ISSUE 34

SCOPE

NZ METAL ROOFING MANUFACTURERS INC.

Below is a brief introduction to the 2013 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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57 Glendhu Road, Glenfield,
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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

MODERN COMFORTS SIMPLIFIED

By Graham Hepburn
It's not always easy to make a virtue out of necessity but architect Graham Pitts has achieved that with the striking steel portal frame home that he designed at Puawai Bay for Marlene and Robin Welch.

With a narrow, sloping site to contend with and a tight budget, Graham came up with the idea of an external portal frame to create interest and cut costs.

As Graham explains, "It was the easiest way to avoid having continuous strip foundations and huge amounts of scaffolding all over the place, which would be another cost. Continuous foundations with a blockwork wall was just not going to be economical. The design solution is essentially that of an extruded house on one level hung within a row of exposed portal frames.

"If the scaffold could be part of the building that would be one less cost to consider and if the cladding could be an economical pre-finished material coated for weather protection, maintenance costs would be minimal. The solution to these issues is the steel portal frames protected with an engineered coating system and the colour-coated corrugated ZINCALUME®."

Graham says the Colorsteel Maxx will not only withstand the rigours of a coastal environment but is also aesthetically pleasing.
"It's a very appropriate cladding for a Kiwi bach situation but also sits well with the portal frame," he says.
Graham says this is the first home he has designed with an external steel portal frame.

"It's essentially commercial warehouse technology; I just domesticated the design," he says. "It's very quick to put up; we had the frames craned in and bolted in place in one day."

Marlene Welch says having removed the original fibrolite bach from the site, she and Robin were looking for a home with presence but also one that would cater for visits from their son and his family who are based overseas. It also had to embrace the north-facing coastal views.

"Graham designed a house before for us in Devonport so we knew him and he knew us," says Marlene.

"We started off with the idea of a long, thin house and we wanted a lot of glass in it. Then Graham came up with the steel portal frame and we loved it."

Graham adds, "The brief was different from the first home which required a gallery to display

challenging and interesting furniture designed and made by Robin, a studio for interior designer Marlene, and one bedroom. When questioned about saleability the answer was, "Not our problem; the estate executors will deal with that!" The same attitude applied with respect to this house.

Unexpected and challenging design was important. However, two bedrooms were included for family and grandchildren visits. And underlying the wish list was a limited budget."

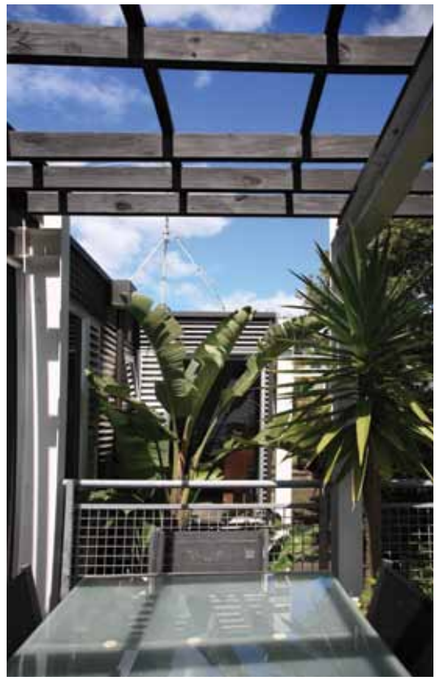
A concrete driveway leads down to the house from the road and forms a "motor court" for parking and ease of turning outside the garage. A level wooden footpath runs down the side of the garage to the front door, which opens into a foyer that links with the open plan main living area.

"The layout of the building meant that if they needed to they could wheelchair straight into the main floor and main bedroom," says Graham. "All their living is on that level so when they don't have guests they could just ignore the fact that they had a basement."

Graham adds, "An earthquake rift offset the garage and main bedroom from the living areas and in so doing defined the entry and created a northern aspect and view for this area. Living and dining are within one long space subtly defined with walls, full height doors, windows, decks and the stairs to the basement all fitting to the regular portal module. The very simple kitchen, which runs along one interior wall, is separated from this area by the stair. The other wall is full height glass overlooking the garden."

Downstairs there are two bedrooms, a shower room and laundry. The downstairs bedrooms have full height double glazed windows that mirror the full height windows upstairs and the doors that open to a deck with sea views. A glass front door was a part of the original design allowing visitors to see though the house and out to sea. This feature was later discarded for a more traditional wooden door.

Marlene says while the home has all the modern comforts, it has been "simplified to a minimalist extreme". Graham adds, "All other design elements such as the balustrade to



decks and the polished concrete kitchen counter are generated from and are consistent with these decisions.

Using a steel portal frame made the construction process – including laying the floor joists and framing up the house - a lot easier and quicker. So much so that the builder got through the initial stages of construction so quickly that he had to wait for subcontractors to arrive at their pre-arranged times."

Graham Pitts

As a student, Devonport-based architect Graham Pitts did an in-depth study of the work of Group Architects who broke with tradition and began exploring a distinctly New Zealand style of architecture that responded to our lifestyle, environment and climate. Having previously run a small to medium architectural practice employing up to seven people, Graham has decided to go it alone in the interests of his clients. He says clients do not want to talk to what is effectively "a front man," they want to deal with the person who will be hands on and is involved in the creative process. Today he deals with all projects directly and has established a loyal group of clients, some of whom have returned to have four or more homes designed. He believes this personal approach achieves the best and most satisfying result for both client and architect.

Clients: Marlene and Robin Welch.

Architect: Graham Pitts,
Telephone: 09 446 1070

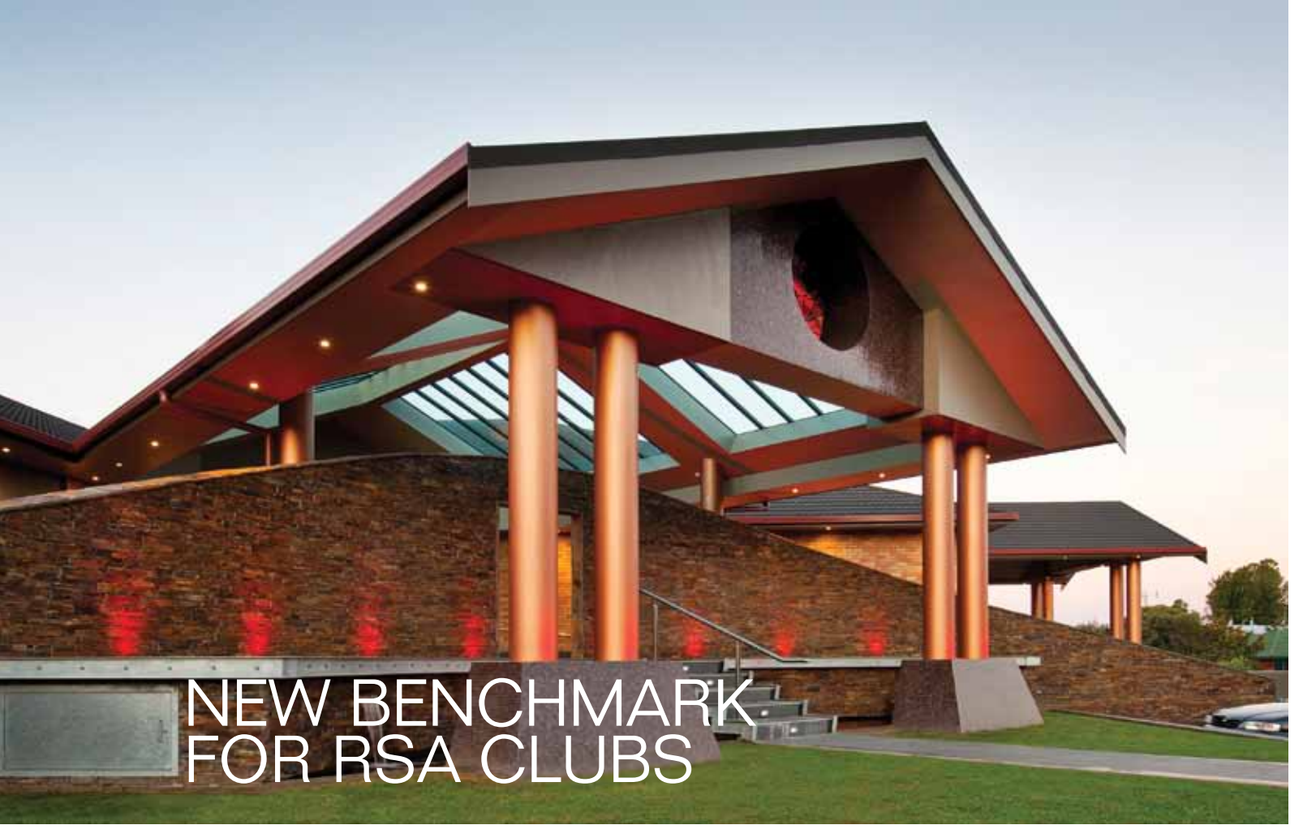
Main contractor: Harbour City Homes,
Telephone: 027 478 2855

Engineer: MSC Consulting Group,
Telephone: 09 486 2210.

Geotechnical engineer:
Ormiston Associates,
Telephone: 09 302 2193

Cladding: COLORSTEEL ®Maxx®
Colour: Ironsand corrugate.

Cladding installer:
Slater Roofing & Spouting,
Telephone: 09 407 4036



NEW BENCHMARK FOR RSA CLUBS

While some traditional sports and RSA clubs are facing difficult times maintaining membership and commercial viability, Swanson RSA is bucking the trend big time.
Having undergone an extensive makeover, which involved demolishing and rebuilding 70% of the existing building, one of Swanson's most iconic community facilities has been totally transformed and has more than doubled its membership.
Bar, restaurant and club activity revenues have increased well in excess of projections, and newly created business facilities within the complex are thriving.

So is this how clubs in New Zealand will evolve in the future?

New thinking

The way people interact socially has changed significantly over the last 20 years, and traditional club-type venues are facing ever-increasing competition from more modern and sophisticated dining and entertainment alternatives.
The designer of Swanson's makeover, Grant Watson from Pure Design, has extensive experience with commercial entertainment facilities, and has a good insight into the issues.

"There are RSAs that do very well and there are RSAs that struggle.

It's much the same with all clubs. The ones struggling are run in a traditional way as a closed club. The successful ones are being run to meet the demand.

"The reason Swanson is so successful is that they have some self employed guys on the committee that know how to run a business. As a national organisation, the RSA has just announced a new strategy to refocus the RSAs as community clubs. This is exactly what we discussed back in 2004 when we started this project."

Building a business

Spokesman for the Swanson RSA building committee, treasurer Roger Cooksley, was one of the prime movers in the project and says the original objectives have been well and truly met.

"The buildings we were in had been around for nearly 30 years and they were very tired. But instead of just refurbishing, we wanted to go that extra step to get something that was more modern and appropriate to attract new members and make the whole experience more pleasing."

Grant recalls: "There was a clear opportunity to increase their overall business potential beyond traditional RSA activities. There was an opportunity to make a seminar venue for conferences during the week, and of course, the restaurant is right next door.

"We set up the restaurant in a way so that you can have a seminar running in the function room and a separate seminar running in the restaurant if need be. Or you can put them together. What we tried to do is take the brief and make the facilities as flexible as possible."

Noise issues

The project was planned in three stages to minimise disruption to the club's day-to-day activities, and while the major building, fit-out and landscaping work was effectively achieved in less than two years, resource consent caused significant delays in the early days.

Roger is pretty candid in his views. "Getting resource consent was the biggest problem by far and it was pain. It took damn near six years and hundreds of thousands of dollars." Grant remembers it well. "The major issue was the club's location in a residential area, and we were up front right at the start with our plans and invited the community to participate. Unfortunately, immediately thereafter, we got a whole lot of abatement notices because people thought because we were going to get bigger, we'd get louder.

"The fact is we're now much quieter than before. We spent a

nevertheless future looking in terms of use of natural resources. All rainwater/storm water is harvested and all the lighting used throughout the complex has been designed to minimise energy use. Grant explains: "There's a large 120-car parking facility and we have a huge roof. All the water from the

huge amount installing noise control systems. A full band can be playing in the function room now at full noise and you can't really hear them outside.

"We stripped all the exterior and interior linings, put in noise insulation inside the walls, put back a higher density exterior lining, then left a 100mm gap and built another wall inside that. We filled that space with acoustic insulation and then double lined it with noise rated plasterboard.

"The whole ceiling has a 300mm deep plywood box filled with acoustic material suspended above the acoustic absorbent ceiling panels."

Sustainability

Sustainability issues were also closely addressed, and while budget limitations due to the cost of resource consent limited what could be done, the facilities are

car park goes through a sand filter and is stored in a tank to water the gardens. We harvest enough from the car park to water our gardens for six months of the year, and we have another tank that collects roof water for use in the bathrooms.

"To reduce energy consumption, a lot of the lighting in the complex uses LED lights where practical. While they are more expensive than the halogen lights previously used, they last for 50,000 hours plus compared to halogen, which lasts between 1000 to 1500 hours. And halogen uses 50 watts of power whereas LED uses only 17 watts." A bonus of the LED system is that it adds a real wow factor as all the lights throughout the complex can be colour co-coordinated.

"We can turn the whole building green on St Paddy's day, pink for breast cancer day, red for Xmas. We can adjust RGB colours and choose from over 16 million colours," says Grant.

Material selection

While the Swanson RSA building committee left most of the materials selection decisions to Grant and his design company, there was one aspect of the old building they wanted to retain. "The building committee wanted the same roof," Roger recalls. "As far as we were concerned, we were happy with what we had. The Gerard roof had been there for nearly 30 years without any hassle and had given us no problem whatsoever, so we thought we'd stick with that."

From the designer's point of view, it also ensured the building would blend in with the surroundings. "The complex is smack in middle of a residential area, so it was important for us that it look like part of that immediate community," says Grant. "Basically, we tried to make it look like a house, albeit a big house."

Due to the complex planning issues, the Swanson RSA project is one of the most protracted jobs Grant has ever worked on, and while it is an unqualified success, Grant is clear about who deserves the glory.

"This journey took six years of town planning, land court hearings and dogged determination on the part of the project team to get to the point of starting the building process. They have been totally selfless and passionate. "But I think Roger's attitude sums up the efforts of the whole club: He's one of these guys that sees a goal, and he sets that goal and he just goes for it."

Design: Grant Watson,
Pure Design Ltd
Telephone: 09 826 1491
Mobile: 021 463 120
www.puredesign.co.nz

Roofing: Gerard Roofs
Telephone: 0800 244 737
www.gerardroofs.co.nz
Profile: Tuffcoat
Colour: Charcoal

Roof installer:
Apex Metal Roofing Limited
Telephone: 09 838 5851
www.apexmetalroofing.co.nz

HEAVY METAL

I understand this is the name of a type of modern music. This article is not about music, but about stuff you don't want in your body, and specifically that you don't want in the paint on your roof or walls.
Unfortunately the definition of "heavy metal" is somewhat loose. Wikipedia provides "any metallic chemical element within the upper range of atomic weights" and then "A heavy metal is a member of a loosely defined subset of elements that exhibit metallic properties" but also "The term heavy metal has been called a "misinterpretation" in an IUPAC technical report due to the contradictory definitions and its lack of a 'coherent scientific basis'". So, a term we have been happily using for decades actually has an uncertain definition.

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However, for the purpose of this exercise a further extract will clarify, "Living organisms require varying amounts of "heavy metals". Iron, cobalt, copper, manganese, molybdenum, and zinc are required by humans. Excessive levels can be damaging to the organism. Other heavy metals such as mercury, plutonium, arsenic and lead are toxic metals and their accumulation over time in the bodies of animals can cause serious illness"

So we have two types – necessary to life in some form in probably small quantities, and toxic at any level and capable of being accumulated in the body. This is particularly pernicious as while a large dose has immediately obvious effects, continuous small doses have less obvious, but no less serious effects over a longer time frame. Nothing happens until the person is seriously ill.

Here we are going to discuss lead in paint, and specifically paint used to coil coat our metal roof and wall claddings; however chromium is another metal of concern for human health, and which also has relevance for paint, chromate primers having been popular for many years (because, like lead, they have good durability properties, but only for the building, not the inhabitants). This however is another story.

Lead and humans have been in close proximity for much of recorded history, and lead has been poisoning people for much of that time too.

Ancient records of lead miners indicate madness attributed to contact with too much lead. So it was known to be dangerous even 3000+ years ago, but they just ignored this and went right on using it. The Romans used lead acetate (lead sugar) to sweeten their wine (and also used lead water pipes). The makeup known as kohl contained lead oxide as did cosmetics used to whiten the face in Elizabethan times. Some Oriental traditional medicine contained lead metal. Lead in cookware (paint or metal) can contaminate food. Lead in bullets may cause damage (other than that of being shot) if it remains in the body. And finally in much of the 20th Century we have used tetra-ethyl lead in petrol as an anti-knock agent. In the late 20th and now the 21st centuries we have been taking lead out of things, except car batteries, and even here you can expect replacement with lithium (possibly more dangerous even!)

Extract from the OSH guidelines on lead in paint documentation (www.healthed.govt.nz/ system/files/resource-files/HE6018.pdf) follows -

It should be noted that the concentration of lead in domestic paints has declined dramatically in the past decades. It may thus be assumed that pre-1970 interior or exterior domestic paintwork is almost certainly lead-based, while pre-1980 paintwork may be lead-based. Post-1980 paintwork may generally be assured to have a very low lead content unless old stock or industrial specification paint was used inappropriately.

Paint formulations contain a variety of materials, several of which (such as lead, chromate and solvents) may be harmful to health under certain conditions. However, research has indicated that lead is presently the predominant public and occupational hazard associated with paint removal work in New Zealand.

Prior to 1945, white lead was extensively used as a pigment in paint, but after this date it was progressively replaced by titanium dioxide. Recognition of the hazards to health associated with lead in paint has since led to strict controls on paint lead content, and other forms of lead have since been withdrawn from paint formulations.

The following are estimates of when various forms of lead were controlled:

- White lead (basic lead carbonate) and lead sulphate were used as white pigments in domestic paints until the mid-1960s.
- Lead chromate (yellow pigment) was an ingredient in domestic paint until the late 1970s.
- Red lead paint (steel primer) is known to have been used as a wood primer until the 1980s.
- Calcium plumbate has been widely used as a roof coating for iron roofs from 1958 until the present time. It is now no longer manufactured and few stocks presently remain.

Lead water pipes tend to get coated inside with calcium carbonate and other deposits and for cold water may not have been too dangerous. Lead acid batteries have the lead pretty well contained and the acid is more of a hazard (in use, and after life they can be recycled). However, all the other uses listed above and more besides have created health hazards for centuries for humans exposed to them. And of course this is not just to humans or vertebrate life. Look at any old building with exposed lead (or indeed zinc or copper) flashings under windows – the area washed by this is clear of algae or lichen even if the rest of the roof is covered.

Only in the last 30-40 years has this been realised and lead use phased out. Indeed for lead in petrol this is even more recent- only since about 2000 has lead in petrol been totally phased-out in developed countries. Perhaps typical of lead use, lead in petrol had many very useful functions, and these have had to be replaced by other, not always as efficient, methods of achieving the same function. It is probably fair to say that the damage lead does to catalytic exhaust converters was also a reason for removal of lead. I noticed on a recent holiday in Europe that lead-containing petrol is still available in some places (no names!)

The same could be said for paint, and it can be said that paint primers containing lead did perform better than their replacements; pity about the toxicity.

So, what about the paint used for metal roof and wall claddings. Apart from the hazards common to other lead applications – toxicity among workers making the lead compounds, making the paint, applying the paint, and disposing of the paint during recycle of the coated steel, we have the issue that many people globally used painted metal roofs to catch rainwater for drinking (and for watering plants).

Both these activities have been shown to have adverse health effects of people (or plants) consuming them. Unlike ingestion in larger quantities the uptake of lead from drinking water is slow but still dangerous, and this means the symptoms may not be so obvious.

The use of paint containing lead for painted metal used for roofs has been banned and controlled since 1996 (and before). Since any pre-painted metal cladding product may be used for a roof from which drinking water is taken, this ban applies to all such product.

Back to HASNO - the following (rather detailed) extract from the regulations spells this out –

3.6 Hazardous Substances and New Organisms Act 1996
The Hazardous Substances and New Organisms Act (HSNO) and its associated regulations places controls on the import, manufacture or use (including disposal) of chemicals that have hazardous properties. This includes house paint or industrial paint containing lead. The Act requires lead-containing paint (manufactured or imported after 2006 note this late date) to be labelled with warning and hazard information. The labelling required will depend on the chemical form in which the lead is present in the paint and the amount present.

Hazardous Substances and New Organisms Act 1996 - Group Standards for Surface and Coatings and Colorants.

Under the Group Standards for Surface and Coatings and Colorants, any substance permitted that is intended for use as a paint must comply with the restrictions as set out in the Australian Uniform Paint Standard, as per Appendix 1 of the Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP) No. 20. The SUSDP prohibits the manufacture, sale, supply or use of any paint with a lead content greater than 0.1 percent and 0.2 percent (percentage based on the non-volatile content of the paint) for lead and lead compounds and lead and lead compounds occurring as an impurity in zinc-based paint, respectively. The restrictions on application apply to: (1) a roof or for any surface to be used for the collection or storage of potable water; or (2) furniture; (3) any fence, wall, post, gate, building (interior or exterior), bridge, pylon, pipeline, storage tank or any similar structure; or (4) any premises, equipment or utensils used for the manufacture, processing, preparation, packing or serving of products intended for human or animal consumption.

This document makes it clear that lead above a certain level has not been allowed in roof paint since 1996, because of run-off. The other effect mentioned in several sources is that once binder of the lead containing paint deteriorates from UV and oxidative degradation the lead filler can blow or wash away as lead containing dust. (Very similar to asbestos both in means of exposure and rectification, although not health effect).

Any roof paint containing more than 0.1% lead or lead compounds and 0.2% lead or lead compounds in zinc based paints is not allowed under the HSNO legislation – regardless of whether it runs off or not. In the case of low quality paint, fading caused by UV degradation means the binder has failed and can release lead compounds into roof water.

At the 2013 AGM, NZMRM members approved the development of a new MRM coil specification, based on AS/NZS 2728 with some modifications. This will be published widely in early 2014. In the meantime, NZMRM requires that coilcoated metal cladding used by our members complies with AS/NZS 2728 Thus so it is also relevant to look at Appendix M of AS/NZS 2728:2013 (and earlier versions) – which follows the HSNO regulations above, but is specifically for coil-coated cladding. This is included in the MRM coil specification.

M1 SCOPE

This Appendix provides guidance on the safe applications of paint coatings on metallic substrates. The proportion of a substance for the purposes of these schedules is calculated as a percentage of the element present in the non-volatile content of the paint.

Use of any of these materials in paint used on coilcoated steel or aluminium roof cladding means that the products then does not comply with AS/NZS 2728, or the proposed NZMRM coil specification, or the NZ HSNO regulations.

Some overseas countries do still allow lead to be used in paint (drinking water is not collected because of other pollution), and at the same time UV resistance required is less in a less severe environment.

NOTE: Third schedule paint should not exceed the following limits:

(a) Lead or lead compound.....	0.1 per cent.
(b) Lead or lead compounds occurring as an impurity in zinc based paint.....	0.2 per cent.

Worth noting also
M3 FIRST SCHEDULE PAINT
A person should not manufacture, sell, supply, or use a First Schedule Paint for application to:
(a) A roof or for any surface to be used for the collection or storage of rainwater.

NOTE: First schedule paint should not exceed the following limits:

(a) Antimony or antimony compounds, excluding antimony tartrate pigments.....	5 per cent.
(b) Barium salts excluding barium sulphate or barium metaborate.....	5 per cent.
(c) Cadmium or cadmium compounds	0.1 per cent.
(d) Chromium as chromates of ammonia, barium, potassium, sodium, strontium or zinc.....	5 per cent.
(e) Selenium or selenium compounds	0.1 per cent.

M4 THIRD SCHEDULE PAINT

A person should not manufacture, sell, supply, or use a Third Schedule Paint for application to:
(a) A roof or for any surface to be used for the collection of storage of rainwater.
The latter (M3) covers some of the other heavy metals which have been useful in and used in paints in earlier times, but are no longer allowed because of health risks discovered during the last decades of the 20th century. Strontium chromate has previously been used as a very corrosion inhibiting primer for coil-coated paints.

Therefore without the right quality controls we could see imported product which will not comply with the criteria outlined and could therefore leads to detrimental health effects for those using roof water for drinking (or even garden watering). Quality of the paint is the key component to ensure this does not occur.

If you are not sure of the source of your painted product, ask the supplier to confirm it is lead-free, or to have a sample analysed or get them to confirm it complies with the NZMRM standard.

For more information the GUIDELINES FOR THE MANAGEMENT OF LEAD-BASED PAINT published by the Ministry of Health and Department of Labour in 2008 (referred to above also) contains more than you will ever want to know.

STEEL YOURSELF THIS HOME IS PARADISE

No need to ask Richard Devine why he chose to build his dream home in steel: as an engineer who'd been designing and building in industrial-strength steel for nearly 40 years, he knew the benefits.

However, that's not how the house was originally designed.

When Richard and his wife Liane moved onto their Forest Road property, they lived for four years in a 144m² 'tin shed', experiencing rural life while also developing their new business in Taupo.

During this time they played around with designs for the house they planned to build on the property. At this stage they didn't think beyond a traditional timber-framed and timber-clad building. When they'd got all their ideas on paper, they took their floor plans to their architect friend Doug Johnson who designed their house according to their concept, and then prompt Council approval meant the Devines were ready to build their house – in wood.

Meanwhile, as they 'got their heads round' their new business, KiwiSpanNZ – building and supplying steel frame buildings, car ports, garages and rural buildings in sizes to suit most conditions – they increasingly came to appreciate the versatility of steel for residential buildings.

Richard soon realised the advantages of combining the wide-span steel beams they used in their sheds with the lighter weight AXXIS® Steel for Framing, and using COLORSTEEL® for cladding as well as roofing – and grasped the full potential of using steel throughout their new home.

So, Doug Johnson redrew the plans to specify steel – steel frames, steel cladding and steel roofing – which meant returning to Council for another building consent.

"Our consented design involved the juxta-positioning of five KiwiSpanNZ 'tin sheds' in three different sizes, each linked to another by passageways, creating easy-flow access," Richard explains. "Each roof is supported by galvanised, high-tensile steel spans, which means the interior steel wall frames are not load-bearing, which in turn means we could put them wherever we wanted. That led to innovative interior design."

This combination of modules gives the 380m² house an interesting roof line, while the corrugated Colorsteel cladding, interspersed with recycled hardwood and stonework, presents an intriguing façade under the multi-level Colorsteel 0.55 Plumbdek Roofing Iron.

All steel is in the subdued shade of Grey Friars, chosen for its consistency in blending with the native bush and rocky outcrops of the surrounding countryside. The property speaks of environmental awareness and a subtle modesty in this anything-but-modest home. The two steel profiles are linked seamlessly by the spouting, also in Grey Friars toning.

The portico's trusses, beams and poles are of recycled hardwood, which has also been introduced in unexpected places, both out- and inside the house – and includes some cedar and a considerable amount of Australian jarrah from poles rescued from demolished bridges.

Inside, there are many eye-catching yet convenient features. Striking are the three different ceiling heights, according to the dimensions of the KiwiSpan frames used, which mirror the exterior roof line. A double-fronted central fireplace with stone surrounds directly warms two living spaces while underfloor heating from a diesel boiler maintains warmth throughout the house, a three-unit DVS system ensures it circulates and double-glazed windows contain it within the house.

"Although we did choose a better-than-standard quality because of the location, not because of the design, we didn't need to install any extra insulation because of our corrugated Colorsteel cladding," Richard explained, adding, "But we did put in a heat pump down in the family room to augment the warmth delivered through the DVS system."

An innovative feature that has proved remarkably successful is the outdoor/indoor barbeque area, a four-metre wide by eight-metre long entertainment zone with the stone fireplace at one end and a barbeque at the other. The area is comfortable in all weather conditions as the Colorsteel side walls slide back and forward, and stack to overlap each other – and so ensure both protection from the cold and a spacious indoor-outdoor flow into the summer sunshine. The stone work at the fireplace end of the room is complemented by subtle use of the recycled Australian jarrah which is such a significant feature on the exterior.

Both the lounge and the master bedroom have sarked ceilings lined with grooved plywood painted in light colours, giving them – and the house – an airy feel. Living, leisure and service area floors have been lightly ground to give an industrial salt-and-pepper effect with scatter rugs covering the lounge, kitchen and two-metre wide hallways, while the bedrooms are carpeted.

The actual building of the house was an inside job. Richard's crew at KiwiSpanNZ were engaged to do the work, which they did in between other contracts. This meant the actual construction took a bit longer than if the crew had been focused on only the Devine house, but then, Richard and Liane had waited four years already – and were living on site anyway.

The fabrication of steel was also done on site – by Eddie Eagles and his Taupo firm of EziSteel, fabricators of light gauge steel framing and trusses for their New Zealand-wide market.

EziSteel set up their computer-controlled CNC roll forming machine on their purpose-built trailer in a shed on Richard's property, where they manufactured the precision-made AXXIS steel frames and trusses. Once the Devines had their concept plan, elevations and floor layout, Eddie's expertise and his CAD programme did the rest.

The proximity was a bonus for both Richard and Eddie.

"This high tensile steel is so light, it took only two men to walk each section from shed to house site and lift the framing and trusses into place – and none of us suffered from those builders' ailments: sore shoulders and back ache!

"Eddie's manufacturing precision to 1/10 per mm ensured all the holes were in the right place, and although the build looks complicated, in fact this was more like a large jigsaw – with all the parts fitting perfectly. Steel is a very user-friendly material to work with – and there are no nails in a steel house: all parts are screwed or riveted together through those pre-drilled holes."

As for changing your mind when you're building with steel: "It happens all the time," agrees Eddie. "But it's no problem. A customer wants a window sill at a certain height but when it's in place it's too high and blocks the view from a sitting position – so we drill out the rivets and get out the tin snips, cut off the extra length and put the wall frame together again. Raising the height of the window sill is a bit trickier but still no real problem."

Eddie's expertise was invaluable, Richard feels. "He didn't just supply the steel materials. He gave us all the support and advice we needed." And now over two years on, how do Richard and Liane enjoy living in their dream home? He says they have lots of admiring comments from visitors to add to their own appreciation of their home.

"We just love it," Richard confirms. "The flow's good. It's really working for us. It suits the whole family. A while ago we've stayed for a night at an up-market hotel – and came away loving this home even more. It's better than a 10-Star hotel.

We face north into full sunshine and never miss a sunbeam. We're 660 metres high, with views of the headlands of Whakatane to the east and hills covered in native bush and farms to the north. We are surrounded by a panorama of rural New Zealand and the native bush sees to it that we are serenaded from dawn to dusk by native birds. What's more, the trees we planted five to ten years ago have now really taken off.

"Heaven can't be any better."

Clients: Richard and Liane Devine

Designer: Doug Johnson

Roofing and Cladding Manufacturer: Steel and Tube
Telephone: 09 274 4056
www.steelandtube.co.nz

Roof cladding: Steel & Tube Plumbdek™ in Colorsteel® Endura® Grey Friars

Wall cladding: Steel & Tube Custom Orb® in Colorsteel® Endura® Grey Friars

ROOFING INDUSTRIES LAUNCH AN INNOVATION ON AN OLD CLASSIC

Few things are more iconic than Kiwi corrugated roofing, yet even an enduring classic can benefit from innovation.

Roofing Industries is proud to launch True Oak® Corrugate – the first major advance in metal corrugated roofing in New Zealand for over 70 years. True Oak® is a return to the deeper, rounder, original corrugate shape that dates back to the early 1800's. Using patented manufacturing technology, True Oak® combines the charm of deeper curves with increased strength performance to create the strongest residential metal corrugated profile.

The sinusoidal wave is strikingly different from traditional shallow profiles however the benefits are more than aesthetic. True Oak® allows for greater spans for reduced construction costs and the deep curves enhance water carrying capacity.

True Oak® can be installed down to a 4 degree pitch which provides new architectural options for metal corrugate.

As well as delivering on design and functionality, True Oak is also an environmental choice. Ecospecifier is currently assessing True Oak® against all major green building rating tools to award True Oak® a GreenTag™. 100% manufactured in New Zealand, its warranties meet New Zealand's Building Code.

True Oak® is available in various metal substrates and Colorcote® and Colorsteel® surface finishes.

Materials

- *ZINCALUME® steel: .40 mm BMT or .55 mm BMT, AZ150 (150gm/m2) G550 Mpa Yield Stress.*
- *Galvanised steel: .40 mm BMT or .55 mm BMT, Z450 (450gm/m2) G550 Mpa Yield Stress.*
- *Pre-painted Colorcote® or Colorsteel® over ZINCALUME® .40 mm BMT or .55 mm BMT, AZ150 (150gm/m2), G550 Mpa Yield Stress.*
- *Prepainted Colorcote® or Colorsteel® over Galvanised steel: .40 mm BMT or .55mm BMT ZM275 (275gm/m2) G550 Mpa Yield Stress.*
- *Prepainted Colorcote® over ZAM™ .40 mm BMT or .55 mm BMT, ZA275 (275gm/m2) G550 Mpa Yield Stress.*

For information on aluminium, stainless steel, pure zinc and copper True Oak® Corrugate products, contact Roofing Industries.
www. roof.co.nz or telephone 0800 844 822.

PATENTED MANUFACTURING TECHNOLOGY

SCOPE NEWS AND VIEWS

THE 46TH ANNUAL NZMRM

Conference was held at the Westin Denarau hotel in Fiji from the 12th to the 17th September.
At Conference Darrell Back stepped down after holding the presidency for 19 years to be replaced by Tom Marshall from Marshall Industries. The new executive is:

President:
Tom Marshall
Marshall Industries
Immediate Past President:
Darrell Back
Taranaki Steelformers
Executive:
Rod Newbold
Steel and Tube
Tony Barbarich
Metalcraft Industries
Phil Prior
Roofing Industries
Warren Oliver
Franklin Long Run
Jonathan Peterson Calder Stewart
Stuart Hayman
(Seconded)

Retiring President Darrell Back gave a retrospective of his time as president, noting that it had been enjoyable but challenging at times! Darrell noted that the association had made great strides over the time of his presidency and stressed how critical it was that momentum was maintained and past gains preserved.

In recognition of Darrell's service to the industry, he was made a life member of the Association.

Other matters dealt with at conference included the NZMRM coil specification, and further progress towards the proposed NZMRM systems warranty.

The social side of conference was, as usual, a lot of fun. A great NZS/PCC dinner on the beach, an exciting night at the golf and racquet club watching the All Blacks beat South Africa, an Indian themed dinner and finally a closing cocktail evening rounded out the list.

Below: Some of the ladies at the Indian Themed Dinner present a colourful addition to the conference social agenda

A SLICE OF COUNTRY

By Graham Hepburn

Creating a home that blends into the landscape and its rural surrounds was part of the brief for architectural designer Brynn McCauley on this award-winning project.

"The owners wanted to create something in keeping with the site and like the surrounding rural buildings so milking sheds – with their simple facades and striking mono-pitched roof forms – were the main inspiration," says Brynn. "The site is set in the valley with hills behind. It's a beautiful site with strong geography, some lovely landforms and a great outlook with a peep of the sea."

The 210sq m home in the village of Manakau was designed to resemble a collection of rural buildings, while vertically arranged COLORSTEEL® appears to fold from the mono-pitch roof down the front of the home, mimicking the steeply rising ridgeline that forms a backdrop to the property.

Bringing these elements together successfully saw Brynn recently become a national winner at the 2013 ADNZ Resene Architectural Design Awards for New Homes Between 150sqm and 300sqm after picking up the regional prize in the same category at the ADNZ awards earlier in the year.

Brynn says having "design-conscious and site-conscious" clients in Lucy Potter and Ramon Hart helped immensely, as well as having a strong site to work with.

The west-facing property features a four-bedroom home with attached garaging and a large forecourt separating it from a 58sqm workshop – both of the latter two features important to Ramon, a logging contractor. The house plan is arranged so the buildings – all similar in form - nestle into the contours of the site.
Budget was also an important part of the equation, and the couple was not prepared to compromise on the size of what was to be a family home.

Brynn says this meant using simple materials and building methods, again in keeping with the functionality of rural buildings. COLORSTEEL® Endura in Metcom7 profile has been used for the roofing and part of the building's façade.

"Normally Metcom7 is used in industrial or agricultural settings but we wanted to use its strong lines to relate it to the alignment of the hills and the way the escarpment ranges up so the house layers in with that and the linear elements of the Tararuas," says Brynn.

"Looking at the house you get the idea of a grouping of buildings rather than one solid form. So what you see is not one amorphous structure but elements that punch out," says Brynn. "It was quite a challenge to create that impression visually with basic building materials. "The plywood is battened on the joins so it has a slightly industrial/ agricultural flavour and looks like a utility building."

Because the project is located in an area identified as having significant landscape and rural character, a resource consent was required to ensure that the house reflected those values and that meant subdued "earthy tones" were required for the exterior. The roof and cladding is in 'Greyfriars', while the board and batten areas have been stained with Resene Woodsman 'Equilibrium'.
The plywood panels and glazing were "formatted" to create symmetry on the exterior, while aluminium joinery was used to complement the light, uncluttered look.

Plywood panels are also used within the house such as on the kitchen island and family room walls to blend the interior with the exterior.

The entrance is at the south end, slicing between the form of the garage and main form of the house.

The kitchen, open plan living areas and main bedroom are then arranged across the front and along the plan on a north-south axis. The children's bedrooms, main bathroom and services areas are set in the quieter space behind these busy areas. This layout optimises the connection of the living spaces to the property and views out over the valley. A woodburner with wetback warms the living space, and, given Ramon's job, there is no lack of fuel.

"The living room has lots of sun and ventilation, and almost feels like an outside space," says Brynn.

While subdued tones were required for the exterior, the interior features splashes of colour – blues, greens and yellows – that define different areas and inject a sense of fun.

The kitchen serves as the main focus to the interior of the house, commanding wide views out over the property.

The living and kitchen spaces all open via stacking sliding doors out onto the large decked areas, to the northern and western sides of the house. Placement of the decks was carefully considered to provide sheltered areas.

Landscaping has been kept to a minimum in line with the rural shed aesthetic.

"Essentially they wanted the property to be left as a paddock running up and around past the house with the decks reaching out into the paddock and some grasses and flaxes around the edges," says Brynn. "There's a stream that runs diagonally across the property with planting along the edges so you cross that through a swathe of plants as the driveway winds its way up to the house."

Brynn says this approach combined with the home's simple but striking forms help to create a sense of arrival.

Brynn McCauley, Architectural Designer

Brynn McCauley has been working in the architectural industry since undertaking his studies at the Victoria University School of Architecture in 1991. He has a Bachelor of Building Science and is a Design 2 Licensed Building Practitioner. He has been a member of ADNZ since 2002. He began his own business working in the Kapiti/ Horowhenua/Wellington region as BMC Design Ltd in 1997. Prior to this he had the benefit of working for a number of leading New Zealand architectural and interior design practices.

Since commencing his own business, he has focused on delivering creative and contemporary architectural design solutions to a wide variety of projects and clients, throughout the country. His projects often have a contemporary flavour, with materials and built form that explores and relates to their intended function, the site and needs of the client.
These projects have involved working in Commercial Interior Design, Retail, Light Commercial, through to New Residential work and alterations. He also often works in close association with other architectural practices, which gives him a wide variety of experience, working on a range of projects throughout the country.
He has been responsible for and contributed to a number of projects that have achieved industry awards and recognition, including a number of ADNZ National and Regional awards.

Architectural Designer:
Brynn McCauley
Telephone: 021 53 4244
brynn.mccauley@xtra.co.nz

Photograghер Ireen Demut Photography

Roofing and cladding:
COLORSTEEL® Endura
Profile Metcom 7
Colour 'Greyfriars'.

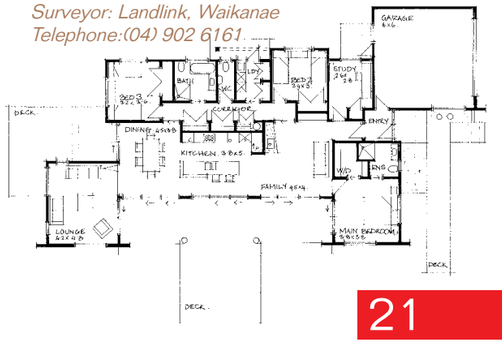
Roofing and cladding supplier;
Metalcraft Wellington

Roofing and cladding installer:
Metalcraft Roofing
Palmerston North,

Builder: Andrew Lloyd Construction,
Levin,
Telephone: (06) 367 8081

Structural engineer:
ISP Consulting Engineers
Lower Hutt,
Telephone: (04) 566 8004

Surveyor: Landlink, Waikanae
Telephone:(04) 902 6161



LanzaTech's pilot plant at Bluescope Steel New Zealand.

NEW ZEALAND STEEL ULTISES WASTE PRODUCTS TO SAVE ENERGY

New Zealand Steel has a 50-year history of developing innovative, world-first processes, based on the potential of ironsand, the basic raw material of this country's unique steel industry. For over 40 years company policy has always included strong focus on environmental awareness and sustainable business practices.

"New Zealand Steel was founded on innovation, and we are always looking for innovative ways to minimise any impact our business may have on the environment," says Andrew Garey, General Manager, NZ Steel & Pacific Islands.. "This includes producing approximately 60 percent of our own energy requirements through an onsite co-generation plant and our support of a pilot plant for Auckland based biofuel pioneer, LanzaTech at our Glenbrook site, as well as our most recent agreement with CarbonScape."

Lanzatech

In 2008, NZ Steel approved construction of a LanzaTech world-first pilot plant on site, utilising steel plant (KOBM) off-gases to trial and prove the technology that captures waste gases from industrial steel production using Swedish Biofuels' technology and chemically converting gases for use as low carbon fuel. LanzaTech has successfully demonstrated it can achieve greater than 70% of the ethanol productivity rates demonstrated in the laboratory. New Zealand Steel has since extended its relationship for an additional five years, signing a collaborative agreement with LanzaTech that gives BlueScope and NZ Steel access to LanzaTech's technology.

As a result of their initial successful trial LanzaTech has formed a partnership with Virgin-Atlantic airlines to commercialise the resulting low carbon, cost competitive, aviation biofuel and the partnership has been recognised as the winner of the 2013 Observer Ethical Award in the Business Initiative category.

LanzaTech CEO Dr Jennifer Holmgren,Richard Branson Virgin Airlines, Virgin Atlantic CEO (2012) Steve Ridgeway

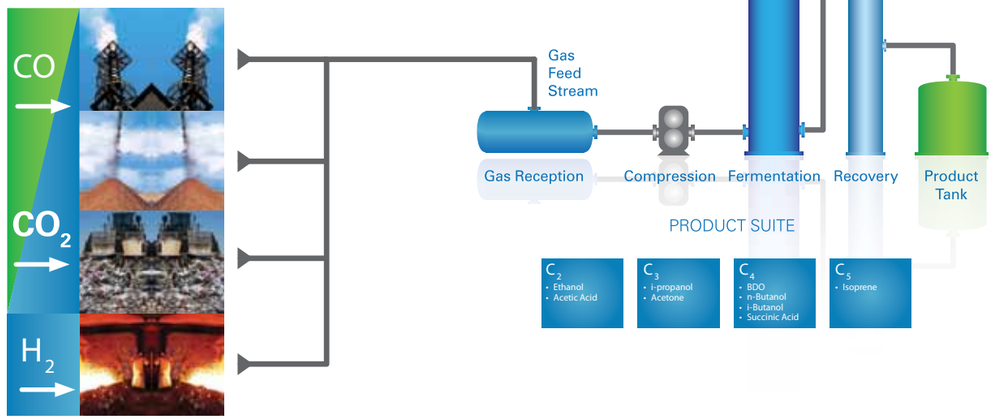
In March 2013, Virgin Atlantic and LanzaTech won the Sustainable Biofuels Award presented by World Biofuels Markets. Last week, LanzaTech was named as one of the world's top 100 sustainable solutions by Sustainia 100. LanzaTech was selected for the positive social, economic and environmental impact the company's gas fermentation technology will have on local communities.

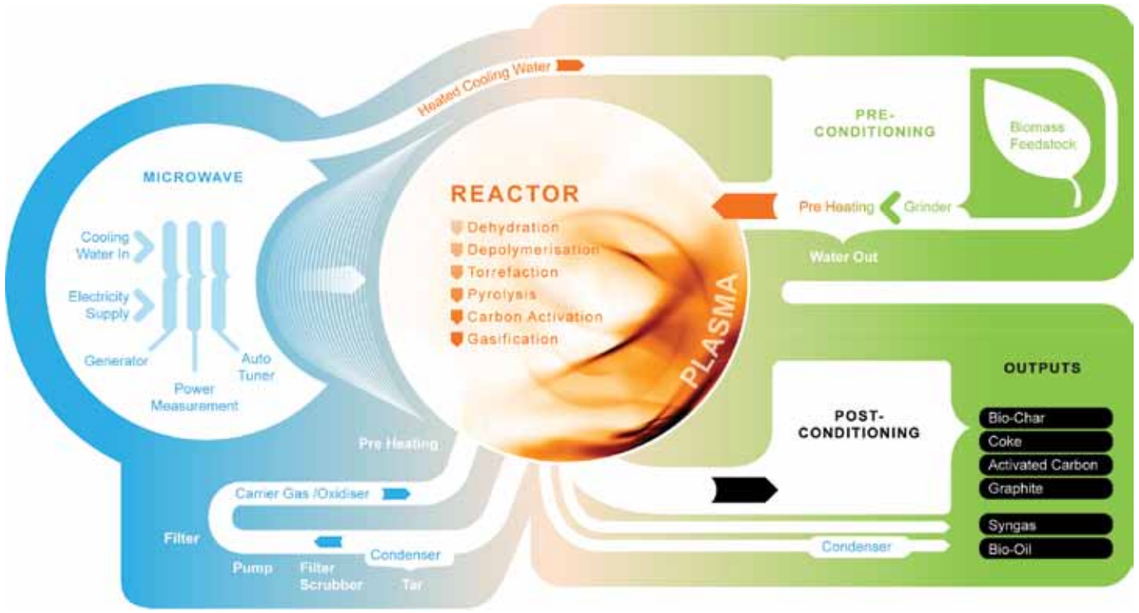
In November 2012, LanzaTech completed the first phase of a multi- phase partnership with Baosteel, China's largest steel producer: A 100,000 gal/ year demonstration facility that coverts waste CO fromBaosteel's production facility into ethanol.

Other LanzaTech projects include;
* A second 100,000 gallon facility with Capital Steel located in China
*A Biorefinery is being developed using forestry waste in the USA.

THE LANZATECH PROCESS

GAS TO LIQUID PLATFORM





CarbonScape Green coke”

Earlier this year NZ Steel signed a future supply agreement with the award-winning entrepreneurial clean-tech company, CarbonScape, for a trial shipment of ‘green coke’ in 2014.

CarbonScape’s patented microwave technology converts forestry waste, such as saw dust and other biowaste, into high-value graphite, activated carbon and metallurgical coke. The company anticipates this renewable coke will replace fossil fuels in the steel industry and NZ Steel intends to use the green coke as an additive in its steel making operation to reduce its dependency on traditional coke, thereby reducing carbon emissions.

NZ Steel and CarbonScape are also exploring other options for using the patented microwave technology in steel making, including high temperature plasma processing. The collaboration is in line with the work being done by the Bioenergy Association of New Zealand (BANZ) environment team in studying options for the reduction of C02 using biomass.

While more recently managing the steel industry’s carbon footprint has been a major focus for NZ Steel, throughout the company’s all-but 50-year history, its respect for the environment and its focus on innovative thinking have been steadfast, with management and staff recognising the challenges of emerging technologies and eager to trial and adopt relevant innovations.

Some History

In the mid-20th century such progress was hardly dreamed of – and, in 1769 when he noted that the ironsand deposits on the Taranaki beaches were a rich reserve of metal ore, Captain Cook could hardly have foreseen then the thriving steel industry that has developed from this abundant resource, along with some spectacularly inventive thinking by NZ Steel personnel.
Following Cook’s observations, it took nearly 200 years, a booming local and global economy and new technologies to make possible the use of ironsand in steelmaking.
Commercial operations began at the New Zealand Steel mill at Glenbrook in 1968, with imported feed coil being used to produce GALVSTEEL™ steel for domestic and Pacific Island markets.
The pioneering by NZ Steel scientists of the direct reduction process for reducing iron oxide (ironsand) into metallic iron saw the commissioning in 1970 of iron and steelmaking facilities to produce billets for domestic and export markets.

Commissioning of a pipe plant followed in 1972 and less than a decade later the installation of a 17km underground slurry line to move the ironsand extract from the Waikato North Head minesite to the Glenbrook steel plant eliminated the environmental nuisance factor of truck transport.

Along with coal and limestone, this ironsand is heated and converted into 1480° molten iron from which high-value, vanadium-rich slag is recovered before the molten iron is processed into steel. Some of the vanadium by-product is exported and some is further processed into a steel-strengthening additive.
Following the principles of avoid, reduce, reuse, recycle, NZ Steel deals with unavoidable waste by first lessening the amount created and then by finding positive ways to reuse and recycle any remaining waste, thus creating marketable by-products with a value to the environment and the economy.

By-products

Since the mid-1980s innovative developments have seen most of the remaining slag processed into a form where it can be reused for a range of environmentally acceptable products – in road surfacing, soil conditioning, road stabilisation and sportsfield drainage, for example, as well as grit for sandblasting and filtering media for wastewater treatment. Iron slag is sold as drainage material and has been used for an all weather hockey field, golf greens and as a wetland for the final treatment of sewage.

Energy

At full capacity the Glenbrook operation consumes up to 1100 Gigawatt hours of electricity a year – about the same as Wellington City. In order to reduce its reliance on electricity purchased from the national grid, NZ Steel has developed a way of using the hot waste gases produced by the multi-hearth furnaces in the ironmaking process to produce energy for the production process. In the Cogeneration plant the waste gas is burnt in an afterburner to provide heat for the boilers, superheated steam from which drives two steam turbines to produce electricity – approximately 20% of the site electricity requirements at that time.

Twenty years later a second Cogeneration plant was commissioned to take waste hot gases from the rotary kilns, with the result that today around 60% of the steel mill’s electricity is generated on site.

Future

New Zealand Steel (NZS) has strived to achieve rigorous sustainability processes and practices throughout its daily operations. This attention to detail has ensured that NZS retains its ISO 14001 environmental accreditation, which hold great esteem within New Zealand’s business arena. These environmental efforts have been recognised on multiple occasions with NZS being judged best practice in energy efficiency by International body, It is important to recognise that NZS as a company not only delivers environmentally conscious services but also produces environmentally sustainable products. Steel resists the impact of earthquakes, has low maintenance requirements, and can be designed to provide thermal efficiency. When sustainability is factored in, many of steel’s advantages achieve a multiplier effect.

In its relatively short life of 45 years New Zealand Steel’s history has been full of innovations. Its use of raw materials, energy, and sustainable resources within the steel making process highlights the pioneering attitude that drives the company through each of its successful ventures. We are confident that in the future we will continue to be surprised and pleased with more New Zealand Steel advances in the future.

Production processes have advanced since that first galvanised steel was produced for local consumption in 1968. Now respected the world over, NZ Steel products have been developed to meet – and often in anticipation of – market demand.

In 1982 the COLORSTEEL® prepainting line came on stream and further major investment in the 1980s saw the commissioning of continuous slab-casting facilities and both Hot and Cold Strip mills.
By 1987, NZ Steel was operating as a fully integrated steelworks, producing flat steel products made solely from NZ Steel feed stock.
The existing continuous galvanising line was modified in 1994 to produce ZINCALUME® steel, in addition to traditionally hot dipped galvanised products.

Then came Axxis® steel for framing, a brand of galvanised, high-tensile steel supplied to New Zealand’s house framing market, accompanied by a smart marketing campaign focusing on steel’s sustainability and its strength and straightness.
Smart too, is Steltech’s manufacturing of made-to-length steel beams from plate steel supplied by NZ Steel. Making structural beams to suit specific application allows for more creative design and more efficient structures.

CARDBOARD MODEL TO MANSION

Looking at this spectacular, meticulously finished home, it's hard to believe it grew out of a rudimentary cardboard model. But given the clients' background, it's hardly surprising. They're very down to earth people.
After 40 years of hands-on hard yakka establishing a hugely successful horticultural business, the owners decided it was time to build their idyllic country retreat. And fortuitously, the architectural designer they approached was perfectly in tune with their vision, and went about the task in an equally down to earth manner.

"Basically, I ended up building a cardboard model of the design, and I showed it to them, and they phoned that night and said, yes go ahead, that's what we want," recalls Nelson based designer Mike Reid.

"The clients were good to work with. They just knew what they liked and the model helped them with their decisions. I think a lot of people find it difficult to visualise how something will look, or to get a sense of scale, just from plans alone."

Super size dimensions

Set on 13 hectares of gently rolling Tasman hills, with views to the Waimea Estuary and D'Urville Island to the north-east, and Richmond Hills to the south, the 535m2 home is nearly three times the size of the average kiwi house.

"You need to be on site to appreciate the scale of it," says Mike. "It's grand in every sense – grand entrance, grand views, a grand presence on site."

The layout of the home is made up of three main areas: A kitchen-living-dining area with outdoor patios; a large, airy entry hall providing access to guest bedrooms; a master bedroom and secondary lounge positioned to achieve privacy from the main living area.

Mike comments: "With the master bedroom and private lounge, they've got their own separate house-sized space down there so when people come to stay, there's plenty of living space and privacy for everyone."

To achieve maximum benefit of the light and views, the three main areas of the house are each rotated in plan 15 degrees to each other.

Traditionally contemporary

Mike says he based the design on a traditional farmhouse look because the clients had a definite preference for a rural styled home and didn't like the idea of 'something trendy' that would date quickly.

"It's sort of contemporary-traditional which sounds strange, but that's the best way to describe it. Traditional lines, contemporary materials and living spaces. My goal was to get something that would stand the test of time and was not subject to quirks of fashion. I also planned the design so that it was no more than one room wide, which is why I spread the house out the way it is. As a consequence, every liveable room gets all day sun."

For ease of circulation, the entire floor plan is on one level. Double height halls feature beautifully finished exposed scissor trusses, and the large living/dining areas have open skillion ceilings.
The house was positioned quite high on the site for the best views, but was also deliberately tucked down to a level below the highest ridge so that no part of the house would interrupt the ridgeline. Another benefit of this was that it helped create more sheltered outdoor spaces.

No skimping

The clients wanted to use only the best materials and didn't want to take any short cuts, says Mike. "The budget was substantial, but the build went well, and cost over runs were quite minimal considering the scale of the job."

Exterior materials are a combination of plaster cladding, schist walls and round columns, topped off with a pressed steel Gerard roof. The schist-faced round columns on each of the four porches are dominant features, but were particularly challenging during the build.

do have greens fingers," says Mike who has visited the property on a number of occasions since the home was completed.

"There's so much more privacy and shelter and the gardens are now just as spectacular as the house – it's all turned out brilliantly."

Architectural Designer:
Michael Reid Architectural Design
Telephone: 03 544 7102
www.michaelreiddesign.co.nz

Roofing Manufacturer: Gerard Roofs
Telephone: 0800 244 737
www.gerardroofs.co.nz
Profile: Corona Shake
Colour: Charcoal

Roof Installer: Ultimate Roofing
Telephone: 03 544 4007
www.ultimateroofing.co.nz

"They are built around steel columns and the diameter is just 700mm which makes it very difficult to get the right size and shaped stone facing," Mike recalls. "It was a finicky job and the stonemasons were there for months and months. But it looks fantastic, beautifully done."

While the initial design specified a tray roofing system, the clients and the builder had a preference for a Gerard roof.
"I just like the look," says builder Russell Stevens. "For the style of house, it sets it off nicely. It's a good product, there's no two ways about that."

On reflection, Mike agrees the outcome looks good: "It has sharp lines and there are some strong performance advantages. Being lightweight is a real bonus."

Timber features

Glazed double-height forms break up what would have been one long ridgeline, giving the home somewhat of a lodge appearance, and high quality finishes have been used throughout the interior, including panelled hardwood doors, Italian floor tiles and schist fireplaces.
"All the doors are solid kwila," says Russell "and I remember it took two guys to lift them because they were that heavy."

An especially striking feature of the interior is the use of exposed timber scissor trusses made of laminated veneer lumber with a kwila finish.
"They were individually fabricated by a local joiner and look absolutely spectacular," says Mike, "but they required meticulous craftsmanship. For instance, in the lounge next to the master bedroom, the room is not rectangular. The walls splay out in a lozenge shape so each truss had to be individually made to suit the space."

Russell agrees. "It was very tricky and took a lot of time. There were three trusses, all different heights and widths. Also, they have a metal bracket above them so that there's a gap between the top of the trusses and ceiling. It's quite a different look."

Mega foundations

With over 30 years building experience, Russell Stevens has worked on many high profile homes and commercial buildings in the area, and it was his track record and 'word of mouth' that secured the job.

"The project went really well. We didn't have a single hassle on the job. The only delay came about because of unexpected foundation work. We had to do a geotech report and found that the clay there doesn't hold well. In the end, we had to do a lot of extra work. There are 92 steel cage concrete poles 3 metres in the ground right around the site, so the foundation costs went up.

"But once we got out of the ground, it was pretty much plain sailing. It was a big project with lots of detail work, but we finished it in just over 12 months despite the foundation delays."

Green fingers

Since the home was built, the owners have embarked on an extensive planting programme.
"You can tell by how they've gone about it that they know about growing things and they definitely

BENEFITS OF LIGHTWEIGHT METAL ROOFING

An exposé by Fair Go on August 21st 2013 about cracks in concrete tiles ("light coloured marks" according to the manufacturer!) sparked the thought that although NZMRM has over the years discussed individual benefits of our lightweight metal roofing products, we have not published a summary of what we see these to be. This article is in response to a request to get all of the great features of metal roofing down in one place.

When a list of these was made it was realised that the possible field of comment is very wide and so each area of the benefits can only be touched on briefly.

Virtually all industrial and commercial roofs in New Zealand are made from roll-formed painted or unpainted lightweight metal cladding. This is because such buildings can only be realistically and economically be roofed this way. In addition many such buildings also have lightweight rollformed metal wall cladding. While the good reasons for doing so also apply to residential buildings, here there are other factors which may influence choice. The very wide range of metal roofing types and the benefits now drive residential roofing and cladding towards metal.

Light Weight

Obviously a major feature of lightweight roofing! But what are the benefits of light weight in a roof when heavier roofing may be cheaper for some designs and locations and can use gravity as its main holding tool?

The order of roofing weights from heavy to light are – slates, clay/concrete tiles; asphalt (shingles or sheet) on a plywood deck, textured metal tiles, 0.55 mm long run roofing, painted metal tiles; 0.40 mm longrun roofing. In terms of actual weight for a "typical" house this runs from 7 tonnes down to less than 1 tonne. This difference has several effects on the design and properties of the house.

Framing.

A study was carried out in 2009 for NZMRM by an architect using input from truss manufacturers, quantity surveyors and an engineer. They looked at three house designs and the effect of lightweight against heavyweight roofing on truss design, bracing, lintel design and lintel and top plate fixing. The first finding was that for simplicity most houses are designed to cope with heavyweight roofing, even though this is a minority cladding and though NZS 3604 makes provision for both types. This results in over specification in all areas except lintel and top-plate fixing, where of course gravity means heavier roofing requires less uplift restraint. The complete study has been published but showed that for a "typical" house (with a 300 m² roof) up to $3000 can be saved on framing costs.

The update to NZS 3604 in 2011 did change some of the parameters but a revisit using the newer factors showed savings of the same order.

Earthquake damage California. Heavy weight roof collapsed destroying the building

Safety The Christchurch

earthquakes and other events round the world have shown that gravity now becomes a significant factor as does relying on it to hold heavyweight roofing in place.

Individually placed heavyweight tiles, not well fixed to the structure, come loose under seismic movement of the house and end up at ground level, often falling through the house to arrive there. Objects or people in the way can be damaged by such quite small heavy falling objects. Reports describe brick chimneys falling through slate, concrete and clay tile roofs but being held up by metal roofing.

Because of the much lighter weight and also the much better fixing to the structure, lightweight roofing has not presented these collapse issues. Perhaps ironically the need to hold metal roofs down onto the structure (instead of using gravity) means that they are much less likely to fall off. In this case the extra cost and work required to fix metal roofing down has safety benefits, as well as wind-uplift resistance.

Above: This building suffered major damage in the Christchurch earthquake but the lightweight roof remained intact.

The Fair Go complaint (about concrete tiles supplied in the Canterbury area being cracked as supplied) illustrated a further safety issue, regardless of earthquakes (although this does add to it). Individual part tiles (the lower part of a broken tile) or whole tiles or slates dislodged by high wind events, slide down the roof and embed themselves into the ground underneath. In the event that someone was standing underneath this could have serious consequences.

Performance Durability

Properly selected for the environment and properly maintained as directed lightweight metal roofing has been demonstrated to last for many decades in many places in New Zealand and elsewhere in the world. Some pressed metal tile roofs installed in the 1950s in Auckland are still in place.

Wind uplift

We do of course see videos of longrun metal roofs blown off in very high wind events and specifically the "twister" which generates extremely high wind in a small area and time-frame. Looking at these more closely we can see that often the roof panel complete with roof cladding has blown off because of inadequate fixing to the rest of the building. Often these are initiated by failure of a garage door, or window or another opening into the sub-roof space. Metal tiles which are fixed more closely to closer spaced support members very rarely blow off either as panels or individual tiles. NZMRM has its own test rig and procedure on which all products can be tested so as to develop fixing patterns for wind loads up to tropical cyclone.

Heavyweight tiles rely mostly on gravity to keep them in place. When this is overcome in very high winds the results are heavy objects flying for short distance before falling onto something. Storms in Australia blowing heavyweight tiles off roofs have resulted in serious property damage including ruined cars.

Weathertightness

Longrun metal roofing in the body of the roof is virtually an impermeable skin and regardless of wind levels, water will not penetrate sidelaps. The NZMRM Code of Practice (and E2/AS1) describes how to flash roof panel intersections so as to prevent water entry. Metal tiles have been tested against extremely high levels of wind-blown rain and show no penetration under expected levels of rainfall. Properly designed metal roofs should never leak water under even higher than expected rainfall levels. And because they always use waterproof roof underlays even if water does enter it can be carried away into the gutters.

Tests showing the effects of high winds and rain on clay tiles, heavy shingles and light weight metal tiles. Wind speeds up to 160m/h with 200mm of rain per hour. Only the metal tile with horizontal fixing survived the test.

Complaints about "leaking" are almost invariably caused by condensation generated by unventilated moisture vapour from the house.

Damage

Of course you can damage a lightweight roof by walking on it in the wrong place or dropping things on it, or putting an unprotected ladder on it. These same incidents can crack a slate or heavyweight tile. However the damage to the metal roof is visible, and generally not likely to cause it to leak or fail, and can be repaired at least to some extent.

Hail

Hailstones have been shown globally to cause damage to asphalt shingles and even concrete tiles have been broken (during several storms in Sydney). Metal roofs at worst are dented. In some areas in Texas, insurance companies paying for hailstone damage require replacement with metal roofing before providing further cover.

Knoll Ridge Chalet destroyed by fire in February 2009.

Fire

There are no NZ requirements for fire resistance of roofing for residential buildings (single occupancy), but this should still be a consideration. Heavyweight tiles in a serious fire can break and fall into the roof space (or the house). Any roof including asphalt shingles or membrane on a plywood deck contain their own fuel, and experience in the USA shows that such roofs are totally consumed in house fires. Metal roofing has no material to burn and even if the support members are burned will not fall into the house with any force.

In Europe there are tests for spread of fire caused by burning brands carried from one house to another and setting fire to the roof, or allowing burning material to enter the roof space. Metal tiles made in NZ have passed these tests as would continuous metal roofing.

Economics

Savings resulting from the appropriate framing design are covered above, but there are a number of other features, of metal roofing, which allow cost savings through the roof manufacture and install process.

Transport

Heavyweight tiles and slates are made in only a small number of locations in New Zealand or are imported. Plywood to support asphalt shingles is also made in only a few places, and the asphalt material is imported.

Above: Custom on-site roll forming reduces waste.
Significant cost savings are made with more than one roof being transported in one load.

This means that these heavy materials have to be transported from the source to the building site and usually a truck can carry only one roof lot (or less for a large roof). Longrun roofing is made locally in a large number of locations round New Zealand. Coils of steel are delivered from Auckland to these many locations by truck or rail in an efficient manner and then made into roof lots. The final weight of these is such that several roof lots can be carried on one truck, and a number of deliveries can be made in one local run.

Waste

Longrun metal roofing is cut to exact lengths for the individual roof in the factory. Cutting on-site is required only to cut corners off sloping areas, and these off-cuts are totally recycled. No waste is left at the building site. Modern technology means that even the angle cuts can be made in the factory, but only steel framed houses can generally be erected accurately enough to allow this process to be used. When it is pre-cut there is no waste at all and all roll-formed sheet ends up on the roof. Waste removal costs are minimal and off-cuts should be removed by the installer leaving no waste on site.

Sustainability

As these savings also result in less use of energy or materials they do contribute indirectly to the sustainability of the metal roofing process. However some other features of metal roofing are more directly sustainable.

MRM's test rig being put to use to show the fixing strengths in wind uplift tests.

Steel manufacture

Steel made in New Zealand is used for the majority of metal roofing and wall cladding installed in this country. This is made at the Glenbrook plant of Bluescope New Zealand Steel. The NZ Green Building Council in its BASE tool for creating sustainable buildings in the Christchurch rebuild requires non-reinforcing steel (i.e. roof and wall cladding) to be made by a manufacturer with;
a) an Environmental Management System complying with ISO 14001 and
b) to be a member of the World Steel Association's Climate Action Plan.

NZ Steel meets these requirements. The actual manufacturing process used in New Zealand in which locally gathered ironsand is transported a short distance and made into iron and then steel using hydroelectricity

Recycling metal has many benefits in achieving sustainable buildings

and local coal, compares very sustainably with steel made elsewhere. In for example Australia, iron ore (rock) is extracted by hard mining, shipped huge distances and processed into steel using power generated by thermal (if clean) power stations. In Asia (from where some steel is imported into New Zealand) the iron ore is first shipped from typically Australia and then processed in often highly polluting plants using "dirty" power.

Having extracted the iron from irons and the residual sand is used by NZ Steel to rehabilitate the area from which it was taken, and then replanted.

We have little doubt that in using steel, made by New Zealand Steel, we are using material made at least as sustainably as any steel and probably made better than anywhere else.

Recycling

One of the significant economic and sustainable benefits of all metals is the ability to be recycled indefinitely with no loss of quality or properties. Steel that has been recycled 1000 times is no different to steel freshly made from iron ore (or in New Zealand's case from ironsand). Other materials in wide use are either able to be recycled with decreasing levels of quality, once or twice, or are not able to be recycled at all. This is not made obvious in recycling campaigns, which are useful in removing rubbish from landfill, not so much in providing new materials.

Glass and plastic are frequently recycled but only into lower quality products and typically only once. Concrete can only be crushed (with high energy cost) and used as fill. Timber is usually burned.

In New Zealand, scrap steel from external sources (old cars, cans, roofing at the end of its life) is processed by Pacific Steel into wire and reinforcing and some other materials. Any scrap produced at New Zealand Steel during the manufacturing process is recycled internally. Metal scrap not processed in New Zealand is exported and reprocessed overseas. Globally some 85% of metal scrap from buildings and 98% of structural steel is reprocessed into product with no loss of quality or physical properties. In NZ 280,000 tonnes are recycled p.a. in NZ which is 45% of the total. In Australia the level is 65%. Reprocessed metal uses less than 25% of the energy of new metal from ore.
Your new aluminium roof may contain material which started life as a Coke can 40 years ago. Your New Zealand Steel roof will contain all the waste generated during its production. Your new car made in Japan may contain some small amount of steel made at the beginning of the steel era 200 years ago.

Design

Let's not forget design! The flexibility of metal roof and wall cladding has enabled some incredibly inventive designs to be developed. As well as roofs of traditional appearance, which is really all you can make with heavyweight roofing, metal offers almost unlimited freedom – from roofs with 3° pitch up to vertical, called walls after 60°, an amazing range of colours and profiles, tiles in all sorts of shapes, and the ability to produce curves and panels in an infinite range.

The ability to use roof and wall claddings of the same or similar material is not given by other roofing materials.

Designers note.

Sometime it seems the imagination of the designer overlooks the possibilities of installation, or the safety of the roofers, and importantly the need to make the roof watertight and durable. Please think about this occasionally and allow for drainage, ventilation, access and safety!

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

Photovoltaic electricity generation. The use of pv cells and membranes directly attached to metal roofing is under development, and profiles are being made specifically to take such products. This is potentially a sizable area of development and attachment to larger surfaces is clearly better.

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 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

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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