

122

NOVEMBER 2015

ARCHITECTURAL

STEEL INNOVATION

WITH BLUE SCOPE

STEEL PROFILE

**NH ARCHITECTURE AND POPULOUS
IN JOINT VENTURE
MARGARET COURT ARENA**

**TAG ARCHITECTS AND IREDALE
PEDERSEN HOOK ARCHITECTS
IN ASSOCIATION
KUNUNURRA COURTHOUSE**

**IN PROFILE:
3XN**

EDITORIAL

Welcome to *Steel Profile* 122.

As a longstanding supporter of excellence in Australian architecture and 30-year Principal Corporate Partner of the Australian Institute of Architects, BlueScope congratulates all recipients of the 2015 National Architecture Awards.

This issue features Andrew Maynard Architects' Tower House which received the highest National Award for Residential Architecture – Houses (Alterations and Additions): the Eleanor Cullis-Hill Award.

The most prestigious COLORBOND® award was saved for a project with a delightfully contemporary, scalloped form that is refined in its expression and clearly demonstrates the suitability of steel as a complementary material to enhance heritage fabric. We particularly applaud Cox Architecture, Walter Brooke and Hames Sharley for the Adelaide Oval Redevelopment (see its Western Grandstand in *Steel Profile* 112) being awarded the 2015 National COLORBOND® Award for Steel Architecture. The project also received an Award for Public Architecture.

We look forward to discovering and sharing many more potential award winners in 2016.

Please feel free to share your thoughts with us via info@steelprofile.com.au

Scott Gregory
BlueScope editor

EDITORIAL ADVISORY PANEL

Steel Profile has an Editorial Advisory Panel to ensure that only projects of the highest calibre are selected for publication. The panellists are:



FRANK STANISIC

Stanisic Associates founder Frank Stanisic is a Sydney-based architect and urbanist.

His work is fuelled by an evolving interest in the diagram and frame as a basis for architectural invention, and the aesthetics of permeability.

Frank's projects have won numerous awards including Australian Institute of Architects' Special Jury, Wilkinson, Aaron Bolot and Frederick Romberg prizes



PENNY FULLER

Penny is a partner at Silvester Fuller, established in 2008. Silvester Fuller's first built projects have been awarded for their creativity and design sensibility. Penny's work draws on experience gained across a broad range of international projects. She is a previous recipient of the Australian Institute of Architects' Emerging Architect Prize



JAMES LODER

James Loder is a graduate architect working at John Wardle Architects. Graduating from RMIT with a Master of Architecture (First Class Honours) in 2012, James was awarded the 2013 BlueScope Steel Glenn Murcutt Student Prize.

His work explores the formal relationships between building and landscape with great consideration given to spatial expression and materiality

ISSUE 122 CONTENTS



A high-speed 'sun-roof' swathed in COLORBOND® steel in the luxurious custom colour Copper Penny™ is a textbook example of how to become a sports facilities world-beater



Inspired by childrens' sketches of a simple tower-like house, Andrew Maynard Architects has used steel to meet the cladding requirements of a series of home additions that together form a 'village'



3XN wowed Copenhagen with the steel-enabled curved facades of The Blue Planet aquarium and now has its ingenious sights set on the transformation of Sydney's Circular Quay precinct



A slick and expansive steel-wrapped pavilion creates a flexible addition for architect John Lowe's heritage-listed Adelaide cottage



A clever box frame modelled around a Vierendeel truss demonstrates – in the form of two new school pavilions – that faith in engineering and architecture can push the boundaries of possibility



Dubbed the "Opera House of Kununurra" by locals, this new courthouse conveys gravitas without intimidation and features an expressive, folding steel roof that traces the outline of its surrounding national park ranges



A parkland shelter made entirely from steel embodies forms drawn from an adjacent mountain bike trail and employs fabrication techniques to dispense with secondary structure

Principal Corporate Partner



Australian Institute of Architects



COVER PROJECT

Margaret Court Arena

PHOTOGRAPHER

Peter Bennetts

NUMBER 122, NOVEMBER 2015

BLUESCOPE EDITOR Scott Gregory MANAGING EDITOR Rob Gillam ASSOCIATE EDITOR Rachael Bernstone

CONTRIBUTING WRITERS Rachael Bernstone, Rob Gillam, Peter Hyatt, Paul McGillick, Micky Pinkerton

CONTRIBUTING PHOTOGRAPHERS Peter Bennetts, Paul Bradshaw, Brendan Finn, John Gollings, Belinda Monck

ART DIRECTOR Natasha Krncevic

PROJECT SUBMISSIONS To submit your project for consideration please visit steelprofile.com.au

SUBSCRIPTIONS For all subscription enquiries please contact us via steeldirect@bluescopesteel.com

EDITORIAL EMAIL rob.gillam@steelprofile.com.au; rachael.bernstone@steelprofile.com.au

MAIL CORRESPONDENCE *Steel Profile*, PO Box 961, Crows Nest, NSW 1585, AUSTRALIA

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MOVEABLE FEAST

Athletic, taut and defined by an origami-inspired roof, Margaret Court Arena provides stellar helicopter views and sublime interiors.

Words **Peter Hyatt** Photography **Peter Bennetts; John Gollings**

**ARCHITECT**

NH Architecture and Populous
in joint venture

PROJECT

Margaret Court Arena

LOCATION

Melbourne, Victoria

Margaret Court Arena is the latest in a suite of venues to further validate Melbourne as a true tennis grand-slam host and global sports and entertainment mecca.

This latest addition to a precinct giddy with expansion is a textbook example of how to become a sports facilities world-beater.

A high-speed 'sun-roof' is key to this \$183 million project that offers premium seating for 7500 spectators. And what's not to like? The roof made from COLORBOND® steel in LYSAGHT KLIP-LOK 700 HI-STRENGTH® profile is swathed in the luxurious custom Metallic colour Copper Penny™, to the last centimetre.

An area of under-used playing fields – with the occasional arrival of Ashton's Circus being the rare exception – Melbourne Park's transformation into a caravanserai of hi-tech coliseums began in the late 1980s with the construction of Rod Laver Arena.

Its latest offering, Margaret Court Arena – a joint venture design by NH Architecture and Populous – expands the precinct's capacity to service every sports and entertainment event imaginable. NH and engineers Aurecon provide an arresting variation from the polite, white modernity of over-arching steel tubing, tensioned columns and Miesian planes.

NH's reputation for clever geometry, resolved skins and tuned interiors is once again showcased with the roof made from COLORBOND® steel in LYSAGHT KLIP-LOK 700 HI-STRENGTH® profile being a signature element of this project. NH and Populous acknowledge that architecture of the public realm should whet our appetite to experience the contest and performance that beckons from within.

"It's not only a tennis, basketball and netball venue, but also a concert stage with complex lighting requirements," says NH Architecture's project team leader Wilko Doehring. "We had to ensure the roof was light-proof and allow for all the movements including expansion, shrinkage and skews of about 150 different scenarios."

Similar to the Melbourne Cricket Ground and neighbouring arenas, this copper-toned beauty – realised with the COLORBOND® steel custom colour, Copper Penny™ – raises expectations and then delivers. Margaret Court Arena's blurring of architecture, engineering and fit-out produces fine results.

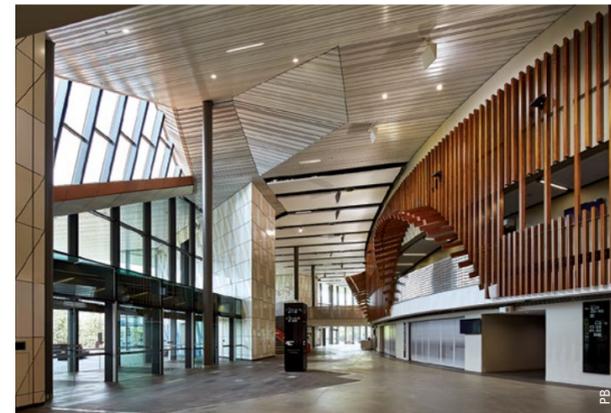
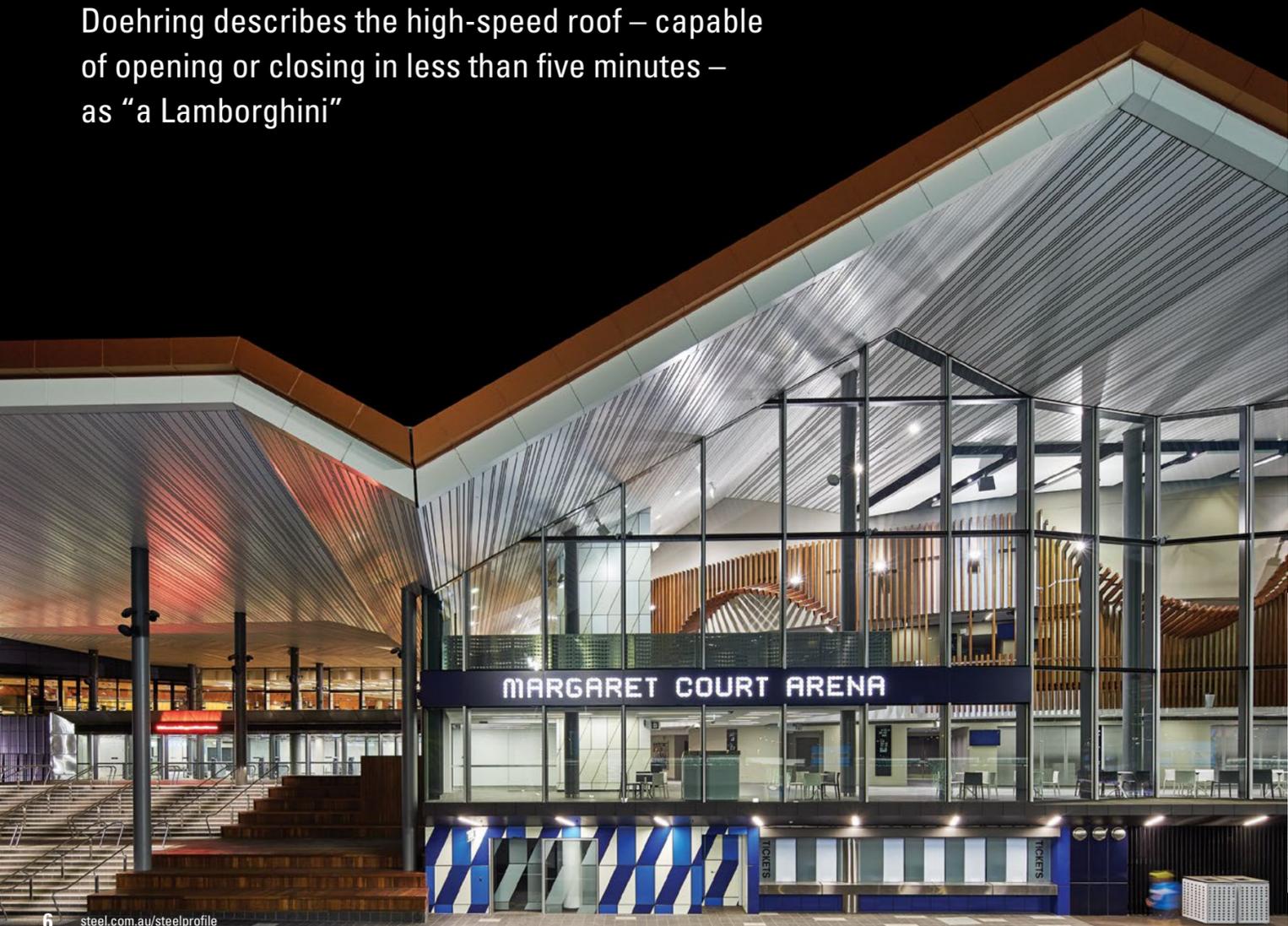
A seamless, floating elegance inspired by automotive and aeronautical associations informs the sleek amenity of circulation areas, where daylight is never far away. Smoothly spooled finishes inside and out

characterise a project of reduced bulk and increased amenity. While many rooftops are the repository of cluttered mechanical services, the 57m x 64m operable rooftop here handsomely caps a sleek entity.

Doehring describes the high-speed roof – capable of opening or closing in less than five minutes – as "a Lamborghini", adding that three-and-a-half minutes would be possible. Such speeds make the once wunderkind roof of Rod Laver Arena (25 minutes) appear sluggish.

But the new facility and its roof are much more than purely about speed. The project underwent an intensive weight-loss program from its conception and the result is a spectacularly slender sheath of metal barely one metre deep.

Doehring describes the high-speed roof – capable of opening or closing in less than five minutes – as "a Lamborghini"



OPPOSITE: A dramatic roof profile of folded strength invests the project with a distinctive signature

ABOVE LEFT AND RIGHT: Low-rise, slender compression and light-filled circulation zones feature in the main foyer

Doehring says the design goal was to produce the most elegant, lightweight and streamlined solution. He explains how the engineering, fabrication and construction teams worked tirelessly to produce a roof barely half the height of a man or woman. Such shrink-wrapped re-sizing can come at a huge cost penalty, but, he says, invention rather than lavish budget provided the solution for an array of shared services including roof drainage, structure and acoustic layers, all integrated in a single thin wafer.

"It very much reflects this age and takes a micro view of the world, of incredible miniaturisation and slenderness not previously possible," Doehring says. "It's inspired by electronic devices becoming thinner and thinner: that really influenced this roof."

"The potential for variation was one of the main challenges. The second was thinness, weight reduction and a profile lower than the bigger brother Rod Laver Arena," he adds. "Fold a piece of paper and it becomes stronger. That is essentially what we did with the COLORBOND® steel LYSAGHT KLIP-LOK 700 HI-STRENGTH® material used for the roof to provide a substantially stiffened, strengthened span."

In engineering terms, the project's crowning glory is equivalent to an ultra-strong lily-pad. Doehring explains that the precedents for fully-sliding, operable roofs of such a scale are relatively few. "Fifty-one roofs, to be precise at the time of launching into this," he muses. "It's not as if you just Google this stuff and cut and paste it into your project. It's intrinsically harder than that." He describes the result as reminiscent of a watch with its whirl of inter-connected cogs, cables, super-structure and precision parts. "It's a concept without precedent and a customised solution. Typically there are rails and assemblies adding bulk and wasting space and materials, whereas this roof tracks independently without rails on incorporated, lowered assemblies."

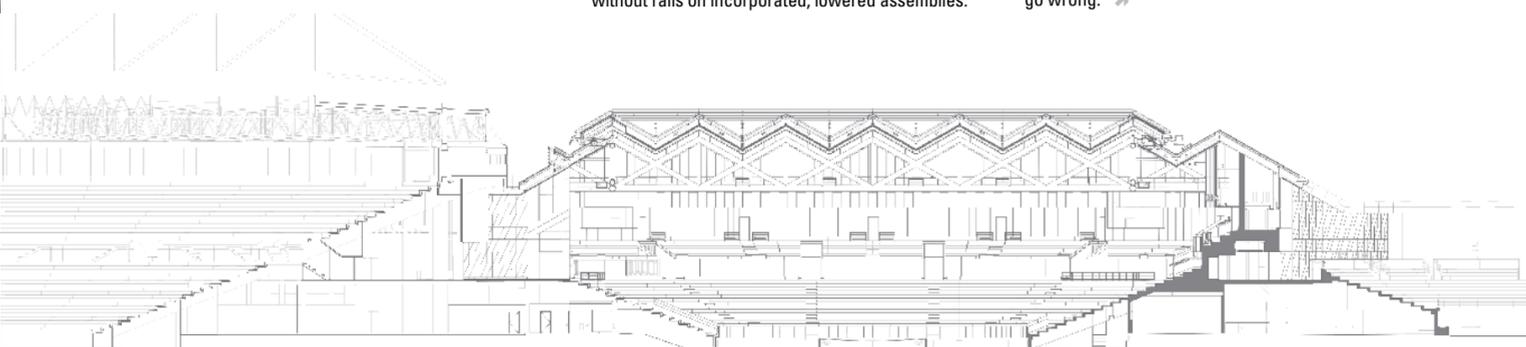
Doehring says the relationship with structural engineer Aurecon and its consultant team was symbiotic, and he credits valuable input from Walter P Moore, which specialises in stadia and operable roofs in the USA, and which worked closely with Aurecon in the project's early phases.

Distilling the roof to such a shallow depth was a consultative process with all of the relevant teams. A conventional layering and structure of services was not an option. The result was a series of stratified zones measured in millimetres.

Doehring recalls the process of rigorous miniaturisation. "The electrical engineer might say: 'I need 200 millimetres'. The mechanical engineer might say: 'I need 600 millimetres'. But then we needed moveable roof structure and drainage and we said: 'Okay, enough. You're not getting a two-and-a-half metre-deep roof. So now, fight for your space. Reduce your working area further.' And they did. We ended up with over 300 penetrations through that sandwich-like steel roof. We modelled every beam to within a millimetre to ensure it would work."

Project structural engineer Mark Sheldon says Aurecon has contributed to every moving roof in Australia during the past 20 years, including one of the world's largest examples – Etihad Stadium in Melbourne (2000), Hisense Arena, also Melbourne Park (2001), and Perth Arena (2012) (see *Steel Profile* 117).

"Designing large sliding roofs is a reputation we don't mind having," says Sheldon of a task clearly not for the faint-hearted, or technically challenged. "They demand incredible expertise in the area of electronic and mechanical controls and the myriad of unusual and secondary forces on the structure mean there are so many things that could possibly go wrong." ❧



EAST-WEST SECTION



Slenderising this roof by the elimination of the usual roof tracking system introduced one of the major engineering headaches. The answer came in the form of inline wheels integrated with the roof edges to help reduce its profile from 'hamburger' to 'sandwich'. Despite being unable to track with such precision, Sheldon says they have managed to streamline the forces and overcome the tendency for excessive roof flex, potentially causing one inline wheel set to shift minutely out of alignment.

Despite the instability of single-rail bogies, Sheldon says the Aurecon team managed to develop a system whereby the bogies and roof steelwork supported each other. Combined, they needed to allow small rotations for humps in the rails and any non-parallel or rail misalignments, yet allow the roof to slide over the bogey during skewing, or thermal movements.

"Its complexity wasn't helped by the interface between the structure and pleated skin that could potentially foul," Sheldon adds. "As much as we want to keep everything in perfect alignment, we can't. Temperature changes and construction tolerances, for instance, also alter dimensions and alignment of the two roof

planes that meet above centre court. Each of the leading edge trusses span some 50m and sit 17.5m above the playing surface."

Unlike the introverted tendencies of most stadia, this has large areas of glazing taking in the sweep of the city with a generous intake of daylight to overcome the disorientating experience of warehouse-like spaces. Doehring says Margaret Court Arena is more like a convention centre with its large foyer, easy transparency and edge spaces, to say nothing of the yawning roof which, like a sunflower, is able to open to the heavens and reveal the seating inside.

NH follows a proven process with its designs – from initial sketches through to *Revit* for every junction, bolt and carefully turned handrail. From a structural viewpoint, the architects and engineers inverted and contained most of the gymnastics within the structure. The new superstructure also resulted in a reduced overall height of 4.6 metres for the steel structure – incorporating XLERPLATE® steel manufactured by BlueScope – much lower than Rod Laver Arena and providing a degree of intimacy with scale, without any sense of claustrophobia. ↗

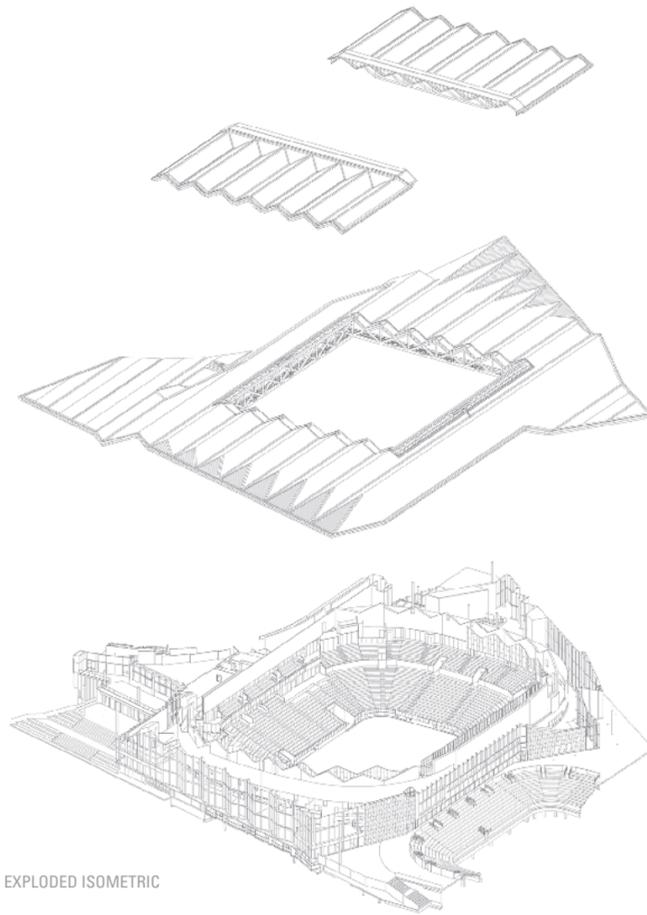
"Patrons feel as if they're close to the court or stage and that is largely due to the inverted steel roof structure that brings seating into more intimate contact with players and performers"



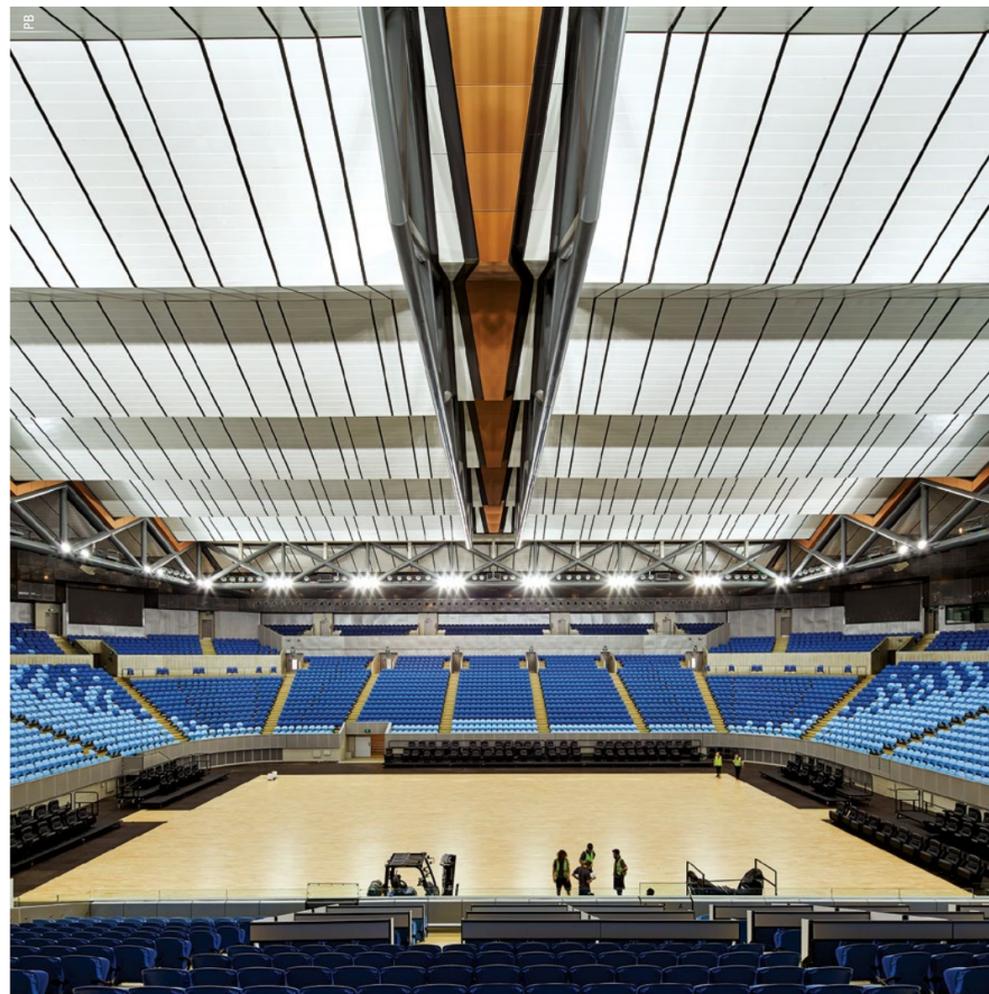
ROOF PLAN 

ABOVE LEFT: A deferential roof-line below that of Rod Laver Arena preserves the iconic form of the old

LEFT: A barely one metre-deep sliding roof space is a triumph of essential engineering and slenderness



EXPLODED ISOMETRIC



TOP AND ABOVE: The lowered roofline and ceiling are balanced by an active use of skylights and materials to maintain spatial generosity and daylight connection

RIGHT AND OPPOSITE: The centre's origami-like qualities are especially evident with interiors where the folded roof and ceiling form contributes a distinctive elegance. Clever engineering ensures steel trusses and columns are contained within the envelope rather than over-arching

"We wanted something unique and to push the boundaries with a unique solution, and to create the fastest roof possible as an example of Australian architecture and engineering," Doebling says, his pride in the roof almost palpable. "The design philosophy of our office is that this is the fifth elevation, or, how I like to say, the first elevation, because the roof is often one of the biggest surfaces. Here the helicopter view is very important because of the elevated context displayed on television."

He adds that the entire design and construction team knew they were working on a very difficult project at every stage. "There were many strands to bring together from off-site fabrication and then an intensive nine months to build and install the whole roof," Doebling says. "The roof comprises a pre-set segmented system of elements each around 8 x 4 metres. This was prefabricated, brought to site, then assembled and lifted into place with the ceiling already installed in the roof system."

"That was a process that really helped accelerate construction time and minimised many of the usual on-site safety issues," he continues. "Three months later the project had to be ready for hand-over. We really had a half-finished building that was opened early and which took just over three years to build."

Doebling says it wasn't a case of being indulged by a one-off roof budget. "We had to make the funds work as hard as possible. It's really a story about achieving a welcoming human scale and comfort rather than something agricultural or industrial," he explains. "Patrons feel as if they're close to the court or stage and that is largely due to the inverted steel roof structure that brings seating into more intimate contact with players and performers."

Whether this stunning roof is open or closed, and regardless of the spectacle taking place inside, Margaret Court Arena reminds us that architecture and engineering are much more than mere construction: they have the power to generate a convincing spark and become part of a song-line for the city. SP

PANEL SAYS

In this magnificent new addition to Melbourne's world-class tennis precinct, the architecture is defined by one strong idea that pulls all of its intentions together: its striking roof. Nestled alongside Rod Laver Arena, this multi-functional venue provides a contrast to its neighbour, thanks to the confident use of COLORBOND® Metallic steel in the custom colour Copper Penny™. The pleated roof imparts a singular identity to the MCA, especially when viewed from the air, as it will be during live television broadcasts. The sophisticated origami of the fast-closing roof is equally impressive whether the structure is open or closed, and the clean appearance of the all-important fifth facade is a testament to the architectural and engineering ingenuity that underpins the entire project

PROJECT Margaret Court Arena **CLIENT** State Government Victoria **ARCHITECT** NH Architecture and Populous in joint venture **PROJECT TEAM** Hamish Lyon, Richard Breslin, Lyndon Hayward, Paul Henry, Ralph Wheeler, Adrian Costa, Mun Ching Wong, Thuyai Chung, Wilko Doebling, Paul Foskett, Emily Kilvington, Astrid Jenkin, Dale Jennins, Michael Neve, Julie Rinaldi, Mieke Vinju **STRUCTURAL & CIVIL ENGINEER** Aurecon. Aurecon project team: Mark Sheldon, Mark Waggoner (Walter P Moore), Peter Murenu, Warrick Plymin, Matt Johnson, Zac Hankin, Mark Spolidoro, Nathan Luke, James McFadyen **BUILDER** Lend Lease **STEEL FABRICATOR** JVP **PRINCIPAL STEEL COMPONENTS** Roofing: LYSAGHT KLIP-LOK 700 HI-STRENGTH® profile made from COLORBOND® steel in the custom Metallic colour Copper Penny™. Structural: incorporating XLERPLATE® steel manufactured by BlueScope **PROJECT TIMEFRAME** 2011-2014 **AWARDS** 2015 Australian Institute of Architects Victoria Award for Public Architecture (Alterations and Additions), 2015 Australian Institute of Architects National Award for Public Architecture (Commendation), Master Builders Excellence in Construction Awards, 2015 Master Builder of the Year and Excellence in Construction of Commercial Buildings over \$80m **BUILDING SIZE** 24,000m² gross floor area **TOTAL PROJECT COST** \$183 million

We've come to expect the unexpected from Andrew Maynard Architects and this project does not disappoint, twisting material assumptions and inverting spatial conventions to create the architectural equivalent of a page-turner.

Words **Micky Pinkerton** Photography **Peter Bennetts**

TALL TALES



ARCHITECT
Andrew Maynard Architects
PROJECT
Tower House
LOCATION
Alphington, Victoria



The story goes that the design for Tower House grew from the sketches that a pair of six-year-olds drew while their parents were talking to architects Andrew Maynard and Mark Austin during an early meeting about an addition to their existing home. Everyone would be familiar with the classic picture of a house that the twins drew: a rectangle topped with a triangle, boasting a single window with a cross through it. And maybe, in keeping with the simplicity of a child-like approach, that's the story we should run with here. But as tempting as a single narrative is, it would ignore the other relevant beginnings that have informed this fascinating and delightful project.

So the story could also start much earlier, with an inference that Maynard's and Austin's childhoods amidst the peaks of Tasmania had a subliminal effect on their approach to residential architecture in geographically flat Melbourne. The musings-on-a-vertical-theme so clearly evident in Tower House can be easily traced back through a number of the studio's award-winning projects, such as HOUSE House, Hill House and Vader House.

Then again, a more recent narrative is that of Google Earth, which the architects contend has led to the rise of the fifth elevation in that the roof is now an acknowledged public face of our buildings, visually accessible at any time. Utzon presciently referred to it as the fifth facade, and it's in this thread of the story that steel plays a dominant role.

As Tower House was taking shape on paper it became clear to the architects that a unifying element was going to be critical to the success of the project. Drawing inspiration from the twins' sketches and the discussions with their parents around the idea of a home as a village, the design had developed into a series of archetypal structures peeling off the existing post-war brick home, arranged around the perimeter of the site and facing on to a 'communal' garden. Steel was selected very early on in the process for its ability to provide the material profile which could meet fifth facade aspirations, as well as visually link the six new buildings.



Steel was selected very early on in the process for its ability to provide the material profile which could meet fifth facade aspirations, as well as visually link the six new buildings

BELOW LEFT AND RIGHT: The design sought to use the form of the buildings to give more to the project, including a high volume above the dining table, and natural light above the kitchen island by placing it under one of the glassed interstitial spaces

"It was to do with getting a cladding material that we could use on both the roof and the walls so we could run it up over the top, and back down," explains Austin. "Steel lent itself perfectly to that sort of approach, and that material wrapping would draw all the little house shapes together in the village."

Lengths of LYSAGHT LONGLINE 305[®] profile made from COLORBOND[®] steel in the colour Surfemist[®] envelop each rectangle/triangle form in a seemingly singular movement. The remaining facades are enclosed in western red cedar shingles. It's an arresting combination which is at turns familiar and unusual. The strata of the steel cladding brings to mind residential weatherboards – but they're run vertically instead of horizontally. The shingles echo the rhythm of roofing tiles – except that they're on the walls, not the roof. Just to keep your eyes 'on their toes', alternate buildings are rotated 90 degrees; this subconsciously lends the village a domestic rather than an industrial feel.

Look closer and the real smarts of the design and construction become apparent. There's no guttering interfering with the simplicity of the forms, or surplus fixings compromising the wrapped effect. The roof plumber was responsible for all the steel cladding and his effort in realising the architects' vision is worthy of a book in itself.

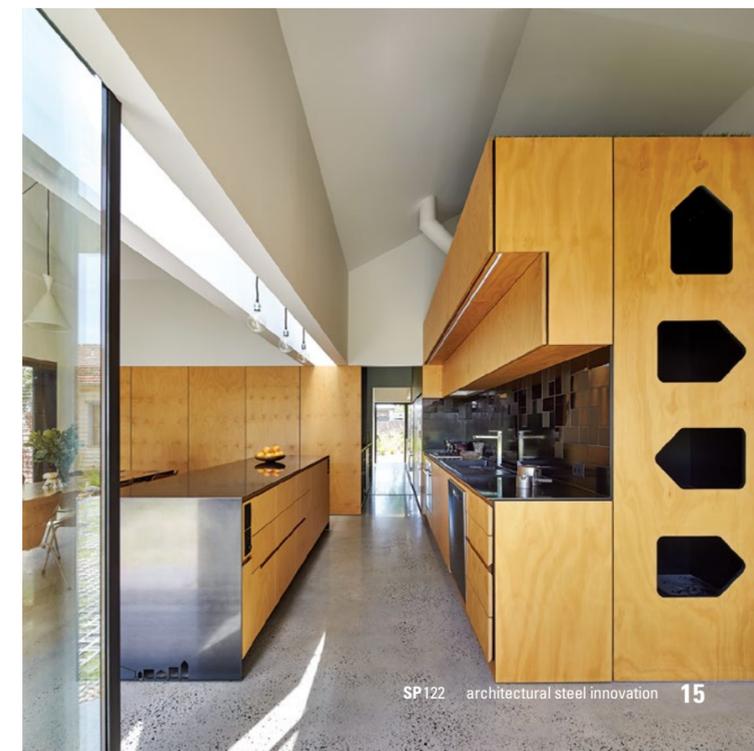
"There was a lot of discussion with the roof plumber about the corner details of the buildings and about how we would achieve the quality in each cut and crimp, and bend on each rib," says Austin. "So he came up with all these different methods and alternative ways that we could do it. We learned a lot about the craftsmanship of roof plumbing as part of that process."

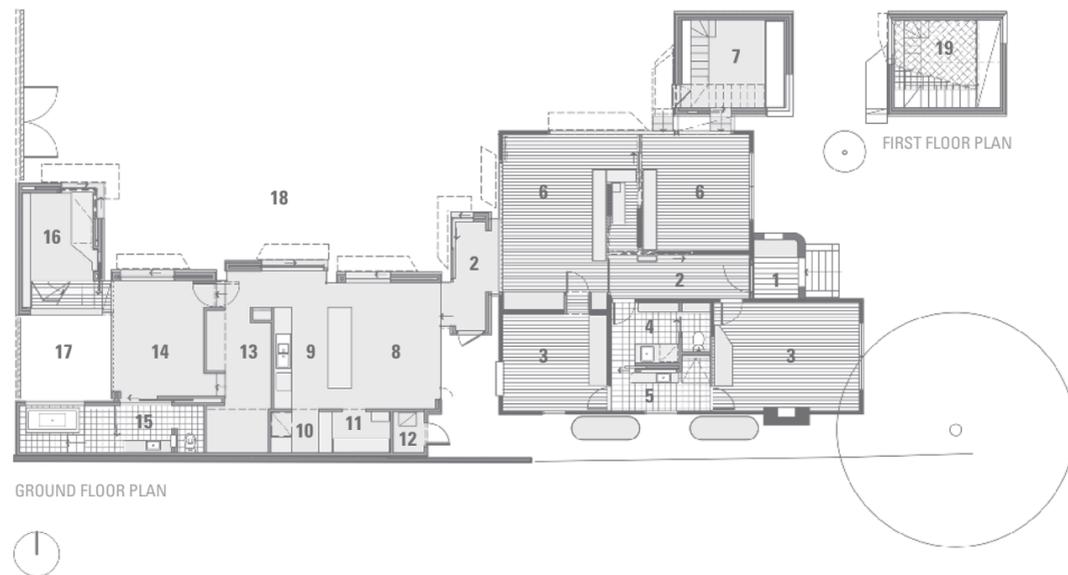
(For those interested in a no-guttering-downpipes footnote, rain simply runs down the walls where it waters the garden at ground level, and excess is drained away using the standard agricultural combination of slotted PVC pipes sitting in a bed of gravel.)

ABOVE: Twelve-metre lengths of LYSAGHT LONGLINE 305[®] profile made from COLORBOND[®] steel in the colour Surfemist[®] envelop each side of the tower



NORTH ELEVATION





- LEGEND**
1. Entry
 2. Hall
 3. Bedroom
 4. Laundry
 5. Bathroom
 6. Living
 7. Study
 8. Dining
 9. Kitchen
 10. Pantry
 11. Store
 12. Services
 13. Walk in robe
 14. Master bedroom
 15. Ensuite
 16. Library
 17. Courtyard
 18. Garden
 19. Study net

PANEL SAYS

Tower House is distinguished by a clear and unconventional idea about an environment for living. The level of craft and detail in this alteration and addition to a home in Melbourne's inner northern suburbs is a testament to a way of designing that always delivers innovative and remarkable results. Like the Cut Paw Paw House (see *Steel Profile* 121), this latest residence by Andrew Maynard Architects uses COLORBOND® steel in the colour Surfemist® to great effect. This edition showcases a completely new and different approach: where Cut Paw Paw resembled a long and low 'unpeeled' structure, the steelwork here creates a collection of aedicules that are almost medieval in appearance. Vertical or horizontal, ground-hugging or sky-soaring, Andrew Maynard Architects always finds an inventive way to re-interpret everyday materials

Steel was also used to great effect in the transition spaces of the project, when moving outside to inside via the doorways and skinny awnings, and in the glassed connections and stairs between each of the new buildings. As in the case of the external cladding, the decision to use steel plate was deliberate.

"It allowed us to keep things really flat, to keep it honest and recessive," says Austin. "Because you can get steel to do a lot of structural work in such a thin profile it's perfect for those details where you want a thin edge. We used it in the walk between one pavilion and the other, whether it's a step or a reveal, so you can read that thinness that almost slices through the building in the edge of the steel."

This provides a neat segue to another plot-line to this tale, the one that talks to the architects' reaction to the rise of the monolithic backyard extension. Think big box addition out the back. To paraphrase Austin, this project was more about working a collection of smaller objects together and being clever about using the interstitial spaces, rather than having one big shed to put the smaller objects in. Which means that although, from an external perspective, you see a collection of village buildings, from an internal perspective the owners have the benefit of a combination of open-plan spaces and more intimate spaces, as appropriate. This includes the kitchen/dining area, which straddles two pavilions with the island workbench strategically placed under one of the glass sections, as well as the lovely, submerged study which accommodates more reflective activities. In the practice's formal project description, *Dr Who TARDIS* analogies are made, and not without merit.

So it's along this winding path via kids' school sketches, architects' backstory, project-specific materiality and pointed spatial questioning that we arrive at the last narrative we have time for, that of play. Such an innocent description; so many loaded connotations. There's a fine line between light-hearted and cute – it's a distinction Austin well-understands.

"It is sometimes hard to get that balance right. We don't go into a project thinking 'Let's make it

"It was to do with getting a cladding material that we could use on both the roof and the walls... Steel lent itself perfectly... and that material wrapping would draw all the little house shapes together in the village"

playful.' A lot of those discussions come out of getting to know the owners and getting to work out what they enjoy and how they work as a family," he says. "From that, an opportunity will come and it's a matter of developing that opportunity in a way that adds delight to the project. For example the net isn't there just because we thought 'let's put a net in', it's a study of how the boys work... We wanted a distinction between the studying space and lounging-around space – as a result we separated them within the same space so that they could still talk to each other."

A project with so many interwoven stories and ideas and allusions could easily have ended up a bloated and confused building, but therein lies Andrew Maynard Architects' particular facility. They say you shouldn't edit your own work but this practice has a clear ability to distill and refine, allowing all the threads to underwrite a central message but never compromise it. The result is an inventive body of work that never takes itself too seriously but always contributes originality and energy to the practice of residential architecture. Tower House, being no exception. **SP**



TOP LEFT: Rotating each structure through ninety degrees gives the collection of buildings a domestic rather than industrial appearance

TOP RIGHT: The twins' studio is a wholly vertical space with a bookshelf running from floor to ceiling and a net hung above their desks where they can read

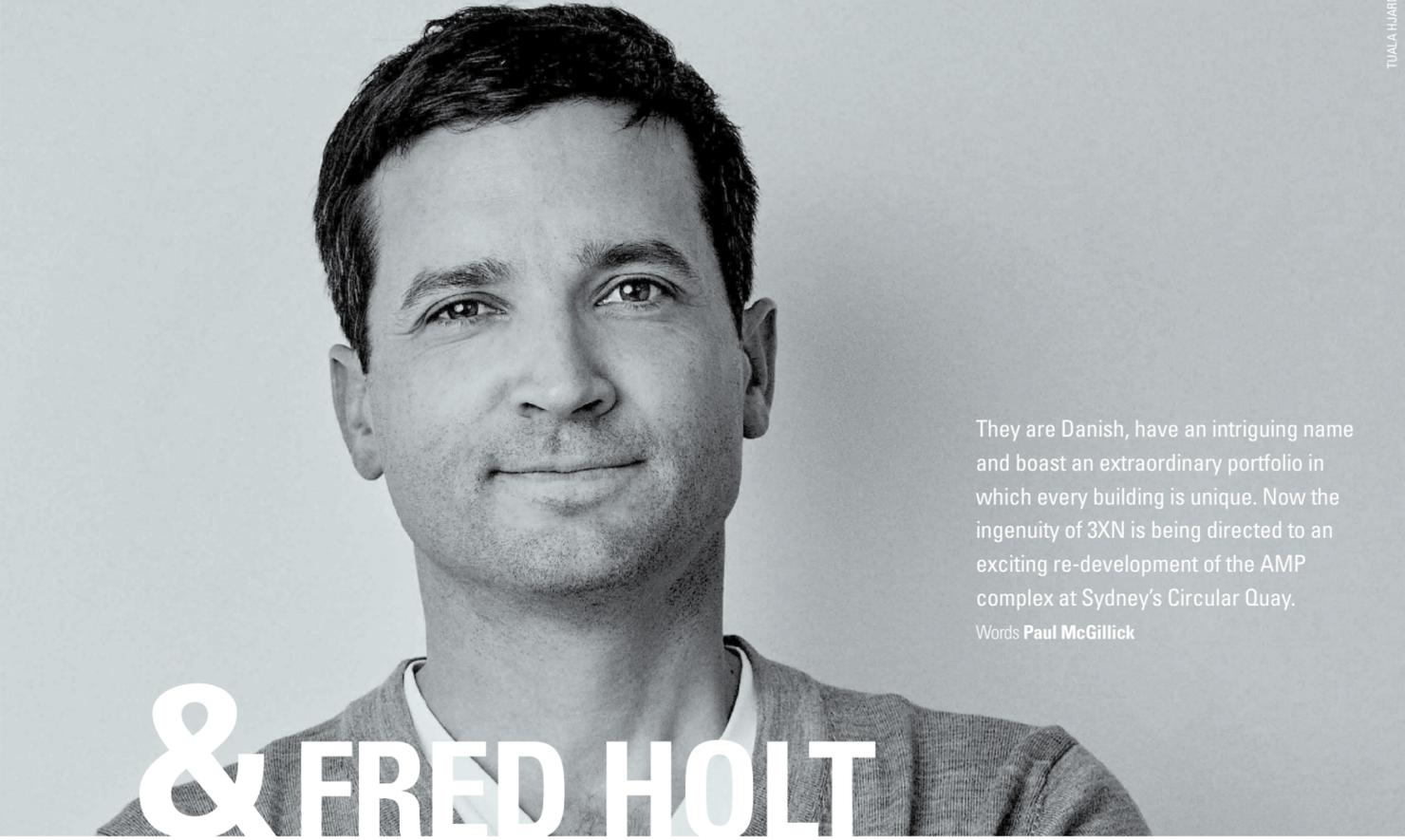
LEFT: The spotted gum library is submerged with the desk almost buried in the garden, creating a contemplative nook

ABOVE: The design is in part a reaction to the rise of the home compound with high fences. Tower House's borders are permeable and with the gates wide open the line between public and private is blurred

PROJECT Tower House **CLIENT** S+P **ARCHITECT** Andrew Maynard Architects **PROJECT TEAM** Andrew Maynard, Mark Austin **ENGINEER** Maurice Farrugia and Associates **BUILDER** Overend Constructions **LANDSCAPE DESIGN** Bush Projects and Andrew Maynard Architects **LANDSCAPING CONTRACTOR** Lucida Landscapes **STEEL FABRICATOR** Skyrange Engineering (Windows); Overend Constructions (Non-structural steel work); Melsteel (Structural steel) **SHOP DRAWING CONTRACTOR** Melsteel **CLADDING CONTRACTOR** MGD Plumbing **PRINCIPAL STEEL COMPONENTS** Roofing and wall cladding: LYSAGHT LONGLINE 305° profile made from COLORBOND® steel in the colour Surfemist®. Doors and windows: Steel-framed double-glazed doors and windows. Steel reveals: 6mm steel plate thresholds between internal and external spaces (including floor, vertical sides & head-over). Steel steps: 6mm steel plate steps at Living 01/Study, Living 01/Rear Garden, Ensuite, Kitchen/Master Bed. Steel stair structure: to stair in Study Tower. Steel bench top to island bench: with laser-cut details to northern side of island bench **PROJECT TIMEFRAME** September 2012-March 2014 **AWARDS** 2015 Australian Institute of Architects National Award for Residential Architecture - Houses (Alterations and Additions); the Eleanor Cullis-Hill Award, 2015 Australian Institute of Architects Victoria Awards: John and Phyllis Murphy Award for Residential Architecture - Houses (Alterations and Additions) **BUILDING SIZE** Site area 500m²; floor area 225m²



KIM HERFORTH-NIELSEN



& FRED HOLT

They are Danish, have an intriguing name and boast an extraordinary portfolio in which every building is unique. Now the ingenuity of 3XN is being directed to an exciting re-development of the AMP complex at Sydney's Circular Quay.
Words **Paul McGillick**

From time to time a building appears and becomes an instant international icon, celebrating the marriage of imagination, materials and new technology. Such was the case with The Blue Planet, Copenhagen's new aquarium, when it opened in 2013. Situated north of Karstrup harbour, not far from Copenhagen airport, it sits on a headland thrusting towards the sea. It takes its

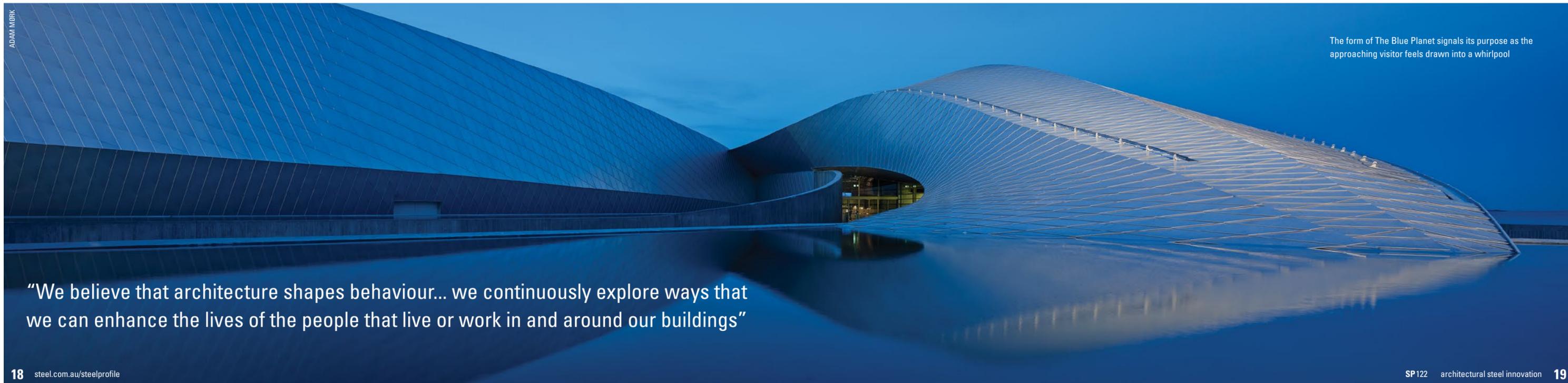
form from the image of a whirlpool, an impression that begins on approach as visitors are drawn up via surging vortex blades to a wonderworld beneath the sea. Sculpturally exciting as the building is, the form also instantly conveys what the building is about. Similarly, the materiality of the building embodies its purpose. Its organic facade is clad with more than 33,000 small, identically-sized diamond-shaped

aluminium shingles that respond to the curving form, reflecting both the sky and the sea, signalling the aquatic experience to come. Not so obvious is the underlying structure that has made this dramatic form possible. Extending beyond the coastline and sited on land prone to subsidence, the concrete structure sits on piles. This load is carried by a system of 54 unique steel frames that

form a base for the curved facades. "Steel is at the heart of The Blue Planet," says 3XN senior partner, Kim Herforth-Nielsen. "It made the shape possible. Without steel we would not have been able to create the shape as we did at a price that was viable." Not surprisingly, this bold exploitation of the potential of steel won the 2014 Danish Steel Award. So, what drives this Danish architectural

practice with the idiosyncratic name, which is about to transform the Circular Quay precinct of Sydney? The firm was founded in 1986 in Aarhus, Denmark's second-largest city. Along with Kim Herforth-Nielsen, the other two partners were also called Nielsen and the company was called Nielsen Nielsen & Nielsen. Kim recalls that a client jokingly referred to them as "three-times Nielsen".

The name stuck and morphed into 3XN. Since then the two other founding partners have moved on and Kim now leads the firm with two senior partners: Jan Amundsen and Kasper Guldager Jensen. The firm also moved to Copenhagen where it has become much more international in its focus – about 80 per cent of its work is now abroad



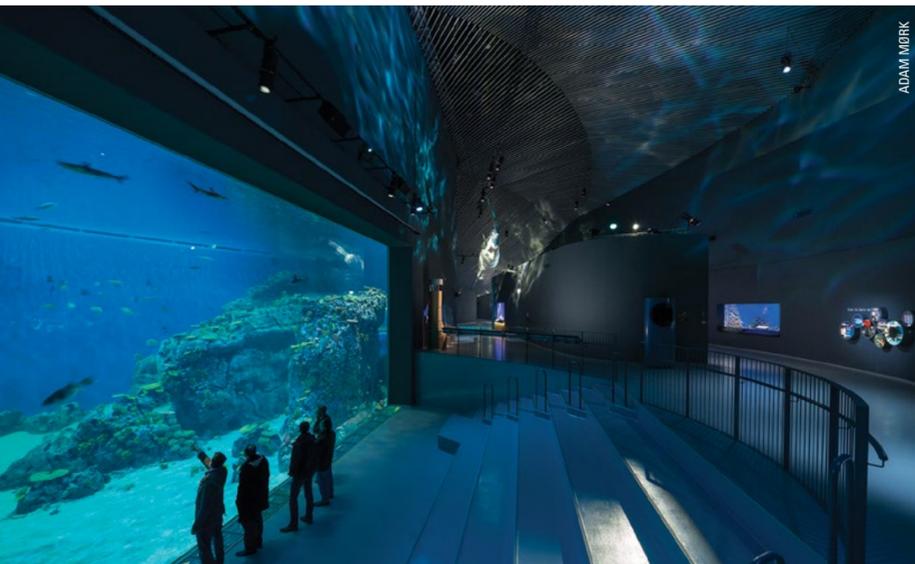
The form of The Blue Planet signals its purpose as the approaching visitor feels drawn into a whirlpool

"We believe that architecture shapes behaviour... we continuously explore ways that we can enhance the lives of the people that live or work in and around our buildings"

“Without steel we would not have been able to create the shape as we did at a price that was viable”



ADAM MORIK



ADAM MORIK

– with a much wider typological scope. In 2007, GXN (with G standing for green) was also established as an innovation unit exploring all aspects of sustainable design, materials and processes.

The practice is known internationally for outstanding buildings such as the Danish Embassy within the Scandinavian Embassy complex in Berlin (1999), the Muziekgebouw in Amsterdam (2005) and more recently the Swedbank in Stockholm (2014). But the practice has clear values that have driven it from the beginning.

“We believe that architecture shapes behaviour,” says Herforth-Nielsen, “and we continuously explore ways that we can enhance the lives of the people that live or work in and around our buildings. We place people at the heart of our architecture.”

This aspiration to add value not just to the people who use the building, but to the community and cityscape around it, goes hand in hand with the conviction that

a building’s form must have meaning and not simply be a sculptural object oblivious to its context.

“People are very much at the heart of our design,” Herforth-Nielsen adds. “We spend a lot of time at the beginning working to understand the specific needs of each client and how people will use the building. We then design solutions that keep people at the heart of the architecture, as opposed to establishing a sculptural form that bears no relationship to its surroundings or considers its inhabitants.”

This is an approach that could be summed up as communication, community, connection and collaboration – one that applies as much to 3XN’s own highly collaborative studio as it does to its projects.

The practice has brought this approach to the re-development of the AMP building in Sydney, a landmark site at Sydney’s Circular Quay defined by Bridge, Young and Phillip Streets, and enjoying



MARTIN KIRCHGÄSSNER



MARTIN KIRCHGÄSSNER

TOP: An aerial view of The Blue Planet reveals the building’s vortical geometry

ABOVE LEFT: One of the themed viewing spaces in The Blue Planet which create a sense of actually being in the sea, among its creatures

ABOVE RIGHT: Construction images show how the underlying system of steel frames supports the dynamic curvature of the building

spectacular views across the harbour and back towards the city. Renamed the Quay Quarter Tower (QQT), it is a perfect case study of 3XN and its values.

3XN is finalising designs for the Quay Quarter Tower at BVN’s offices in the centre of Sydney. This is a long way from Copenhagen, but as Kim Herforth-Nielsen says: “AMP invited us to participate in the initial competition. While our first concern was that it is quite far away, we regularly work on projects outside of Denmark, and we realised that this is an opportunity to work with a client that truly values design and sees it as an integral part of their business success.”

Fred Holt, a partner at 3XN, is leading the design team out of the Sydney offices of BVN. BVN is the local, executive partner in Sydney and Holt has stayed on to see the design through the various phases of the project.

“We often design from the inside out, to influence the formal geometry of a building,” Holt says. This strategy has driven the remarkable re-modelling of the QQT, where the architects began with conceptualising the workspace then relating it back to the building form and to the city. Holt believes this is why 3XN won the competition – not just because it is “a great gesture” and a response to the city, but because it also adds value to the workplace interiors. “I think it set us apart from a lot of our competitors who were mostly just focussed on a building that looked interesting,” he says.

Holt explains that with QQT, 3XN has taken all the qualities of a low-rise office building – proximity to outdoor space, deep penetration of daylight, open space – and brought them to a high-rise. Cutting atria into the building provides vertical as well as horizontal views, together with internal cross-views of the workspaces. All of this drives connection and social interaction which adds value and increases productivity.

There are two aspects to the strategy. The first is to break up the mass of the building by cutting into it to form five faceted tower blocks. These have internal atria, typically 12 metres high, forming a series of vertical and horizontal villages – a kind of interior cityscape that, because of the transparency of the building, begins to merge with the actual cityscape outside.

The second aspect of the building’s strategy concerns the podium that is “essentially the horizontal village to the vertical village of the tower,” Holt says. The new podium will offer greater amenity to the retail tenancies by creating multiple levels and enhanced porosity at street level. The aim is to activate the precinct and draw people towards Circular Quay through the building which will include an elevated garden terrace accessible to the public.

RIGHT: Quay Quarter’s five faceted tower blocks are stacked, breaking down the mass and creating a series of internal vertical and horizontal villages

As a major component of AMP Capital’s \$1 billion Quay Quarter Sydney (QQS) project, the Quay Quarter Tower will contribute to the revitalisation of a large section of the northern end of the CBD. With economic, social, environmental and cultural benefits embedded into planning and design processes across the precinct, the scheme aims to reinforce “Sydney’s credentials as a global city in the 21st Century Asian economy”, according to Louise Mason, AMP Capital managing director – Office & Industrial.

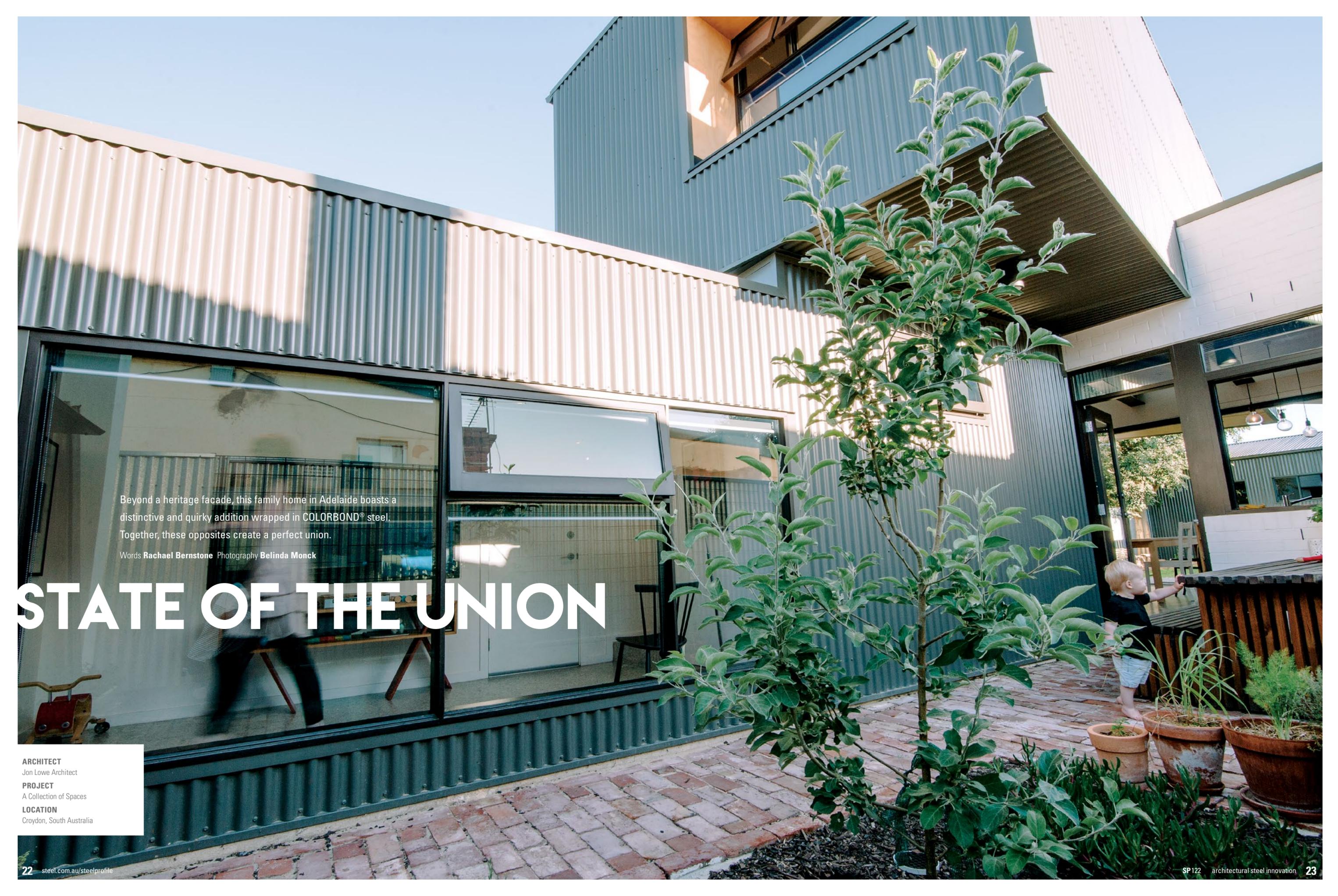
For a firm that sees all challenges as potential opportunities, this project offered a unique chance

to design a building that would become an active participant in its context. Holt points out that the massing subtly references the Opera House through its slightly varied, repetitive components and the Harbour Bridge, while the sun-shading is a deliberate reference to Harry Seidler’s pioneering use of sun hoods on some of the surrounding tall towers.

The last time a Danish architect gave Sydney a building it became a global icon. It will be interesting to observe the delivery of 3XN’s vision for its own type of world-class architecture at one of Sydney’s most prominent locations. SP



3XN



Beyond a heritage facade, this family home in Adelaide boasts a distinctive and quirky addition wrapped in COLORBOND® steel. Together, these opposites create a perfect union.

Words **Rachael Bernstone** Photography **Belinda Monck**

STATE OF THE UNION

ARCHITECT
Jon Lowe Architect

PROJECT
A Collection of Spaces

LOCATION
Croydon, South Australia



Drive through this inner-west suburb of Adelaide on its main roads – tree-lined four-lane highways edged with big box retailers, saw-tooth-roofed warehouses and convenience stores – and you’ll miss the eccentric and eclectic gems that make this place special. Turn into residential streets and you’ll encounter typical handsome stone villas, an occasional Tudor-esque house with steeply pitched gables, and a smattering of 1930s bungalows. A small strip of shops near the railway station boasts retro furniture and fashion stores, an artisan

Their heritage-listed double fronted cottage – built in about 1905 – was also relatively affordable.

The pair lived in the home for several years while establishing their careers and considering how best to tackle a renovation. When Jon put pen to paper he envisaged a double-storey contemporary pavilion at the rear, joined to the original home by a transition space or link way, opening to courtyards on either side. Like all good relationships – especially a harmonious marriage – this one required a lot of thought and work to make it successful.

rooms in two distinct parts, each celebrating its own unique characteristics.

Jon’s design aimed to preserve the old-world charm of the cottage’s four main rooms while removing lean-to structures that housed the kitchen and bathroom. After work had commenced, it became apparent that the external rear wall was sub-standard, so it also had to be torn down. That stumbling block forced the couple to reassess and make alternative arrangements. Adding new footings and walls added additional time and expense to an otherwise straightforward project.

The two front rooms – now bedrooms – have mullioned windows that overlook a narrow verandah enclosed by a picket fence. They share three-metre high ceilings and original wide jarrah floorboards, and the larger one has a working fireplace. Behind them, a smaller third bedroom and open living room round out the original footprint, where Jon deliberately maintained the scale of the humble cottage.

“Jess’ dad used to hit his head on the old doorframe of the lean-to kitchen, it was so low,” Jon says, “However, I wanted to keep those proportions in this space, so the ceilings are still low and the windows were deliberately placed low to the ground.”

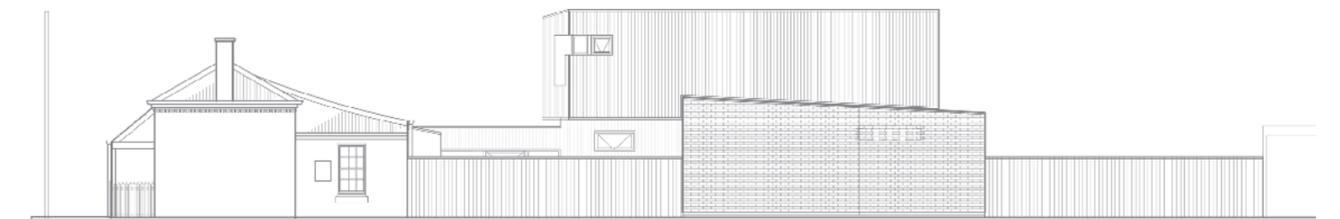
The link between old and new – a wide multi-function zone that can easily transform from corridor to study, to home office, with the addition or subtraction of furniture – hints at what lies beyond. The link narrows to create a second short hallway, with doorways

“The house provides a series of flexible rooms in two distinct parts, each celebrating its own unique characteristics”

bakery and several cafes. The fine grain of this up-and-coming neighbourhood is easy to appreciate if you venture inwards, away from its busy thoroughfares.

Those were some of the qualities that attracted a young couple – architect Jon Lowe and his partner Jess Murrell – to the area in 2008, when they bought their first home. They also liked the easy commute: it’s two stops on the train or a 5km cycle ride through parklands and along the River Torrens to the city.

As the couple embarked on the design, with Jess acting as informed client, they had vague notions about starting a family sometime in the future. “We thought that we might have a baby one day, nothing more definite than that,” Jess says. It eventuated that their first child was born just as they moved out so that construction could commence. But even that challenge didn’t throw this couple off-course. Conceived as a “collection of spaces”, the house provides a series of flexible



EAST ELEVATION



OPPOSITE: The new extension combines seconds quality bricks painted white at ground level and COLORBOND® steel in the colour Woodland Grey® above, to give the upper box a distinctive presence from the street

RIGHT: At the front, the heritage cottage abuts the footpath – possibly denoting it as the oldest house in the street – while the extension is tucked in behind, and angled to the north

to two new bathrooms and a laundry. From this compressed hall space one enters the new back room. Like saving the best till last, Jon exploded this new living zone – which contains sitting area, dining space and kitchen – and filled it with light and air, making it a natural antithesis to the cosy and constrained rooms up front.

The double-height space is overlooked by a mezzanine and balcony, which is reached by a steep ladder-like staircase, and is currently set up as a studio and library. At the rear of this upper level, one can look across the garden to the suburban rail line one block away, while the front corner window frames the ornate onion domes of a nearby Orthodox church.

The ground floor of the new addition was largely constructed with the same generic materials as the old cottage: seconds-quality bricks painted white, over a timber frame. For the upper box, which is visible from the street and neighbouring houses, and which is angled to the north to flood the entire space with natural light, Jon opted for an eye-catching steel frame and steel cladding solution.

“Most people would use a timber frame for a renovation in Adelaide, but you can’t achieve these cantilevers or thin edges with timber,” Jon says. “Because I work with steel in my architectural projects in the office – on government and commercial projects – I’m comfortable with the material and what it’s capable of.”

The back room is framed by expressed UCs – which Jon selected for their more pleasing square appearance thanks to deeper flanges than I-beams. They give the volume a sense of generosity that belies its compact floor space.

“This was quite a different process to building a house with a timber frame and brick veneer,” Jon says. “The ground-floor brickwork took three months to complete, but the steel structure for the upper floor – which was craned into place – was erected in just a few days.”

The sides and roof of the upper section were wrapped in Revolution Roofing’s True Oak™ ‘Deep’ profile, made from COLORBOND® steel in the colour Woodland Grey®. “The top roof pitch is just three degrees, which is one reason we chose True Oak™ ‘Deep,’” Jon says. “I also wanted to create a very thin edge on the top of the roof, so I used recessed gutters to achieve that.”

The decision to reveal the structural steel in the new section was a considered one, Jon says. “Over time, you get better at finding ways of using materials and knowing where to spend money,” he explains. “In this house we opted to expose the steel and celebrate that structure, and create shadow lines in the back room. But in other parts of the house where it wouldn’t have been as noticeable, we didn’t go to the same lengths with the detailing.”

Both Jon and Jess concede that the mezzanine is not ideally suited to life with a toddler, but the

temporary addition of a stair gate, and carefully supervised visits upstairs, mean they can still enjoy their sanctuary. In a few years, they may find themselves relegated back downstairs – with the upper section making a perfect teenage retreat – a switch that will be easily accomplished, such is the inherent flexibility of all the home’s spaces.

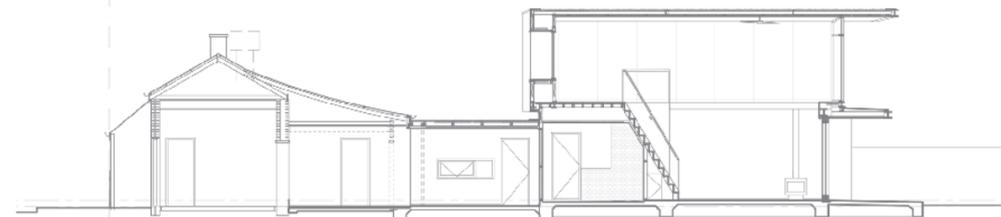
The traditional attributes of the original house compare and contrast beautifully with the expansive volume and slick production values of the new pavilion. Standing in the link-way between the two distinct parts, the architect’s ability to manage relationships – to balance heritage and modern, sophisticated detailing and simple refurbishment, scale and volume – is evident.

This outcome resulted from a careful synthesis of the architect’s (his) and client’s (hers) visions. “Jon was very consultative – we had regular

design meetings, and shared images of things we liked on Tumblr,” Jess says. “Jon can appreciate the ‘carbuncle’ aesthetic of the exposed steel, but I like the sleekness of Scandinavian modernism.

“Also, Jon’s all about the grey – charcoal grey structural steel, Woodland Grey® COLORBOND® steel cladding, he’s a typical architect – while I prefer white walls, and I don’t like too much wood. This is a perfect marriage of those two approaches,” she continues. “It was an extremely collaborative process and the final product is a reflection of both of our styles.”

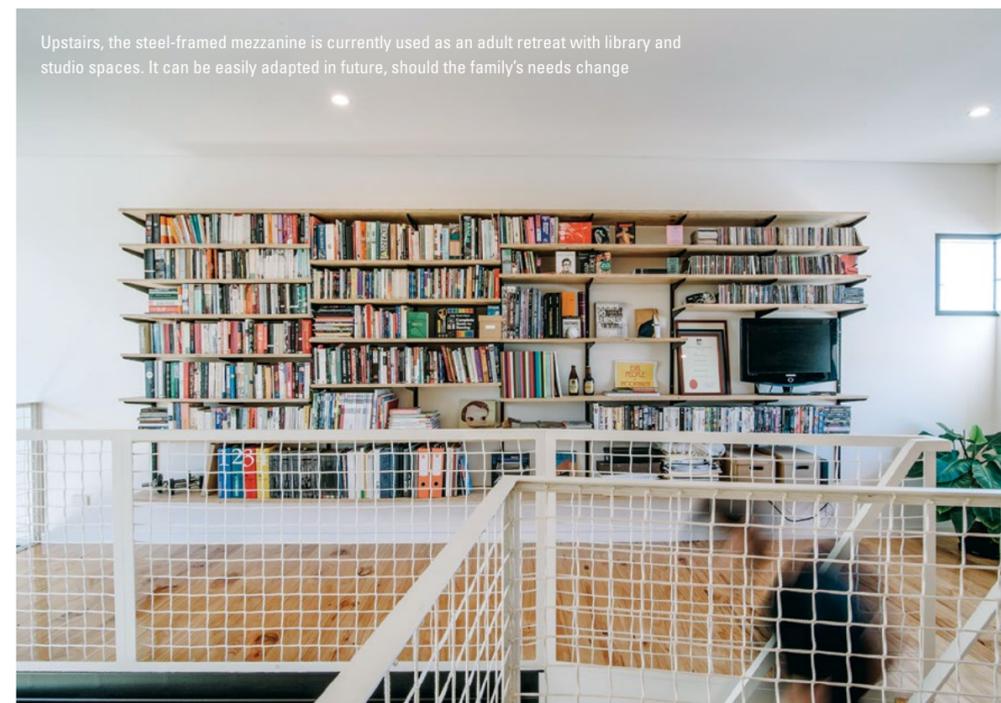
It adds up to an old/new, historic/contemporary, expansive/sustainable house that can readily adapt and change as the family grows. There is obviously a great deal of design thinking embedded in this project, but the end result appears effortless. Like any good relationship, these two make it look easy. SP



SECTION



FLOOR PLAN



Upstairs, the steel-framed mezzanine is currently used as an adult retreat with library and studio spaces. It can be easily adapted in future, should the family’s needs change



PANEL SAYS

The considered selection of COLORBOND® steel in the colour Woodland Grey® to clad a new pavilion-like structure at the rear of a heritage house in Adelaide’s inner northern suburbs gives the home a unique presence in the street. The steel is both dominant and recessive: it provides a distinctive edge to the bold new structure as seen from the street, but also enables the bulk of the upper level box to blend in with the surroundings. Internally, the volumes are carefully arranged to create various spatial types: some are deliberately compact in line with the historic cottage at the front, and others are expansive and undeniably contemporary, such as the living spaces that overlook the garden. The cut and thrust of the materials, and the collision of old and new, work skilfully together to create a terrific domestic environment for a young family

ABOVE LEFT AND RIGHT: The hallway that connects the linkway with the new living space (above left) mimics the proportions of the hall in the original cottage. The new living space, in contrast, is a double-height room that is flooded with natural light

BELOW: From the rear garden, it’s easy to appreciate the fine steel work which includes crisply detailed structural framing made from UCs, and the thin-edged roof made from COLORBOND® steel in the colour Woodland Grey®, in Revolution Roofing True Oak™ ‘Deep’ profile, with recessed gutter



PROJECT A Collection of Spaces CLIENT Jon Lowe and Jess Murrell ARCHITECT Jon Lowe STRUCTURAL & CIVIL ENGINEER Jim Wilson BUILDER Evoque Homes
 STEEL FABRICATOR AND SHOP DRAWING CONTRACTOR Peluso Engineering CLADDING CONTRACTOR City Roofing & Gutters PRINCIPAL STEEL COMPONENTS
 Cladding and Roofing: Revolution Roofing’s True Oak™ ‘Deep’ profile, made from COLORBOND® steel in the colour Woodland Grey®. Hot rolled sections, UC and RHS
 PROJECT TIMEFRAME Eight months (construction) AWARDS 2015 Australian Institute of Architecture South Australia Awards: The John Schenk Award for
 Residential Architecture – Houses (Alterations & Additions); People’s Choice Award (Houses, Alterations and Additions) BUILDING SIZE 120m²

HOVER CRAFT

A gravity-defying engineering system traditionally reserved for building bridges has been employed by Architectus to thrust the ends of a new school building 10 metres into space.

Words **Rob Gillam** Photography **Brendan Finn**



ARCHITECT

Architectus

PROJECT

Tintern Schools – Middle Schools

LOCATION

Ringwood, Victoria

Entering Tintern Schools for the first time, it is clear its landscapes are cherished. Its many buildings skirt around the 'shore' of generously turfed sporting fields and are linked by a series of bushy gardens and stands of mature trees.

When he approached the design for a new building – at the geographical and hierarchical middle of the school – Architectus design principal James Jones* took this into account by extending its two wings around a gigantic gum tree.

"The way the pavilions make way for the trees is a bit of a reference to the Plywood House Hertzog & deMeuron designed, where they gently splayed a modest house around a tree," Jones says. Here, though, the concept is exaggerated by largely separating the wings from each other to physically embody the school's parallel learning model which tailors the years seven-to-nine curriculum into separate classes for girls and boys.

Privacy between the wings is maintained via an opaque all-in-one cladding and glazing material that allows for daylight penetration. The wall cladding is punctuated with strip windows that provide controlled views.

Tintern Schools' business and site manager Damien Horman says that investment in design systems early in the process paid dividends during the build. "James helped us with some key decisions to keep the building within budget, including the structural steel system and the prefab Kalwall cladding, both of which allowed for speedy erection," Horman explains.

"Once the building's floor level was established, it went up in just two weeks. We estimate that this helped us deliver the project 10 per cent under budget."

Jones agrees that economy is one of the reasons he specified steel for the building's structure. "We needed a lightweight and economical material. We could have tried to build with other materials but we'd have been looking at much bigger structural members,"

he says. "Steel gives great strength, particularly when it's used in tension. It is engineered well and you minimise material waste and on-site welding because it can be fabricated off site. Assembling it as a kit of parts made for great economy."

At a "crunch time" in the build, it was discovered that delivery of the composite panels which are made in the US would be delayed," says Jones. "Because of the lead time, the shop drawings for the wall panels had to be signed off before the steel work went up. Normally you'd get to measure and then work out tolerance but in this case the steel frames had to go up first.

"The repetition of the steel frame for the cladding – which is constructed from standard universal steel sections – was critical in this regard and the mathematical precision of the builder was to be admired," Jones adds.

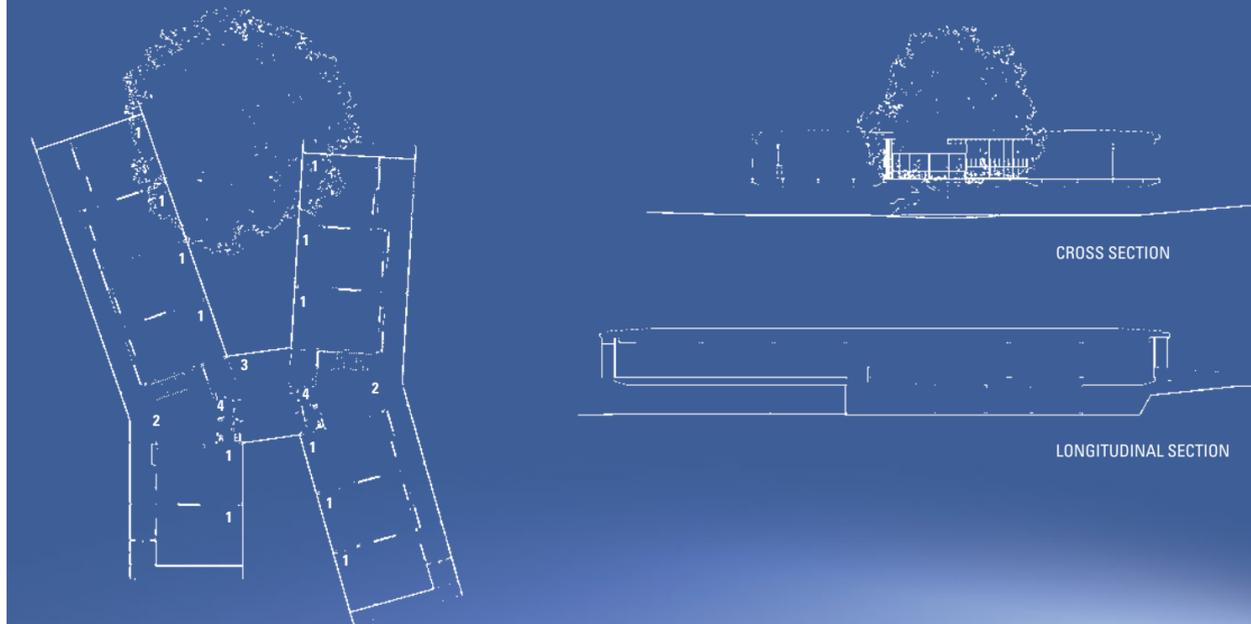
Jones also selected steel to roof the building. "Because we conceived the building like two big horizontal boxes floating in the landscape, we didn't want the roof to attract attention to itself; it's more about what's inside the building. It's a big roof but we wanted it to have a low profile."

LYSAGHT KLIP-LOK® 406 profile made from COLORBOND® steel in the colour Shale Grey™ was selected for its connection to the surroundings, Jones says. "COLORBOND® steel Shale Grey™ represents a colour often found in the Australian landscape," he says. "We wanted it to fit with the tone of the landscape and not differentiate itself too much from the other buildings. It does of course stand out, quite literally, but at the same time it seems like it's always been here."

Structural steel including Universal Beams for both beams and columns contributes to the building envelope, but as Jones says: "There is only one cross-section through the two wings so there's only one structural section. It's effectively relying on a box frame for the 60 metre-long extruded sections." This is where architecture and engineering combine to perform seemingly magical feats.

Jones has created such structural illusions before. In 2008 with Heffernan Button Voss Architects (HBV), he and engineer Jim Gandy designed a post-and-rod tension system to create a column-free 43-metre-wide roof with a 12-metre overhang for Aurora Energy's Southern Operations Facility in Tasmania (see *Steel Profile* 102). His next seemingly gravity-

A Vierendeel truss minimises diagonal members and places the structure over the classrooms so they sit inside, rather than on it



FIRST FLOOR PLAN
LEGEND
 1. Classroom
 2. Lobby
 3. Staff
 4. Support



"We wanted to make the building like two big horizontal boxes floating in the landscape"

ABOVE: The structural system allows for a generous cantilever from the last column that 'floats' the pavilions 10 metres into space and creates an outdoor undercover area
 BELOW: The schools' grounds are cherished and the architects took this into account by extending the building's two wings around a gigantic gum tree





defying project with HBV and Gandy was Tasmania's Transend Primary Store (*Steel Profile 107*), which eschewed bulky internal steel portal systems for a lightweight external truss that suspended a roof of bridge-like proportions, spanning 54 metres.

The Middle Schools' pavilions effectively rely on a clever box frame modelled around a Vierendeel truss. As Jones explains: "Rather than putting big beams through to hold up the floor and putting the classrooms on top, the structure goes right over the top of the classrooms so they are inside the truss, rather than sitting on top of it."

"The truss minimises the number of columns you need," Jones says. "It effectively negates the need for big diagonal members. It's almost like a portal frame in three dimensions."

"I'm not the engineer so I won't profess to say exactly where all the forces are going," he adds, "but the roof, walls and the floor all work together to create the structural box".

Jones worked with structural engineer Phil Gardiner of Irwinconsult who admits Vierendeel truss systems aren't often employed in buildings. "It's not a common system but James had a vision of how he wanted the pavilions to look and he wanted a particularly big cantilever – it's close to 10 metres on the roof," Gardiner says. "We needed to find a way to elegantly achieve that, without throwing in massive structural members that would upset the look of the architecture."

A number of schemes went backwards and forwards between the architect and engineer before they arrived at the truss which, Gardiner says, "is a truss but in reality is a little cable-stayed structure, like a little bridge".

"A 10 metre-deep cantilever is starting to get out there in terms of pushing the boundaries," he concedes. "We had to do some serious analysis because we were concerned about the foot-borne vibrations."

"We did a lot of software modelling but once we had the specs locked in, it was relatively straightforward."

Just as the foundation of Tintern Schools is Anglican faith, Jones wanted the cantilevers to personify his faith in structure. "It might sound a bit clichéd but one of our embedded ideas was to have faith in the building's ability to seemingly defy gravity," he says. "We wanted the cantilevers to express an optimism."

The concrete columns below the classrooms were deliberately propped high, to account for settlement. Horman says that when they were removed "there was a bit of doubt in my mind for a moment that the building might not hold up. I think everyone held their breath."

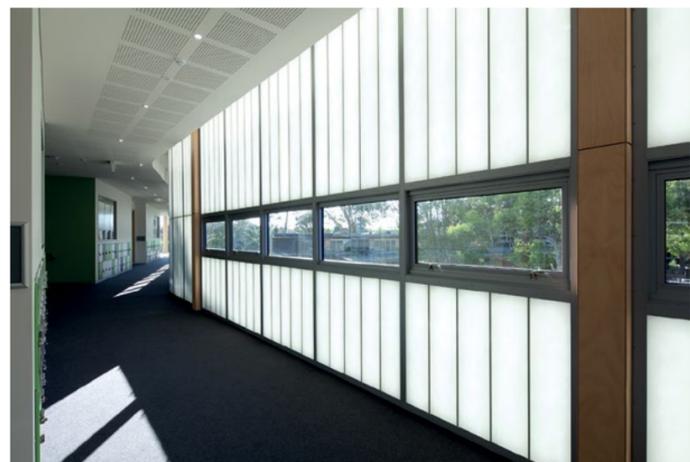
Of course, the cantilevers did not collapse and they now provide 'free' covered space underneath the building. "Almost like a redefinition of the veranda," as Jones puts it.

For students and teachers, spending time in the end classrooms that release the view to the school's oval is similarly prized. "It's quite a delightful place to be," says Horman. "When you're up in the classroom you feel like you are in the tree-tops. You feel calm and welcome. The staff and the kids love it."

How does Jones feel about the building now it is complete? "It has a level of finesse that I think makes it successful," he says. "It's a robust building with a bit of an industrial feel to it, but it doesn't look harsh or heavy. I trust that it delivers what we set out to do, which was to create some beautiful classrooms."

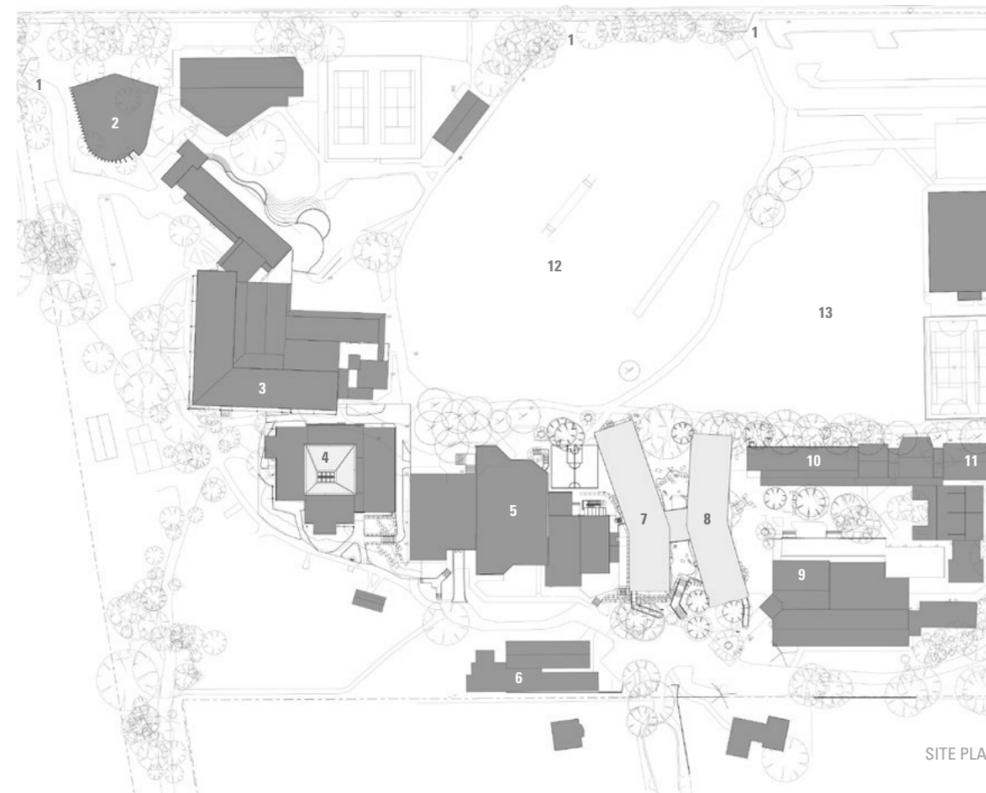
Jones however doesn't give too much weight to his opinions. "The most pleasing thing about this building is how other people respond to it. I think the measure of success is found in how people identify with a building." He'd have been overjoyed, then, to hear a teacher tell me: "The feeling you get from being up here is priceless. If only you could bottle it..." **SP**

**James Jones has since left Architectus to co-found Jones Moore – Architecture, in Tasmania.*



ABOVE: Spending time in the end classrooms, which release views to the school's oval, is highly prized

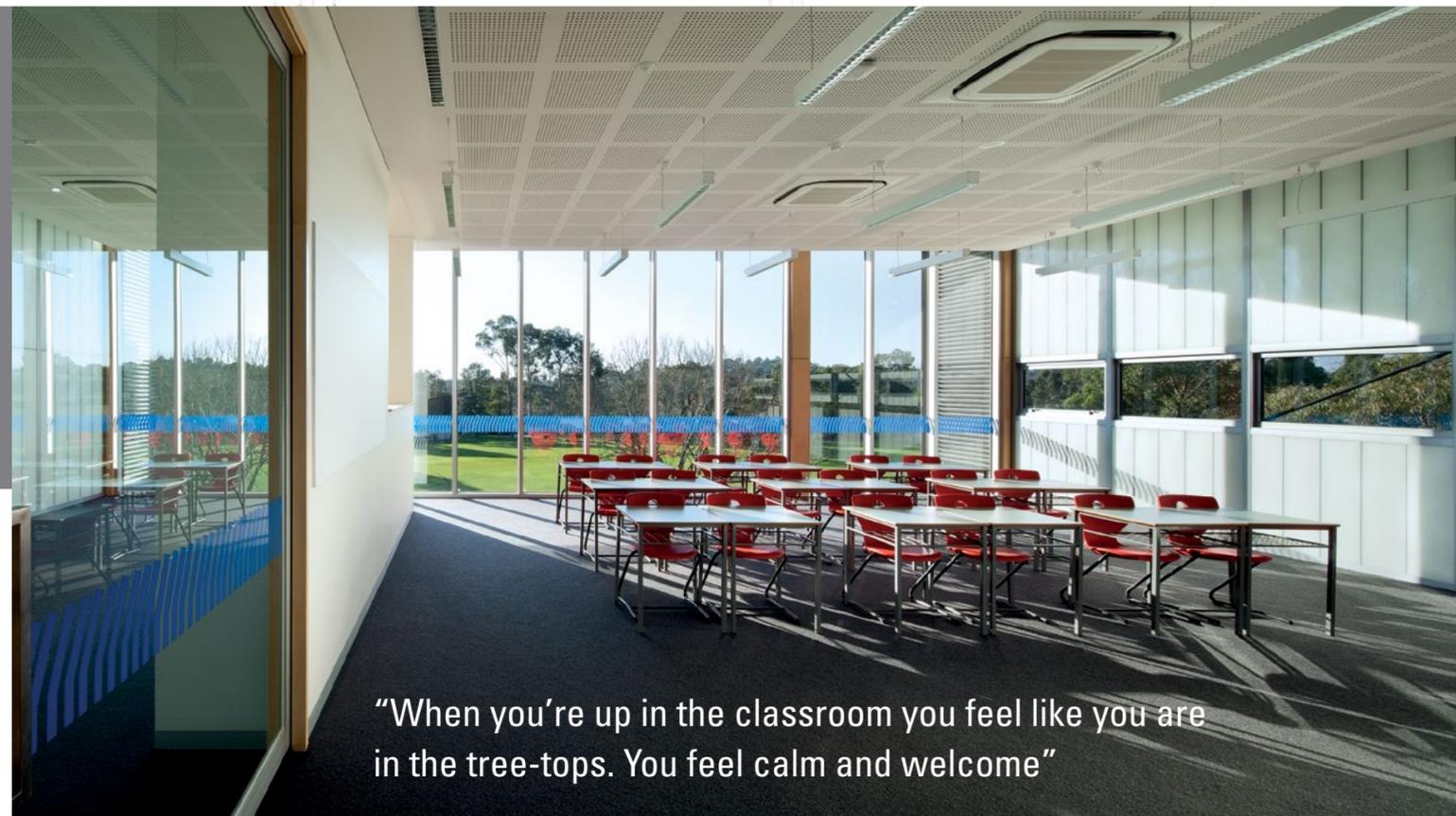
BELOW: An opaque all-in-one cladding and glazing material allows for daylight penetration. The repetitive steel system for the walls was built ahead of the cladding installation, requiring mathematical precision



- LEGEND**
1. Entry
 2. Early Learning Centre
 3. Colebrook Building
 4. Hamilton Centre
 5. C.M.Wood Building
 6. Tintern Schools administration building
 7. Male wing
 8. Female wing
 9. Arts building
 10. Senior school
 11. Science centre
 12. The oval
 13. Hockey field

PANEL SAYS

This is at once an understated and bold design that uses Vierendeel trusses to achieve two finger-like cantilevered forms, which give the building a distinctive appearance and provide covered outdoor space. Inside, the classrooms have a light and cool feel, with a lofty outlook across the tree canopy and landscaped grounds. It's refreshing to see the architect refer to his collaboration with the structural engineer in this design. At first glance, one might be forgiven for overlooking the innovative use of steel in this project, but the incredible cantilevers provide evidence of the embedded ingenuity that forms the backbone of this unique school building



"When you're up in the classroom you feel like you are in the tree-tops. You feel calm and welcome"

CLIENT Tintern Schools – Middle Schools **ARCHITECT** Architectus **PROJECT TEAM** Amy Cantwell, Mark Gifford, James Jones, Jennifer Rodenzo, Simon Smith, Mark Wilde **STRUCTURAL ENGINEER** Irwinconsult **BUILDER** Melbcon **STEEL FABRICATOR AND SHOP DRAWING CONTRACTOR** Wisteria Steel **CLADDING CONTRACTOR** Kalwall® Systems **LANDSCAPE ARCHITECTS** Frank Hanson of Architectus **PRINCIPAL STEEL COMPONENTS** Roofing: LYSAGHT KLIP-LOK® 406 profile made from COLORBOND® steel in the colour Shale Grey™. Structural steel: including Universal Beams for both beams and columns. Roof purlins made from channel sections. Perforated flooring plates to entries made by Locker Group **PROJECT TIMEFRAME** July 2013 - June 2014 **BUILDING SIZE** 1800m² **TOTAL PROJECT COST** \$6.5 million



LEGAL RE-DRESS

The new Kununurra Courthouse is a study in contrasts and owes its expressive and evocative form to the attributes of steel.

Words **Rachael Bernstone** Photography **Peter Bennetts**

ARCHITECT

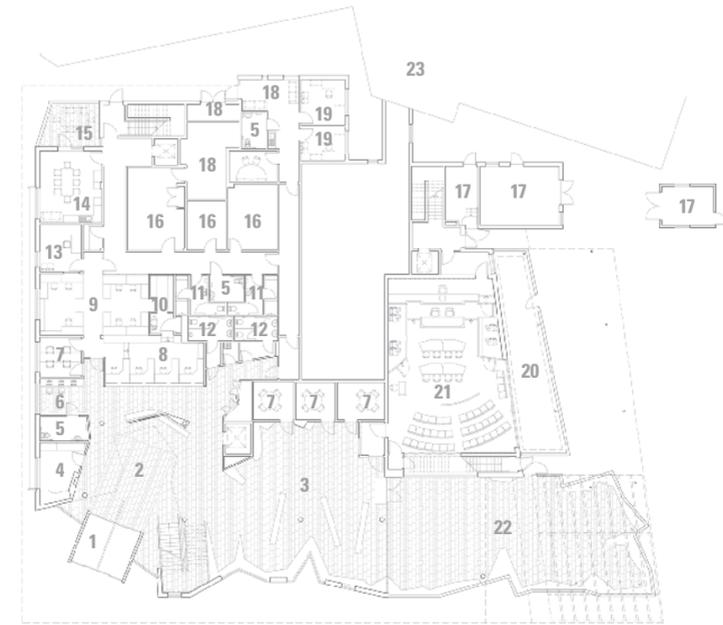
TAG Architects and iredale pedersen hook Architects in Association

PROJECT

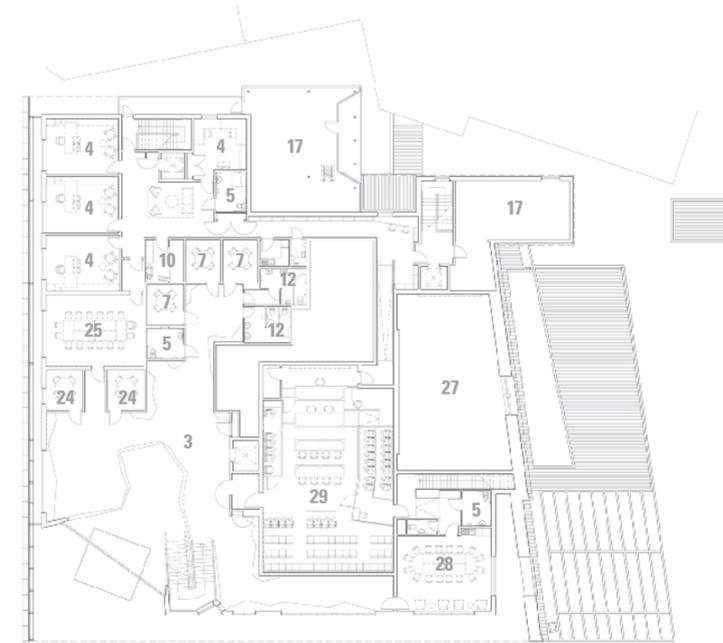
Kununurra Courthouse

LOCATION

Kununurra, Western Australia



GROUND FLOOR



FIRST FLOOR

LEGEND

- | | | |
|---------------------|--------------------------|--------------------------------|
| 1. Air lock | 11. Staff WC | 21. Magistrate court |
| 2. Entry foyer | 12. Public WC | 22. Public courtyard |
| 3. Public waiting | 13. Clerk of courts | 23. Police station |
| 4. Office | 14. Staff room | 24. Meeting room |
| 5. UAT | 15. Staff room | 25. Meditation room |
| 6. Public computers | 16. Store | 26. Void over entry |
| 7. Interview room | 17. Plant | 27. Void over magistrate court |
| 8. Registry | 18. Waiting | 28. Jury deliberation |
| 9. General office | 19. Office | 29. Jury court |
| 10. Utility room | 20. Landscaped courtyard | |

“We saw the possibility to once more reinstate the value of the courthouse to the community as a figurehead for the town, a bit like they used to be at the turn of the previous century in regional WA”

The town of Kununurra in Western Australia is a place of vibrant contrasts. Modern buildings on curved streets are juxtaposed against tall-layered pinnacles of ancient sandstone. Some residents are attracted by jobs in the mining and agriculture sectors, while the Miriwoong Gajerrong traditional owners have lived in the area for millennia.

The town’s new courthouse – designed by TAG Architects and iredale pedersen hook Architects in Association (they also collaborated on the award-winning West Kimberley Regional Prison, see *Steel Profile* 116) – takes its cues from these multiplicities.

The result is a complex building that marries competing briefs to operate effectively on different levels – both pragmatic and ephemeral. Understandably, its design posed many challenges. First, it had to acknowledge the disproportionate representation of Aboriginal people in the state’s criminal justice system. Indigenous Australians comprise 3.8 per cent of the population but account for more than 40 per cent of the adult prison population. With this in mind, the architects aimed to deliver a building that would appear authoritative yet at the same time welcoming.

“There is a great deal of complexity in designing a courthouse because you have to maintain the safety and security of many different user groups,” says TAG Architects director Michael Spight. “We designed for the needs of the staff, the public, the jury, the judiciary, vulnerable witnesses and people who are brought through from police custody – some of whom are being held temporarily, while others will have been brought in from remote locations.”

The extreme variations in climate imposed a layer of difficulty, Spight adds. “In the wet season it can be close to 45 degrees Celsius, so we’ve had to try and deal with all that humidity by pressurising the building to dehumidify the internal spaces. From a sustainability point of view that seemed undesirable, but the fact is for eight months

of the year the building needs to run in that mode to avoid condensation and mould build-up, a requirement shared with conditioned buildings in this climate region. Truly sustainable design achieves the right balance of all needs of the building.”

The entire program was a complicated balancing act and TAG and iph’s unusual and highly responsive design has generated high praise, with some locals referring to it as the “Opera House of Kununurra”, according to iph director Adrian Iredale. “It’s certainly the biggest building in town, and it’s on a really important corner location where you come into the heart of the town,” he says. “We saw the possibility to once more reinstate the value of the courthouse to the community as a figurehead for the town, a bit like they used to be at the turn of the previous century in regional WA.”



TOP: The courthouse roof form (top) and internal spaces pay homage to the folding ranges near Kununurra, such as Mirima (Hidden Valley) National Park (above)

Those grand old courthouses boast solid stone foundations and heavy masonry walls, with stately columns that shade imposing porticoes and graceful arched doorways. High on the walls, prominent bas-relief coats-of-arms spell out their function. “The courthouses at Coolgardie and Kalgoorlie are classic examples, but that focus has been lost over time with the design of regional courthouses,” Iredale says. “They typically became generic designs in the 1970s and 1980s, which would just be unfolded and applied to generous sites.”

This project – which houses courtrooms on two levels – replaced an earlier courthouse on the site, and required a bespoke solution, Iredale says. “Firstly because of the tightness of the site – it really isn’t big enough to fit the courthouse program that we needed to fulfill, with all of its car parking and courtyard requirements,” he says. “We were also trying to find something that is uniquely specific to this town, to represent the qualities of the town and its people.”

It wasn’t hard to identify qualities that make the town special, says Spight. “Kununurra is unique – there aren’t any places in WA that are quite the same,” he says. “It has a broad flood-plain which has been cultivated over the years with the Ord River irrigation scheme and, as a backdrop to the town there is a series of ranges including Kelly’s Knob and Mirima (Hidden Valley) National Park. Those folding ranges leave the greatest impression when you first arrive, and they are ever-present in the town.

“The external profile of the roof, which is obviously very expressive, is a result of developing the qualities of the interior space and knowing that the folding metal roof would create a strong dialogue with the surrounding hills, including Kelly’s Knob,” Iredale says.

Both architects agree that the distinctive roof – and the variable heights of the courthouses, public foyers and office spaces beneath it – could not have been achieved without using steel. “The entire building is steel framed, although there are some concrete columns downstairs,” Iredale says. The structure was created with a combination of LYSAGHT® 150C x 64 external wall framing and Rondo 92C x 35 internal wall framing, and various steel sections including SHS, RHS, UC, UB sections, with Z Purlins used for columns, beams, roof beams and roof trusses.

The first floor slab was formed on LYSAGHT BONDEK® steel decking made from DECKFORM® steel, which provided time-saving and structural benefits, Iredale says. “Using LYSAGHT BONDEK® allowed us to get the roof up before the onset of the wet season, which runs from November to March,” Spight explains. “It was a matter of getting that construction sequence to happen early enough to get the roof on, so work could take place underneath it in the rain, and provide ongoing shade in the dry season.”

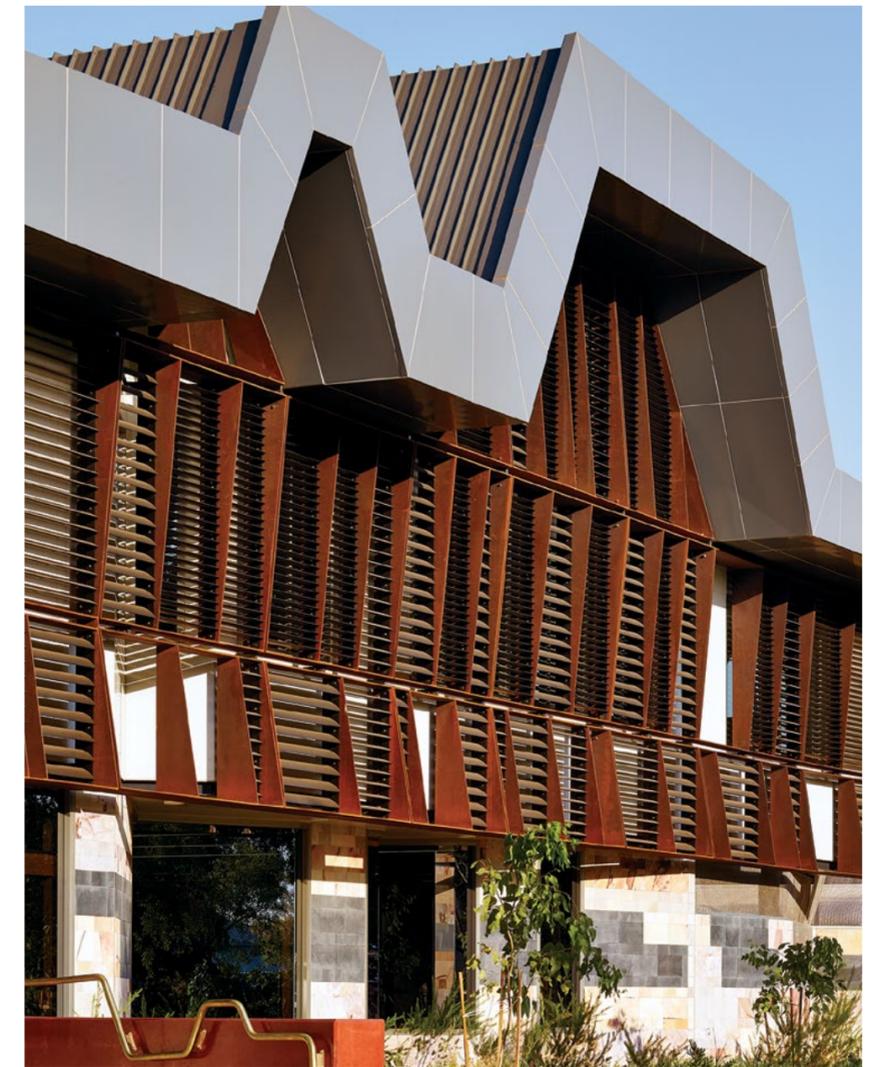
The decision to clad the roof using Revolution Roofing Rev-Klip™ 700 profile made from

COLORBOND® steel in the colour Woodland Grey® was a deliberate one. “The courthouse that was demolished had an old caramel-coloured Brownbuilt-profiled roof with a square canopy and small caps or what we refer to as ‘Canterbury prickles’ over each of the ribs,” Spight recalls. “We’ve got a similar detail on the new building: we’ve got a fairly broad rib and we’ve used all those same cappings on all of the returns of the building. It reduced the whole impact, in comparison to applying cover flashings on every change of direction.

“The small caps over the ridge give a smooth, clean fold to the edge which you can see in one of the photographs that looks towards the entry: each one of the ribs is quite crisp against the sky, as a result,” Spight continues.

As well as being the courthouse’s most prominent feature, at least from the outside, the roof had to perform well, too. Keeping water out of the building is easier said than done when downpours can deliver 500 millimetres of rain in over just two days – with accompanying strong winds – and the risk of water ingress is exacerbated by several changes in roof plane direction.

“We spent a lot of time detailing that roof, because it is so expressive and everyone sees it first”



“We spent a lot of time detailing that roof, because it is so expressive and everyone sees it first,” Iredale says. “And the main concern that was raised at the value management workshop in relation to the roof was that it wouldn’t leak. When we create those undulations, inevitably there will be some water collected between the roof planes. We were able to insert a deep pan roof sheeting profile in those parts, which was wide enough that it wouldn’t be perceived as or perform as a box gutter.”

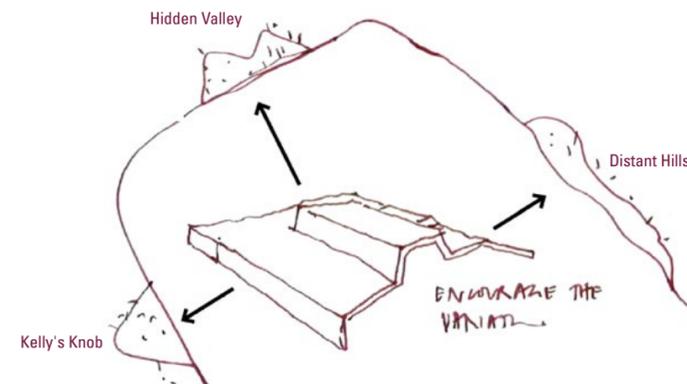
“Most importantly, the Revolution Roofing Rev-Klip™ 700 profile enabled us to almost entirely eliminate visible fixings, with the obvious additional advantage of reducing penetrations through the roof sheet,” Spight adds.

“When it rains – and in the wet season it buckets down – you can be sitting in the foyer spaces upstairs or downstairs and see water shooting off the building in a great waterfall,” Iredale says. “It’s a reference to the valleys and gullies of the landscape where water cascades down in a similar way.”

Stormwater proceeds either directly to roadside gutters or to underground storage tanks alongside the building, which slowly release it to a natural swale that drains to Lake Kununurra.

Of course the roof has to protect the building from fierce sun as well – top temperatures above 40 degrees Celsius are not uncommon – so it functions like a giant sunshade to protect the walls and double-glazed windows, along with a series of perforated screens and fixed metal louvres that are mounted on BlueScope XLERPLATE® WR350 weathering steel frames around the upper level perimeter.

The upper levels are protected by a series of perforated screens (opposite page) and fixed metal louvres (above), all of which are mounted on BlueScope XLERPLATE® WR350 weathering steel frames. The louvres were designed to frame views – both near and far – from inside the building



“Because of the proximity to the equator the sun tracks more vertically, so every single side is hit by sun at certain times of the year,” Iredale says. “The parasol wall – over the upper level foyer on the northern elevation and the judicial chambers on the southern side, combined with triple insulation in the roof – helps to reduce the heat load.

“The XLERPLATE® WR350 weathering steel-framed screen with fixed louvres was designed specifically to frame distant and close views of the surrounding landscape and town from inside the building. The spacing of the steel frame relates to the interior built-in seats, so that visitors can find a quiet and intimate space with a distant view to the hills or sky, or a group space with views to the community. This synergy between exterior and interior elements creates a variety of spaces that enable individuals and groups to find their place of preference,” he says.

Unusually, perhaps, in such a hot climate, the architects specified roof cladding made from COLORBOND® steel in the colour Woodland Grey®. They admit the colour Headland® is a more common choice in the Kimberley but assert that the darker shade was warranted in this case. “We selected Woodland Grey® as an appropriate way to deal with the red dirt,” says Spight.

“We knew the presence of this building would be strong, and we wanted a colour that would

“We knew the presence of this building would be strong, and we wanted a colour that would complement that with sophistication, such as Woodland Grey®”

complement that with sophistication, such as Woodland Grey®,” Iredale says. “It also echoes the shadow of charcoal that you can see at certain times of day in Hidden Valley. It was also important to carry the roof colour down the fascia and under the soffit to visually reinforce the continuous folding parasol roof form.”

From the outset, the influence of Hidden Valley – one of the locals’ favourite places to visit among the region’s many natural wonders – is evident.

The building’s undulating steel roof mimics the form of the sandstone rock formations which also informed the interiors. Local stone and recycled timber combine with masterful horizontal and vertical spatial manipulations to create recognisable and familiar cave-like spaces in the public foyers.

Both outside and inside, the building exemplifies many contrasts – ancient and modern, Aboriginal and non-indigenous, light and heavy, natural and man-made – and fulfills its many obligations without ever losing sight of its users. Like the best of Western Australia’s traditional courthouses, it conveys meaning and civic pride using symbolism that is readily apparent to both everyday and occasional visitors.

The use of locally sourced and readily available materials reflects the town’s unique identity

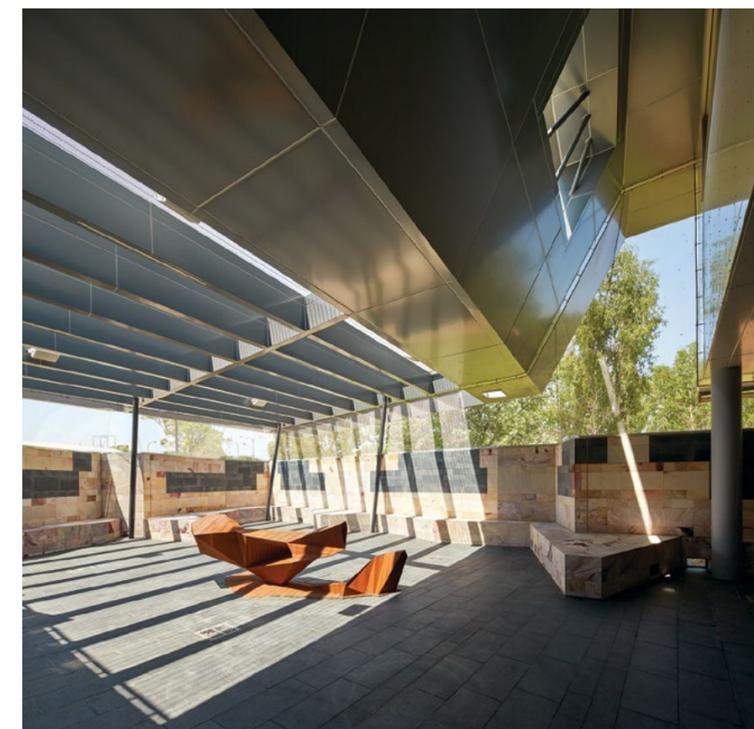
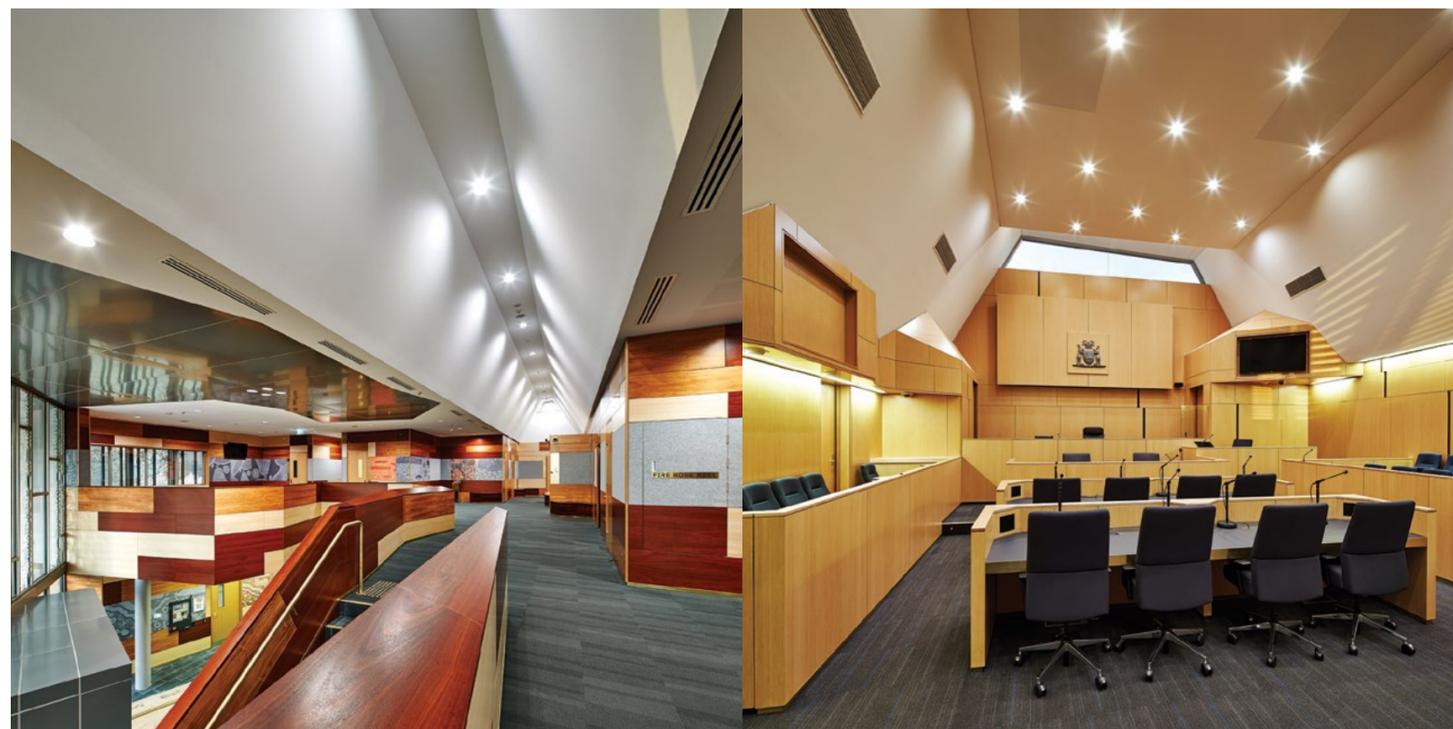
and location. Their massing and arrangement helps to establish an authoritative presence yet retains an air of approachability. “Aboriginal people from this region are not used to having to attend large complex buildings such as this, so we wanted the building to convey gravitas and respect without intimidation,” Spight says.

It’s a design solution that has already reaped rewards, including The Julius Eischer Award for Interior Architecture at the 2015 WA Chapter Australian Institute of Architects Awards.

“This is a building for everyone,” Iredale concludes. “It specifically references both the ancient and the new landscapes that are very much embedded within the minds of traditional owners and all residents of Kununurra.” SP

PANEL SAYS

This expressive building in the Kimberley – which is so reminiscent of its landscape owing to the use of local stone and the architects’ skillful handling of steel – actively invites people to enter and experience its atmospheric and layered interiors. The clever manipulation of the unusual roof form – an undulating structural steel-frame clad with COLORBOND® steel in the colour Woodland Grey® – traces the silhouette of the nearby ranges, with another reference made through the customised fritted pattern of the northern elevation screen, tying the building into its surroundings. These are just some of the qualities to be found in a project that transcends the brief to provide a welcoming courthouse, one that goes a long way to de-institutionalise a typology that can often appear rigid and stern

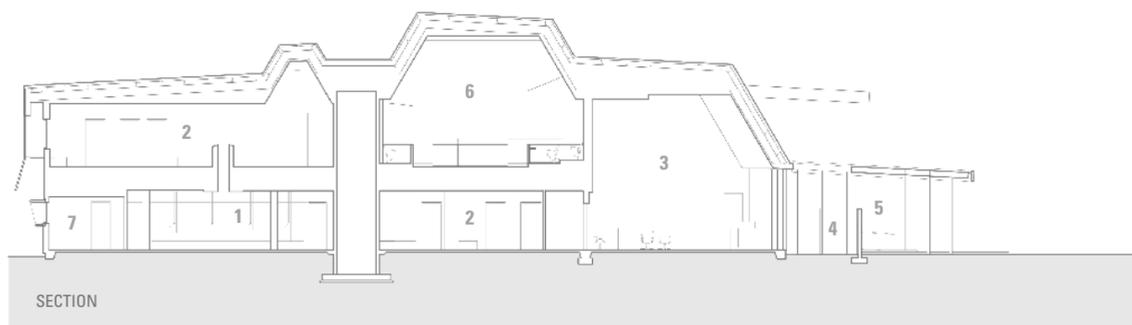


ABOVE LEFT AND RIGHT: The cave-like internal public spaces were framed using steel sections, and clad with local stone and recycled timber, to create a recognisable and familiar sensation similar to the experience of entering Hidden Valley

Unlike the courthouses of old, the new building at Kununurra boasts naturally lit courtrooms (above left) and access to public courtyards (above right), which offer visual and physical connections to the landscape and sky

LEGEND

1. Public registry
2. Foyer
3. Magistrate courtroom
4. Courtyard
5. Parking
6. Jury courtroom
7. Interview room



PROJECT Kununurra Courthouse **CLIENT** Department of the Attorney General; Department of Finance, Building Management & Works **ARCHITECT** TAG Architects and iredale pedersen hook architects, Architects in Association **PROJECT DIRECTORS** Jurg Hunziker, Michael Spight, Adrian Iredale, Finn Pedersen **DESIGN ARCHITECTS** Adrian Iredale, Michael Spight **PROJECT ARCHITECTS** Daniel Bubnich, Nikki Ross **OTHER ARCHITECTURAL TEAM MEMBERS** TAG Architects: Cynthia Teng, Julie-Anne McGuinness, Daniela Casadio, Hayley Brigatti, Melanie Burnett, iredale pedersen hook architects: Martyn Hook, Cherie Kaptein, Caroline Di Costa, Rebecca Angus, Jason Lenard, Mary McAre, Vincci Chow, Khairani Khalifah, Drew Penhale, Brett Mitchell, Jonathan Ware, Matt Fletcher, Mathew Omodei **BUILDER** Cooper & Oxley Builders **STEEL FABRICATOR AND STEEL SHOP DRAWINGS** Metro Steel Lintels **ROOFING CONTRACTOR** Charman Roofing **STRUCTURAL ENGINEER** Terpkos Engineering **MECHANICAL / SERVICES ENGINEER** DB Mechanical Consulting **LANDSCAPING** Place Laboratory **PRINCIPAL STEEL PRODUCTS** Roofing and wall cladding: Revolution Roofing Rev-Klip™ 700 profile made from COLORBOND® steel in the colour Woodland Grey®. LYSAGHT BONDEK® steel decking made from DECKFORM® steel. Structural steel: a combination of LYSAGHT® 150C x 64 external wall framing and Rondo 92C x 35 internal wall framing, and various steel sections including SHS, RHS, UC, UB sections, with Z Purlins, used for columns, beams, roof beams and roof trusses. Balustrade framing to void: 40 SHS x 4.0 posts shaped to void profile and clad in timber panels. Brise Soleil Truss made from BlueScope XLERPLATE® WR350 weathering steel **AWARDS** 2015 Australian Institute of Architects Western Australia Awards: The Julius Eischer Award for Interior Architecture. MBA Awards WA 2015: Winner – Best Regional Project; Bankwest Best Commercial Building – Building Excellence Award, Kimberley-Pilbara Region: Cooper & Oxley Builders; Bankwest Best Commercial / Industrial Building \$6,500,000 to \$25,000,000, Building Excellence Award, Kimberley-Pilbara Region: Cooper & Oxley Builders; Winner – LYSAGHT® Judges Innovation Award; Winner Midwest North West Award for Excellence in Glazing **APPROX COST** \$23,500,000 **APPROX SIZE** 2280m²

BESPOKE SHELTER

With a design that speaks of bicycle frames and red dirt tracks, Group GSA has maximised steel's load-bearing potential to create a parkland shelter that dispenses with the need for secondary structure.

Words **Rob Gillam** Photography **Paul Bradshaw; Simon Wood**

For what is at first glance a simple building, the Wylde Mountain Bike Park Shelter in the Western Sydney Parklands has its share of flair.

These structures are truly reflective of their context. When observed from varying distances, heights and angles, they begin to unfurl their secrets and embody forms drawn from the adjacent mountain bike trail. The shelter's roof evokes the form and colour of jumps and hills on the trail. The weaving and turning layout of the trail is mimicked in the continuous form of the tubular structural system (made from galvanised mild steel) that snakes around and under the elegant roof canopies. This pipework is also reminiscent of the backdrop of silvery angled eucalypts and the self-bracing tubular frames of the mountain bikes that bisect the trails.

GroupGSA principal architect Andrew Coomer says the shelters (there are two, with plans for more in the future) have also been likened to insects. "With dark-red ribs on their 'backs' and 'legs' sticking out from underneath, they appear like ants crawling across the landscape," says Coomer.

The flat steel plate folds up the edges 90 degrees to create a seam that joins and stiffens the adjacent sheets

The ribs that run across the shelter's folded canopy provide more than visual interest, as Coomer explains. "The canopy appears as one continuous, long sheet but is actually a series of individual sheets bent and folded from BlueScope HW350 grade XLERPLATE LITE® weathering steel.

"We chose weathering steel because it is hard-wearing and suited the remote, public environment of the trail and allowed us to utilise the long span lengths of up to 2.5 metres. Sheets fold up at the edges and overlap by 150mm as they follow the fall down towards the gutter, providing us with a 'rigid' structural canopy."

To introduce structural integrity to the steel sheets that form the canopy, they have used another trick at the joins to further stiffen the whole thing. Coomer explains that "once you take a flat sheet and turn up the edges, it makes it stronger. We have done the same thing with the flat steel plate by folding up the

edges 90 degrees to create a seam that not only stiffens the sheets, it allows adjacent sheets to be joined together."

A capping made from 3mm XLERPLATE LITE® weathering steel runs up, over and down the paired edges and is secured horizontally with weathering steel bolts. Oversized holes and separation washers allow for some movement at the bolt connection, to allow for expansion and contraction of the steel as it heats and cools throughout the day.

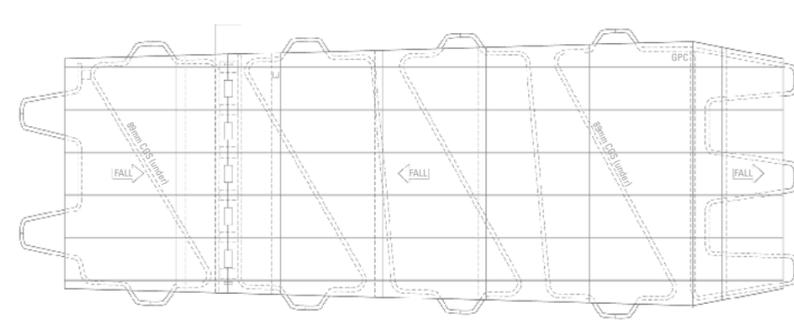
Fleetwood Urban steel fabrication manager Kevin Dingley says that fabricating the capping proved challenging. "Like for the roof plates, the architects wanted the cappings to be as thin as possible. We had to make a special jig to bend the capping because it was such a small width."

The capping further contributes to the structural rigidity of the sheets – "Almost like a series of mini beams, if you like," says Coomer – which were designed to work in tandem with the tubular framework to avoid the need for secondary structure.

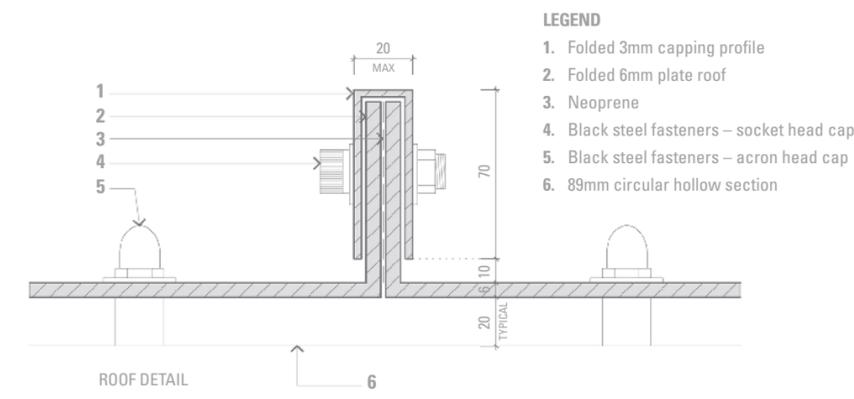
"The rib design of the rigid canopy combined with our concept for supporting the roof with a continuously rolled circular section. The spanning capability of the canopy allowed the continuous form of the structure to weave beneath with no apparent connection between these two elements." To achieve this floating appearance, discreetly located stand-off brackets separate the weathering steel canopy from the galvanised structural tube.

Reminiscent of the trail it that inspired it – the structural tube zig-zags up and down, back and forth in a clever diagonal arrangement that allows the structure to become self-bracing. There is no need for additional cross-bracing or finer sub-framing for support. "This allows the structures to maintain a beautiful simplicity," Coomer says. "Secondary bracing would have them feeling cluttered and clumsy, but it maintains a clean, sculptured form.

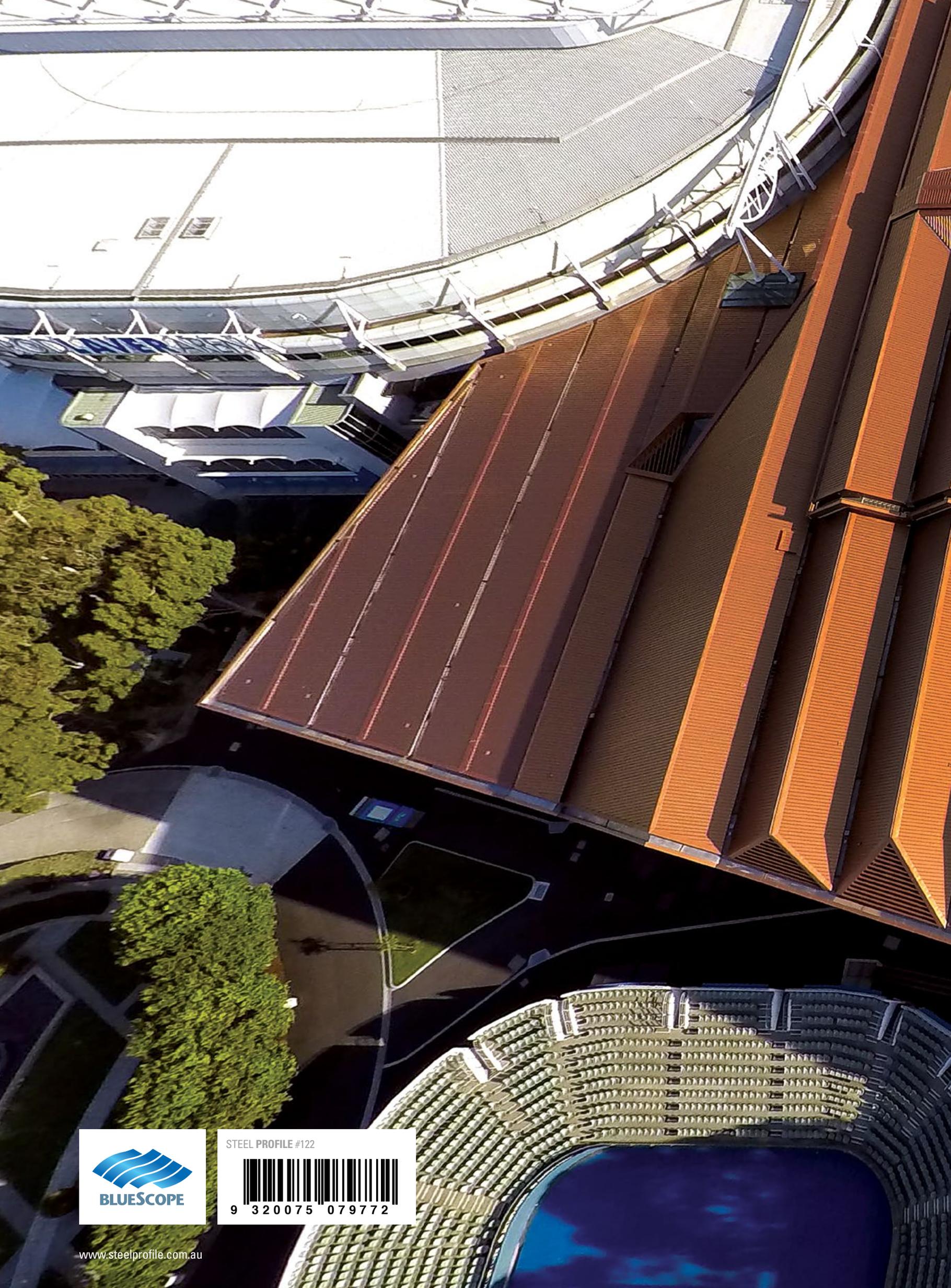
"When you're looking at the shelters from underneath, all you see is the thin six-mill canopy floating lightly above the smooth, unbroken tubular support structure. That's one of my favourite things about the shelters: they are made entirely from steel yet they don't seem heavy. I love the way they sit so lightly in the landscape, like they were always meant to be here." **SP**



LARGE SHELTER - ROOF PLAN



PROJECT Wylde Mountain Bike Trail Shelters **CLIENT** Western Sydney Parklands Trust **ARCHITECT** GroupGSA **PROJECT TEAM** Principal architect, Andrew Coomer; project architect, Lucian Gormley; landscape architect, Steven Hammond **STRUCTURAL & CIVIL ENGINEER** Structural Engineer: Cantilever; Fabrication and Detail Engineering: Fleetwood Urban **BUILDER** Shelters: Fleetwood Urban Landscape; Walling: Co-Ordinated Landscapes **STEEL FABRICATOR** Shelter: Fleetwood Urban; Landscape Walling: Charles Heath Industries **SHOP DRAWING CONTRACTOR** Walling: Co-Ordinated Landscapes **CLADDING CONTRACTOR** Walling: Charles Heath Industries **LANDSCAPE ARCHITECTS** GroupGSA **PRINCIPAL STEEL COMPONENTS** Roofing and cladding made from BlueScope HW350 grade XLERPLATE LITE® weathering steel. Framing made from galvanised circular hollow section from OneSteel **PROJECT TIMEFRAME** Shelter Construction: three months **AWARDS** 2015 Premier's People's Choice Award in Landscape Architecture; 2015 AILA NSW Award for Design in Landscape Architecture **BUILDING SIZE** Shelters: 10x6m and 19x7m **TOTAL PROJECT COST** Shelters: \$95,000 (small) and \$150,000 (large)



STEEL PROFILE #122



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