Maunganui coastline. There is an existing Californian style barn on the property that was converted into a 2 bedroom dwelling where the owners lived during the building process. This has since been rented to provide a passive income.

The property has been divided into 4 paddocks with extensive shelter belts offering protection to the donkeys, sheep and pigs on the site. To provide for future income an orchard has been planted with around 50 avocado trees and 50 citrus trees.

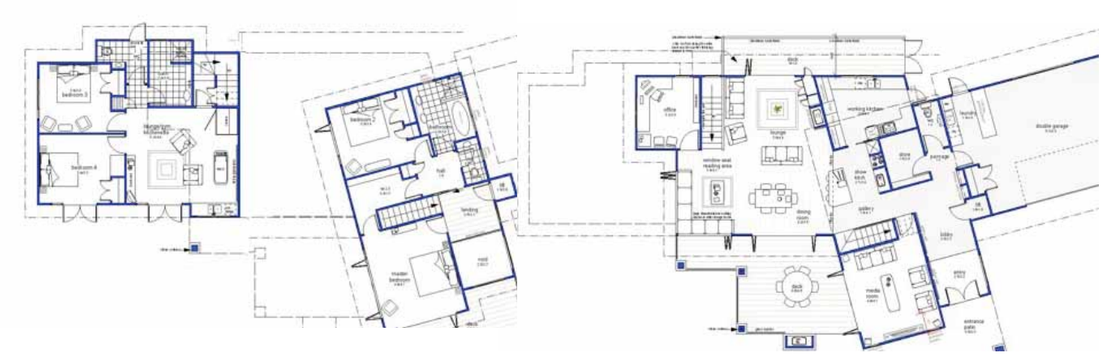
The building site slopes gently to the North and the home designed, on three levels, to capture the maximum in sun and views. Part of the brief was to include a B & B as a future business opportunity. This occupies the lower level and is completely self contained offering privacy to the occupants and the main household.

Melanie has a strong leaning towards design and had some very specific features designed into the home. On the interior a separate living space with a bar/kitchen for entertaining which is completely apart from the main kitchen to avoid noise and utilities becoming a distraction. A room set aside for TV viewing away from the main lounge area, an isolated office, plenty of storage and a generous garage with space to move around without feeling restricted. As breeders of Havanese dogs the home and surroundings also has some unique design features to accommodate and control the canine members of the family.

On the exterior the building layout had to provide for privacy from every aspect including the decks and outdoor patios to each level. Particular attention was given to the shelter provided by the eaves that are 1000 to 1200 mm and specially engineered and all feature V-groove linings.

Andre Laurent acknowledges that the owners had done considerable work in designing the various components and requirements.

BASEMENT UPPER LEVEL GROUND LEVEL



Their brief was well thought out and detailed. Our role was to add value to the concept and make the various features work in both design and structure.

"At the time of designing and planning, and today', says Andre, "this home is well ahead of its time. It was one of the first homes in New Zealand to utilise an excavated tube solar water heating system from Switzerland. The home has many design features such as gas and log fire options, decks that are free draining to the exterior to eliminate weather tightness issues, generous eaves, sunshield louvred roof, Schist columns and fireplace and custom balustrades."

Lyn and Melanie also wanted to be sure the design would be "future proof" in terms of technology. While many of the options are not utilised the entire home is wired for sound systems and broadband access to every room. Even the driveway to the gate has been wired to accommodate surveillance cameras in the future.

As part of the future design plan a lift cavity has been incorporated making installation in the future a simple and cost effective process.

Particular attention was given to the lighting allowing many alternatives to the exterior lights from the drive to the home in both intensity and colour.

The home takes full advantage of the location and the views with large glazed areas and folding doors that open onto outdoor living areas. The the main outdoor entertainment area features gas fired heating and a sunshield roof which effectively makes it an extension of the lounge and provides a superb dinning option.

While a Bed and Breakfast was the original intention in the design of the lower level this has never been used and would be ideally suited, if circumstances change, to a granny flat or to accommodate extended family members.

The home is 346 square meters and the overall concept has been to simplify daily living, enjoy the environment and be as maintenance free as possible. The roofing chosen for this purpose was Steel & Tube's Plumbdek® in ZINCALUME® and the cladding in COLORSTEEL® Endura™ with accents of linea board and stone in natural colours to blend with the environment.

From both the design and living aspect this home has proven to be a pleasure to live in: Cool in summer, warm in winter, light, bright and makes the most of the site, technology available and the views.

Creative Space

Our mission at Creative Space Architectural Design Ltd is to provide fresh and innovative architecture that complements the way you live, function and work. We believe that every site and lifestyle is different and this requires unique and individual ideas to fully unlock the potential that suits our clients.

We know that successful architecture creates function, value and equity and because of this we strive to achieve the perfect solution every time.

Our in-house building and project management experience is an essential factor in ensuring that our design is practical and achievable. We have designed, specified and built/project-managed many homes with excellent results.

Client: Lyn McLean & Melanie Wakeman
0220 856603
brulyn2@kinect.co.nz
www.bayleys.co.nz/2831659

Creative Space Architectural Solutions,Tauranga
Andre Laurent
Telephone: 07 543 3030
studio@creativespace.co.nz
www.creativespace.co.nz

Builder Matt Walker of Waihi
Telephone07 8636305
Mobile: 021 438 758
matt.donna@xtra.co.nz

Roofing & Cladding manufacturer:
Steel & Tube Roofing,Tauranga
Telephone: 07 578 1089
Roofing: Plumbdek®
Cladding COLORSTEEL® Endura™

Roofing and cladding installation:
Waihi Plumbers
Telephone: 07 863 7153

Glazing: Elite windows and doors
Coromandel
Telephone: 07 865 8919

Electrical: Paul Wilson
Telephone: 029 575 0894

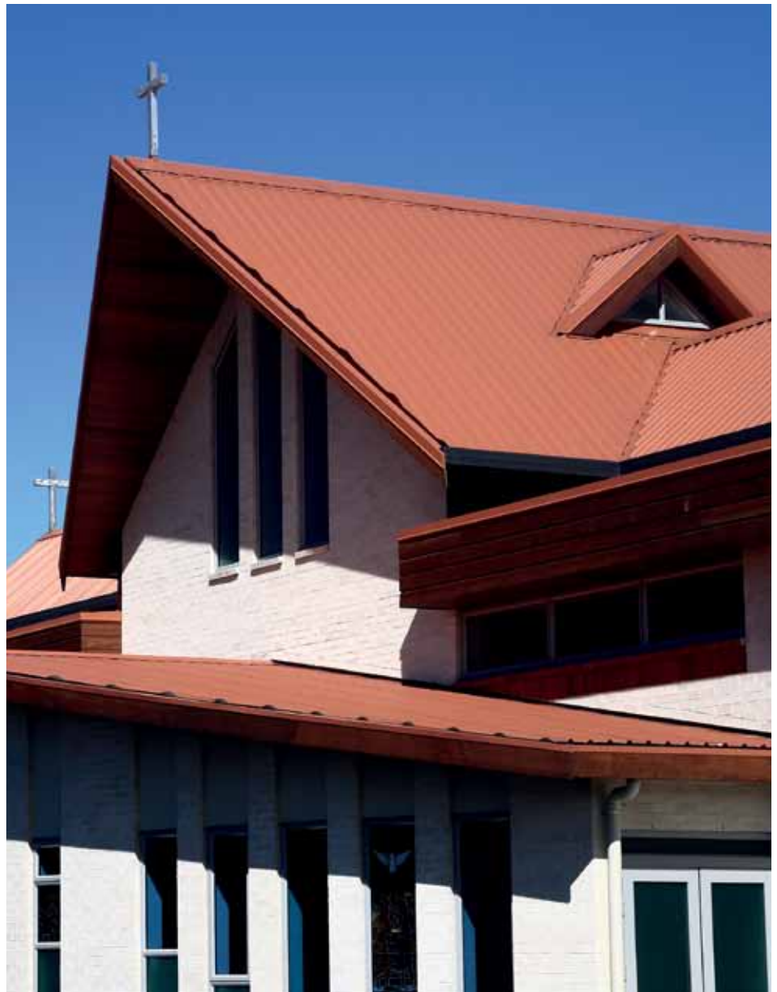
Kitchen: Mastercraft Tauranga
Telephone: 07 578 9641

ST PATRICK'S CHURCH, PUKEKOHE

Alison Brown

Blending the new with the old was an essential aspect of the project architect Jann Hurley undertook in designing Pukekohe's new church complex.

Blending the new structure's steep-pitched roof with that of the existing low-pitched church hall and the linking foyer was a major challenge. The result is a well-proportioned terrace of roof planes, capping four distinct spaces. Observers on the roadside are left in no doubt that they are looking at a church, which is both spectacular and unpretentious.



From the start of the project, the church building committee consulted thoroughly with the parish of St Patrick's Catholic Church. With a history dating back to 1866, it's little wonder parishioners were adamant their new church and parish centre would present an uplifting and inspirational atmosphere, while maintaining continuity between the old and the new.

While it was accepted that parishioners would find many features in the new complex were neither familiar nor traditional, it was also agreed that they should feel at home as soon as they moved from their old building into the new.

To be both comforting and comfortable, echoes of the past were created by using the cross, altar, tabernacle and Stations of the Cross from the original church and by opting for pews for the seating, to keep a more traditional feel and make use of the visual warmth of the timber material.

Adding to the sense of homeliness the kitchen and ablutions areas were kept in the same location with the refurbishment of the existing hall.

While plans for the new church buildings evolved over more than a decade, several aspects remained constant. Importantly, parishioners wanted an airy, cathedral-like spaciousness, with height through the centre aisle to focus on the altar.

Jann Hurley's goal was to create a refreshing, empowering ambiance

that would enthuse parishioners to carry the Word of God out to the world. She felt the building must be familiar and welcoming, avoiding any semblance of ostentation. She used light and curvature of the walls to move people through a 'welcoming pool of light', from the port-cochère, where passengers are able to alight under cover, through the foyer and to the main axis of the church.

Light is an important feature of the complex. Windows located high on the walls, delineated by a soldier course placed just under the roofline, ensure the congregation's view is focused on the altar, not on what might be going on in the carpark, while these windows, together with a skilfully located skylight, create a naturally well-lit interior. Jann considers the placement of the windows has made the interior even lighter than she'd expected and feels this achieves her clients' requirements.

Linking the existing hall with the new building, the foyer has been designed to accommodate additional seating for large church services and also to meet the parish's wish to see the area used as a space of interaction before and after services, for cups of tea and chat.

Her brief covered not only the design, functionality and accessibility of the interior - the foyer, linking church and hall; the sacred space; the service areas; and the overall artistic aspects, but also Jann had an eye on how the outside of the complex would impact on the area.

She used red brick for the soldier course and red in the roof colour to visually tie the red-bricked walls of the hall, and the new church and the adjoining Historic Trust-preserved presbytery into one complex.

However, for the passer-by, it's the remarkable juxtaposition of the roof planes that catches the eye.

Mike Lieshout and his team from Pukekohe Builders Ltd. were responsible for interpreting Jann's design and constructing the complex. The roofing was in the hands of Anthony Stoppard of A

regard to E2, the building code clause covering external moisture."

Always an issue when working on any roof, safety concern is increasingly important as the pitch steepens.

"We used looped safety mesh and wore safety harnesses," noted Anthony, "but most of all, we used our brains. Commonsense is an essential ingredient in the roofing industry."

The logistics involved were challenging: not only did the roofers have to make sure hi-reach equipment was on hand to get the long run COLORSTEEL® up to the roofing framework, but Anthony also had to ensure product to the

Stoppard Roofing, contracted to Franklin Long Roofing, specialists in the supply and manufacture COLORSTEEL® roofing products.

For Anthony, working around the other tradesmen meant his team of six were juggling tasks to complete jobs in line with deadline-driven builders and where they next needed to work. In some instances Anthony's men had to reverse the normal procedure, laying the flashing before the roofing iron, to fit in with the other tradesmen.

"We were constantly challenged to think outside the square," said Anthony, "while also working within compliance codes, with particular

precise measurements would be available when needed at Franklin Long Roofing. "We weren't their only customer and couldn't take the supply for granted. We had to work in closely with the builders

and progressively order our requirements as we needed the product."

The high standard of the masonry and timber workmanship in the

building is impressive. Materials selected were common domestic materials, used on a grander scale.

Construction spanned just over a year and included refurbishing the hall and then creating the foyer linking the old with the new. While experienced in steep roofed construction, having re-developed Waiuku's A-Framed St Andrews Church, Mike Lieshout said St Patrick's had the added tricky challenge of requiring Swiss gables.

Commenting on the interior's spacious airiness he likened the roof to a halo, a separate structure floating above the band of windows, believing this feature brings an added spiritual element to this sacred space.

Back on the ground, though, dealing with variable roof lines while standardising floor levels was critical. "Tying the separate structures back in was definitely challenging," he conceded. "When you remember the presbytery is a listed building under the Historic Places Trust, while the church itself is brand new, blending the complex to look right has been an achievement we're all proud of.

"St Patrick's is unmistakably a church."

Jann Hurley Architect

After graduating from the Auckland University School of Architecture with a Bachelor of Architecture with honours Jann Hurley Architect was established in 1993 in Ponsonby and 6 years later relocated to Pukekohe.

During this period of growth, her company specialised in residential design, while also working on a number of civic projects covering a variety of designs including schools, churches, marae and other community-type groups.

Recently Jann has expanded her team to include a graduate architect and technician, each with more than ten years experience.

From the beginning, Jann has sought to set her company apart from other firms by being as customer focused as possible. Listening to her clients and producing a high standard of construction documentation to reduce downtime, has helped her to realise her vision of a business that offers friendly, professional service as she collaborates with both builders and clients as a team.

Jann Hurley Architect
Pukekohe.
Telephone; 09 238 9459
Email: enquiries@hurleyarchitect.co.nz
www.jannhurleyarchitect.co.nz

Builder: Pukekohe Builders
Mike Lieshout
Telephone: 09 238 7758

Roofing Manufacturer:
Franklin Longrun Roofing
Pukekohe
Telephone: 09 238 9249
email: warren@franklinroofing.co.nz
www.franklinroofing.co.nz
Roofing profile; Styleline
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COLORSTEEL® Endura™
Colour: Terracotta

Roofing Installer:
Stoppard Roofing
Anthony Stoppard
Bombay
Telephone: 09 236 0045
Mobile: 021 484 039
Email: astoppardroofing@xtra.co.nz
www.astoppardroofing.co.nz

WAIHOHONU HUT TONGARIRO NATIONAL PARK

By Graham Hepburn

Wellington firm Pynenburg and Collins Architects has designed about 70 tramping huts for the Department of Conservation (DoC) in the past 11 years.
And in that time they have created a manual for huts that accommodate up to 40 people, including standard designs for two-bunk, four-bunk, six-bunk, 10-bunk and 12-bunk huts.
"Our hut manual has the procurement process, design information for challenging environments such as alpine and coastal, drawing and specification details, means of compliance and how to build it," says Ron Pynenburg. "It says this is what it will be built of and these are the facilities it will have."

But the Waihohonu Hut, on the Central Plateau, like other larger huts being built along this country's designated "Great Walks", and other popular tramping areas has unique, site-specific features.

Because it is more aimed at families and tourists – rather than hardcore back country trampers – it includes a few more comforts, and the design is also site-specific.

"We wanted to get a view out of the living spaces of Ngauruhoe and Ruapehu so that's why the building is a boomerang shape," says Ron. "The two mountains are the key focus for that hut so it really needed to relate to them. We plotted the mountains into our CAD machine so we could stand inside the hut and know that we could see the mountains.

Picture windows in the living area afford those mountains views, and there are also decks outside where trampers can enjoy the scenery, something that is not normally a feature of older huts.

"With our huts we don't want them to be just a place to stop at night," says Ron. "They are a key part of the tramping experience because of the way we have linked them to the location. The larger huts should inherently have a sense of place so that if you see them or you are in them, you know where you are."
The hut is also oriented to gain maximum warming from the sun, keeping it warm and dry but also making it a light, bright and pleasant environment that visitors will tend to look after more.

Waihohonu is also quite large, with 28 bunks as well as staff quarters and roomy communal spaces.
Ron says a hut above the bushline such as Waihohonu would normally have robust metal cladding and roofing because it can withstand the elements with little maintenance, thus reducing DoC's costs. But on this job some ply and batten cladding was introduced for aesthetic reasons and because DoC staff can easily access the site to maintain the timber.

"Because of the size of the hut we wanted to break down the bulk of it so we used a mixture of metal cladding and ply and batten," he says.

The building is designed for higher than normal windloads and snowloads and is stepped along the contour of the site not only to keep it out of the weather but also to tuck it into the landscape for aesthetic reasons. The roofing and cladding colours – Ironsand and Lichen respectively – were chosen to help blend the building in with its surroundings.

Initially Colorcote® ZMX™ was not specified however Roofing Industries firmly believed this was the right roof cladding in a harsh environment known for potential Geothermal activities. By analysing and estimating alternative products Roofing Industries were able to demonstrate that a lower roofing cost did not offer the same long term protection and economy as Colorcote® ZMX™.

Terry Slee, DoC's project manager on the job, says the decision to clad and roof with Colorcote® ZMX™ – which is typically used in corrosive environments such as Rotorua - was based more on its longevity than any worries about damage from sulphur fumes.

"Long-term that product offers lower costs and that's why we chose it because sulphur's not a problem in that part of the park unless you get an eruption and the fallout from it."

Terry says the hut, which is on the Tongariro Northern Circuit at an altitude of about 1100m, replaces the nearby 1970s Lockwood-style hut, which was having issues with ground movement. It had been strengthened about 10 years ago to give it a new lease of life but the decision had been made to build a new hut, in line with the policy of gradually upgrading all the Great Walks huts.

He says sustainable features such as passive solar design, beefed-up insulation and double glazing were important to incorporate as they not

only make the hut more comfortable but cut the amount of fuel needed to keep the hut warm. And that's important when all your supplies – including firewood – have to be helicoptered in.

A woodburner with a wetback warms the hut and provides back-up to the solar hot water. The hut also has solar panels on the roof and a battery bank and inverter to power essentials such as lighting.
The hut has two lobbies where wet tramping gear can be hung to keep moisture out of the communal areas and bunk rooms. Ron says vents in the gable ends act as a powerless ventilation system by creating a stacking effect that means moist air is moved out of the hut.
All the features incorporated in Waihohonu add up to make for a much more enjoyable stay. And Ron, more than anyone, knows how huts can contribute to the tramping experience. He has been tramping around New Zealand for 35 years, and takes great pleasure in his work for DoC.

"I'm a tramper from way back and I'm more than happy to be putting something back in."

Pynenburg & Collins Architects
This practice is led by three directors/ principals in registered architects Ron Pynenburg, Ken Collins and Tim Burns, who are supported by a team of architects, technicians and interior designers. With extensive experience and knowledge in design, documentation and construction, Pynenburg & Collins aims to deliver a first class built environment by working with their clients as a team.

Architect: Pynenburg & Collins Architects,
Telephone: 04 473 7577

Engineer: Mike Cathie,
CHP Consulting,
Telephone: 04 384 9591

Builder:
Miles Helberg,
Forest Hills Construction,
Telephone: 06 328 4525

Roofing contractor: APV Plumbing,
Palmerston North,
Telephone: 06 326 9342

Roofing supplier:
Roofing Industries,
Palmerston North,
Telephone: 06 353 8480

Roofing: ColorCote ®ZMX.™
Roofing Profile:
Roofing Industries Corrugate
Roofing colour: Ironsand

Cladding Profile:
Roofing Industries Corrugate
Cladding colour: Lichen

Solar panel 1 March 2012 Solar waters heaters – NZMRM's preferred installation methods

Stuart Hayman.
NZMRM Technical committee

Introduction

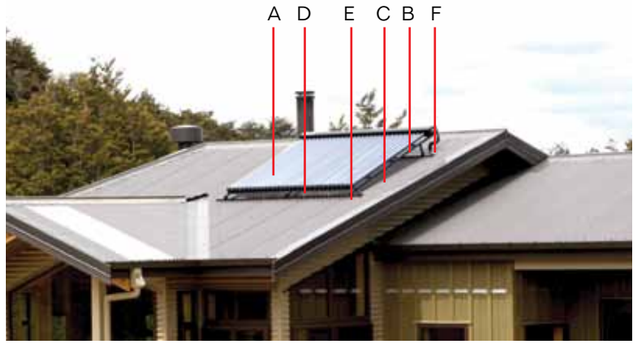
Solar water heaters are an increasingly popular way of "getting something for nothing" from nature, and if you ignore the purchase and installation costs, you do indeed reduce your water heating bills significantly. By how much depends on how the panels are oriented. Unfortunately, incorrect installation can result in damage to your roof, leaking into the house, and durability failure. Since even optimal installations still have around a 20-year payback, getting any of this wrong rather nullifies any benefits of the system. If your roof corrodes out in 10-15 years the cost of replacement of even part of it will outweigh the savings of your cheaper hot water.

Now all of this is reasonably well-known (although looking at the number of bad installations, not as well-known as it should be) and DBH have provided installation methods in G12/AS2 (2007) and the Guideline Document (2009), and BRANZ have covered this topic in Build 115 (2009/2010) and a thorough investigative report SR 184(2007).

None of these really address the specific concerns NZMRM have for installation onto metal roofs and particularly longrun metal roofs. What we have said several times is that roof damage resulting from incorrect installation will not be covered by the manufacturer's warranty. A recent installation on a new DOC hut deep in the back blocks of the North Island looks like it could have many good installation features. We have not been able to inspect the details of this rather palatial-looking hut's installation, but since a good installation would look quite like this, we have chosen to use this example to illustrate key features of a "metal-roof-friendly" installation. Most of these comments apply equally to photo-voltaic solar electricity generators that come in panels.

Key factors for protection of the roof

- Type and weight of installation
- Ability for roof underneath to be washed by rain or manually
- Support of panels by roof support structure, not by the roof cladding
- Method of support of weight
- Correctly made penetrations for support and pipes and for efficiency and durability of the installation
- Orientation to the sun
- Correct insulation of pipes



Discussion

A – type – evacuated tube type – cylinder inside – relatively light weight

B – supported off roof to enable limited nonroof orientation

C – clearance to allow rain and manual washing

D – rail supports not point

E – roof penetration of mounting

F – water pipe penetration - insulated

Solar panel article Page 2 March 2012

A – type and weight

This appears to be an evacuated tube collector with a small header tank and the cylinder inside the building. This is a lighter weight system and the individual tubes will allow some rain washing of the roof underneath. This is a good choice from our perspective. PV panels weigh even less and present no weight issues.

B and D - support

The weight of the collector should be supported by the roof support structure, not just by being fixed to the roof cladding itself. The method of screwing willy-niily a bracket into the roof, supporting one-quarter of the weight (a leg at each corner) can damage the roof cladding in several ways – corrosion, denting allowing water ponding, and interference with movement.

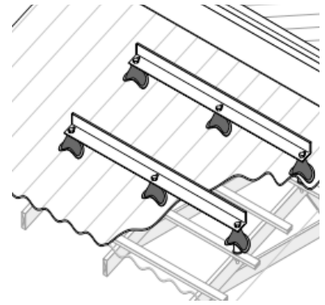
We want to see that the support goes through the roof cladding into a purlin,or purlin/rafter, which can take the weight of a collector panel provided the cylinder is inside the building or separately supported from underneath.

If the collector just has leg at each corner it may well not coincide with the structure members underneath. For this reason the support rail is preferred, as shown in G12/AS2 etc.

This allows the support bolts/ screws to be mounted over the support members underneath the roof. It also allows the rear of the panel to be elevated to provide better orientation. This is particularly important for pv panels.
Mounting the panel from support rails allows more easily the 100mm minimum washing clearance required by NZMRM between the roof and the panel.

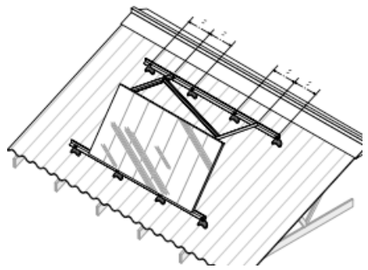
Rails and supporting members must be made of materials / finishes of good durability, but which will be compatible with the roof. For most metal roofs this means hot dip galvanised or zinc coated and painted.

From G12/AS2



C - Raising the panel at the rear, as well as providing almost certainly better orientation (see later) to the sun, allows much better access for rain-washing and if the panel is raised by 100 mm at the front and more at the rear may remove the need for manual washing altogether. This requires the rail to be fixed at a minimum of four points front and rear.

From G12/AS2



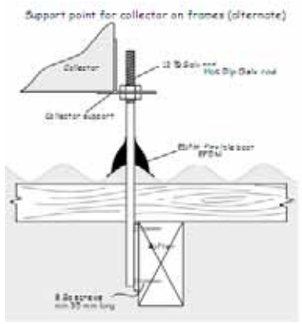
E – Method of support fixing and penetration

As mentioned above, the fixing should be into the purlin, or the side of the rafter.
G12/AS2 suggests several methods for this, of which this is one, which also shows the use of a boot flashing on the crest of the roof cladding, so that the support bolt/stud is securely fixed and its penetration of the roof cladding is water-tight.

Metal tiles use small section battens and supports should always be fastened to the rafters not just to the battens.

Obviously any panel raised above the roof, and particularly if at an angle requires to be attached well enough to resist local wind forces.

PV panels weigh less and could be supported from a purlin.
Solar panel article Page 3 March 2012

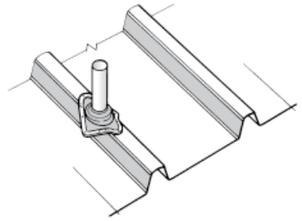


F – Water pipe penetration

Penetration of pipes through all types of roofs, when installed after the roof, is typically the point at which common sense and respect for other people's work seems to be abandoned. Penetrations for water pipes for solar water heaters (or electric cables for pv panels) is a good example of how rushed or plain inadequate workmanship can create problems later (in some cases, not much later).
BRANZ report SR184 of 2007 surveyed a number of solar water heater installations and found not a few examples of bad workmanship, including this aspect.

The method of putting a pipe or cable through a metal roof is well documented in E2/AS1, the NZMRM COP and elsewhere. While large pipes and ducts are not quite so simple, the small diameter pipes and cables required here are very simple.

This diagram from the COP is it. A synthetic rubber boot flashing (EPDM) containing no more than 15% carbon black, mounted on the crest of the roofing and diagonally to the roof, with some sealant under it.



Drawing 6.3.A MRM

For solar panels one or possibly two pipes would seem to be the maximum required in one area, so the practice of forcing a number of pipes through one hole, with liberal silicon sealant, is unnecessary. Two other factors that can ruin even a good penetration quite quickly are corrosion and insulation.

The BRANZ report shows a number of examples of how not to do it. Many of the pipes used for these applications are copper. Copper runoff onto a metal roof (unless it is also copper) is not allowed by any legislation or by NZMRM. Since this contains hot water it is normal to insulate the pipe from the collector to the penetration. This is commonly done with a closed-cell foam sleeve. This protects the roof from run-off because the pipe is not exposed to the rain. Unfortunately most of these insulating materials are subject to quite rapid UV degradation, and when this occurs the insulation is lost and the copper run-off can occur. Since it is always black the heat gained assists the degradation process.

BRANZ recommends that the insulation should be painted with compatible paint of the same colour as the roof to avoid both problems. So, provided you do all of these things, which are not actually more expensive or difficult than doing the installation incorrectly, you should have a solar collector which functions well, does not blow away in the wind and does not damage the roof cladding – which is usually more expensive then the solar collector. Such an installation would look pretty much like that on the DOC hut. Let's hope theirs actually has all these features as well as looking like it.

However there is one non-roof related feature to think about –

Orientation

Both G12/AS2 and the Guidance Document provide tables showing the effect on efficiency of solar gain from orientation vertically and horizontally. Interestingly they are not identical, and the GD table shows 10° steps not the 20° of G12/AS2. What both of these show clearly is that 95-100% efficiency is only gained by a very tight band of orientation in both horizontal (inclination) and orientation (angle towards due North). Efficiency of as little as 45% can be the result of getting these both wrong. Since the payback for installation depends heavily on efficiency, surely this is of key importance? And yet, almost without exception, a panel just following the roof orientation and inclination will have much less than optimum performance. The correct inclination mean for NZ is 40° and orientation due geographic North (which differs from magnetic by about 23°). What chance is there of the roof panel achieving these? Probably very little on a typical house. What the tables
Solar panel article Page 4 March 2012 do suggest is that within a band of "about North" the inclination is more important than orientation.

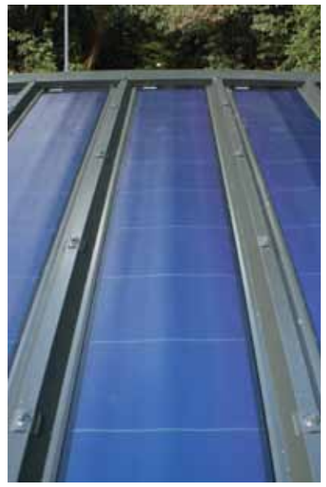
The raised rear type of panel above, and preferred by NZMRM offers the opportunity of getting this right, or more right and even of adjusting the inclination during the year. It doesn't look as if the DOC hut panels are at 40° does it? Maybe they could be altered.

Final thought

Why aren't solar panels mounted on the ground on adjustable stands? No weight in the roof, thermo-siphon movement of hot water, no leaking and perfect orientation.

DUMPLING HUT PROVIDES POWER IN THE WILDERNESS

Milford sound is one of the most popular tramping destinations in New Zealand but the remote location brings with it a number of problems, not the least of which is power. Calder Stewart Roofing, Tansley Electrical and PCC donated materials and man power to provide a self sustaining solar powered system for lighting and radio transmission.
At the heart of the system is Solar-Rib®



In late 2008, Calder Stewart Roofing, a privately owned New Zealand company, launched a new state of the art roofing profile called Solar-Rib®. This product features the use of a unique photo voltaic laminate, which produces continuous electrical power from the sun. What makes this product unique is its ability to be installed into ordinary roofing situations without the need of any additional foundational support, making it a first in the industry. Solar-Rib® roofing and its laminate technology are set to become a common addition to new and remodelled buildings across New Zealand. Solar-Rib® is ideally suited for remote locations and powers the lighting system here at Dumpling Hut. Solar-Rib® takes advantage of a wide variety of lighting conditions, producing 50 watts peak per m2 whether it's fine, sunny, cloudy or raining. Twenty square metres of laminate can produce over 4KWh of electricity per day. This energy can be used locally (as it is at Dumpling Hut) or in other situations be fed directly back into the main power grid to be made available for wider use.

Dumpling Hut with its original iron corrugated roof prior to installation of Solar-Rib®.

With support from the Department of Conservation, the re-roofing of Dumpling Hut, with the new Solar-Rib® profile, commenced on Monday the 15th March 2010 and was completed and operational for the opening, by the Conservation Minister Kate Wilkinson and Invercargill Member of Parliament Eric Roy, on Friday the 19th March 2010.

The time frame was critical, and given the various constraints the project had, organising the logistics and materials to site was no simple task.

"All the flashings were pre cut and all materials and tools were air freighted to Milford Sound airstrip." says Tony Frew, Project manager for CS Roofing Southland. "Purpose made clamps, secured to strops, were attached to a helicopter that made three 20 minute trips into Dumpling Hut."

Together with a team from DOC work began on a Monday however work on the hut was restricted by the coming and going of trampers using the hut. Nothing could be done until the hut was cleared after breakfast and had to stop as trampers arrived back at around 5.30pm.

Conservation Minister Kate Wilkins on inspects the Solar-Rib® installation with Calder Stewart Roofing's Mike Tou.

"One of the issues that had to be tested prior to installation was unique to the location. Keas. It was unknown to what extent Keas, with their inquisitive (and destructive) nature, would present a problem with the Photovoltaic panels. A test rig was organised at Mintaro Hut prior to going on site and fortunately this proved successful. Not an issue our northerly counterparts have to worry about!" says Keith Ivey, Managing Director CS Roofing.

Kea have been responsible for short circuiting and even destroying power supplies in remote locations, but the Solar Rib® design and robust ColorCote® roof foiled all attempts by the parrots to undermine it.

"Overall the team did very well despite one wet day and time constraints the project was completed and up and running on the 19th March as scheduled for the official inspection."

Pacific Coil Coaters

ColorCote® by Pacific Coilcoaters Ltd has been one of New Zealand's leading brands of pre-painted roofing and cladding products for more than 30 years. PCC is proud both to have donated the original coil roofing material for Dumpling Hut (a stop on one of the greatest walking tracks in New Zealand) and to have been associated with Calder Stewart Roofing Ltd and their new Solar-Rib®" roofing profile. We see it as a model for "The Roof of the Future" - and look forward to its wider use, providing environmental protection and sustainable energy for some of New Zealand's harshest climates.

Solar-Rib® promises to provide continuous freely available energy for years to come.

Tansley Electrical

Tansley Electrical donated the Solar Powered Lighting installation at Dumpling Hut, Milford Sound. The installation consisted of the following equipment:

4 x 68 watt 12 volt Solar panels
1 x Sunlight controller
2 x 6 volt 375 Ah Batteries
7 x 12 volt 13 watt Fluorescent Lights

The sunlight solar lighting controller connects the solar panels, batteries and light fittings.

The controller uses the solar panels to charge the standby battery pack and also detects sunrise and sunset to determine when the light fittings are to be switched on and off. Tansley Electrical offers a comprehensive design and build service to accommodate all solar power installations from stand alone packages to grid connection options. It is also committed to working towards a future where we can all live in a healthy and sustainable environment.

Calder Stewart Solar Rib®

Calder Stewart's Solar Rib® negates many of the problems sometimes associated with solar panels. There are no roof attachments to cause problems and there is no penetration of the roofing material. Because the voltaic Laminate is adhered directly to the roof panels it presents a water tight seal that eliminates moisture and the creation of potential unwashed areas. Each panel runs from the ridge down the roof, with no joints, and the electrical connection is from the top of each panel and is fitted under the ridge capping without penetrating the roof cladding.

Solar-Rib® with its clean bold lines, strong looks and wide pans also has excellent spanning capabilities. High tensile strength G550 x 0.55mm in ZINCALUME™ or pre-painted steel can be roll-formed to the Solar Rib profile. The profile is also available in Aluminium but when using, or intending to use photo-voltaic panels (PVL's), it is recommended to only use a steel based material with a PVF2 paint system. Calder Stewart Roofing Ltd recommend the colour Grey Friars as this is the closest match to the colour of the PVL's. Solar-Rib® has been independently tested to AS4040 and being an asymmetric trapezoidal profile, with a very high water carrying capacity, is capable of being used down to 3 degrees in roof pitch. Where PVL's are installed the purlin spacing's will need to be closed up.

For complete information and specifications it is recommended you visit the Calder Stewart website and download the Solar Rib® specification sheet.

The team involved in the re-roof project and installation of the new Solar-Rib® roofing at Dumpling Hut. From Left Right Steve Donaldson Tansley Electrical, Keith Ivey C S Roofing Southland Ltd, Conservation Minister Kate Wilkins, MP Eric Roy, Calder Stewart Roofing's Mike Tou.

Client: Department of Conservation

Steel provider:
Pacific Coilcoaters Ltd.
ColorCote® ZRX™ pre-painted roof panels
Telephone: 09 579 9199
www.colorcote.co.nz

Roofing Installation:
CS Roofing Southland
Telephone: 03 218 4394
keith@csroofingsouthland.co.nz

Roofing manufacturer:
Calder Stewart Roofing, Invercargill
Sales & Marketing Manager:
Mike Tou
Profile: Solar Rib®
Telephone: 03 214 5544
0800 115 232
www.calderstewart.co.nz
mike.tou@calderstewart.co.nz

Solar Power installation:
Tansley Electrical (1993) Ltd, Dunedin
Steve Donaldson
Telephone: 03 455 1105
www.tansleyelectrical.co.nz

Arahina is one of Marton's grand buildings and it is also a place where many lives – young and old - have been shaped. Built in 1919 for Alfred Crooke, a retired lawyer and magistrate, Arahina was originally named Astolat after a legendary city mentioned in the tales of King Arthur.

In 1946, the two-storey Tudor-style residence was sold to the New Zealand Girl Guides Association, who renamed it Arahina, which, in Maori, means to lead or to guide.

ARAHINA RE ROOF PROJECT

By Graham Hepburn

For the Guides, Arahina was the culmination of a dream to have a dedicated national training centre for its leaders where they could learn about their role in the movement and share ideas. The size of the home was perfect for this and so was the central North Island location of Marton, a junction on bus and train routes that made it easier for leaders to come from all parts of the country.

In 2000, the Guides sold the property to a local private concern that then onsold it in 2001 to the Institute in Basic Life Principles, a Christian, not-for-profit, non-sectarian training and community service organisation. It is used as a national training centre for the institute's home education programme and as a national office for the institute's other ministries. The institute also delivered counselling and training to troubled youth, addicts or people with disabilities who were referred to it by government agencies. It is also used by the likes of businesses, Christian groups or sports groups for accommodation and functions. With all these different activities housed under one roof, it's important to have a sound roof so when the historic building's bituminised tile roof began to fail, planning began in earnest about how best to replace it in sympathy with the building's heritage.

As Arahina's operations manager, Gordon Strong, says: "The roof wasn't looking very attractive and we could see that something needed to be done before it developed any leaks and so forth." Wayne Pratt, who was working as a woodwork instructor at Arahina at the time, was designated as project manager for the re-roof and he began researching materials as well as the building's heritage.

The initial plan was to replace it with a similar product from the United States but that proved problematic. "A friend of mine and I did some pricing and it was going to be pretty expensive," says Wayne, " and at the time we couldn't get a team that was authorised to install it so there would be no guarantees on the product."

Gordon says the decision to go with metal roofing was based on it being the "most cost-effective and what would last the longest and the corrugated look is out of yesteryear".

While Arahina, as a complex, has grown over the years with a number of buildings added such as accommodation blocks and a large hall, the original homestead has nine bedrooms upstairs while the downstairs has three large offices, a commercial kitchen and a dining room that seats up to 90 people. When the re-roofing project began, heavy tarpaulins were put in place so that day-to-day activities could continue uninterrupted, which is just as well as the job was tackled during winter when wind, rain and frosts were an issue.

"The time of year that we were doing - it in June/July – and the pitch of the roof made it a little bit difficult, and safety was a paramount issue," says Wayne.

However, Wayne had plenty of labour on hand to help with demolition and the re-roof, calling on his students to help out. Normally, Wayne and his students were involved in the demolition of old homes so they could salvage timber such as rimu and matai, which they would then turn into furniture that they would sell.

Trainees, who normally stay until they are 17 before they are placed with guardians, were also involved in restoring the downstairs of the homestead to something approaching its original state. Some of Wayne's senior students helped out on the re-roof, which took about two months with weather interruptions.

Wayne says getting the roof colour right was also something they took very seriously. He says the Ironsand hue was similar to what had been there before and was in keeping with the colour of roofs of that era.

"We did a bit of research and that colour seemed to come up as the overall colour for grand residences, " he says. "My wife is a bit of a historian and that charcoal colour for roofing is one that she identified as being right."

Project Manager: Wayne Pratt, Telephone: 021 233 9344.

Builder: Neil Pepper Builder (now retired)

Roofing installer: Lance Berry Roofing, Telephone: 06 324 8887 or 0274 432450

Roofing supplier: Roofing Industries, Palmerston North, Telephone: 06 353 8480.

Roofing Manufacturer: Pacific CoilCoaters Rob Armstrong Architectural Manager Telephone: 09 571 1220Profile: ColorCote® ZR8™ 0.40 Colour: Ironsand www.colorcote.co.nz

NOISE ATTENUATION BY METAL ROOFS.

Stuart Hayman. March 2012

In October 2011 we updated you on the next stage of the noise through roofs technical project. The Acoustics Research Group of the University of Canterbury did some research for NZMRM to determine the attenuation of road traffic noise through various roof cladding materials and roof/ceiling installation systems used in New Zealand. The research was designed to provide a comparison between these various systems in order to determine the best and most cost-effective way to reduce the level of traffic noise entering the living spaces via roof/ceiling system.
This article describes this project in more detail and discusses the way in which the work was done and the outcomes. We have recently completed a technical summary of the results, which together with the full reports from the University are now available on the NZMRM website, www.metalroofing.org.nz

Introduction

The genesis of this work goes back to the Stonefields development in the Mount Wellington quarry in Auckland.

The quarry site is bounded on all sides by roads which take reasonably high levels of traffic (more now that the development is proceeding). One side the road is in close proximity to the housing, however in most of the quarry development the housing is further away from the through roads or well below road level.

Auckland City Council has a District Plan which requires noise levels in bedrooms to be no more than 35 dBA L10 between the hours of 10 pm and 7 am and no more than 45 dBA L10 in other rooms at any time. When Fletcher Residential were looking at building many of the houses in the Stonefields development they wanted to make sure they complied with the District Plan. For the houses most exposed to road noise, they engaged one of the principal NZ acoustic consultants to advise them.

An initial investigation report was produced in 2006, followed up in 2008 as building commenced. This report concluded that for the most exposed houses the 35 dBA level in the bedroom (generally of course the nearest rooms to the roof) could be met by:

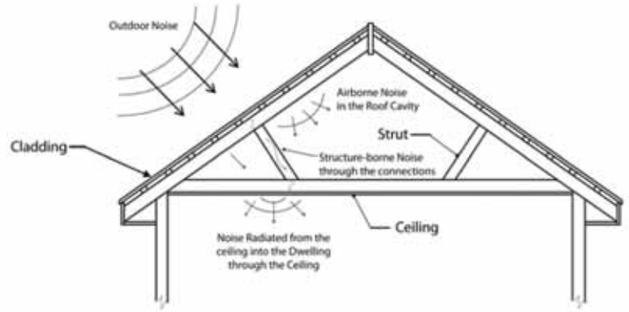
1. Long run metal roof cladding on 17.5 mm plywood with resiliently supported ceiling of 13 mm GIB Noiseline® and sound absorptive material of R1.8 in the cavity; or

2. Textured metal tiles on 17.5mm plywood with resiliently supported ceiling of 13mm GIB® Standard plasterboard and sound absorptive material of R1.8 in the cavity; or

3. Concrete tiles with resiliently supported ceiling of 13 mm GIB Noiseline® plasterboard and sound absorptive material of R1.8 in the cavity.

So, ignoring the minor idiosyncrasies that metal tiles can use a GIB® Standard plasterboard and the other two require GIB Noiseline® plasterboard, and that the plywood was not 17 or 18 but 17.5 mm, this was all bad news for metal roofing, and almost before we got onto it, we had some long run roofs fitted on plywood in Stonefields. Of course this adds significantly to the cost. There are questions about how to fix roofing to sarking properly and the effect on moisture transmission and ventilation, both of which are important and complicated by the use of ply.

Different acoustic experts were consulted. They noted that the report quoted very little actual on-site noise measurement. We "borrowed" a new house on one of the affected roads which had a metal tile roof and installed sound measurement equipment inside and outside, and monitored the external and internal noise levels over an entire day/night. The results showed that the outside noise



Transmission of outside noise through roof cladding (not structure paths)

from the road was indeed around the estimated level, but the level inside the bedroom was less than 35 dBA. This was enough to show Fletcher Residential that in this particular part of the development, we didn't need plywood under metal tiles, but it didn't resolve the wider issue and it wasn't long before we (NZMRM) received reports of jobs lost elsewhere to concrete tiles, because of this report. Houses elsewhere in Stonefields were built with plywood under metal roofing or used concrete tiles.

We consulted further with people involved in building noise control, and it became obvious that to resolve the issue authoritatively we were going to have to undertake some research ourselves. For several reasons we engaged the Acoustic Research Group at the University of Canterbury to do this work for us.

Research

The first step was to commission, with some funding from TechNZ, a literature survey of published work worldwide to see what else had been done and where. Our researcher at Canterbury discovered that while there has been a lot publication of intra-building noise control research, in fact very little work had been published globally about our specific interests, transmission of road noise through roofing. Existing publications suggested other factors affected noise in rooms – the transmission paths through the windows, for example. It also showed that increasing the ceiling insulation had been effective in reducing noise transmission through roofs. Some work had been done on reducing aircraft noise through roofs, which is a source directly above the roof, and we discovered that in several places, ceiling insulation had been mandatorily increased under flight paths, including in New Zealand.

From this we concluded that we would need to do the research ourselves. With further valuable support from TechNZ, we developed a programme with the University of Canterbury to investigate the noise attenuation properties of roofing installations using the three main roofing materials used in NZ, to see how attenuation could be improved by various means.

All the testing was carried out to international standards by a recognised authority and therefore these results can be relied upon.

Testing

Firstly we tested variants of the different roof claddings (various types and thicknesses of longrun roofing, painted and textured metal tiles, and concrete tiles with and without underlay).
From this we determined what did and did not have an impact, and whittled the products down to three basic types:

- Long run corrugate 0.4 mm (with underlay as is required) as representative of profiled metal roofing (longrun)
- Pressed Metal tiles, textured (with underlay as is required) as representative of pressed metal tiles
- Concrete tiles, with and without roof underlay (underlay is optional, but as you will see, important)

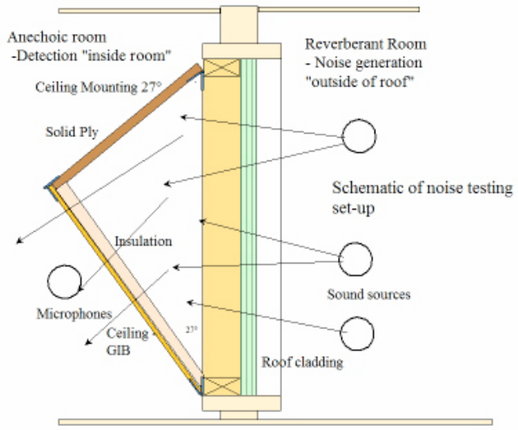
Then we took these three types and one variant and installed them in a standard roof installation, using the current H1 requirements for ceiling insulation (which is higher than the 2006 and 2008 reports referenced). Then we looked at the effect of the following variables (i.e. used when not normally used, or in increased quantities):

- Plywood sarking
- Roof underlay
- Batts
- GIB® plasterboard ceilings

The results were somewhat unexpected and very interesting, and have proved, amongst other things, that adding plywood decking under roofing is the not the most effective way of reducing roof transmission noise, and is very expensive.

Set-up

The test process looks only at the sound transmission through the different roof systems used, and makes no attempt to measure sound transmission through the road-facing wall of the building, or



Schematic of noise testing set-up

through the house structure. The method used was to create a 4.5 m wide x 2.4 m high hole in a solid concrete wall. This wall separates a "reverberation" room and a "semi-anechoic" room. (These two rooms simulate the typical external and internal conditions). The roof material is mounted over this hole and the

Roof structure under construction

Underside of "ceiling" from receiving room

Pink® Batts® on "ceiling"

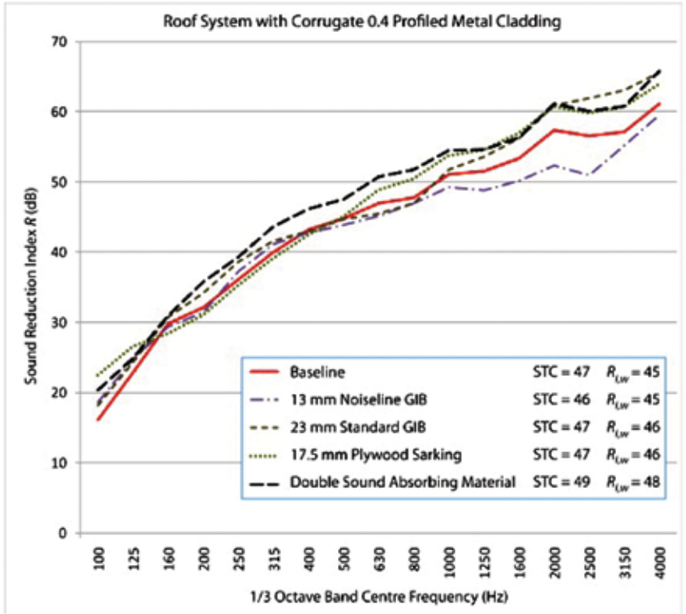
roof structure/ceiling is mounted in the room on one side. While this looks somewhat strange (the "roof" is vertical and the "ceiling" at the angle of roof pitch to vertical), it does simulate a roof/ceiling structure realistically.

A diffuse sound field was created on the cladding side of the roof using loudspeakers which generated pink noise. The sound intensity on the ceiling side was measured to determine the sound reduction index following the guidelines of the international standard, ISO 15186-1. The measurements were relatively quick, but the reconstruction of each set of roof structures takes much longer. So you might have a day's work setting up a roof and three hours doing the testing, then change the roof over again. The actual sequence of test structures was set so as to minimise the building work.

So, what were the results?

Of course there are a huge number of individual test results but each lot of testing has been illustrated

Example frequency distribution



Underlay installed

Concrete tiles from inside

Plywood sarking from inside

Metal tiles from inside

Underside of longrun roof from receiving room

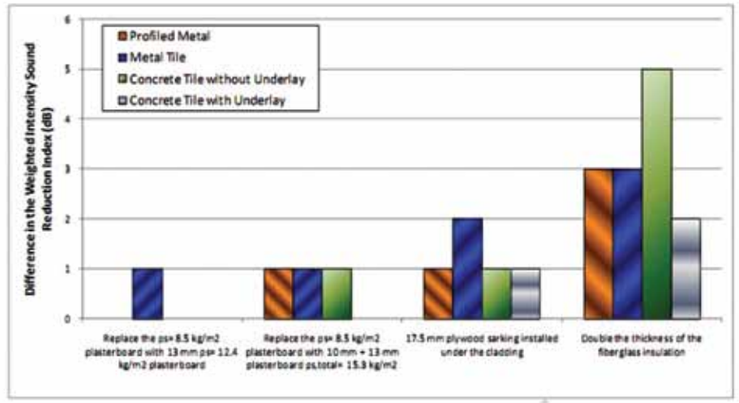
in several graphs, and these are presented in the Acoustic Research Group's reports on the NZMRM website.

These graphs show the sound reduction index for the various materials/installations at the 1/3rd octave frequency bands. The higher the lines are on the graph the better. The basic test method complies with ISO 15186-1:2000 which covers frequencies from 100 to 5000 Hz.

The roof structures have significantly higher noise attenuation than the roof claddings – as you might expect.

What you might expect is that the air-tightness of the longrun roofing would be effective in reducing higher frequency noise, and that metal tiles would be worse and concrete even worse. Concrete might be expected to reduce low frequency noise. Some of this is true, but the rest is not so obvious.

Example plot showing effect of different systems



The full technical report is finished, and is now on the website but here is a summary of the outcomes:

- Roof cladding materials alone (note metal roofing was always fitted with roof underlay (RU), as required by the NZBC, except where stated) :
- All the long run materials were similar with 0.4 mm corrugate slightly better.
- Painted and textured metal tiles were similar.
- Concrete tiles (no RU) were good up to 1000 Hz but significantly worst at higher frequencies.
- Concrete tiles (no RU) were worse than metal tiles (no RU) but when fitted with underlay both were improved to a similar level (i.e. the underlay has a significant effect on reducing high frequency noise.
- Plywood sarking on its own is similar to longrun but together the high frequency reduction is improved.

Roof cladding materials as above were installed over a 27° pitch roof cavity and a range of ceiling materials.

- The first thing to note is that all the installed roofs were significantly better than the roof cladding alone, and as we half-expected, adjusting the ceiling construction is more important than changing the roof cladding.
- The second thing is that all of the roof claddings have quite similar levels in each configuration – which means that the roof system installation is always more important than the actual cladding.

There are graphs for the effect of standard GIB® against Noiseline® against two layers of GIB® and standard bulk insulation against double the standard (note that the standard is much higher now than it was when the original report was written in 2006), and the effect of plywood sarking directly under the cladding.

Change of pitch to 45°

The original intention was to repeat a series of tests using a different roof pitch. This would have altered the reverberation in the roof cavity and changed the path for noise through the support members. A start was made on this, and showed that there was a change in the frequency distribution attributed to the different path, but this work was repeatedly interrupted by earthquakes and resources ran out.

Outcomes

- The best effect and the cheapest method to improve noise reduction,through the roof/ceiling system, is to double the amount of bulk insulation (which of course has the collateral benefit of improving the heat insulation of the house – none of the other methods improves anything except noise.) This has the maximum benefit on the worst cladding, concrete tiles without underlay.
- Then next is using plywood sarking under the roof cladding, which is probably the most expensive method and the one with other possible detriments. This is best for tiles with underlay.
- Double skin of GIB® plasterboard (10 mm standard plus 13 mm standard) has a similar effect to sarking except for the tiles.
- Using 13 mm GIB® Noiseline plasterboard improves the tiles with underlay.
- Changing the pitch of the roof may have an effect but this was not able to be fully investigated.

Summary

- Different roof claddings do have different noise attenuation properties for traffic noise, as suggested in the 2006 report, but not in the order suggested by the report and generated by computer simulation.
- Longrun roofing is best, presumably because of its airtight nature.
- Concrete tiles with no underlay are worst, presumably because of the large air gaps.
- Plywood does make an improvement but the most cost effective improvement with a desirable secondary benefit is the use of double bulk insulation. (Extra insulation is 30% of the cost of plywood sarking). All improvements to the roof/ceiling system are more important than the roof cladding itself.

Next steps: Field study

These studies do not include noise transmitted from the outside through the roof support members, or the soffit. Although our roof structures did have rafters and purlins, they are not connected to the external world. Field studies are being done elsewhere for completion.

Building Code

Clause G6 and its Acceptable Solution AS1 are among the oldest unamended sections of the Building Code, possibly because of disagreements on changes. During this testing programme, the DBH issued a draft of G6/AS1 for comment, which contained methods of dealing with three levels of external noise through various elements of the house, including the roof. This programme already allowed us to comment usefully on the draft and this whole study will assist in providing useful guidance via the Acceptable Solution method.

URBAN EXCELLENCE

Urban Residential Developments have been building high quality homes and alterations in the Waikato since 2004.

The owners of Urban Residential Developments are Daniel and Bronwyn Klinkenberg and they take pride in providing an exceptional combination of high quality workmanship and excellent customer service.

Prior to launching Urban Residential Developments Daniel was a Project Manager in the building of the Five-Star Sheraton Bora Bora Nui Resort in Tahiti, which is famous for its 120 luxury overwater bungalows and has been described as "the most exclusive luxury resort to open in French Polynesia in the past 40 years."

Daniel's project management experience, "eye for detail" and exacting standards has provided him with a unique skill set that flows through all aspects of his business, starting with his contractors who he personally selects.

Shaun Cooke from Cooke Roofing took personal responsibility for overseeing the installation of the Metrotile Shake Textured Charcoal roof on the Urban Residential Developments Serrano Show Home.

Shaun has been installing metal tiles for 16 years and is an expert craftsman. During this time he has progressed from being a labour only contractor, to owning his own contracting company and becoming a Metrotile Distributor.

In the last three years Shaun and Catherine Cooke have built Cooke Roofing into a highly successful roofing company and Shaun is highly regarded by his builder customer base. The quality of Shaun's workmanship shows through on the Serrano Show Home roof with the installation of the tiles, valleys, ridges and flashings being undertaken to a very high standard, in keeping with the quality expected by Daniel from all his contractors.

However the Metrotile Shake Charcoal roof is only one of the features that make the Serrano Show Home special. The contrasting weatherboard cladding and stonework complement the contemporary colonial design of the house and provide it with exceptional style and visual appeal.

The Serrano's grand entrance way draws you into a welcoming open plan house with plenty of space, a designer kitchen and luxurious resort-style bathroom and bedrooms.

The mix of classic and modern designs have been brought together to create a home that has the highest quality decor, function and comfort and a timeless elegance.

Daniel's high standards have also been recognized by his peers. In their second year they entered the very competitive Masters Builders House of the Year Awards receiving a Gold Award, a Category Award and a Supreme Award.

The key to Daniel's success lies in the quality of his team and their shared desire to be the best at everything they do starting with the quality of their service and communication.

Client: Urban Residential Developments

Architectural design:
Urban Residential Developments
Contact: Daniel Klinkenberg

Builder: Urban Residential Developments Ltd
Contact: Daniel Klinkenberg
Telephone: 07 839 5570 or 027 539 7005
www.urbanrd.co.nz
E-Mail: daniel@urbanrd.co.nz

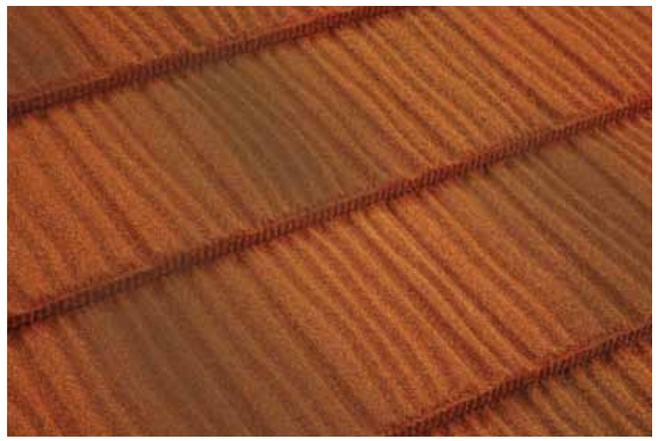
Show Home:
1 Bramber Street,
Eton Estate,River Road North,
Hamilton
Telephone: 07 839 5570

Roofing Manufacturer:
Metrotile
Telephone: (09) 297 2125
www.metrotile.com

Product: Metrotile Shake
Finish: Textured
Colour: Charcoal

Roofing Installation:
Cooke Roofing
Contact: Shaun Cooke
Telephone: 027 471 9543
E-mail: cookeroofing@clear.net.nz

A CHARITABLE RE-ROOF FROM EDWARDS & HARDY AND METROTILE



A 20 year, on-going relationship with Housing New Zealand involves Edwards & Hardy Auckland in a commitment to engage with the community.

So when the badly leaking decramastic roof on Mangere's Mataatua Marae needed to be replaced this year, it was a good opportunity to empower the mainly elderly volunteers - many of whom work extraordinary hours to maintain the facilities on the marae - to start planning for its 30th anniversary. General Manager of Edwards & Hardy, Tony Thorn had the task of informing them that the 30 year old roof had to go but he'd already devised a plan to involve industry partners in the ideal project to fulfil the company's social contract with HNZ.

The marae in Killington Crescent, Mangere is owned by Rangitahi Te Anga Waikato.

Tony approached Metrotile New Zealand Ltd and Mitre 10 Glenfield in what has been the most satisfying project of 2011. With the marae safely scaffolded employees from Edwards & Hardy dedicated a week in June to transforming it - stripping off the old roof and battens, replacing the valley boards, inserting building paper, new battens and then Metrotile's Shake Textured Ember tiles, along with various custom made flashings required to complete the reroof.

With Metrotile and Mitre 10 on board with materials the installation was performed pro bono, reducing the cost of the re-roof by two thirds which Edwards & Hardy has picked up as its commitment to the Mangere community.

Gary McNamara (Metrotile) was back at the marae to take these images of the finished roof which is drawing positive comment.

CLAUDELAND'S EVENT CENTRE

With a vision to provide a world class venue, and capture the economic benefits for the city, the Claudeland's Event Centre was born.

The site is unique by world standards and set on 34 hectacres of parkland within a 10 minute walk of the city centre. This space provided the opportunity for facilities and environmental considerations denied to many venues.

For the re development of Claudelands Chow Hill architects, a company that specialises in large complex design projects, were commissioned by Hamilton City Council. To ensure the project met world standards and reflected "best practices" Chow Hill brought in Populous, an architectural firm based in Brisbane, who specialise in the design of sports facilities and convention centres.

The brief was to deliver a world class venue that could claim to be the best in Australasia, would be within the 68.4 million dollar budget and meet the proposed sustainability objective of a 4 star rating.

Much of the design philosophy of the centre reflects the pre-European history when the area boasted one of the largest Kahikatea and Tawa forests in New Zealand known as TePapanui. (a bird snarer's seat or large flat land).

The rich bird life, in particular the Kuku (native pigeon) and the Kahu huruhuru (feathered cloak) and the Tao (long spears) are amongst the many cultural elements that influence the sculptured and aesthetic forms used in the design of Claudelands.

The Claudelands Event Centre is designed to be multi-functional offering the flexibility to accommodate a wide variety of activities.

The Arena has a 4,200 seat Auditorium, with the capacity to host up to 6,000 guests in various configurations. A C-shaped seating bowl provides an intimate atmosphere for performances, with most seats within 65 metres of the stage. Corporate hospitality spaces

and numerous support areas allow the building to be used in a wide variety of ways.

The Conference Centre has a 1,000m2 main hall on the ground floor and 400m2 of meeting rooms upstairs that can be combined or subdivided. The existing shell of the original exhibition hall was strengthened and upgraded to house the new conference and main catering spaces.

Adjoining the Conference Centre is a new exhibition hall that is comprised of two large halls of 2,000m2 each. The exhibition space combines a 10,000 square metre indoor and outdoor exhibition area.

The development incorporates a strong focus on environmental sustainability – which has been factored into the design, construction and ongoing operation of the facility.

With no official green star rating available, for event centres, the New Zealand Green Building Councils standards were used as a guide.

From the recycling of demolition materials onsite to the use of excavated material in building earthen bunds - each aspect of sustainable development has been considered. Approximately 9000 native trees have been planted, a grassed parking area provided and all water is collected onsite and utilised in a variety of ways including sanitation and irrigation.

Installation of high efficiency air conditioning systems, energy efficient lighting and lighting control systems, and installation of the latest LED street and pedestrian lighting will all help to minimise the venue's energy usage.

In fact there are very few environmental aspects that have not been considered in the development of the Centre. Transport, recycling of waste, CO2 monitoring, air-conditioning, solar heating and light control and noise reduction all play a role in minimising the environmental impact of the project.

Dimond Roofing supplied a number of products used in the project. DP955 on the roof, Veedek for the upper wall cladding and DimondClad Rib 50 for the lower cladding areas.

Geoff Pickford from GAP Roofing and Roofing Specialists were contracted by Foster's Construction to fix both the roofing and cladding on the project, Geoff says, "the wide cover of DP955 made it extremely easy to lay significant areas, and the pan width & strength allowed for easy movement of both roofers and sub trades with minimal damage."

Architects Chow Hill

Chow:Hill, established in 1992, focuses on providing leadership in strategic planning, architecture, urban design, interior design and landscape architecture.
"Our dreams form the foundation for our success and our ability to facilitate and inspire the dreams of others is the reason people choose to work with us as colleagues or as clients. Fundamental to our ability to achieve our dream is our ability to lead. Inspired Dreams need inspired Leadership."
The essence of Chow:Hill is Total Design. This is a holistic, creative philosophy that integrates design disciplines, characterises leadership style, informs their design and management processes and describes the way they run their business.

Client: Hamilton City Council

Architects Chow:Hill
Newmarket, Auckland
Telephone: 09 522 6460
E-mail office@chowhill.co.nz
http://www.chowhill.co.nz

Main Contractor:
Fosters Construction
Te Rapa, Hamilton
Telephone: 07 849 3849
E-mail colinw@fosters.co.nz

Roofing Maunfacturer:
Dimond
Telephone: 0800 DIMOND
dimond@dimond.co.nz.
www.dimond.co.nz

Roofing Profile:
Dimnod DP955 Longrun
Cladding:
Dimond Veedek and
DimondClad Rib 50

Roofing and cladding Installers:
GAP Roofing Hamilton
The Roofing Specialists Ltd
Telephone: 07 849 4160
E-mail: roofingspecialists@xtra.co.nz

VENTILATION

The Roofing Industry is currently seeing a significant increase in complaints of “leaking” and “condensation” especially in systems like skillion roofs and curved roofs. NZMRM and underlay manufacturers believe the answer lies in increasing what is currently the non-existent ventilation of roof spaces. We have approached DBH and BRANZ to request an urgent investigation into this issue, so far without result.
Here Stuart Thomson provides some background and his own inimitable take on the situation.

This article is the second in the series on Underlay/Ventilation/ Insulation which discusses the designer’s role and responsibility for ventilation of roof spaces.
There is no doubt that the last few decades have been marked by an accelerated speed of change. While it is difficult to keep up with the latest iPhone technology it is equally hard to keep up with the changing regulations and technology of the Building Industry.

One of the advantages of ‘maturing’ is that one can look back and remember how and why things were done years ago. Buildings were simpler in those days but the level of skill required to be a trades person was much more onerous than at the present time. From the 1st March 2012, although an LBP is required to design or supervise most building work, he does not have to have undergone any formal trade education or have any trade qualification. Sure he needs referees and to have been working in a trade for some time but there is no guarantee that this person has been taught by anyone with trade or design qualifications. Registered Architects are assumed to have studied and have an understanding of the science of moisture in building. Recent experience does not bear this out.

The irony is that as building has got more complicated the numbers of indentured tradespersons with ‘inherent skills’ is now less as they come to retiring age. But this is not simply the fault of teachers and students; it is part of the social and educational changes in the trade system and is something that is not going to revert. What this means is that although we have a performance based Building Code we now require prescriptive solutions that do not require ‘inherent skills’ but have recipe book designs which must be followed for both successful design and installation.
We do have a serious problem of excess moisture within buildings and the Roofing Industry believe that this is not addressed in the Building Code nor understood by designers.

A LITTLE HISTORY

So how has this come about and what has changed in residential building in the last forty years?
Houses were quite draughty (air-leaky), often with slatted foundations, with weatherboards, wooden windows, doors and barges covered by wide facings boards.
The fireplace provided an automatic seven air changes an hour, and by the fireside in the winter, your front was toasted and your back cold and draughty. Some windows remained permanently open for ‘fresh air’, clothes were ‘aired’ on the clothesline, and a shower was a one minute affair over the bath. We put on more clothes in the winter and went to bed early with a ‘hottie’.
Condensation was seen occasionally on the windows, but in the roof space it was taken care of by the bituminous underlay under metal roof cladding.
A moisture problem? What moisture problem?

Until insulation was made compulsory it was common practice to ventilate the wall space because timber at that time was likely to be very wet and a common phrase heard was that ‘the birds were still singing in it’.
Dwangs were either turned on their side or drilled with a 1” hole to provide ventilation. A hole was included the top plate to allow moisture laden air to escape into the attic space which in turn was vented with either gable vents or soffit vents as recommended in NZS 3602: 1975 which said:
24.2.3.1.Roof cavities including cavities beneath flat roofs should be ventilated by such means as:
a) grilles in eaves;
b) louvre frames in gables;
c) a continuous gap in the roof soffit:
d) ventilating ridging: or
e) other suitable means

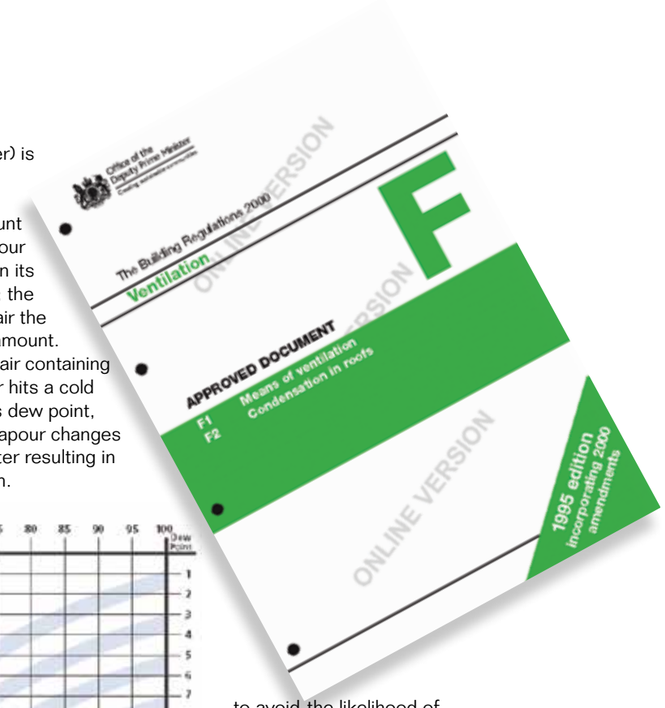
Up to this time was also common practice for the builder to leave the job for up to a month or more after the external cladding and roof had been completed to allow the drying process to continue. It was not until the late 1970s that the use of kiln-dried timber became into general use that the problem of wet timber was considered to have disappeared.
A major change came in 1977 when by law all houses were required to be insulated because this was the time of the energy crisis (1973, 1979) and everyone’s attention was drawn to saving the cost of electricity or gas for heating.
However what started out to be an energy conservation initiative, ended up to be the opposite (due to vigorous and dubious advertising) because the owner expectation of ‘warmth’ jumped 5 degrees.

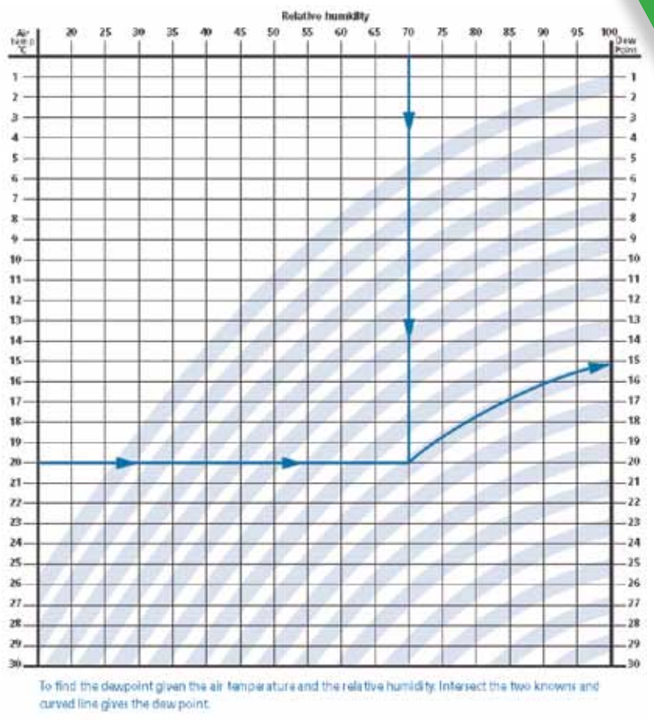
At this time it seemed logical (to some) to gum up the holes and it was decided that ventilation of the wall was not an issue any more and that installation could be stuffed in the cavity willy-nilly. Coincidentally at this time the chimney disappeared, weather- stripped aluminium windows and concrete floors became the norm so that draughts were reduced to ziltch.

This was when we lost the plot. What everybody (almost) had forgotten was the science of moisture and this included BRANZ who still continue to maintain that ventilation of the attic space is not necessary. Moisture from wet timber is one thing but moisture generated within a house is another

Considerable moisture is generated within the house by the cooking, bathing washing and drying and breathing – as you do.

Air (like water) is a conveyor and can hold various amount of water vapour dependent on its temperature; the warmer the air the greater the amount. When warm air containing water vapour hits a cold surface at its dew point, then water vapour changes phase to water resulting in condensation.





COP Table 4.2.2.

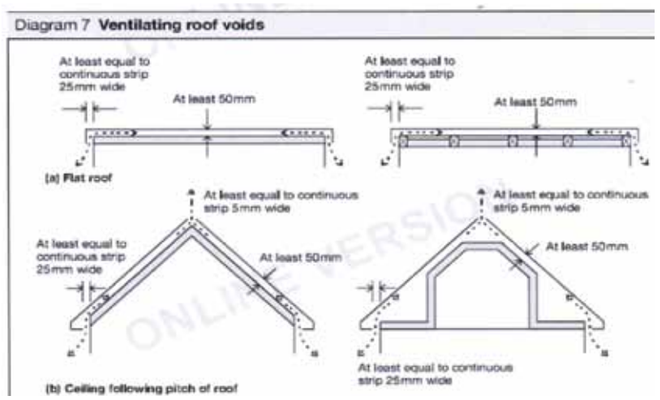
This water vapour must be vented to the outside at its source and never into the roof cavity. If it is not then this moisture has to go somewhere, and usually because warm air is lighter than cold air, it ends up at ceiling level and when this is permeable it ends up in the attic space.

The NZMRM Code of Practice is quite clear on the subject of ventilation and in section 4.6 it details the requirements to comply with that document.

Designers were then caught between a rock and the other place. They were required to design in opening windows (15% of floor area) but there was (and still is) no legislation to make anyone open them.
The NZBC E3 and E3/AS1 only exacerbate the problem.
E3.1 The objective of this provision is to-
Safeguard people against illness, injury, or loss of amenity that could result from the accumulation of internal moisture;
E3.2 Buildings must be constructed to avoid the likelihood of
(a) Fungal growth or the accumulation of contaminants on linings and other building elements; and
(c) Damage to building elements being caused by the presence of moisture.
But E3/AS1 says: 1.1.4.b) Insulated cavities shall be enclosed with no ventilation
N.B. The MRM and RANZ have met with the DBH and asked them to justify the E3/AS1requirement and explain how it sits with E3.

New Zealand is out of kilter with the rest of the world.
Overseas it is common practice to ventilate the attic space and a British standard BS 5250.2002 is a Code of Practice for the control of condensation in buildings. Also the UK building regulations 2004 have a separate section in their approved document C/2 which considers condensation in roofs which details soffit and ridge ventilation as a requirement for both attic and skillion roofs.
NZ used to agree.

In the USA there is a prescriptive requirement for the amount of ventilation based on the ceiling area of the building. For every hundred square metres two thirds of a square metre of free open area is required and is divided between the soffit and ridge.



Most metal roof claddings have effective chimneys in the corrugations or ribs. They were not designed for that purpose but because they slope upwards (to let the rain flow downwards), the corrugations allow warmer air to rise, creating natural ventilation. This is described as the stack effect. Also because the corrugations or rib ends are at the highest point (except on curved roofs) it is just about impossible to stop the hot air getting out entirely. This ventilation can be inhibited by filler blocks and flashings at either end of the corrugation, but given the normal changes of temperatures during the day and night there will be a small constant leakage of air, including water vapour.
This ventilation chimney is not only necessary on the top side of the underlay but also on the underside as well since the underlay needs air movement on both sides to dissipate the condensate absorbed by it. The COP requires a 20mm gap but most times that amount is unnecessary.
For ventilation to occur a bottom inlet and a top outlet are required which allows natural convection to do the rest.
The laws of physics do not change. Water finds its own level. Water Vapour pressures will equalise. Hot air rises – (actually cold air sinks).

When moisture accumulates at a rate greater than its removal and the capacity of the structural materials to store it, then condensation is inevitable.

Leaky homes were not caused by untreated timber but by the lack of ventilation to dry it out.
It is not often recognised that tongue and groove timber ceilings allow free moisture entry while ceilings perforated like a Swiss cheese with downlights are really small chimneys conveying moisture laden warm air into the attic space.

Industry experience from the investigation of many attic moisture complaints has shown that the occupants of the house and their lifestyle habits have a major bearing on the severity of the condensation problems experienced. However this should be irrelevant as the building design should be able to cope with the variations in peoples' habits that are part of today's society.
The idea that people are prepared to open their windows at night to provide ventilation has gone out the same window that was supposed to be open. In many cases windows have been sealed up by tenants to cut down on heating costs.
An analysis of these complaints has shown that the majority could have been avoided had positive ventilation been included in the design. This however goes head-to-head with the Acceptable Solution to Clause E3 of the building code (E3/AS1) which has been interpreted as prohibiting the ventilation of insulated cavities.
Also designers have either intentionally or unintentionally forgotten about ridge vents, gable vents and soffit vents.
The simple solution is to blame the underlay for roof moisture problems when most people do not recognise that this is only the symptom and not the cause. Roofers also field their share of the blame because the assumption that such a large amount of water from the roof must be a leak. Almost invariably the dew point is on the underside of the underlay and without sufficient means of ventilation the underlay becomes overloaded which results in wetting of the insulation leading to mould

Mould is a water problem. Without water there is no mould. Mould requires nutrients to grow and it gets it (cellulose) from dead plants - timber and paper. The cause

is excess moisture which is not vented either from within the living space or from the attic space.
The Medicos have got it wrong. The most important factor for asthma and allergies is humidity not temperature. If there is an excess of moisture in the air then mould will grow even at uncomfortable temperatures. Auckland's Relative Humidity over the last 8 years averaged 82%. Over 80% moulds grow and dust mites thrive (both are triggers) which is not good news for those with asthma or allergies.
New Zealand children have the second highest incidence of asthma in the world at 15% while the ARC says that Auckland's children rate is nearer 25%. Ventilation is needed for the health of the occupants as well as the house.

There is a common myth that cold gives you colds. I worked at 13,000 feet up in the Himalayas putting on a few roofs, where the temperatures were well below zero. Nobody had colds up there and I did not get one either. Asthma was unheard of in the mountains.

David Schlim – a doctor who worked in Nepal for many years reports the following:
Despite the fact that some people with asthma are provoked by cold and exercise, the vast majority of people with asthma do quite well at altitude. Asthma exacerbations are exceedingly rare at high altitude in Nepal, and no one has ever been evacuated from high altitude due to an asthma attack. There is also no evidence that people with a history of asthma are more prone to acute mountain sickness.

The history of ventilation is pretty interesting. The Victorians in the

19th century were obsessed with ventilation because they believed "the evil of bad air" (carbon dioxide) caused diseases like cholera, dysentery and typhoid. They polluted their own air with coal fires, candles, oil lamps, pipe smoking but really invented ventilation and we would now say they were paranoiac about fresh air. This attitude lasted well into the 20th century as well because my grandparents and my schoolroom windows were open summer and winter.
Air conditioned offices got people out of the habit of opening windows.

While ventilation is necessary to comply with E3 there are other very good reasons why ventilation is essential. Recently the investigation of closed stoves has shown that their failure to stay alight was due to lack of oxygen. Like the canary in the coal mine this is telling us that without a designed ventilation system the health of the occupants is at risk.

Recently reported - A terrible diet and a room with no ventilation are being blamed for the death of a man who was killed by his own gas. There was no mark on his body but an autopsy showed large amounts of methane gas in his system. His diet had consisted mostly of beans and cabbage and it was just the right combination of foods. It appears that the man, who was said to be a very big man with a huge capacity, died in his sleep from breathing his own poisonous gas. It was also said that had he had his windows opened it wouldn't have been fatal.

There are three ways to prevent the condensation problems in roof spaces

1. to reduce the creation of moisture where it has generated such as the laundry bathroom, kitchen and bedroom ;
2. to prevent such moisture entering the attic space by a vapour or air barrier;
3. to remove the moisture laden air from within the attic space to the outside by a passive but positive means of ventilation.

A number of buildings have produced condensation problems due to the installation of home ventilation systems. These systems are being grossly oversold because of the heat recovery claims made by their makers. A recent ECCA report prepared by the University of Otago confirms our view:
Based on the modelling work detailed in this report, it is recommended that existing positive pressure mechanical ventilation systems should not be promoted and marketed on their heating and/or cooling potential.
They do have one advantage but it is not the one they are being sold on – they do provide trickle ventilation which can reduce condensation.
But do you really want to recirculate stale air?
There are two main types – forced air and heat exchanger systems.
Heat exchanger systems with the provision for additional heating are the only type that can be relied upon to reduce the likelihood of condensation through the seasons.
Heat exchanger systems meet the G4 building code requirements for ventilation with outside air, but forced air systems do not.

There is a lot more that can be said about ventilation:
- What about the millions of dollars of damage that has been done to schools because of condensation and lack of ventilation?
- What about the builders who create their own problem by not venting a building with a curing concrete slab?
- What about skillion roofs and curved roofs that have no provision at all for attic space ventilation?(Not surprisingly these roofs are most commonly affected because the volume of air is very limited)
- What about the expectation of the underlay to cope with condensation from beneath when it has only been designed for condensation from above?
- What about the added insulation now being squashed into roof cavities? –(this will be discussed next time in the third article in this series)

There are a number of new innovations and products coming onto the market from overseas that claim to cure condensation. From adhered polyester fleece or polyurethane sprayed directly onto the underside of metal roof cladding, to intelligent membranes that are claimed to eliminate moisture build-up within the construction.
While the MRM are aware of these new products there is much testing and New Zealand experience required before the added cost of such systems can be justified.
In Europe the drive for an 'air-tight house' for energy conservation is likely to become mandatory but is believed that there are much simpler and cheaper ways to solve these problems.

There is no doubt that New Zealand has a ventilation (or lack of) problem.
There is also no doubt that we have solutions to the problem. The issue is to get the solutions accepted as they once were.

For further information on Metal Roofing or Cladding or details of any of the articles which appear in this publication please contact any of the members listed below.

Members of the NZ Metal Roofing Manufacturers Inc.

A Ellery & Sons Ltd
PO Box 178
Greymouth
Telephone: 03 768 5029
Contact: Clark Ellery

AZKO Roofing Limited
41 Shakespeare Road
Christchurch
Telephone: 03 365 9808
Contact: Maurice O'Flaherty

Brockelsby Roofing Products Ltd
49 Rutherford Street
LOWER HUTT
Telephone: 04 566 1971
Contact: Malcolm Smith

B J Moss Ltd
PO Box 1007
Gisborne
Telephone: 06 867 1219
Contact: Roger Moss

B R Roofing & Walling Co Ltd
Ford Road
Onekawa, Napier
Telephone: 06 843 6968
Contact: Phillip Fendall

Calder Stewart Industries Limited
PO Box 1400
Invercargill
Telephone: 03 214 5544
Contact: John D'Arcy

Continuous Spouting New Zealand Ltd
PO Box 151
Takanini, Auckland
Telephone 09 268 1555
Contact: Richard Mabin

Contour Roofing Nelson Ltd
PO Box 9015
Annesbrook, Nelson
Telephone: 03 546 4260
Contact: Dave Freeman

Dan Cosgrove Ltd
PO Box 211
Timaru
Telephone: 03 688 4169
Contact: Brian Cosgrove

Dimond
PO Box 13546
Otahuhu, Auckland 1643
Telephone: 09 622 4625
Contact: Darren O'Brien

Franklin Long Roofing Ltd
PO Box 151
Pukekohe, Auckland
Telephone: 09 238 9249
Contact: Warren Oliver

E.R. Freeman Ltd
Freeman Roofing, Nelson
Roofline Marlborough, Blenheim
Canterbury Long Run Roofing, Timaru
Canterbury Long Run Roofing, Ashburton
Roofing Solutions, Dunedin.
P.O. Box 2317
Stoke, Nelson
Telephone: 03 5443108
Contact: Shane Atherton

Gerard Roofs
PO Box 18071
Glen Innes, Auckland
Telephone: 09 978 9043
Contact: Grant Williams

HB Longrun Ltd
PO Box 3056
Napier
Telephone: 06 843 6159
Contact: Chris Patheyjohns

Marshall Industries Ltd
PO Box 846
Invercargill
Telephone: 03 218 2579
Contact: Tom Marshall

Megami Metal Roofing Systems
PO Box 113
Takanini, Auckland 2245
Telephone: 09 268 8959
Contact: David Moselen

Metalcraft Roofing
PO Box 51286
Pakuranga, Auckland
Telephone: 09 274 0408
Contact: Tony Barbarich

Metal Design Solutions
PO Box 33
Drury, Auckland
Telephone: 09 294 9134
Contact: Jan Alberts

Metrotile (NZ) Ltd
PO Box 72-062
Takanini, Auckland
Telephone: 09 299 9498
Contact: Gary McNamara

Quin Roofing Ltd
PO Box 1087
Levin, 5540
Telephone: 06 3679480
Contact: Bruce Love

Roof Manufacturers Limited
PO Box 319
Tauranga
Telephone: 07 578 2650
Contact: Martin Smith

Roofing Industries Ltd
PO Box 302 385
North Harbour Post Centre 0751
Telephone: 09 414 4585
Contact: Paul Ross

Roofline Products Ltd
PO Box 16302,
Christchurch
Telephone: 03 349 8439
Contact: Colin Megaw

Silbery Long Run Ltd
69 Montgomery Crescent
Upper Hutt
Telephone: 04 526 9343
Contact: Angie Silbery-Dee

Steel and Tube Roofing Products
PO Box 204216 ,Highbrook,
Manukau 2162, Auckland
Telephone: 09 273 7628
Contact: Rod Newbold

Stratco (NZ) Ltd
PO Box 8494
Christchurch
Telephone: 03 338 9063
Contact: Andrew Staff

Taranaki Steelformers Ltd
Wanganui Steelformers
King Country Longrun
PO Box 36 Stratford
Telephone: 06 765 5191
Contact: Darrell Back

The Architectural Roofing Company
PO Box 8052
Hornby, Christchurch
Telephone: 03-3445991
Contact: Bruce Gibson

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