NH ARCHITECTURE AND POPULOUS IN JOINT VENTURE
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KUNUNURRA COURTHOUSE
IN PROFILE: 3XN
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 celebrates 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.

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

FRANK STANISIC

Stanisic: Australian founder Frank Stanisic is a Sydney-based architect and urbanist. His work is lauded for its evolving interest in the transformation of Sydney’s building and landscape with great consideration upon information contained in this publication. The views expressed in this magazine are those of the authors and do not necessarily reflect those of BlueScope Steel Limited.

PENNY FULLER

Penny is a partner at Silvester Fuller, established in 2008. Silvester Fuller’s first built projects have been recognised 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, Special Jury, Wilkinson, Aaron Bolot and Frederick Romberg prizes.

JAMES LODER

James Loder is a graduate architect working at John Wardle Architects. Graduating from RMIT with a Master of Architecture in 2012, James was awarded the 2015 BlueScope Steel/Steelmag Student Prize. His work explores the formal relationships between building and landscape with great consideration given to spatial expression and materiality.

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34 Dubbed the “Opera House of Kununurra” by locals, this new council chamber graces Kununurra without intimidation and features an expressive, building steel roof that traces the outline of its surrounding national park ranges.

42 A parkland shelter made entirely from steel embolds forms drawn from an adjacent mountain bike trail and employs fabrication techniques to dance with secondary structure.
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
Margaret Court Arena is the latest in a suite of sport venues to take to the skies and add to Melbourne’s grand slam host and global sports and entertainment mecca. This latest addition is a precinct piddly with expansion in a stakeholders 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 7,500 spectators. And what’s not to like? The roof project that offers premium seating for 7,500 spectators. And what’s not to like? The roof was light-proof and allow for all the movements including expansion, shrinkage and无frac{1}{2}0 different scenarios.”

Similar to the Melbourne Cricket Ground and neighbouring arenas, this copper-toned beauty – realised with the COLORBOND® steel custom profile LYSAGHT KLIP-LOK 700 HI-STRENGTH® profile is swathed in the luxurious custom Metallic colour Copper Penny™, to the last centimetre. 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 Populous architected that architecture of the public realm should allow us to experience the context and performance that best suits each discipline.

“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 growths of about 150 different scenarios.”

A seamless, floating elegance inspired by automotive and aeronautical associations informs the sleek manner of circulation areas, where daylight is never far away. Smoothly spooled finishes inside and out charaterise a project of reduced bulk and increased amenity. While many rooftops are the repository of cluttered mechanical services, the VTR’s 6km 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 unwieldy roof of Rod Laver Arena (56 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 slice of metal barely one metre deep. 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 “as a Lamborghini”, adding that three-and-a-half minutes would be possible. Such speeds make the once unwieldy roof of Rod Laver Arena (56 minutes) appear sluggish.

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Would the Sydney Olympic Park ever be the default roof? 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 ridiculed movable roof structure and drainage and 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 wouldn’t go wrong.”

Project structural engineer Mark Sheldon says Aurecon and its consultant team was realising with Aurecon in the project’s early phases. Distilling the roof to such a shallow depth was a consultation 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 ridiculed movable roof structure and drainage and 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 wouldn’t go wrong.”

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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 bogies during skewing, or thermal movements.

“Too complex and earthed by the interface between the structure and sheeted 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 56m and sit 17.9m 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 soaring roof which, like a sunflower, is able to open to the heavens and reveal the seating inside.

“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.”

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. 
“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,” Doehring 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,” Doehring 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.

Doehring 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.

**PROJECT** Margaret Court Arena  
**CLIENT** State Government Victoria  
**ARCHITECT** NH Architecture and Populous in joint venture  
**PROJECT TEAM** Hamish Lyon, Richard Brenek, Lyndon Haywood, Paul Hanly, N Kitchen, Adrian Costa, Max Ding Wong, Thi Pham, Wilco Duckling, Paul Frith, Emily Kilvington, Arnold Jarden, Dale Jueno, Michael Nove, Jula Reardon, Mark Spalding, Nathan Lua, James McFadyen  
**BUILDER** Lend Lease  
**STEEL FABRICATOR** JVP  
**PRINCIPAL STEEL COMPONENTS**  
Roofing: LYSAGHT KLIP-LOK 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 (Alterations and Additions), 2015 Australian Institute of Architects National Award for Public Architecture (Landscape)
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
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.

“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 Surfmist® 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 familiar and unusual. The striation 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 bond 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.)

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

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.

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Steel was also used to great effect in the transition spaces of the project, when moving outside to inside via the doorways and sunnyAwareness, 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 recession,” 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 each 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.”

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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 Ammundsen and Kasper Guldager Jensen.

“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”

Fred Holt, a partner at 3XN, is leading the design team out of the Sydney office 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-modeling 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.

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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 Berstone  Photography Belinda Monck

STATE OF THE UNION
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 hardman 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 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. That was 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.

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.

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

As 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 bathrooms. 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.

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

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.
Both Jon and Jess concede that the mezzanine where it wouldn't have been as noticeable, we and knowing where to spend money,” he explains. “Over time, you get better at finding ways of using materials section was a considered one, Jon says. “Over time, recessed gutters to achieve that.”

“Deep,” Jon says. “I also wanted to create a very thin edge on the top of the roof, so I used ‘Deep’,” Jon says. “I also wanted to create a volume, which is one reason we chose True Oak™ 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.”

“Most people would use a timber frame for a renovation in Adelaide, but you can’t achieve those 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.”

This outcome resulted from a careful synthesis of the architect’s (his) and client’s (hers) visions. 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.”

“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 upper section making a perfect teenage retreat – themselves relegated back downstairs – with the temporary addition of a stair gate, and carefully supervised visits upstairs, may 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 volumes 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 refinement, scale and volume – is evident.

“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 upper 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 deeply suited to life with a toddler, but the

to two new bathrooms and a laundry. From this compressed half floor one enters the new back room. Like owning the beat! Ill last, Jon exploited this new living zone – which contains sitting area, dining space and kitchen – and fitted it with light and air, making it a natural orthogonal to the cozy 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 study 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: second-hand 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-catchingly thin steel frame and steel cladding solution.

“Most people would use a timber frame for a renovation in Adelaide, but you can’t achieve those 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.

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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
Entering Tintern Schools for the first time, it is clear the landscapers 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 – Architectural design principal James Jones* took this into account by extending to two wings around a giant 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 embraced a modest house around a tree,” Jones says. Here, though, the concept is exaggerated by largely separating the wings from each other to physically unbody 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. The wall cladding is 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 adds.

Jones also selected steel to roof the building. “Because we conceived the building like two big horizontal boxes floating in the landscape,” Jones says. “COLORBOND® steel 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 to fit with the tone of the landscape and not differentiate itself too much from the other buildings. It does of course stand out visually, but at the same time it seems like it’s always been here.”

Structural steel including Universal Beams for both beams and columns contributed 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 80 metre-long extruded sections.”

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 lot 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 leadtime, the shop drawings for the wall panels had to be signed off before the steel work went cut. 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.

“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.

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“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 122).”

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**FIRST FLOOR PLAN**

**LEGEND**

1. Classroom
2. Lobby
3. Staff
4. Support

**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.

*A Viewpoint from Viewpoint contains images of buildings and is an opportunity to see the projects described in this magazine. For more information, visit www.viewpoint.com.au.*

**“We wanted to make the building like two big horizontal boxes floating in the landscape”**

**SP 122 architectural steel innovation** 31
defying project with HBV and Gandy was Tasmania’s Tintern Schools Transend Primary Store (Steel Profile 107), which achieved bulky internal steel portal systems for a lightweight external truss that suspended a roof of bridge-like proportions, spanning 34 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 frame”. 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 Jones 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, “The most pleasing thing about this building 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.”

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 lot of 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.”

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 stuff and the kids love it.”

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**Site Plan**
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
TAC Architects and iraede pedersen hook Architects in Association

PROJECT
Kununurra Courthouse

LOCATION
Kununurra, Western Australia
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.”
“We spent a lot of time detailing that roof, because it is so expressive and everyone sees it first”
Unlike the courthouse of old, the new building at Kununurra reflects naturally (see diagrams above left and access to public courtyards (above right), which offer visual and physical connections to the landscape and sky.

“The building’s undulating steel roof mimics the form of the sandstone rock formations which also informs the interiors. Local stone and recycled timber combine with materi...”

**ABOVE LEFT AND RIGHT:** The cave-like internal public spaces were framed using steel sections, and clad with local stone and recycled timber, “The XLERPLATE® WR350 weathering steel-cladding in the roof – helps to reduce the heat load. “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. “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®.” He 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 facia and under the soffit to visually reinforce the continuous folding-purposed 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.

“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 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 facia and under the soffit to visually reinforce the continuous folding-purposed 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 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 Elischer 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.”

**Jury courtroom**
**Magistrate courtroom**
**Foyer**
**Public registry**

**AFTER 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.
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

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 it actually consists of individual sheets bent and folded from BlueScope WH350 grade XLERPLATE LITE® weathering steel.”

“We chose weathering steel because it is hard-wearing and resisted the severe, public environment of the trail and allowed us to achieve the long span lengths of up to 2.5 metres. Sheets fold up at the edges and snap together. 120mm 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 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 via a heats and cool throughout the day.

Flathead/Lorne steel fabrication manager Kevin Dingley says that fabricating the capping proved challenging. “Like for the roof plates, the architects wanted the capping 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 shelter. “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 ribs design of the rigid canopy combined with our concept for supporting the roof with a continuously rolled circular section. The opening 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 inspired it — the structural tube zig-zags up and down, back and forth in a circular diagonal arrangement that allows the structure to become self-laying. There is no need for additional cross-bracing or liner sub-framing for support.”

“Secondary bracing would have them feeling cluttered and clumsy, but it maintains a clean, uncluttered feel.”

“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 and they don’t seem heavy. I love the way they sit so lightly in the landscape, like they were always meant to be here.”

### STEEL DETAILS

**What is at first glance a simple building, the Wylde Mountain Bike Park Shelter in the Western Sydney Parklands has its share of quirks. These structures are truly reflections of their context. When observed from varying distances, heights and angles, they begin to unfold their secrets and embody forms drawn from the adjacent mountain bike trail. The shelter’s roof evokes the form and action of jumps and hills on the trail. The rolling and turning layout of the trail is mimicked in the continuous form of the tubular structural system begins from galvanised mild steel that snakes around and under the elegant roof canopies. This pipework of the tubular structural system (made from 89mm circular hollow section) that snakes around and under the elegant roof canopies. This pipework provides more than visual interest, as Coomer explains. “The canopy appears as one continuous, long sheet, but it actually consists of individual sheets bent and folded from BlueScope WH350 grade XLERPLATE LITE® weathering steel.”

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### Wylde Mountain Bike Shelter in the Western Sydney Parklands

**ARCHITECT**

Principal architect, Andrew Coomer; project architect, Group GSA

**CLIENT**

Western Sydney Parklands Trust

**PROJECT TEAM**

Architecture: Andrew Coomer; Landscape: Steven Hammond

**STRUCTURAL & CIVIL ENGINEER**

Lucian Gormley; landscape architect, Steven Hammond

**BUILDERS**

Shelters: Fleetwood Urban Landscape; Walling: Charles Heath Industries

**STEEL FABRICATOR**

Shelter: Fleetwood Urban; Landscape Walling: Co-Ordinated Landscapes

**CLADDING CONTRACTOR**

Shelters: Fleetwood Urban Landscape; Walling: Co-Ordinated Landscapes

**SHOP DRAWING CONTRACTOR**

Shelter: Fleetwood Urban; Landscape Walling: Co-Ordinated Landscapes

**PROJECT COST**

Shelters: $ 95,000 (small) and $150,000 (large)

**AWARDS**

2017 IAPA Architectural Steel Innovation Award

**BUILDING SIZE**

Shelters: 10x6m and 19x7m

**TOTAL PROJECT COST**

Shelters: $ 95,000 (small) and $150,000 (large)

**INTERIOR STEEL COMPONENTS**

Roofing and cladding made from BlueScope HW350 grade XLERPLATE LITE® weathering steel. Framing made from galvanised circular hollow section 89mm CGS (under)89mm CGS (under)

FALL 

1. Folded 3mm capping profile
2. Folded 3mm plate roof
3. Neoprene
4. Black steel fasteners – socket head cap
5. Black steel fasteners – screw head cap
6. 8mm circular hollow section