ISSUE 35

SCOPE

NZ METAL ROOFING MANUFACTURERS INC.

Below is a brief introduction to the 2014 executive of The Metal Roofing Manufacturers Inc.
It is intended that Scope be representative of the Metal Roofing and Cladding Industry in both commercial and residential sectors. Your submission of material you consider is of interest is welcomed be it design, research, manufacture or construction.

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If you would like to submit material please contact any member of the executive or the publisher.
Visit our website at:
www.metalroofing.org.nz

Opinions expressed in Scope do not necessarily reflect the views of the NZ Metal Roofing Manufacturers Inc., it's executive, committee members or publisher unless expressly stated.

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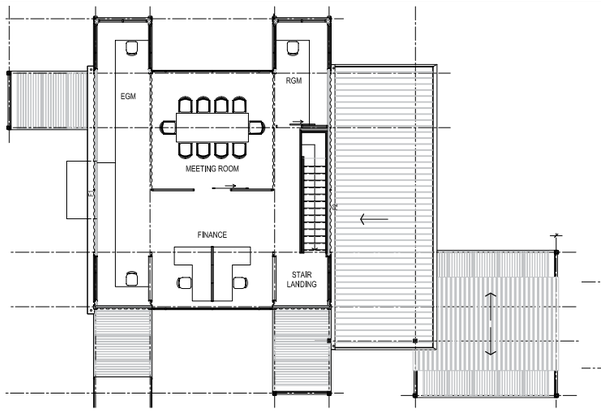
e-mail: conceptart@xtra.co.nz

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

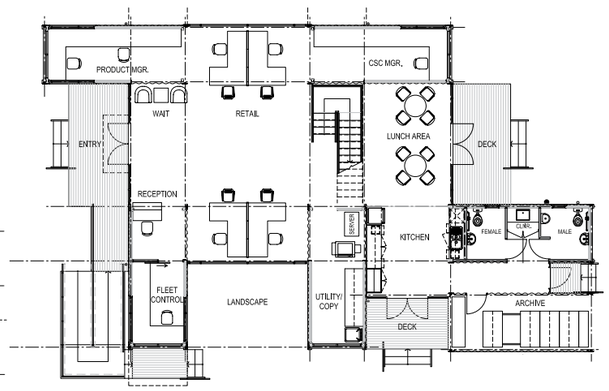
INNOVATION

Royal Wolf offices.
A new benchmark in container design and construction
It's fitting a company specialising in shipping containers has an office made out of the product it knows best.

And when Royal Wolf, Australasia's biggest provider of shipping containers, was looking to build its new offices in Auckland it was two 40-foot and six 20-foot containers that were modified to become the centre-piece of its East Tamaki operation.



1ST. FLOOR KEY PLAN



GRD. FLOOR KEY PLAN

Architect Frank Tonetti, of Devonport based Architettura, was chosen to design the offices because of his innovative work with container building solutions, ranging from single and multi-storey residential "modules" to "emergency houses" for aid projects.

His brief from Royal Wolf was to create offices that showcase the company's modification expertise, innovative and expressive container construction, and, most importantly, the functional and efficient space it has created for Royal Wolf's administration centre.

Mr Tonetti initially made a cardboard box model of his proposal and from that Royal Wolf was sold on the idea.

"The challenge though," he says, "was to demonstrate the versatility of containerised building solutions, stepping beyond the usual conventional stacking method that is most common."

"The hybrid building solution offers a unique container aesthetic. There are offices and service spaces that require privacy occupying the containers themselves, and the larger spaces between containers provide versatile open plan reception, retail and boardroom facilities.

"It's all about the spaces between, around, and under the containers. The diverse orientation, stacking and cantilevering of different sized containers in combination with fully glazed voids and spaces between containers creating interesting architecture - an inter-play of solidity and transparency."

Mr Tonetti says essential to the office project is the Metalcraft insulated panels and the pre-finished COLORSTEEL® external metal.

He says the beauty of the Metalcraft panels is that they can span long distances yet are lightweight which saves on installation costs and assembly time.

"They have performed admirably and they provide excellent building insulation to walls, roof and floor because it eliminates concerns around 'thermal bridging' that is normally associated with traditional construction."

Meanwhile, the COLORSTEEL® skin, which provides a durable and attractive roof finish and internal ceiling finish, is particularly suitable for commercial building applications, he says.

Mr Tonetti believes further development of insulated panel construction by the likes of Metalcraft should be encouraged because they have a crucial role to play in residential buildings of the future.

"These products have a long and successful construction history in New Zealand already, but now with the advent of new improved PIR core options, and enhanced metal skin coatings and pattern profile options, there is an excellent opportunity to utilise these systems in residential construction.

"This is an area where New Zealand is desperately looking for alternative and affordable prefabricated solution to replace outdated traditional construction systems."

Mr Tonetti says containers, which are made from high grade Corten A steel, are also a valuable alternative to traditional construction because they are portable, robust and in terms of sustainability they are unbeatable.

"For longevity containers cannot be matched. In terms of earthquake resistance they significantly exceed NZ Building Code earthquake requirements and the best thing is that they are supplied like this."

Mr Tonetti's company Architettura has more than 30 years experience in commercial, institutional and residential architecture in both New Zealand and southern Africa.

More recently however the company has placed a renewed focus on community and aid projects.

His design philosophy these days is strongly influenced by his passion for aid work and his belief container solutions out-perform and out-live conventional construction systems.

With this in mind Architettura has developed a system for transportable building structures to respond to emergencies in cyclone and earthquake prone areas, and for deployment to inhospitable areas.

The Icon system uses a full range of connected Royal Wolf shipping containers with unique layout design to overcome spatial limitations and offer generous open plan spaces between containers. It also utilises cantilevered floor and roof beams which span between containers, and long span ISP floor and roof panels means construction set up is quick and relatively easy.

"The system has significant structural durability, thermal performance and weather tightness advantages which out-perform conventional construction systems and more than meet Building Code requirements.

"Custom pre-fitted out containers could be ready and off to Tonga in a day and then be operational almost immediately once it makes it to its destination. The ability to do that is remarkable rather than the costly and slow method of dropping partially framed structures that need to wait for specialised tradesmen to be assembled on site.

"In these sorts of disaster environments containers easily outperform timber constructions. If you want a building that's instant, robust and will perform in a remote location or harsh environment then this is it."

Architettura

Architettura has been in practice for over 30 years with varied experience. Our interest and speciality is innovative architectural design and construction particularly in remote or complex sites where traditional construction is difficult or impractical. Since the development of this new hybrid container /panel system, there has been considerable interest in its use and its construction simplicity and versatility. We believe that the system offers significant advantages over conventional forms of construction and would be particularly suited to self help community/aid projects, both locally and offshore.
More technical and project details may be viewed at this website: www.iconbuildings.co.nz

Architect: Architettura Ltd
NZIA Practice
Francesco Tonetti B.Arch
CAD : Tuan Chew
2/26 Victoria Road Devonport
Auckland
Email frank@architettura.co.nz
Telephone: 09 446 1015
Mobile: 021 14410 22

Client: Royal Wolf NZ

Main Contractor: Cape Interiors

Structural Engineers:
Pont Consultants

Electrical & Data:
Adsel Electrical & Data

Plumbing:
Southern Cross Plumbing

Aluminium Joinery:
Windows 2000

Roofing Manufacturer :
Metalcraft Insulated Panels

Roofing Profile: Thermospan
External COLORSTEEL® Maxx®
Smokey

Wall Profile: Thermopanel / Internal
COLORSTEEL® Titania

Kitchen cabinetry: KitchenTop

AUCKLAND COUNCIL PROPOSAL WOULD RAISE THE COST OF BUILDING

The Proposed Auckland Unitary Plan (PAUP) contains a regulation preventing the use of uncoated roofing and cladding with an exposed surface or surface coating of "more than 10% zinc or copper". This proposal would effectively ban the use, going forward, of metal roofing that is not coated. There is no definition of what a coating must comprise, other than not containing 10% zinc or copper.

Unpainted ZINCALUME® roofing and cladding

Zincalume® steel, is the foremost product used in New Zealand and Australia for buildings not using factory painted cladding or rainwater goods. Factory painted steel roofing is available in NZ under the COLORSTEEL® and Colorcote® brand names. Such a regulation would clearly prevent the use of any roofing, wall cladding, or rainwater goods made from galvanised steel, zinc or copper which is not coated. As written, it is not clear whether or not Zincalume® steel would fall within the definition or the rule.

Both New Zealand Steel and New Zealand Metal Roofing Manufacturers Inc (NZMRM) have made submissions to Auckland Council on the Plan and the ambiguity around the definitions and the rule itself. Subsequently, the Auckland Council has agreed that the proposed restriction will not take immediate effect for Zincalume®, meaning that during the interim period of the formal PAUP process (extending to at least 2016) Zincalume® will not be captured under the current definition in the PAUP and will not require Auckland-wide consent during this formal review process. We believe that the Auckland Council intends to engage with the industry during the PAUP finalisation process and we welcome this approach.

The restrictions proposed in the Plan would restrict the use of metal roofing that is not coated, except for pure aluminium or stainless steel.
Scope readers will be aware of the industry's significant advances in technology over the last 20 years, resulting in a 90% reduction in the weight of zinc per square metre on roofs so the technical discussions and arguments to be dealt with through the PAUP process are very significant.

Unpainted ZINCALUME® roofing and cladding

While houses in most cities, including the previous Auckland City, are increasingly using prepainted materials (COLORSTEEL® or Colorcote®) we estimate that 10-15% are still being clad with unpainted Zincalume®. This may be for architectural or for cost reasons. Typically buildings designed specifically for the appearance of unpainted cladding are larger and use it for walls as well as the roof. Whether painted before, during or after installation in order to maintain this (zinc-tight) status, as well as for appearance, such materials will need repainting during the 50 year expected life of a building. The frequency of the repainting will depend on the location and exposure of the roof/wall and the quality of the paint from the first repaint, but experience shows that two repaints is a minimum (currently when it is done to maintain the appearance of the cladding).

There is no current (or proposed in the PAUP) regulation to require repainting of these prepainted roofs when the initial paint coat loses its effectiveness in limiting the concentration of zinc (or copper) in the water from a roof. It would seem that the only way for this proposed regime to be effective in its intent would be to pass a bylaw requiring regular re-painting of these materials and to support that with certified inspections. The criteria for such repainting are not clear. We suggest such a by-law would be more usefully applied to existing buildings with galvanised roofs. This of course would require more action from the Council than just controlling the use of approved materials through the consent process..

In the now very large Auckland Council area, the majority of agricultural buildings have traditionally been unpainted as appearance is unimportant, and many warehouses, commercial buildings and factories have also been unpainted; all of these would be affected by the proposed regulation.

There are also a very large number (far more than will be built in the next ten years) of existing houses up to 100 years old, all with galvanised roofs in various stages of decline.

In 2005-7 the ARC proposed a similar ban, but research by the NZMRM, New Zealand Steel and Tonkin and Taylor, and some other technical investigations showed this to be ecologically unnecessary and the ARC report was withdrawn, leaving Zincalume® (unpainted) as an acceptable material, but not any other roofing material with an exposed surface containing a greater proportion of zinc (i.e. no galvanised).

The NZMRM has objected to this regulation on two grounds –

- Technical; as no explanation is provided for the correlation of stormwater objectives and the limit of 10% zinc;

- Economic; while the cost implications of using prepainted are provided (as required by the RMA S32) this is only shown per house, and excludes any repainting cost or the likely overall cost to the economy. It does say "Greater emphasis on on-site stormwater requirements will have consequential costs to site owners and developers and lead to a shift in cost from the public to private sector." "On-site controls will require on-going maintenance and compliance which will result in on-going costs for site owners and the requirement for compliance management regimes." Although these comments apply to the stormwater retention and treatment proposals they would apply to the painting requirement (if there was one introduced).

In summary, the NZMRM believe there is no technical justification for this philosophical/ecological position of which the cost will fall entirely onto building owners. This cost could be very large, and if extended throughout NZ as a result, the overall cost to the economy could be extreme. This comes at a time when central Government is seriously trying to reduce the cost of building in NZ, not increase it.

The salient points of NZMRM's objections to this proposal are:–

- the ambiguity in the definitions and the rule itself;
This is an unnecessary means of reducing zinc in stormwater without proper assessment of cost, except that it will be borne by the "private sector";

- It has a history of previously being rejected by the ARC after representation by industry;

- There is no technical basis provided supporting the limit proposed for zinc in roofs in relation to the target concentration of zinc in rainwater run-off of 30 µg/L;

- There is no defined basis for the target level of 30µg/L nor consideration of the cumulative effects of rainfall events from roofs and the combinations of other rainfall run-off from other materials and surfaces which significantly reduces any impact from roofs;

Unpainted ZINCALUME® roofiing

■ The total cost to building owners and so the economy over the 50 years for which we expect buildings to last will be very high,;

■ The industry has already made significant advances in technology over the last 20 years resulting in a 90% effective reduction in Zinc run-off on unpainted roofs in NZ via:

■ 150g/m² aluminium/zinc coated steel verses Z450g/m² zinc (1994 introduction of Zincalume®) – an 85% reduction in the weight of zinc per sq metre on roofs; and

■ Increase in the expected life of the roof of 30% providing a net run-off effect reduction of 90%.

We consider this proposal is actually quite hard to pick up, so where is it to be found?

It is buried several layers deep in the PAUP and is summarised below:
Part 3 Section H 4.14 - Stormwater 3.1 – 3.2.1, and 3.2.2 refer to run-off areas that need to be controlled when run-off is from an HCGA (high contaminant generating activity) which includes high contaminant yielding roofing under Section 9(2) of the RMA.

3.2.1.2 provides the roof areas that need to be controlled

"2. New high contaminant-yielding roofing, spouting, cladding or architectural features

a. The total area of high contaminant yielding roofing, spouting, cladding or architectural features used on the site must not exceed:

i. 25m2 in urban areas

ii. 25m2 in any rural zone where the stormwater runoff from the roofing, spouting, cladding or architectural features is piped directly to a watercourse

iii. 250m² in any rural zone where the stormwater runoff from the roofing, spouting, cladding or architectural features is directed to any vegetated drain/swale, wetland or similar."

Tables 3 and 4 in 3.4.2 show the control limit of 30 ppb (µ gms/l) for 95% of runoff.
In Section 4 Definitions – H - is the definition of HCGA

"High contaminant-generating areas Specific areas that contribute a high proportion of contaminants to the overall site stormwater discharge. High use roads are also areas that generate high contaminant loads and are defined elsewhere.
Includes:

■ *high contaminant yielding building roofing, spouting, and external walls cladding and architectural features using materials with an*:

■ *exposed surface or surface coating of metallic zinc or any alloy containing more than 10 per cent zinc*

■ *exposed surface or surface coating of metallic copper or any alloy containing more than 10 per cent copper or*

■ *exposed treated timber surface or any roof material with a copper or zinc containing algaecide*"

This covers unpainted galvanised steel (or any uncoated metal roof or wall except aluminium or stainless steel); copper spouting, flashings, and asphalt shingles (which often contain copper as an algaecide), or any exposed "treated" timber. As written, it is not clear whether products such as Zincalume® would fall under the proposed rules.

We are unable to find any basis for where the 10% zinc comes from or how it links to 30 ppb.
The definitions of HCGA in this area come from Technical Report 2013/035 although a link to this is not provided in the PAUP itself.

Top and center: Painted galvanised steel.
Left: Old painted galvanised steel

This 125 page report does not appear to explain how 10% is derived, or suggest where it comes from. As Zincalume® is 20% zinc by volume; it would specifically prevent the use of Zincalume® (depending on how the term "coating is defined)– which is the predominant unpainted roof cladding material for residential, agricultural and industrial buildings in New Zealand.

Section 32 of the RMA (extract) – s32

Requirements for preparing and publishing evaluation reports

(2) An assessment under subsection (1)(b)(ii) must—
(a) identify and assess the benefits and costs of the environmental, economic, social, and cultural effects that are anticipated from the implementation of the provisions, including the opportunities for—
(i) economic growth that are anticipated to be provided or reduced; and

(ii) employment that are anticipated to be provided or reduced; and

(b) if practicable, quantify the benefits and costs referred to in paragraph (a); ……."

The only reference to this in the PAUP is in:

S 32 Evaluation for Report 2.2.4 of the PAUP p 31.

"The main costs expected from the proposed policies and rules are: Greater emphasis on on-site stormwater requirements will have consequential costs to site owners and developers and lead to a shift in cost from the public to private sector.

On-site controls will require on-going maintenance and compliance which will result in on-going costs for site owners and the requirement for compliance management regimes."

This suggests the significant costs associated with the proposal are intended to be borne by the building owner. We believe these costs to be very large, and that they have not been adequately identified as required by the RMA. S32

Auckland City Technical report 2013/043 deals in great detail with the (large) costs of stormwater retention and treatment, but has only this to say about the cost of roof cladding

"2.9.4 Roofing Materials
As mentioned in Section 1, HCGA areas also include uncoated galvanised iron (sic) and copper/zinc based cladding materials. In these cases the least expensive option is to use appropriate non copper/zinc generating materials. For roofing, this would be appropriately coated aluminium (sic) roofing materials.

Above: Unpainted ZINCALUME®
Center: Unpainted ZINCALUME®
Below: Unpainted galvanised steel

For example, the supply cost of coated aluminium cladding is approximately $21/m^2$ compared to uncoated at $15/m^2$, an additional cost of $6/m^2$ (Source: Roofing Supplier). Installation and maintenance costs are assumed to be the same, giving the same extra total present costs of $6/m^2$
For a house with a $200m^2$ roof, this equates to an additional $1,200."

MRM notes

- We agree with the cost of $6/m^2$ for pre-painting, but comment, as the report does not, that this is a 40% increase in cost – not trivial.

- Maintenance cost in fact is significantly higher as repainting in situ is much more expensive than the original pre-painting.

An audit of the report was carried out by NZIER/Harrison Grierson and it says, inter alia,

"It is common in the sampled topic reports to include an assertion that the information is sufficient and then not justify or support the statement. There is very little back-up for these assertions (e.g. by referring to references or appendices). There is very little in many sampled topic reports on the uncertainties and limitations of the options presented. "

In this case it seems (but is never stated as such) that the only alternatives are the use of painted zinc-or copper- containing roof and wall cladding etc., or retention of stormwater and treatment in some way to remove dissolved zinc. This method (of zinc removal) is not mentioned and we think it may not be possible in any economically practical means for on-site solutions.

This audit comment supports the NZMRM view

The NZMRM says that the significant reduction in zinc resulting from the change to Zincalume® and its painted variants has been produced by the industry and recommends that the Auckland Council leaves new roofs to the industry and that they undertake a review of the need to achieve these low levels of zinc from roofs. Key factors the Auckland Council needs to consider:

1.The target levels of zinc from roofs are not substantiated;

2.The derivation of the target levels for roofs after consideration of the cumulative effects of all runoff have not been addressed;

3.The consequential determination of 10% zinc content in coating material has not been provided;

4. Coating has not been defined;

5.The ability to install economically viable treatment systems is doubtful

Above: Unpainted Galvanised steel

6.The apparent omission of consideration of treating existing HCGAs as being a more effective target – e.g. car tyres;

7.The assumption that painted cladding is acceptable and then ignoring the need to implement controls and painting at a significant cost to Auckland home owners cannot be ignored;

8.The industry has reduced the amount of zinc in stormwater from unpainted roofs by 90% over the last 20 years with a cost saving to the building owner; and

9.The industry is continuing to improve technology and is currently reducing the amount of zinc in the coating of mild steel by another 20% with an additional lifespan of the material.

New roof construction should be left to industry and if the Auckland Council is serious about reducing zinc levels in stormwater there are other areas contributing far more that can be easily addressed.

The industry is achieving greater results for the environment at REDUCED COST to the country than could ever be attempted by restrictive material use regulation.

Criticism of a proposed regulation or standard should always be accompanied by a recommended change to improve it.

So, consider this

This article contains a number of pictures of roofs made of metallic coated steel, in size from small to large, and condition from very old to new. What they are made of is labelled.

Facts

a) Galvanised steel for roofing was phased out in 1993;

b) Zinc (galvanised) coating was originally 200-300 gms/m^2 on the topside; Zincalume® coating is 75 gms/m^2 on the topside of which 45% by weight is zinc (20% by volume);

c) Zinc (galvanising) protects the underlying steel from corrosion by continuous sacrificial protection, which is why it has a finite life to red rust; and

d) Aluminium/zinc (Zincalume®) protects the underlying steel by forming an inert film of aluminium oxide over the entire surface which will last indefinitely unless it is seriously damaged or interrupted (at edges or holes or scratches) – when the zinc component acts as protection.

Even assuming

i) There really is an increasing (rather than declining) problem with bio-active zinc compounds in Auckland's harbours causing harm to marine organisms; and

ii) This bio-active zinc can actually be derived from metallic zinc on roofs (rather than e.g. zinc oxide from vehicle tyres),
(neither of which assumptions have been demonstrated or proved), and

iii) When old galvanised roofs (all now at least 20 years old) finally die or are determined to be unattractive, they will be replaced with Zincalume® painted or unpainted;

Then

Which of the roofs illustrated would you think poses a greater environmental risk, now or in the near future?

Would it not be much better to repaint or replace the older galvanised roofs, rather than potentially banning unpainted Zincalume®? Or is it just too difficult?

Between now and the final implementation of the PAUP in 2016-7 there will be opportunities to view the progress of the Plan and to make some comment.

This will start soon when submissions to the PAUP will be published between May and July.

We suggest that involvement by Scope readers can influence the outcomes, and ask you to make yourselves conversant with this aspect of the Plan as well as any other issues that may affect you.

NZMRM plan to continue the information process through Scope.

ACCENT ON OUTDOOR LIVING

Pataua Development in Whangarei, located on a large rural site. The clients, who are based overseas, requested that we create a master plan for a large rural site in the Pataua Development, Whangarei. A vision that could be brought to life in stages. The site consists of two key developments. At the road side, on the flat, the summer house and boat shed structures alongside the tennis court. Higher up, at the back of the site, the new house has been designed with a master bedroom wing, a living wing and a bedroom wing, stretching across the site to maximise the views of the surrounding valley and ocean. A retained courtyard to the rear of the house creates an ideal entertaining area, capturing the afternoon sun. The house is clad in a mixture of dark stained grooved ply and dark vertical profiled metal cladding.

The clients wanted this home to be the complete package, a place to relax with friends and family and to make the most of the stunning landscape and natural playground.

The summer house acts as a pavilion for entertaining and a shady place for the spectators of tennis matches. It also functions beautifully as a generous guest suite, incorporating a kitchen and bathroom. The boat shed alongside has ample storage for the boat and other outdoor toys.

From the road the developments are sleek and unobtrusive, cut close into the slope to achieve a minimal disturbance on the horizon, and coloured a dark charcoal to recede further into the landscape. The vertical profile of the cladding adds texture into the architecture and is an attractive foil to the long horizontal aspect.

Design features/ Creative Solutions

A key part of the design was maximising the views out to the eastern and northern valleys from all rooms of the house including the outdoor spaces. This was achieved through stretching the house across the hill on the highest part of the site. The house was designed with a low sleek form facing out to the east and is benched into the slope to create a sheltered courtyard to the west off the living to capture the afternoon sun.

The house has been designed with distinct master bedroom wing separated by covered outdoor room and narrow hallway that link it to the living pod. The living area is separated by a further hallway that leads back to the north-western bedroom wing. This wing is stepping back to open up the living and deck to the northern sun. The curved northern deck was shaped to reflect the owner's interest in surfing. This deck wraps around the eastern side of the house and links to the outdoor covered room.

These spaces provide a range of entertaining or relaxing areas, allowing the option to seek or retreat from the sun and enjoy the varied views.

Due to the narrow depth of the design this enables the owners to also capture the view through the house when entertaining in the sheltered western courtyard. This is further enhanced by extensive glazing on both sides of the living pod and walkway to master bedroom pod. This glazing to the rear courtyard opens up to allow the afternoon sun to reach the living areas and also the covered east facing outdoor room that has an expansive view of the ocean.

Designers Profile

Creative Arch is an award winning, multi-disciplined Architectural Design firm that was founded by Director and Architectural Designer Mark McLeay in 1998. Our range of work is as diverse as our clients and encompasses Residential homes, Renovations and Coastal Developments. It also extends through to Remedial work and Commercial Architectural Design Projects such as the Hugh Brown Drive project.

Client service is paramount at Creative Arch and therefore working as a team is a priority for the designers. Our company is focussed on supporting our client's vision and helping them to perpetuate their dreams through creative architecture. We always take time to listen and to gain a full understanding of our clients needs, subsequently offering ideas and working collaboratively with them to achieve the desired result.

We also work closely with other professionals to ensure the project is within budget giving our clients financial assurance. We have strong company values, investing a great deal in systems and computer technology to ensure a consistent and high standard of service for our clients. Visit our website to see for yourself the standards we have achieved consistently over the years through award winning architecture and numerous publications.

Client: Martin Smith and Aneta Bird

Designer: Mark McLeay and Mark Callander
Architectural Designers: Creative Arch
Contact: 09 309 6032
Website: www.creativearch.co.nz

Interior Designers: Yellow Fox

Contractor: David Reid Homes – David Reid Homes - Whangarei

Roofing Manufacturer: Metalcraft Cladding and roofing: Metalcraft cladding MC760, Grooved Shadowclad, Colour: Ironsand

Joinery: Vantage powder-coated aluminium ;

DIANA BLAKE DESIGN WHANGAMATA

Designed for the hardest clients in the world.....My family & I!
Situated on an acre of picturesque avocado orchard just on the outskirts of Whangamata with views back over the tranquil harbour to Whangamata township beyond it needed to be a strong robust low level family home constructed with natural honest raw materials.
Inspired by the strong minimal architecture of Ludwig Mies van der Rohe the house needed to nestle down to the land and anchor it in the natural environment with robust materials and a floating roofline to hover above with large overhangs to protect and allow areas for outdoor living.

A seamless link from interior to exterior with extensive glass openings to allow the outdoors in while maintaining the views to the South and capturing the suns energy.

An ultra low energy home which requires little or no heating and cooling systems was a priority. By carefully choosing the best building materials and using passive solar design has achieved the objective resulting in a comfortable warm healthy family home.
Our family are testament to the success of the design as they never want to go away and when they do they are always happy to get back to their home.

Creative Solutions

The major challenge to overcome was the shape of the site. A long narrow section, only 29m wide, and the direction of the view which is South across the Harbour. The solution was to run the Living Pavilion East to West with glass dividing walls between the South and the North facing deck. The glass walls slide back into clever cavities and over exterior walls to open up in both directions. This innovation allows for year round entertaining whilst still capturing the amazing water views.

The second most important challenge was to create a comfortable and healthy home for our family which uses passive solar design to reduce energy consumption and keep the interior at a constant temperature. This requirement lead to the choice of construction materials including concrete tilt panel walls, polished concrete floors, double glazing and superior insulation. The house maintains a constant temperature year round of between 19-20 degrees.

An opening Louvre roofing over the entertaining area also allows extra sun to penetrate during the winter months and provides protection from the weather creating a cosy outdoor space on the extensive Mahogany deck around the outdoor wood fire.

The Plumdek longrun roof keeps the house sitting long and low on the land and the carefully calculated overhangs allow optimum sun control.

All challenges met with a beautiful healthy practical family home build to fit naturally in its setting for many generations to come.

Metal Products

Steel Beams, Posts and Steel Portal Brace Frames form the Structural Skeleton of the house to achieve the big open spaces. Concrete tilt panels (metal reinforcing) also feature throughout.
Furniture: Exterior Tables & Bench Seats made from Galvanised Steel
Fire grate hand made from steel

Diana Blake Design

An innovative and exciting architectural design office based in the lovely resort town of Whangamata.

We love a challenge and provide a professional, friendly and exceptional service to our clients. We love NZ for it's diversity and our clients willingness to embrace good design.

Diana has been a member of the Architectural Designers of NZ (ADNZ) since 1996 when she worked for an Architectural Firm in Hamilton. She enjoys being part of an organisation which is forward thinking and leading the way in the design industry with great opportunities for continuing learning as well as a great social network for meeting similar people in her field of work.

Diana Blake Design was formed in 1998 after extensive experience in the industry in Hamilton.

Diana has won the National Architectural Designers of NZ National Awards for Residential Interiors 2013 for her own home and also the Regional Award for

Architectural designer:
Diana Blake Design
Telephone: 07 8657948
Email: diana@dianablakedesign.co.nz
www.dianablakedesign.co.nz
Member of ADNZ

Builders: Barry Blake Builders
Telephone: 027 2411970

Project Manager:
Barry & Diana Blake

Engineer: Grant Crook
Telephone: 0274 728 695

Roofing Manufacturer:
NZ Steel and Tube
Auckland
Telephone: 09 274 4056
Roofing Profile:
ZINCALUME® 0.55 Guage Plumdek

Roofing Installer:
Mark Spiers Roofing Ltd
Telephone: 07 865 7304
Mobile: 027 477 6177

Photography by:
Linda Herraman
Telephone: 07 865 9976
Daniel Davie
Telephone; 027 434 7282

VENTILATION OF ATTIC SPACES

Stuart W. Thomson. Building Consultant

It is said that money makes the world go around, but actually fashion is the driver, not only when talking women's apparel but talking the building industry as well. A lot of house renovations are started just because it is 'out of date' or 'past its use by date' or simply because it is 'old-fashioned'. Fashion is good for architects and designers because they are in the fashion business too, and are always looking for something new and innovative which makes living a lot more exciting than sticking with the same old, same old.

Not all fashion is good design though and one such instance is the stiletto heel. Very popular with smart young ladies until they twisted their ankles or destroyed somebody's timber or vinyl floor.

Not all building fashion is good design either and the fashion to try and make fibre cement or polystyrene walls look like concrete by bandaging up the joints with plaster was never a good idea. To use an organic material as the frame (timber) and an inorganic material (fibre cement sheeting) as the cladding and expecting them not to move was (and still is) bad design. That dumb fashion has cost individuals and the country heaps.

In New Zealand we went through a stage (BI- before insulation in 1977) when we all had leaky homes – except that they were not water leaky but 'air-leaky' (about 7 air changes an hour!) and after that date we (some of us) lost the plot. Because we now had wall and roof insulation it was assumed incorrectly that we had to gum up all the other holes to obtain the energy efficiency - the original aim. For the next three decades condensation loomed large as a problem, with metal roof cladding getting the blame for what was essentially a design problem, including mouldy ceilings and rotting timbers. Many were labelled as leaky homes when they were not leaking from the outside! This was bad design and that together with making buildings air tight and cladding buildings with fake concrete appears to the writer to be very like two stiletto designs.

We had turned our back on our original ventilation design standard which said:
NZS 3602: 1975: 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

However the official (questionable) idea of not venting the attic space was carried on into E3/AS1 1.1.4.b which says: *Insulated cavities shall be enclosed with no ventilation.*

Breaking News!!

The E3/AS1 requirement of 1.1.4.b has now been deleted from E3/AS1.!!
After over 2 1/2 years, the lobbying by the MRM has paid off. Common sense has prevailed and because of this revision we can now legally vent our roof attic spaces again.

So are we back to 1975? - well no we're not but fortunately the pendulum swing to energy efficiency at any cost has now gone too.

Prior to 1977 we had free air, since then no air, so now the swing of the pendulum needs to end up somewhere in the middle using controlled air ventilation.

We need to design into our buildings provision for some air movement - not too much - not too little. So now the designer has to work out what that is and how to fit it into his building design and the purpose of this article is to help designers do just that.

If you keep your Scope magazines, (as we hope you do) you could revisit Scope 29 where there was an article written on ventilation, and in two other adjacent Scopes 28 and 30 where articles can be found on insulation and condensation which will give the whole picture. Past issues can be downloaded from the MRM website. The Scope article on ventilation created much national discussion and the article contained a promise.

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.

Now is crunch time when we need to assist designers and show the details of just how passive ventilation can be designed into roof spaces. While the principle is the same for all roofs these details are more specific and intended for insulated ceiling spaces with metal roof cladding.

So how to design ventilation into the attic or skillion roof space- and the first question is how much ventilation?

The idea is that ventilating the attic air takes with the water vapour which is the real culprit.
Just how much air movement do we need to keep the attic space healthy? While every building will have a slightly different answer there already are some quantitative figures out there.

The NZMRM COP has suggested a maximum of ½ air change per hour based on the ceiling area of the building but this is dependent on many factors the two most important being the wind and the pitch of the roof. The pitch of the roof is important as flat roofs cannot take advantage of the stack (chimney) effect that a roof slope can provide. It is likely that even ¼ of an air change per hour would be adequate for an attic space but each ventilation design must take into account the type of roof, the design of the building and the site environment.

Because most of our ceilings are 'vapour permeable' there will always be some infiltration of moist air into the attic or skillion air space from below. Tenants are loathe to open windows for ventilation because they think they are wasting their energy dollars but are quite happy to buy a humidifier to try and solve their condensation problem (if you need one of these you have got a problem!). Not all clothes driers, showers and stoves are vented to the outside and you cannot stop your teen-age daughter spending hours in the shower. But assuming that good design has prevailed and the basics such as venting kitchen and bathroom fans to the exterior, air-tight attic hatches and no vented downlights have been followed then this should have prevented most water vapour from infiltrating the attic space.

We do not know the optimum amount or flow rate as this varies dependent on the number, habits and age of the occupants, but what we do know that a trickle of ventilation in attic spaces will solve most condensation problems.

The exposure of the site where there is 'too much' wind – very high and extra high - could provide too much air movement and in these cases the minimum venting is recommended which will minimise any decrease in the efficiency of the insulation due to what is termed 'wind wash'. Loss of efficiency due to wind wash is not normally a problem in attic spaces providing the insulation is horizontal and the eave detail is correct but it can occur in skillion designs. All this air movement is above the insulation so while this could happen sometimes, the simplest and most efficient method of compensation is by overlaying the top of the insulation with a permeable underlay (an air barrier not a vapour barrier) or simply increasing the R value of the insulation. This can in fact turn out to be a win-win situation when using (say) 2/ R2.6 segments instead of an R5 segment a 4% increase in R Value is obtained while saving about 11% in cost.

N.B. Although the actual minimum R value for roofs for Climate zones 1 & 2 is R 2.9 and R 3.3. for Climate Zone 3, this requirement is not simply satisfied by using the R value of the insulation used.
Unfortunately like a lot of similar situations in building there are no hard and fast rules as every building site is different and the designers judgement will determine the success or failure of the ventilation design.

The NZBC E3: 2004 has this to say:

E3.1 The objective of this provision is to-
(a) 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
(b) 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.

It stops short of saying how you can achieve this!!

While the NZBC emphasises IAQ (indoor air quality) there is no specific mention of attic spaces.

The COP 4.6 2003 has this to say:

To prevent moisture accumulation and to remove excess moisture in buildings with metal roof cladding, attic spaces should be ventilated using static, balanced ventilation systems with a total of 1m2 net free venting area per every 150m2 of ceiling area (0.6%)

While this agrees with the building codes of some countries others opt for ½ of that value @ 1/300. Ventilation designs within these parameters will in most instances provide air movement sufficient to avoid condensation problems. But it will not stop condensation forming on the underside of metal roofing While UK figures vary considerably we are in the same ball-park.

BS 5250 has this to say:

Code of Practice for control of condensation in building.

It should be recognized that some energy will have to be expended on the removal of water vapour if condensation is to be controlled. It is essential that adequate ventilation is provided to maintain the dew point temperature of

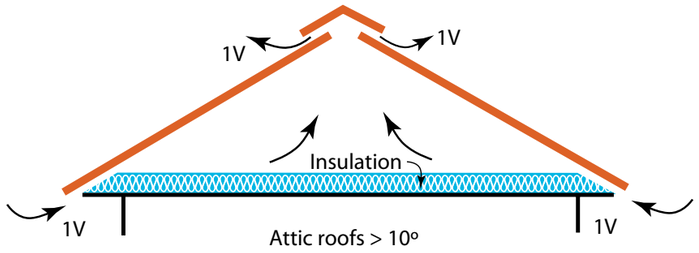
the air below the inside surface temperature of the building envelope at all times.

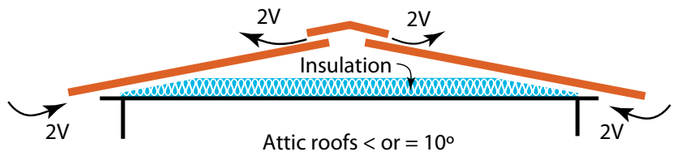
BS 5250:2002, Amendment 1 UK ventilation requirements of free air space equivalent to a continuous opening in mm varies between 25mm and 5mm.

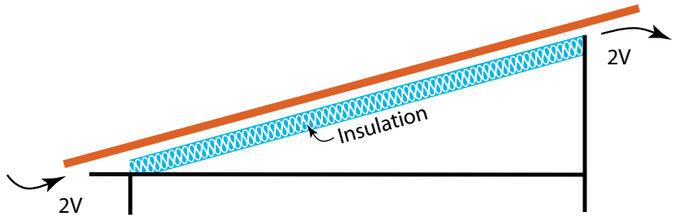
The differences between the two methods of calculation is the amount of ridge ventilation as in NZ we recommend inlets to have equal area outlet for maximum air movement. The requirement for less ventilation at the ridge, in the UK is because most of their roofs are clay and concrete tiles and are very permeable. The NZMRM COP attic space ventilation recommendations are made for impermeable metal roofs recognising that NZ has a greater problem of water vapour because of our high humidity and permeable ceilings. As water vapour is lighter than air we vent at highest point on the roof and the efficiency of a ridge vent depends on wind velocity and direction. Generally skillion and roofs < 10° require more free vent area as shown in the drawings.

The principle of passive ventilation is well known. If there is a temperature or a pressure differential, then under the laws of equilibrium the temperatures and pressures will try to equalise. This equates to air movement but the common belief that hot air rises is actually not true! In fact it is the cold air that sinks under gravity. The fact remains air movement takes place and the hot air carries with it the moisture we are trying to get rid of (water vapour is 33% lighter than dry air).

What is required is a designed space to vent it outside the building, however for the stack effect to work we need a balance of intake (lower) vents and outlet (higher) vents. If the design is a monopitch this requires equal air inlet and outlet areas whereas a duo-pitch gable would require soffit vents on both sides totalling the area of the ridge outlet vent. This system is termed passive ventilation







because it does not use energy to extract the air or to condition it as most European air tight buildings require. We are looking for a healthy minimum of ventilation to balance energy efficiency, healthy homes and healthy occupants.

While a duo-pitch gable requires soffit vents on both sides it can have either a ridge vent or gable end vents. For skillion construction it is best to vent the barge on either side unless a polypropylene cavity batten is used on top of the purlin which is another option, while a mono-pitch can either have soffit/ridge vents or barge vents on both sides up the slope.

The important design parameter is to retain a ventilation path and where possible allow a 20mm air space either up and down or across the roof.

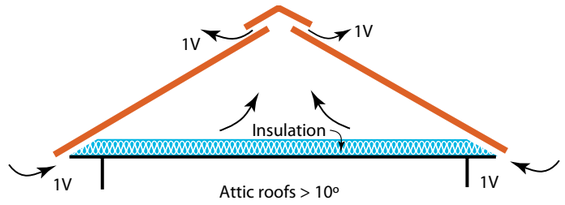
While the 20 mm dimension has been questioned this dimension has by default been assumed over time to be a safe gap because timber battens are nominally 20 millimetres. The NZMRM Code of Practice also advocates the use of underlayment which is only 6 mm high but covers the whole surface area of a roof providing the trickle ventilation which is most desirable.

What is not known is the minimum space required to provide trickle ventilation in different circumstances of wind or differential pressure, temperature and roof pitch for each specific site.

Worked examples as follows.

It can be seen from the two examples (above right) that the calculation of the amount of NFA required is not an exact science but requires the input of the designer to assess the site and construction.

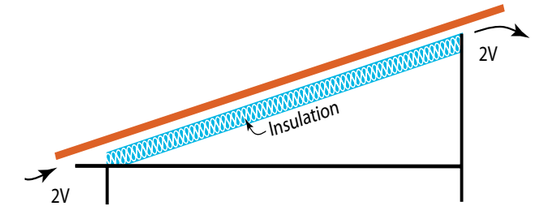
A.
Exposed marine environment. Duo-pitch =25º.
Residence = 10m width and 18m long.



Eave + ridge perimeter length x 2	= 72m
Ceiling area (+ eaves)	= 180m2.
Ventilation requirement 1/300 of ceiling area	= .6m2
NFA (Net Free Area)	= 600,000mm2.
NFA (Net Free Area)/m	= 8333mm2.
Use TVES 25 eave ventilation strip or equiv.	= 9500mm2

N.B. This strip should have the marine membrane adhered to the inside of the ventilation strip to inhibit any salt ingress.

B.
Protected environment. Monopitch Skillion =120.
Residence = 7m width and 15m long.



Eave + ridge perimeter length	= 30m
Ceiling area (+ eaves)	= 105m2.
Ventilation requirement 1/150 of ceiling area	= .7m2
NFA (Net Free Area)	= 700,000mm2.
NFA (Net Free Area)/m	= 23,333mm2
Use TVES 50 eave ventilation strip or equiv.	= 17,500mm2

The broad parameters for design are recommended to be any NFA between 1/150 and 1/300 of the flat roof area of an insulated roof.

There are two unknown and variable forces at work, one is the stack effect which is determined by the pressure or temperature differential and the other is more variable and that is the wind. It is obvious that the steeper the roof the greater the air movement and that is why low pitched roofs require more ventilating area than steeper roofs.

The air movement required in roof spaces is not great but needs to be sufficient to keep the humidity to a level that the underlay under the metal roof cladding can work within its intended capacity. Supposed and perceived problems with synthetic underlays, have not been found to be with the product but with the overload of attic moisture due to lack of ventilation of moisture from below as this is many times more than the amount of roof cladding condensation from above.

The cost of this design fault has been many buildings that have had to be reroofed or redesigned because of condensation problems as often the insulation has been found to be hard up to the underlay without any provision for ventilation. The lack of ventilation has also led to a greater number of noise problems.

Continuous ridge vents were very popular in the 1960 – 80's but cheaper designs leaked and they became unfashionable. Given good design and installation the ridge vent must be considered as an efficient and viable option. In the US, a type of Cupola ridge vent has become part of their style of architecture although they are seen in New Zealand also. This one is down the road from my home – note the long vertical inlet on the wall.

Gable end vents work well because they are placed at both ends of the ridge and provide cross ventilation and used with soffit vents they work independently of the wind direction. They also must be of a design that will not leak under extreme conditions and for this reason all the options offered have not copied overseas designs but are specifically intended for New Zealand conditions.

The photos (taken in Auckland) show that not all architects and designers have forgotten about attic space ventilation even though some may appear to inadequate! All built before the rot set in – about 1977!

These gable vents look promising except they are fake! If they had been for real they may have saved Sacramento apartment owners some of their rotten timbers! Many rotten buildings have been found to have no leaks – only condensation!

Many of the serious condensation problems that have arisen over the last couple of decades have occurred with skillion type roofs. This is not surprising as the air space volume left after the insulation has been stuffed into the gap is pretty well zilch. That is not to say that attic spaces don't have problems - they do but for different reasons.

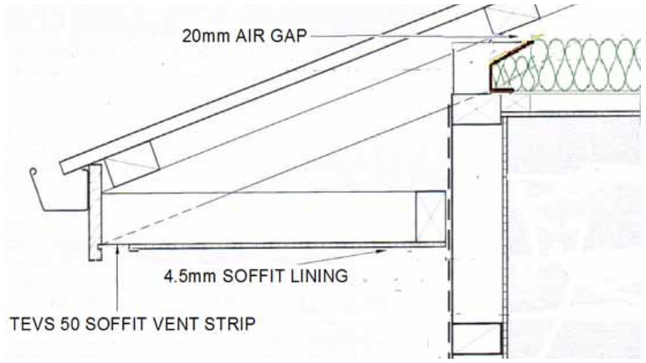
There are four very different situations – attic, skillion, monopitch and duopitch and a different design type is required for each and new building and retrofits also need a slightly different approach.

All vents must be vermin proof and in marine environments must exclude salt aerosol which can be achieved by the use of a permeable membrane adhered to the back of vent grilles.
It is best to explore all the options for passive roof venting before opting for any alternative powered systems which are not energy efficient.
All of the following proprietary ventilation products are available through NZMRM metal roof cladding manufacturers.

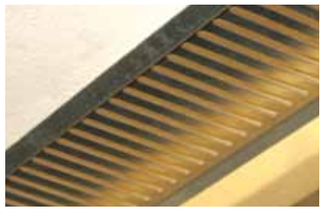
SOFFIT VENTS

Soffit venting is common to all roof space venting systems.
NZ commonly uses 4.5mm fibre-cement for soffit linings with rebated timber fascia boards.

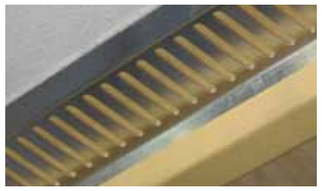
TEVS aluminium vent strips are made in two standard widths with 3mm slots either 50mm or 25mm long x 3.00m although other special sizes can be made to order.



The TEVS can be powder coated or have a permeable backing for marine environments. The TEVS fits into the standard groove of a fascia board while the two different sizes provide the designer with the options to balance ventilation for the site. Aluminium soffit vents can also be used on sloping barges and apex ridges.



The TEVS 50 has a NFA (net free area) of 17,500mm2 per lineal metre



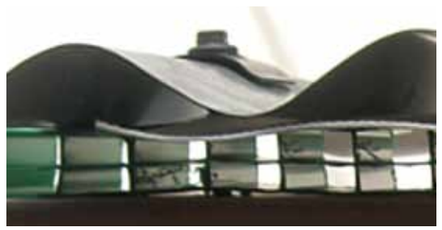
TEVS 25 has a NFA of 9,500mm2 per lineal metre

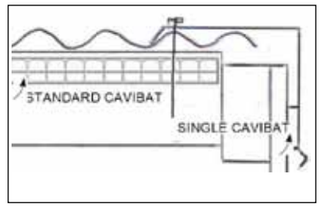
The drawing (above) highlights a common major fault made by insulation installers who, by stuffing the insulation as far into the eave space as they can, effectively blocking off any air movement. A 20mm space is needed between the roof cladding or the purlin to provide ventilation between the soffit and the ridge or gable vents. While there are proprietary products made for this purpose, safety mesh stapled to the bottom or top chord is equally effective although this is not required if a cavity batten is used.

CAVITY BATTEN

A double polypropylene cavity batten (approximately 13,000 mm2 NFA) fixed above every purlin can be used to ventilate the attic space up the roof slope but the actual air movement is very much dependent other factors of the building design.

As an alternative to using soffit venting on barges, a single Cavity batten with insect mesh can be used behind a barge or apex flashing to provide approximately 5,000mm2 of NFA but again the actual flow is very dependent on the inlet area.

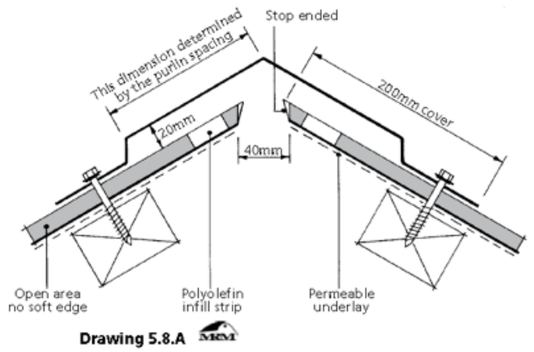




ALTERNATIVE VENTILATION SYSTEMS 'WHIRLYBIRDS'

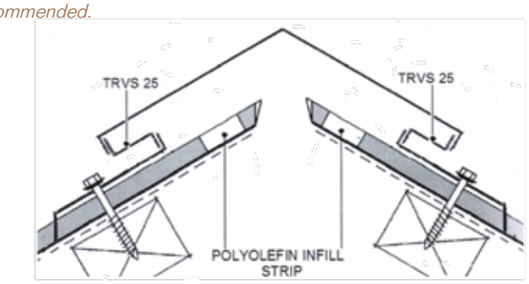
Extract from NZMRM Code of Practice 4.6.2.

Exhaust vents such as continuous or intermittent ridge vents, gable end vents and turbine vents should always be used in conjunction with intake vents.
Turbine vents rely on the wind to rotate the fan blades and when wind is present they draw air from the ventilated area at a greater rate than do passive vents when wind is present. The amount of air movement can be dampened but is normally uncontrolled as it is developed as a function of wind speed as well as turbine size and efficiency. They are not vulnerable to wind direction and their size and number can be calculated for a given air movement and wind speed.
One 300mm throat turbine vent will provide exhaust ventilation for a building of approximately 100m2.



Drawing 5.8.A

In high wind or marine environments an aluminium ridge using a TRVS 25 is recommended.



VENTILATED RIDGING

Ventilated ridging or ridge vents work well in moderate wind conditions and exposure however they are not recommended without eave ventilation. (Drawing 5.8.A)
For flatter roofs additional baffles are recommended.
N.B. Underlay must not be carried over the ridge.

Solar is another exception to passive venting. Solar powered fans are designed only to operate when there is high humidity or temperature in the attic space.
This fan runs on Solar Power with a 12v Solar PV panel with a38v DC motor (with alternative mains power) with an adjustable thermostat and humidistat humidity control switch on at 75% RH & off at 65% RH.
Energy usage is approximately 0.03kwh = $5 per year and the vent is adjustable to the orientation – it tilts and rotates.
One 600mm x 600mm x 270mm vent is suitable for 200m2 @ 18° pitch.

HEAT TRANSFER VENTILATING SYSTEMS

Any claims made by those promoting heat transfer ventilating systems to heat and ventilate your house are easily disproved if you do the science and the only advantage of those acceptable (those with fresh air inlets and a heat- exchanger) is that of trickle ventilation which you can get for free by passive ventilation.

Common sense and science have now prevailed and New Zealand can now re-join the rest of the world in venting their attic spaces. However the responsibility does fall on the designer as it his call as to what system is suitable for each project. All the information provided in this article is intended to assist designers to specify suitable products to comply with the recommended ventilation of attic and skillion roofs. If you have specific questions then most will be able to be answered by NZMRM members or their consultants.

EAGLE'S NEST

The brief called for a contemporary style, with a rustic Coromandel aspect to accommodate the client's style. Single level living was required for the couple, with self-contained living below for family. A pole construction design resulted, terracing down the slope and dramatically bisected by a full height entrance and stairwell with views to the gulf. A corten steel façade and stone chimney reference the mining heritage of Coromandel, and continue the organic flavour.

Specific client requests included:

- Bold entrance way.
- Art studio with views.
- View from ensuite bath.
- Large storage area for gardening equipment .

A decaying three level A-Frame bach had been in the family for years. The owners believed the site was too restrictive to redevelop due to its narrow 18 meter width, coupled with the very steep terrain and related daylight angle issues. When they could find no nearby sites to compare, we began looking at the brief and working towards a solution.

The site is on a long thin peninsula and slopes steeply to the north west away from the road down to the rocky shore. Native plants cover the site and surrounding area. Expansive views are enjoyed north over the Hauraki Gulf and islands.

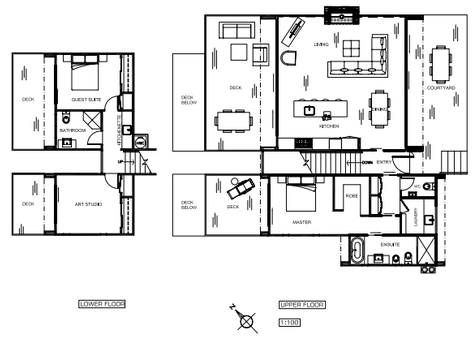
The brief called for a contemporary style, with a rustic Coromandel aspect to accommodate an eclectic mixture of possessions built up over years in the bach. The views were to be as unrestricted as possible as a progression from the earlier narrow A-frame outlook.

Particular challenges of the site included:

- Restrictive day lighting angles combined with the narrowness of the site.
- Dealing with slope in terms of car parking and project build methodology.
- Capturing morning sun due to the building platform nesting below the ridge line road to the east.
- Creating shelter from changeable winds to enable outdoor living.

Design Features and Creative Solutions

A two level pole construction was adopted to deal with the slope. The design terraces down the site with the lower floor tucked below the upper level to limit pole lengths and to form the structure for decking above. The cubic forms of the four dwelling components (living, master suite, guest suite and art studio) are dramatically bisected by a full height entrance and stairway. This space leads the eye on a vertical traverse from stairs to vegetated slope, rocky shore, ocean, islands and sky, as a contrasting preview of the more horizontal vistas to follow. Neighbours were extensively consulted and convinced as to the benefits of mutual consents for daylight encroachments, in maximizing their narrow sites.



This lead to concept design for one neighbour's home, including images of view implications of each home, before consent was given.
The living pavilion has stacking doors for views, and to extend the site restricted living space each way. South east and north west outdoor areas allow sun and wind flexibility.

Energy efficiency is addressed through solar orientation, sunlight control with eaves to glazing ratio, cross flow ventilation, high level insulation & double glazing.
Internally, rustic timber flooring and a stone chimney offset a neutral palette and invite the owner's rustic furnishings into the contemporary space.

Externally, dark band sawn weatherboards are used for a natural aesthetic to blend with the bush surrounds. A feature corten steel façade and Coromandel stone chimney reference the mining heritage of the area, and continue the organic flavour of the home.

As the house is set down below the road the aesthetics of the roof were very important. The Trimrib™ lines were chosen to deliberately reflective of the sea swell and chop lines in the Hauraki Gulf beyond & provide continuity with the strong lines of the weatherboard cladding.

The ironsand colour was chosen to blend with the native bush setting.

There is a very low pitch central roof axis above the entry/stairs in membrane and the trough profile roof provides a visual contrast to this flat area of roof and creates visual interest with glimpses of the bush and shoreline.

Functionally the Trimrib™ was chosen for its lightweight nature given the pole house construction, cost effectiveness and durability.

Clients: George & Fran Campbell.

Architectural Designer: Kris Wilson,
Telephone: 021 574 700
Website: www.designhouse.co.nz
Member of the ADNZ

Main contractor: Steve Wilson Design & Build,
Telephone: 0274 887 688

Engineer: Llandem Consulting engineers,
Telephone: 027 442 4234.

Roofing: Roofing Industries
Trimrib™ 0.55BMT COLORSTEEL®

Design House Architecture

A Hamilton based design firm lead by Director Kris Wilson. Kris has over 10 year's experience in the construction industry working primarily in the Waikato and Coromandel areas.

Our Company mission is to create simple, bold designs using sound aesthetic and practical principles in order to maximize site potential and achieve client satisfaction.

We understand the need for simplicity of structure, which leads to a simplicity of form & the use of proven materials. At Design House we are actively up-skilling in the field of sustainable design, with the goal of creating comfortable, healthy, energy efficient buildings. We focus on, and specialize in residential design, whilst also working with light commercial and education sector clients.

Kris believes communication is the key component of the design process. This begins with the client brief and extends to communication with councils, consultants and trades, always keeping the client informed of relevant outcomes. Communication is also important visually, so all concepts are 3D rendered for client approval. 3D modelling allows for great flexibility, and in conjunction with cost management input, provides for client's peace of mind, before proceeding to detailed design and construction.

Kris is an active member of Architectural Designers New Zealand (ADNZ), and benefits significantly from the organisations inclusive culture and continuing pursuit of excellence.

A BACH NOT A BEACH HOUSE

By Graham Hepburn

Creating a relaxed environment for beachside holidays was the prime motivation for the owners of this Whangamata home. But they also wanted something that was architecturally interesting and displayed the materials and structure of the building.

As Glenn Bodger, of Strata Architects, says, "The owners of this home are probably the most creative clients that we have had. They wanted something that was a bit out there but they also wanted a bach not a beach house."

The narrow, wedge-shaped beachfront site, which was subdivided from a cross-lease title, had strict planning controls but enjoys views over the sand dunes out to sea.

Glenn's two-storey design involved creating a concrete block "plinth" on which the "carcass" of the upper floor sits and overhangs. The home has mono-pitched roof planes, and the view of the sea is framed with an angled picture window. As the section widens out from the street towards the beach, the home expands with it.

Glenn says his clients didn't want a "precious home" that required lots of cleaning and maintenance.

"They wanted a different living experience to the one that they have at home, one that was easy and relaxed and where kids could come in with sand on their feet and the place could take a bit of knocking around. The idea is the place is loaded up with kayaks and bikes and when you get there you throw all that stuff out on the lawn." With that in mind, Glenn and his clients were looking for materials that were durable, would require minimal finishing and would speak for themselves.

Glenn says roofing and cladding were always going to play a big part in the look of the home so it was vital to find the right material. "I wanted to do the roof in lead because I've been to France and seen that and like that matt grey look," says Glenn. "Then David Peake [of Peake Construction and Roofing] told us about Terne Coated Stainless Steel and we saw it and fell in love with it. The great thing about the Terne is that is starts out with a silver satin finish, but as soon as it is exposed to the elements, it begins to weather to mimic the lead look, which ultimately colours to a rich grey patina. The beautiful grey patina blends in with the iconic block wall and the cement board. It is grey on grey on grey."

The majority of the walls and roof planes of the house were wrapped in Independence Gray/TCS II Satin - Terne Coated Stainless Steel, a product new to New Zealand but one that has been used on high-profile buildings in Europe and the United States. The Roll Cap Eurostyle™ profile accentuates the building lines. Eurostyle™ is manufactured by Roofing Industries and available in seven roofing, cladding and panel profiles.

Glenn adds, "The nice thing about the Terne is that the joins are easily soldered and with the solder you can see the manmade elements there. Once it's installed, you leave it to weather and it gets better with age."

That philosophy applies to the whole house where robust materials have been used that can withstand the elements and the coastal environment but soften as they undergo a natural weathering process.

"Nothing on the house is painted," says Glenn. "The block wall and the cement board have all been sealed but then they have just been left to weather."

And the same applies inside where unvarnished timber had been used for ceiling and panelling, while the floors are polished concrete.
"The owner has been collecting tawa and kahikatea for years so that has all been used inside," says Glenn.

The home has been designed to cater for up to three families with a bunkroom and garage that can be used for extra guests.
Even the garage door is a statement in itself, made from fibreglass sheets. "You can see the fibres in the door and the door is translucent so it glows at night when the light is on."
Glenn says the downstairs is quite "utilitarian" with garage, storage, a laundry, bunkroom, bathrooms and two bedrooms. Upstairs are the living spaces and kitchen.

"It was quite a complicated build," says Glenn. "There are seven different levels throughout the home, the spaces step down and around, all the rooms taper and nothing is square. The stairs start at 1100mm wide and at the top they open out to 1500mm wide.
"While it's a really tight house there are areas where the ceiling is 4m high and other areas like the front door where it's 2m high and you can feel the weight of the building."

A feature of that entrance is the Terne cladding wrapping under to form a soffit over the entrance.
It's just one of the design details that provided a huge challenge for David Peake, of Peake Construction and Roofing.
"The job itself was very technical as the building is not square – the lines of it run out of parallel to frame the sea views," David says.
"There are no square angles on it anywhere and that meant no two sheets were the same. The attention to detail was a bit mind-numbing at times but the result looks spectacular."
Because the joins in the Terne sheets are soldered, David says he had to "re-learn how to solder and go out and buy some soldering equipment".

He says other challenges they faced were detailing an internal gutter, picture frame flashing the large, angular windows and creating a ventilated ridge on the roof.
"The design required no ridge flashing on the high side so we had to create a ventilated ridge without showing any ridge flashing," says David. "As there are no proprietary flashing details for a vented ridge that is unflashed, we created a detail in collaboration with the architect in order to achieve the look they wanted, while at the same time meeting the technical requirements for the product installation."

The roofing was laid on a plywood substrate with Enka-Vent matting between the two to allow for venting and expansion.
David says it was the first time he had used Terne and he was impressed with it.

"As a material, it's very similar to copper but lighter than copper and very soft and easy to work with," he says. "We also did all the spoutings and downpipes in Terne and those were all soldered, too."
Terne Coated Stainless Steel has been brought into the country by Auckland-based Ambro Metals Ltd. and manufactured by Roofing Industries in the stunning Eurostyle™ product.
Adrian Ward, of Ambro Metals, says that because the Whangamata home was the first to use the product in New Zealand, he had to vet aspects of the design and installation.

"My role was to make sure the material was installed properly not just for the sake of the product but for the sake of the home," says Adrian.

"I supervised the job and educated the installers about the product because there are practical aspects to it that you can't ignore such as breathability and allowing for expansion. It is also wise to use long lasting stainless steel fixings, not galvanized."

Adrian says a proper installation was vital in the humid coastal environment of Whangamata.
"Convection currents under the roof need to be released because if a home can't breathe sweating and deterioration may take place," Adrian says. "The material also needs break points to allow for expansion and contraction."
He says TCS II Satin - (Terne Coated Stainless Steel) has a proven track record as a durable and attractive architectural roofing and cladding material.

"It has been used on numerous buildings such as the London Opera House, various airports and schools; it's got a long-standing history and it has never failed.
"It's great to work with, solders beautifully and is more compatible with other construction materials we use."

He says the Whangamata job was a challenging first assignment because of the detail involved in the design but the time spent nutting out every element of the installation paid dividends.

"Everyone involved loved the product and walked away with peace of mind that it was going to perform and last the distance as it should."
Strata Architects

Strata Architects

An Auckland-based architectural practice, Strata Architects mixes creative and intelligent design solutions with a strong working knowledge of project management, contemporary construction techniques, and statutory requirements.
"We aim to deliver inspiring projects that exceed the expectations of our clients by pushing the boundaries of what can be achieved in today's working environment. Our goal is to ensure delight and enjoyment for the building's end-users, and consequently, the very best outcomes achievable. Attention to detail in all aspects of the design process is paramount in our approach.

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Strata Architects
Glenn Bodger
New Lynn, Auckland.
Telephone: 09 827 7901

Roofing and cladding:
Terne Coated Stainless Steel in Roll Cap Eurostyle™

Roofing and cladding: supplier:
Roofing Industries Hamilton,
Telephone: 07 849 5115

Roofing installer:
Peake Construction and Roofing,
Telephone: 07 871 8334

Builder:
Coastal Property Specialists,
Telephone: 0274 390 989

What is Terne Coated Stainless Steel?

Produced by US-based Revere Copper Products Inc., Terne Coated Stainless Steel is a Type 304 (non-magnetic) stainless steel suitable for roll-forming covered on both sides with Revere's Z-T Alloy™ with a micro embossed finish.
Revere Copper's patented coating process applies a uniform thickness of minimum 12.7 microns to each side of the stainless steel substrate. The Z-T Alloy™ coated stainless steel is then passed through high-pressure rollers resulting in a micro embossed low glare, satin finish. The Z-T Alloy™ Coating is oxygen reactive and weathers to form an attractive rich earth tone grey patina. The coating provides outstanding resistance against severely corrosive atmospheres, including those encountered in chemically polluted, chlorine laden, and marine environments. The first Terne Coated roofing products were produced in the 1800s, by a company that eventually became the Follansbee Steel Corporation. In 2012 Follansbee Steel Corporation was purchased by Revere Copper, the oldest manufacturing company in the USA. Revere Copper have built a new Revere Z-T™ Alloy coating line with many improvements over the previous already successful manufacturing process. This material is now available in New Zealand exclusively from Ambro Metals.

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

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 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 2014 Ltd
PO Box 211
Timaru
Telephone: 03 688 4169
Contact: Gary Fahey

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

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: Harry Boxall

Queenstown Roofing Ltd
PO Box 2418 Queenstown
Telephone: 03 442 3883
Contact: Bill Giller

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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