steelprofile

Architectural steel innovation with BlueScope Steel

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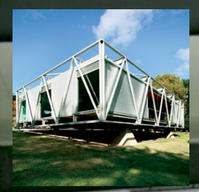

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(cover photograph) The entire exterior of Underwater World Langkawi in Malaysia is clad in ZINCALUME® steel, with the bluish-grey colour complementing the maritime theme and keeping the lines of the building clean.

(this page) Boarders take a break at the top of Snowplanet's 200m long indoor ski slope.

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Project Snowplanet, Auckland, New Zealand

Client Snowplanet Ltd

Architect Warren and Mahoney

COOL CUSTOMER

It has ski lifts, a terrain park, an après-ski bar and even the requisite baggy-panted, beanie-wearing lifties. About the only thing Snowplanet lacks is the mountain.

Just 45 minutes' drive north of Auckland, Snowplanet, the Southern Hemisphere's biggest indoor snow slope, is hard to miss. Glaringly white, it slithers down the side of a hill in full view of motorway traffic.

But the sight of the 250m-long building may have initially left motorists scratching their heads. Unlike many overseas indoor ski slopes, there isn't a pitched chalet roof, twinkling light or jolly artificial chimney in sight.

Snowplanet general manager Christian Dunnwald, the former concept director of the world's biggest snow dome company, Snow World, says this is exactly the way he wanted it.

"If you look at snow sports in Europe, après ski is almost half the sport itself. People ski in the morning and after lunch they sit drinking and partying in the pubs. There are lights strung across the streets and chalets. In New Zealand, skiing is more about the sport."

Dunnwald says creating a kitsch building that looked as if it had been plucked from the Swiss Alps would have been

More than 16,000 square metres of 300mm BONDOR® insulated panels were used to build the distinctive Snowplanet.

(below left) Warren and Mahoney created gutters between the stepped BONDOR® insulated panels.

totally out of place on the rural outskirts of Auckland.

"We wanted a more urban, functional look that is still an attraction and a fun place to ski – without chalets and rustic elements."

Architectural project director John Coop, of Warren and Mahoney, agrees, saying his natural inclination was to steer away from the theme park-like appearance of some indoor ski slopes. He specified 300mm BONDOR® EPS Insulated Panel manufactured from COLORSTEEL® 'Titania' prepainted steel for the roof and wall cladding.

"Our interpretation of the brief was to design a simple structure that didn't have a stage-like facade. The form of the building was designed as a pointer to the function of the building rather than a pastiche facade hiding a shed building.

"Our approach was to unify the entry and front-of-house with the function of the building in a single unified idea," says Coop, who points to Wellington's Westpac Stadium (known locally as the Cake Tin), which wasalso designed by Warren and Mahoney and which represents a similar integrated approach. "I think Snowplanet is expressive of the snow sport environment."

From the beginning, Coop wanted Snowplanet to be white – partly to relate to its function as a snow facility, and partly to make a statement. "We went to the local council and said the building was going to be a dynamic structure in the area. So rather than attempting to hide it – because hiding a building of such scale wasn't possible – we wanted to celebrate it and turn it into a building people could relate to."

At night the structure is arguably at its most striking – and conspicuous – with blue

At night, with blue lights glowing between sheets of Glass Reinforced Polymer (GRP), Snowplanet is a striking sight.

The view down the slope towards the restaurant and bar's tall windows.

From the entrance at the bottom of the slope, skiers and snowboarders are greeted with sweeping views to the top.

STELTECH® beams were deliberately left grey to give skiers a sense of perspective as they headed for the bottom.

lights glowing from between two layers of oyster blue corrugated Glass Reinforced Polymer (GRP), which clads the frontage, along with a wall of ZINCALUME® steel over-painted in the arctic blue of Snowplanet's logo. As well as providing an interesting lighting effect at night, Coop says the GRP also acts as a natural light source during the day.

Coop specified BONDOR® 300mm structural insulated sandwich panels in the colour of Titania for the roof and wall cladding. BONDOR® insulated panels not only help keep the interior chilled to –5°C but also offer a long span, says Coop. STELTECH® structural beams were used as framework.

Coop says a key aim when designing the building was to minimise volume, in order to keep material costs down and make the ski area easier to chill. However, he didn't want too low a roof to impinge on views up the slope from the entrance. "We wanted to have a huge impact at the first moment when visitors come in. It's very important in terms of meeting visitors' expectations."

The solution was to design a 10m high rectangular structure that moulds to the slope of the hill.

Coop says drainage was a key challenge for the project. The design team eventually opted to step each BONDOR® panel and create gutters between them. These gutters progressively widen across the building's roof and the natural slope of the hill ensures water simply drains off the side.

"The slope gave us a slope in the gutter to work with. It seems simple but in effect it was a solution that simply worked and worked in terms of the building. It also enabled as many of the panels as possible to be the same size."

Coop says a key moment for the project came when it was decided that Snowplanet did not need an insulated floor.

In general, construction costs in New Zealand soared while Snowplanet was being designed and it was clear early on that eliminating the building's floor would produce significant cost savings. But before this could happen engineers Sinclair Knight Merz had to conduct in-depth tests of the soil to determine the long-term effects of chilling the ground to –8°C, the temperature needed to start making snow.

Fortunately, the modelling software determined that building without a floor

would be viable – but would mean that it would take longer to cool the ground and produce snow. This was resolved by starting the chilling process while the restaurant and other interior features were still being fitted. In some ways, structural engineer Dave Bradshaw says, the snow acts as a layer of insulation itself.

The facility's refrigeration units, painted white, can be seen along the snow dome's interior walls.

Bradshaw says it was important to ensure the corners of the building were completely sealed together, to create a vapour barrier.

"You can compare it to a freezer. If you leave the door open on a freezer, it gets filled with ice," says Bradshaw, who explains that ice would clog up the refrigeration unit fans as well as drop on the snow slope.

The ski slope itself is 200m long and 40m wide with Doppelmayr lifts running up either side. Both lifts were sourced from the North Island's Mt Ruapehu ski field.

While Snowplanet is the fifth largest snow dome in the world, it is dwarfed by its bigger European cousins, some of which contain six-seater chairlifts.

At the base of the slope, which was designed by snow terrain specialists, children, learners and tobogganers scramble up a beginner ski elevator, while more expert skiers head for the top of the slope and the terrain park, which is dotted with jumps and rails. At its tip, the slope is on a 25 per cent angle, which equates to a blue ski run. Snowmaking technology ensures the packed powder base is kept between 50cm to a metre.

Coop says the STELTECH® structural steel beams remain dark grey because painting them white would make it difficult for skiers and boarders to retain a sense of perspective as they head down the slope.

Snowplanet's restaurant and bar, Mountain View, is at the bottom of the slope and tall windows look out over the snow – perfect for parents who may like to sip hot chocolates in the warmth, while keeping an eye on their charges.

To ensure the windows do not fog or suffer from condensation, they are double-glazed under pressure, with an electrical wiring circuit built in.

The restaurant is the facility's only obvious nod to what many perceive as European après-ski culture, with rich-coloured timber walls, warm, low lighting, and red candles flickering on deep brown polished wood tables. The floor is honed concrete. "It was really about abstracting the alpine aesthetic rather than a mimicry or a nostalgic appearance," says Coop.

Interestingly, the restaurant and bar has been very successful as a stand-alone venture, especially among locals.

Next door to the restaurant, businesses can hire a small conference room, which also overlooks the slope. Reflective glass ensures skiers can't see in.

Meanwhile, the ticket desk and ski and board hire area are similar to those found on any ski field, though in this case the rental desk is clad using ZINCALUME® steel in baby corrugated profile.

In its first year of operation, Snowplanet attracted 170,000 people to the snow dome and 300,000 to Mountain View restaurant – far exceeding the target of 130,000 visitors to the ski slope and 150,000 diners at the restaurant.

When asked about his favourite feature of the building, Coop says it is the facility's commercial success. "From the point of view of serving the client we worked with them to arrive at a cost-effective solution. That's my favourite feature."

Anna Saunders

(right) Skiers and snowboarders can hire all equipment at Snowplanet including boots and jackets at the rental centre.

(below) Warm lighting and wood panelling help give Snowplanet's restaurant and bar a cosy après ski ambience.

Project:
Snowplanet

Client:
Snowplanet Ltd

Architect:
Warren and Mahoney

Architectural project director:
John Coop

Project architect:
Alec Couchman

Project manager:
Arrow International, Mark Taylor

Builder:
Arrow International

Engineer:
Sinclair Knight Merz

Principal Steel Products:
BONDOR® insulated panels, STELTECH® beams, ZINCALUME® steel overpainted in blue

Approx cost:
$10 million

Approx size:
10,000 sqm

Photography:
Paul Bradshaw

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Project Woodend House
Clients Deane Rankin and Lex van Os
Original architect Father Emmanuel Green

FATHER FIGURE

A building resembling a spaceship, designed and built by a priest for a bunch of schoolchildren, and now the home of two former city dwellers? Welcome to Woodend House.

Deane Rankin and his partner, Lex van Os, spent most of their lives in the city. Until their third renovation, their homes were Victorian terraces, cheek by jowl with neighbouring properties. So a move to Woodend, to a building resembling a spaceship, represented a dramatic shift in both location and style.

"I had just retired from working as a television director and producer," Lex says. "I think I was looking for a quieter place that was surrounded by trees. I wasn't quite ready for country living; I still wanted something relatively close to the city."

After several visits to Woodend, Victoria, the couple discovered a 'for sale' sign in the local agent's window which read, 'A unique architectural style steel-framed building comprising four very large classrooms, foyer and offices – an exciting residential conversion opportunity'. On the market for several months, the building didn't tempt either the locals or those visiting Woodend, a small township an hour's drive north of Melbourne.

Set on 0.8 hectares of gently sloping land, and framed by 120-year old cypress trees, it excited Rankin and van Os, who were both speechless. "As soon as we turned the corner of the street, we both knew it was our next project," says Rankin, who was captivated by the way the building cantilevered over the site, raised on concrete pyramid-shaped plinths.

While the space-age steel structure had potential, it was originally designed as a school building (circa 1972), 'Our Lady's School'. Clad in panelling made from ZINCALUME® steel, the 330 square metre building features aluminium windows and striking steel trusses. Originally manufactured by BHP Steel (now BlueScope Steel), the trusses span the exterior walls and roof, which are also made of steel.

While the interior had been trashed, the original features remained intact, with vinyl-clad sandwich panels creating divisions in the space. "The area was broken into four or five spaces. The idea was to adjust the feet (attached to each panel) and move them around, presumably to suit the number of students in each

Reclad in ZINCALUME® steel in MINI ORB® profile, what was once a schoolroom is now a sleek, contemporary home. The building's original steel trusses provide a striking combination.

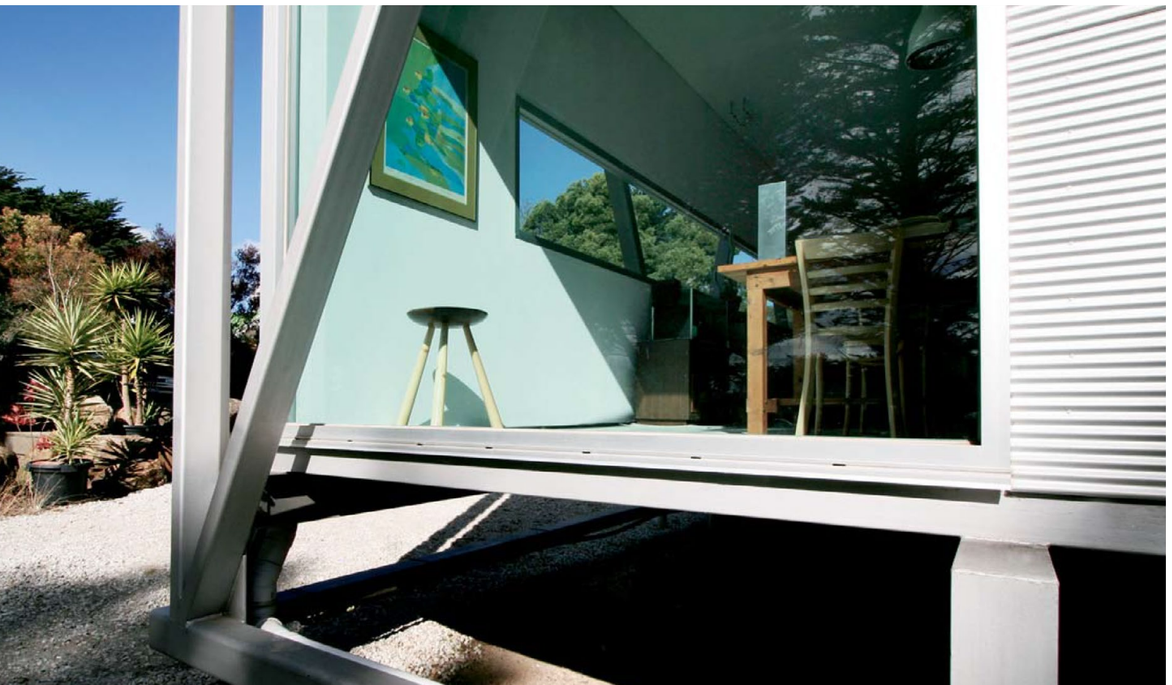
(below) Elevated on concrete plinths, the house is framed by 120-year-old cypress pine trees.

(bottom) Floor-to-ceiling glass windows bring the outdoors into the interior of the home.

class," says Rankin. There was one sink and considerably more toilets, nine cubicles in total. There was also one Vulcan heater to service the entire building and no hot water. "We weren't disheartened by the condition of the interior. The steel trusses were still as beautiful as the day they were first bought on site," says van Os.

Rather than ripping into the renovation, the approach was slow and steady. "We lived in one of the classrooms, brought in a second-hand kitchen, heating and hot water. The rest of the renovation was carried out over several months. We wanted to get the feel of the light as well as work out how we were going to use the spaces," says Rankin, who worked with van Os and local builder Alan Larter.

As the house is centred in the middle of a gently undulating site, the building benefits from natural light from all aspects. Generous northern light enters the kitchen and living areas and western light filters into the entrance lobby and study. But while the orientation of the building was perfect, the original classroom-style windows were relatively small.



One of major alterations to the original design was to create large picture windows around the entire building. There are now three floor-to-ceiling windows in the main living area (2.5 by 3.5 metres) and one elongated window in the kitchen area (approximately 8.0 metres in length). Picture windows also feature in the study and main bedroom.

"We wanted to be able to enjoy the entire aspect. But we were also keen to reveal the steel trusses. They're so much a part of the design," says van Os, who delights in the way the steel trusses cut diagonals across the windows. "It's important to be able to read the structure from inside the building," says van Os, who researched the building and discovered it to be designed by architect and Catholic priest, Father Emmanuel Green.

Mindful that they were renovating a significant building, the owners were keen to play down the alterations as much as possible. The windows, for example, feature aluminium louvres both internally and externally to allow for the movement of air. The exterior side is fixed, while the interior louvres, separated by flywire, are operable.

For the exterior, ZINCALUME® steel in MINI ORB® profile was selected and used to clad all four sides of the building. "We thought about leaving the original cement panels, but we didn't want to risk the chance of asbestos," says Rankin, who was drawn to the elegance of the profiling. "It seemed appropriate, and offered a clean and contemporary look. It just has that very Australian feel to it."

The cladding made from ZINCALUME® steel was also designed to be recessive in terms of its placement behind the trusses. "It's quite textured, and not overpowering," Rankin says. The natural colour of ZINCALUME® steel was

(above) An 8m-long window in the kitchen allows the owners to see who is arriving at any time.

also appreciated, being evocative of the simple steel sheds dotted in and around Woodend township.

Fr Green is and was captivated by steel. "I grew up with the steelworks in my back yard," he says, recalling a childhood in Newcastle, NSW. "I've always had a natural affinity to working with steel. It seems as natural as the Italians and Greeks working with stone, and the Scandinavians working with timber," says Father Green, who still gets a reaction to his dual professions.

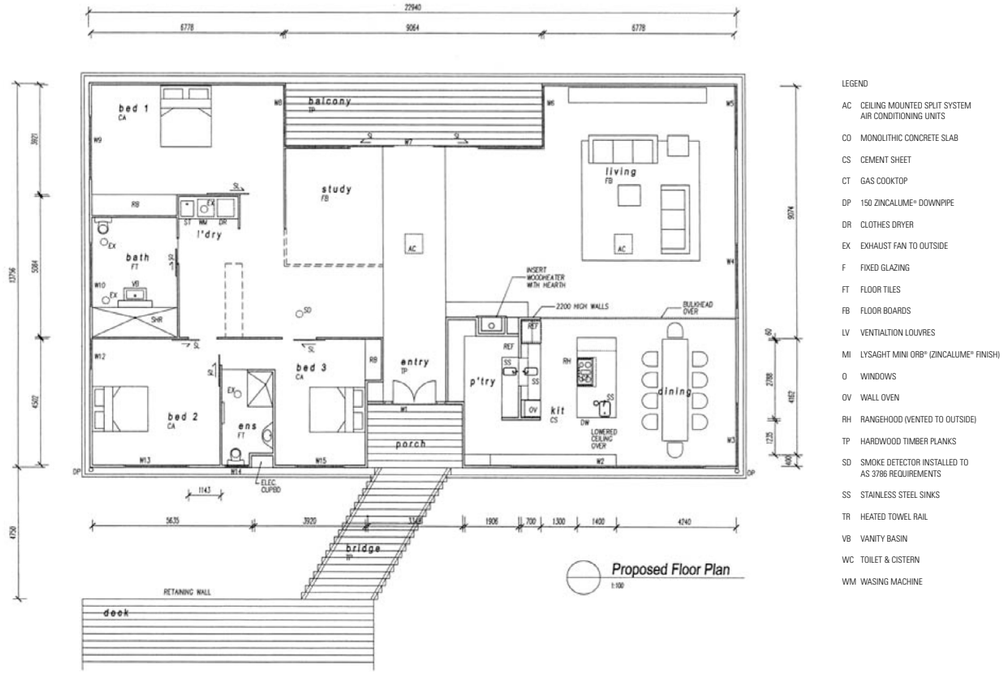
In the early 1970s, with tight budgets and a frugal parish, the sum of $51,000 dollars to build the school seemed lavish (this figure included all fittings, gas heating, blinds, carpets and blackboards). And although the engineer was hesitant to commit to this amount, he was impressed with the time span for construction. "They couldn't believe it could possibly be built in 10 days, even using an integrated box frame steel system," says Father Green, who supervised the building from an onsite caravan, donated by one of the neighbours.

Fr Green's designs have always commonly employed steel trusses. "There are no load-bearing walls, which means that designs can be flexible," he says. The school building was originally designed for 90 students. However, it allowed for expansion up to 150 students. "Another building could simply be brought on site as numbers increased. It's a module design that could keep growing," Fr Green says.

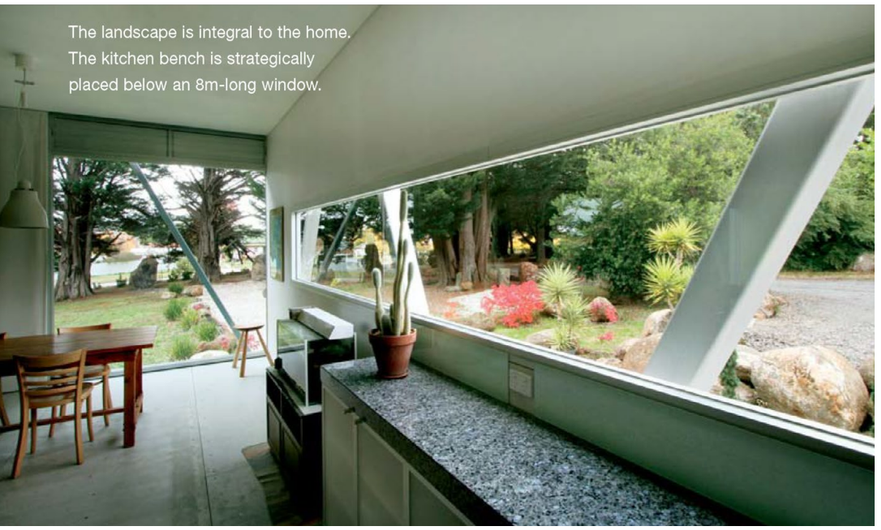
The external load also allowed for rooms within the building to expand or contract with ease. "The walls were like partitions," he says. "They could be easily arranged to suit the numbers and the function of each space."

Steel joists were also incorporated into the flooring to avoid the possibility of white ants, as well as protection from the threat of fires (common in rural Victoria).

The open-plan living areas feature large picture windows. The original steel trusses frame the established cypress pines.



The open-plan living areas are defined by open shelves as well as the arrangement of furniture.



The landscape is integral to the home. The kitchen bench is strategically placed below an 8m-long window.

An outdoor deck was added to the original design. During warmer months, the doors to the deck are left open to increase ventilation.

Rankin and van Os were keen to retain as much of the original steel as possible. They retained the steel floor joists but put down new floor coverings (the original carpets were riddled with cigarette burns). A new floating timber floor was laid in the living areas and compressed cement sheeting was added in the kitchen. As the kitchen and living areas are open plan, different floor materials define the spaces.

The new kitchen (the second-hand one was removed) features a central island bench, with a cook top and rangehood. "I wanted to be able to look out into the gardens, as far as the fence lines," says van Os, who now runs a teashop with Rankin in nearby Kyneton. "I didn't want to cook with my back against the view." And while their previous Victorian-era home included high-back chairs in the dining room, a casual trestle style dining table suffices at Woodend. Spun aluminium light fittings above the dining table are far removed from the chandeliers the couple once owned. "I think they cost $10 each," Rankin recalls.

Keen to retain the open-plan feel of the interior, the spaces were divided by custom-made bookshelves. To create a transparent feel to the study, moveable frosted glass walls were installed. "When we first moved in, we appreciated the flexibility of Fr Green's wall panels," Rankin says. "We've tried to create the same feel with a more contemporary design."

While the box-like form of the house wasn't altered, an outdoor deck was added to the western façade. "We wanted to create an outdoor space that was accessible from the living areas," van Os says. "It's probably the largest alteration." The access has been strengthened with large glass sliding doors. "On warmer days, we tend to open the house right up," he says. "You're not even aware of moving outdoors." However, while the deck is new, it was sensitively treated with a steel handrail and stainless steel fishing wire, nestled behind the trusses, forming the balustrade.

The markings of the classroom walls have also disappeared. Now there are three bedrooms and a bathroom, together with a main bedroom and ensuite (not strictly an ensuite as this leads from a dressing area /combined laundry). The history of the building has been integrated into the new design. A weathered sign above the washing machine and dryer is a reminder of the building's past: 'Our Lady's School Primary and Sub Primary No.289'. And the concrete washing tubs, used by the children, have been relocated to the gardens, transformed into sculptural art.

As the school wasn't designed for parents to drive in and pick up children, there was an absence of parking and garaging. To complement the home, Rankin and van Os designed a new carport, garage and studio. Clad also in ZINCALUME® steel in MINI-ORB® profile, this building was conceived as a backdrop rather than as a statement. And although the garage and studio are located in a stand-alone building, it features the same clean and minimal lines as the house. The main connection is via an outdoor deck and shade cloth that provides some protection during the warmer months.

For Fr Green, returning to the house after decades has been heart warming. "The whole purpose of a building is to accommodate change," he says. "It's no longer a school. It's a beautiful home. The house recently received an award from international design magazine Wallpaper* for Best Restoration (judges included architect Sir Norman Foster and fashion designer Donna Karan).

Fr Green is mindful of the importance of steel in this and more contemporary building projects. "The everyday home builder can see for themselves the efficiency of using steel," he says.

Stephen Crafti

Project:
Woodend House

Clients:
Deane Rankin and Lex van Os

Original architect:
Father Emmanuel Green

Builder:
Alan Larter (worked on the renovation with the owners)

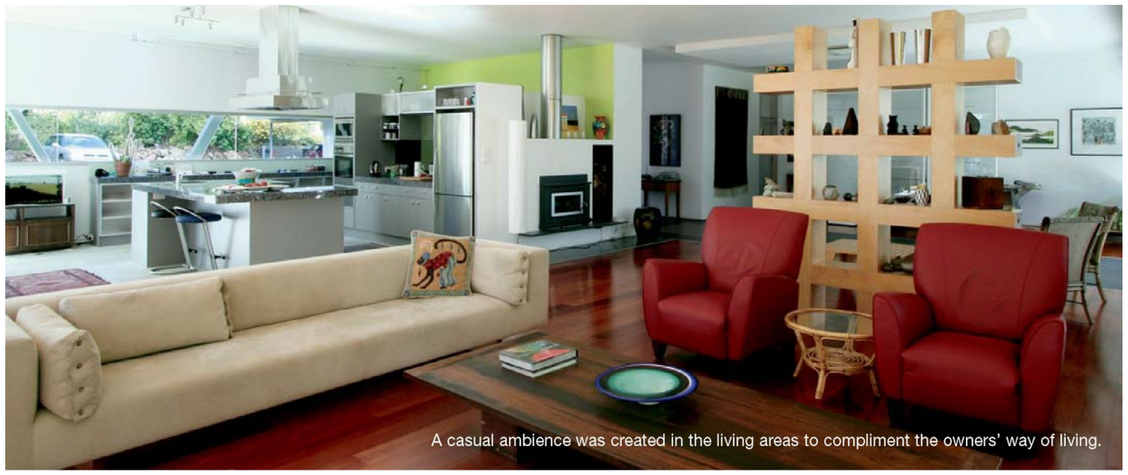
External Wall cladding:
ZINCALUME® steel in MINI ORB® profile

Approximate cost of renovation:
$250,000 including a 90 square metre carport, garage and studio

Landscaping costs:
approximately $70,000

Approximate size of the house:
330 sqm and outbuildings approximately 90 sqm

Photography:
Peter Hyatt



A casual ambience was created in the living areas to compliment the owners' way of living.

018

Project ICT Building, University of Newcastle, Callaghan Campus

Client University of Newcastle

Architects Bligh Voller Nield

MASTERS OF DESIGN

Parked high among the treetops of the University of Newcastle's Callaghan Campus, a new centre for design and IT elevates a quietly distinctive steel shed. Silver-jacketed, this single level building sits atop an existing multi-storey car-park.

The University of Newcastle is one of the front-runners of architecture in tertiary education but as is so often the case, a fiendish budget tends to drive down pomp and eliminate excessive architectural 'features'. The university's newest campus building was a real test of parking a new building on top of an old idea.

If Bligh Voller Nield (BVN) had a tough time with this complex 110m x 45m skyhook, it barely shows. The approximately $10 million budget might not appear especially parsimonious but 'invisible' high-tech innards quickly drive up costs, even with ingeniously low-tech buildings.

It pays to advertise, especially when you have a good product, and the University of Newcastle has achieved a higher standard than most, especially in the past decade or so. What began with the flamboyant Red Square (1992) by the UK's Michael Wilford set an agenda to be aspired to.

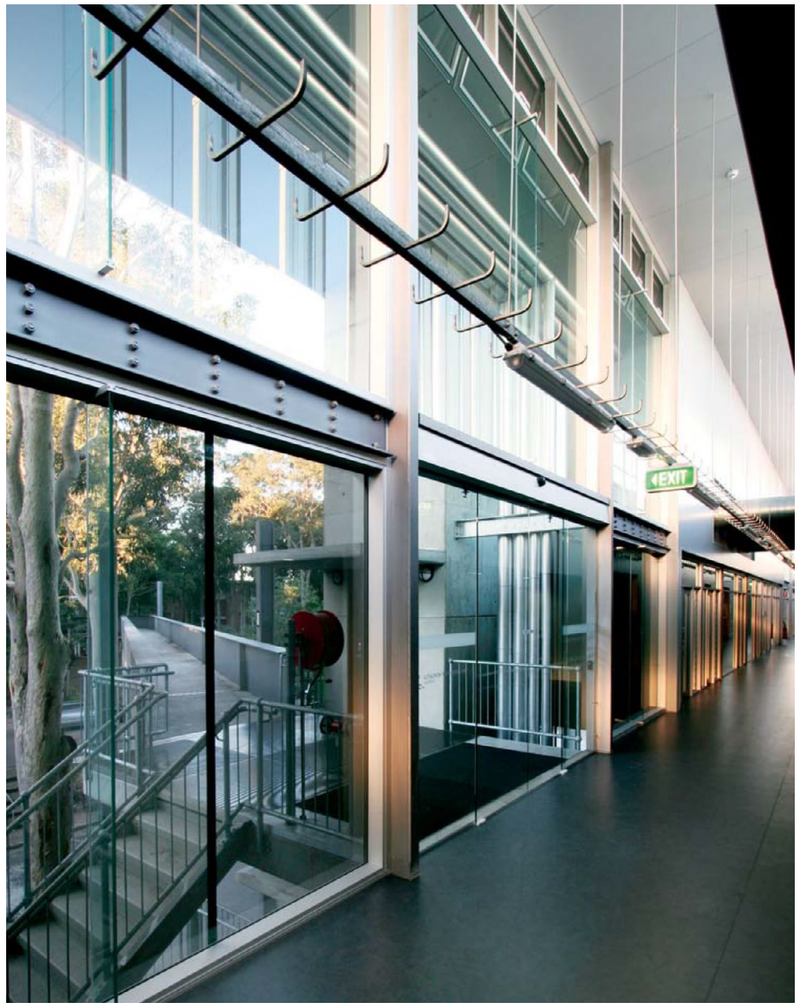
There was clearly a willingness to advance this 20,000 strong student campus largely on the back of some exceptional architecture. Stutchbury Pape and Suters' Life Sciences building (2001) and Grose Bradley's Architecture Faculty building (1996) are among the stars.

Set on 140ha in the suburb of Callaghan, 12kms from the city centre, the campus has achieved an exemplary balance between natural bushland and top-drawer architecture. The university has persevered with a master plan that provides a tranquil cohesion rather than the fragmentation created by the stylistic impulses of many tertiary institutions.

Newcastle was a steel city for what seemed an eternity and this has permeated almost every aspect of its existence – including architecture. Even though dependence on steel has since faded, its legacy endures, not so much in blood ties as in the material's high utility and value.

Last year the university faced a cash crisis that was eventually brought under control with, among other manoeuvres, major departmental number crunching. With the ICT project approaching completion, the administration reaffirmed its commitment to its new home for the visual arts and IT departments.

The Callaghan Campus of Newcastle University's new ICT building surmounts an existing, multi-level car-park.



"Our approach is that buildings born from financial austerity and astringency have a greater level of reality," architect Matthew Blair, of BVN, who worked closely with BVN Principal James Grose on the project, says. Taking the metaphor further he says: "They are fundamentally about solving problems. It doesn't necessarily make it easier for us as architects to design with less money than you might like, but it does sharpen up just what is absolutely essential.

"It's really the underlying nature of the campus. The university's avoidance of grandeur is admirable."

While the campus doesn't have the formal entry, grand boulevard and the wondrous building 'up on the hill', Blair agrees the ICT building does present an impressive sight when you enter the campus.

Unsurprisingly, he values the parenting behind such new work, noting the lineage of Glenn Murcutt in the underlying philosophy of the university's master planning and landscape design. "The university has never had a lot of money to throw at building, and this has brought out the underlying ideas rather than just including form and shape for the sake of it," Blair says.

The centre serves as home to the School of Design, Communication and IT part of the Faculty of Science and Information Technology.

The architectural solution is a crafty, light and breeze-filled box strong on environmental response and resistant to the grander pose. The brief called for a hard-working building to incorporate various teaching spaces that include TV/multipurpose production studio, sound studio, recording rooms, editing suites, computer labs, teaching rooms, research areas, academic offices, school office and staff facilities.

Essentially, many rooms were required and the architectural challenge was to create a 'heart' to the complex and to avoid a rabbit warren of rooms and corridors. The existing concrete car park was completed around 2000.

Located outside of the University Ring Road, and slightly isolated, the bridge becomes an umbilical cord or, as the architects view it, 'an astronaut's tether' to the rest of campus. As an umbilical, the bridge also carries all the services to and from the building, including data and communications, hydraulic services and chilled and heated water from a central energy plant.

This new steel pedestrian bridge, also by BVN, spans across the University Ring Road and connects the building to the rest of the campus. This bridge enters the building in the middle and immediately locates the school office. Academic offices are located along the sunny north-facing wall and enjoy the flexibility of filtered views into the tree tops and light through louvers and grilles. All offices open on to a 7m high naturally ventilated breezeway and primary circulation zone.

Structural columns on the north elevation were required to allow for a wider building 'footprint'. Interiors are lined with BONDOR®'s panel system that imparts a soft gleam to interiors.

A relatively narrow volume to structure ratio allows a high level of permeability for light and breeze. Classrooms achieve high levels of reflected light while two courtyards provide informal gathering points with high amenity.

(opposite) Main reception uses light plywood timbers to complement the overall program of slender material usage and easily illuminated spaces.

A central courtyard behind the school office splits the buildings and brief in two and creates the 'heart' of the building. Edit suites and the studios are contained within a 'black box' air-conditioned environment to the west of this courtyard under a high mono-pitch roof. Computer labs and teaching spaces are to the east of the main courtyard and served by external circulation breezeways. These rooms surround a smaller, more intimate courtyard in addition to teasing daylight into classrooms.

"It's all part of an architecture of optimism. Buildings can shine and gleam rather than being flat and drab. We're optimistic that the building promotes that idea of lightweight, permeable architecture."

The existing car-park structure was designed for another building to fit on top at some future date. This allowed the architects to consolidate the car-park and new building as a single structure rather than making the new appear tacked on.

The new building houses a single level of accommodation elevated four storeys in the air to clear the existing car park and to give enough head clearance beneath the new footbridge to allow truck access to the rest of the campus. BVN worked closely with Richard Yates of James Taylor and Associates to resolve the rigours of the structure that contains the building accommodation – forming a post-stressed, concrete platform with a steel superstructure (hot rolled primary members and cold formed purlins and girts).

BONDOR® insulated cladding panels provide a lustrously soft gleam that reflects rather than acts as a 'dead' surface. These flush fit, flat panelled, insulated sandwich panels offer high thermal performance and precise fit. "With the panels' inherent strength and light weight, framing is reduced and assembly speed increased," Blair says.

His assessment is typified by an exterior and interior that features BONDOR® insulated steel panels to provide external shell and internal walls and trim.

"We were four storeys high up in the tree tops – we didn't want to scaffold the building because of site difficulties and trees – so the desire was to come up with a system that you could install from the floor," Blair says. "The BONDOR® panels span from top to bottom, and as they're only fixed in two or three locations, they went up very quickly. The slab was poured and the frame went in and the rest – the walls, frame and roof went on incredibly quickly.

"The BONDOR® panelling has a certain lustre that is eye-catching without being crass. The finish has an honesty about its expression," Blair adds.

There are other aspects conspicuous by their subtlety. This university is the rarity, with an aversion to its buildings being swaddled in carnival graphics. "We had quite strenuous discussions about identity and we always argued that any identity that had to be added through signage or overt means indicated there was a problem," relates Blair.

Design of the building revolves around two central courtyards and the roof form resulting from this achieves studio height for lighting and gantries. No less important is the sense of being inside a healthy building with ample light and fresh air.

But the expansive quality of such buildings, being open to the bush, has its problems. Wildlife, including possums and bandicoots, regularly access buildings, while leaves, bush debris and spiders add an interesting mix.

In the end it was the BONDOR® panel's smooth, virtually seamless finish that convinced BVN that "footholds for little critters were best avoided".

"While it might appear odd to find a shining, floating, box on top of this car-park in 'the bush', to experience the building is to feel its openness and optimism," Blair says.

Peter Hyatt

Project:
ICT Building, University of Newcastle, Callaghan Campus

Clients:
University of Newcastle

Architect:
Bligh Voller Nield

Project team:
James Grose, Matthew Blair, Anne Simpson, Nesha Naidoo, Rob Weiss, Walter Carniato, Kathy Roberts, Kim Humphries, Geoff Cook, Greg Knight

Structural engineer:
Richard Yates, James Taylor and Associates

Principal steel components:
BONDOR® insulated cladding panels for external and internal walls, in COLORBOND® Shale Grey and LYSAGHT KLIP-LOK 700 HI-STRENGTH® made from COLORBOND® steel in the colour of Shale Grey™ for roofing and courtyard verandahs

Budget:
$10 million

Photography:
Peter Hyatt

024

Project Underwater World Langkawi, Malaysia

Client Eden Enterprises (M) Berhad

Architect L Tay Architect

A TALE OF THE SEA

You've heard of four seasons in one day. Well how about three ecosystems in one building? That was the challenge laid down for architect Dr Boon Hock Tan, who was asked to design a new extension to Underwater World in Malaysia.

For today's generation of technology-savvy children, the echoing halls and dusty, glass-enclosed exhibits of traditional aquaria often no longer cut it.

The past decade has seen the rise and rise of modern interactive aquariums, where static, stuffed exhibits have been swapped for "experiences" and demonstrations.

So when Dr Boon Hock Tan of L Tay Architect was asked to design a new extension for Underwater World Langkawi, Malaysia, his immediate thought was to make the experience as sensory and as realistic as possible.

"We wanted to try to bring the exhibits and animals as close to the people as possible. The feeling should be that you could almost touch them. We actually encouraged people to touch the acrylic enclosures."

The original Underwater World, on Langkawi Island, was built in the early 1990s to house 5000 varieties of aquatic life. In 2004, it was recognised by the Malaysia Book of Records as the country's largest aquarium.

But a decade on from its construction, Tan says the utilitarian, whitewashed brick building was beginning to show its age.

Tan was asked to design an extension by Underwater World's owners Eden Enterprises (M) Berhad after a request by the former Prime Minister, Dr Mahathir Mohamad.

"He had just visited Antarctica where he saw plenty of penguins," says Tan. "Dr Mohamad wanted to build something here that would educate people about them."

The brief from Eden Enterprises was to design a building that would include a 3D cinema and three distinct ecosystems: freshwater ecosystem, a rainforest environment, and a sub-Antarctic ecosystem, which, most importantly, contains a penguinarium.

Tan immediately settled on a maritime design theme. "We wanted to play with the form and shape of the building and create a simple building with two or three strong forms."

The bright blue membrane and yellow and black aluminium cladding in Underwater World's entrance replicate those of a tropical fish.

(above) Graceful sloping roofs give the appearance of waves, while a funnel-like tower rises behind.

(below) The original Underwater World can be seen to the left of the new extension.

The front of the building features a series of graceful sloping roofs; some are peaked and wave-like, while others are seashell-like shapes. Together, they give the impression of waves slapping against each other. Meanwhile, a huge 20m funnel-shaped tower rises from behind the main entrance.

"So from the front it looks like the funnel of an ocean liner coming out of the waves," says Tan.

From the outside, the aquarium dwarfs the original four-metre high Underwater World. "One of the comments we often get from people is about the height of the building and the volume," says Tan, who wanted to create tension between the two buildings by using contrasting size, materials and form. This experimentation between spatial differences is continued inside the building.

"We really wanted to give a sense of volume to this new building so when you walk in you get an uplifting feeling," says Tan.

"We had an opportunity to create something modern, a building with subtle maritime themes which hopefully visitors associate with a public aquarium."

The entire building is clad using ZINCALUME® steel, with the bluish-grey colour complementing the maritime theme and keeping the lines of the building clean.

Tan also used steel because it was flexible enough to be bent into the curved shapes of the building, especially the funnel-shaped tower. Seams could also be tapered.

The structural members, along with the roof and wall claddings – designed to combat any potential condensation or humidity created by exhibition tanks – were fabricated offsite and shipped to Langkawi, partly because of labour shortages.

Tan says prefabrication also meant the roof and walls could be erected more quickly, allowing other trades and animal specialists to start work inside earlier.

An unexpected benefit of using ZINCALUME® steel was that lighting the exterior with metal halide spotlights produced a "surreal" effect at night. "This is one aspect of the design which we hope to play with in future designs," says Tan.

The only splashes of colour on the exterior are yellow louvred windows along one side, which ventilate a service area and help to break up a monolithic slab-sided wall. A blue and aquamarine stretched membrane over the ticket counter also adds variety.

"We used yellow and black aluminium cladding on the ticket counter because we took that from the colour of an exotic fish. It's quite symbolic. We didn't want to use too many colours. The interior finish is rather bare given the prominence we needed to put on the exhibits."

"We wanted the building to speak for itself. For me, in some ways, the actual building was just a shelter for these exhibitions. After all visitors are there to see the exhibits, not the building."

Inside the aquarium, Tan aimed to create a sense of anticipation that would propel visitors through the facility.

Before tourists even purchase their tickets, they can see into one of the tanks which backs onto the lobby, and hear the sounds of water cascading (from a series of three cascading tanks, depicting a cross-section of a freshwater river) and birds chirping (from the next-door rainforest ecosystem).

Step inside the second ecosystem (rainforest courtyard) and the temperature immediately rises to 33°C. "It's pretty colourful, with birds flying around."

The huge rainforest courtyard, which is 20m-high, features live trees and bush, and nine tanks, some splashing noisily onto each other. The rainforest is populated with a variety of freshwater fish as well as animals ranging from anacondas to capybara – the world's largest semi-aquatic rodent ("very hairy and about the size of a bull terrier," says Tan).

The tanks themselves are reinforced concrete with viewing panels, made from acrylic – a much cheaper option than using glass, and waterproofed with fibreglass.

Tan recalls that designing the tanks was particularly challenging as the reinforced concrete rebates for the acrylic viewing panels had to be accurately set out and cast.

(above) The bluish-grey colour of the ZINCALUME® steel reflects the maritime theme.

(below left) Yellow louvred windows along one side of Underwater World.

(top) Visitors feel as though they are under the sea in the aquarium's 3D cinema.

(above) The entrance offers views into some of the tanks in the rainforest ecosystem.

"Since the curved acrylic panels were delivered from China in large sections, which had to be seamlessly joined on site, we had to ensure that the level of tolerance was well within the specified curvature of the acrylic panels. We had to get it right the first time."

Because of Malaysia's high rainfall, the rainforest area had to be enclosed so visitors were kept dry.

However, to ensure that the area was still flooded with natural light, Tan opted for a polycarbonate roof.

Steel beams are painted green to minimise the impact of man-made elements, and columns are few and far between.

"That was key for us. We tried to keep it as column-free as possible to maximise the size of the exhibits," says Tan, further explaining that the long span design was another reason for using steel.

Anticipation is built as visitors approach the end of the rainforest area, with a slight drop in temperature – hinting at the sub-Antarctic ecosystem next door. The two sections are separated by heavy sheets of plastic (similar to those used in cool stores) and though they are largely effective, some heat escapes, Tan says.

This third ecosystem is painted in blues and greens, while subtle lighting ensures the tanks are highlighted, and marine and rock-scaping helps the penguins feel at home.

The sub-Antarctic ecosystem begins with a fibre-reinforced cement igloo, which visitors can walk though. The juxtaposition between the comparatively small igloo and the vast 20m high rainforest ecosystem enclosure is similar to the marked contrast between the old Underwater World building and the new extension.

"We were keen to let visitors explore the different spatial qualities in the building, and the igloo is one of these," says Tan.

"As a designer I am fascinated by people's reactions to different spatial qualities and how we can design these spaces to enhance and heighten their senses."

The igloo leads visitors to the first of two sub-Antarctic ecosystem tanks. Here, visitors wander into a tunnel tank containing Blackfoot penguins swimming beside and above the visitors.

An alternative route for disabled visitors allows them to travel round the tunnel (which has several steps) and view the penguins at eye level, from the opposite side of the tank.

The second sub-Antarctic tank contains Rockhopper penguins, which are viewed at eye level.

Finally, the path leads out into an educational centre filled with photos and information panels about Antarctica.

The last feature of the new building is the 3D cinema on the second floor.

The maritime theme is continued in the cinema, as the room is designed in muted blues and greys, with coloured acoustic panelling cut into the shapes of whales and undersea creatures lining the walls. The sound system and ambient lighting give viewers the impression they are actually under water.

Tan says accommodating the animals and marine life was both the most enjoyable aspect of the project and the most challenging.

"Things like the animal life support system and water filtration were pretty new to us. We had to design the tanks but had to learn specifically what was required."

The project also required a tremendous amount of coordination – not just between the usual team of engineers and architects – but also a host of animal experts and consultants, including international life support specialists.

"We all had to come together – and we did. I think everybody enjoyed this project.

"The client was easy-going and the chairman of the company kept stressing enjoyment. He wanted everyone to enjoy the project because it's one of a kind. That attitude kind of rubbed off on the consultants. I think that was the key to it."

Despite the hard work between all the consultants, Tan says he was still nervous about how the animals would adapt to their man-made home.

"As much as we would like to make the ecosystems as close to their actual environment as possible, there is always an element of doubt, I suppose.

"There were a number of occasions when I was walking through the empty building and sitting in front of those empty tanks filled with water."

The first animals to go into the new extension were harbour seals in the sub-Antarctic section. "The moment they went in and hit the water… that was a great feeling."

Anna Saunders

Project:
Underwater World Langkawi, Malaysia

Client:
Eden Enterprises (M) Berhad

Client Advisor:
Underwater World Curatorial Department

Architect:
L Tay Architect
Project Team: Tay Lee Lee, Tan Boon Hock, Ng Tzer Ying, Seng Lee Yee, Tan Yaw Nan, Wong Ooi Bee, Patrik Ng, Lee Chung Hoe

Consultants:
Mr Frank Todd – Ecocepts International, USA

Structural Engineer:
Jurutera Perunding ANR

Builder:
Blackrock Corporation Sdn Bhd

Steel Fabricator:
Fook Soon Engineering Sdn Bhd

Principal Steel Cladding:
LYSAGHT® HR29 made from ZINCALUME® steel used as roofing. ZINCALUME® steel used as wall cladding. The cone building clad in LYSAGHT® SELECT SEAM® made from ZINCALUME® steel.

Size:
Existing 40,000 sqft (3716 sqm), New 60,000 sqft (5574 sqm)

Photography:
Paul Bradshaw

Acrylic tanks are filled with thousands of varieties of aquatic life.

steelprofile

I have always been interested in Australian architecture, because I feel the aspirations, values, character and history of a people are embodied in its buildings. And I have always liked using steel because it's such an Australian material.

As a land, Australia speaks of space, and so does steel. Steel is conducive to the expression of the Australian characteristics of strength and flexibility.

Real and timeless architecture doesn't have to be expensive or entail the use of expensive materials. Good design comes from the use of economy of structure, and steel is ideal for expressing this.

When the earth moves – as it occasionally does – steel shrugs its shoulders and settles down again, unlike concrete, masonry and brick, which can be inflexible.

Structural steel – which incorporates the best characteristics of cast iron and mild steel – is ideal, I believe, for use in schools and houses, as it is both strong and flexible.

The Woodend school, now a residence, was an innovative step forward to an integrated trussed box-frame structure, a design that opens up endless aesthetic and functional opportunities for architects, builders, developers and owners. While it was no more expensive than a standard brick-veneer structure, the supporting structure does not intrude on inner wall or ceiling surfaces, and internal walls and spaces can be rearranged simply as required.

Father Emmanuel Green CCS, Architect FRAIA

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