

STEEL PROFILE

ARCHITECTURAL INNOVATION WITH BLUESCOPE FEBRUARY 2022

132



FMD ARCHITECTS
COOPWORTH HOUSE

ARM ARCHITECTURE
ARTS WEST, UNIVERSITY
OF MELBOURNE

LYONS
YAGAN SQUARE



Editorial

Welcome to STEEL PROFILE® magazine edition 132. We are, as always, proud to bring you a collection of some of Australia's most inspired steel architecture and accompanying glimpses into the brilliant minds behind it.

Firstly, congratulations to the winners of the 2021 Australian Institute of Architects' National Architecture Awards. BlueScope commends all recipients and especially applauds the COLORBOND® Award for Steel Architecture winners for buildings that exemplify inspirational and innovative design. Last year's National COLORBOND® Award for Steel Architecture – Lavarack Barracks – shone particularly brightly amongst a worthy field of state-winning contenders.

Also deservedly, we feature some past National COLORBOND® Award for Steel Architecture winners in this issue.

We have asked architects, designers and industry stakeholders what they would like to see more of in STEEL PROFILE®. Substantial feedback indicated a closer examination of projects' technical properties would be welcome, so from now on we are introducing a new section to every project article: Steel Details, which takes a deeper dive into how feature aspects were considered and resolved.

In the past, we have endeavoured to profile architectural practices to accompany our

excellence-in-steel project coverage. Counterbalancing our dialogues with established architects, we are also seeking perspectives from fledgling-to-young architects. As such, in this issue we meet rising star, Sobi Slingsby, of Peter Stutchbury Architecture.

Ever on the hunt for projects featuring ground-breaking, innovative use of BlueScope steel, we invite you to share your projects for consideration in future issues. Just visit steelprofile.steelselect.com.au/submit-a-project

Whether you're attending in person or virtually, we look forward to seeing you and hearing your thoughts at this year's National Architecture Conference.

All the best, Melissa Barlow.



MELISSA BARLOW
BlueScope Managing Editor



RAJ NANDAN
Publisher

Contents

04



Coopworth house has been influenced by the traditional agricultural sheds of the area, but teleports the typology into the 21st century with its exceptional level of detailing and technical resolution.

NUMBER 132, FEBRUARY 2022

COVER PROJECT
Coopworth house

PHOTOGRAPHER
Dianne Snape



12



A multi-layered celebration of Western Australia's unique features: WA Museum, Boola Bardip is diverse in its landscapes, particular light quality, its interconnected and sometimes conflicting stories of people and culture.

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Principal Corporate Partner



20



As an architect of note, Fiona Dunin has forged her place as an exemplar practitioner within the Australian architecture and design community, creating projects that are both sensitive to place and genuinely fulfil clients' briefs.

24



With the building's signature steel fins: four-and-a-half-thousand of them, all made from 8mm XLERPLATE® steel (250 grade) and the vast majority of them individually unique. Arts West, University of Victoria is truly one of a kind.

32



Yagan Square is one of Australia's first public spaces designed collaboratively with First Nations Peoples. Whadjuk Elders contributed to the project, authorising cultural narratives to bring deep Country experiences to the design conceptualisation.

40



As a young architect, Sobi Slingsby has already been recognised by BlueScope and the Australian Institute of Architects for her work. This rising star is making a name for herself in the architecture and design community, climbing the industry ladder at record speed.

44



The Christopher Cassaniti Bridge is Australia's first double-helix bridge and provides the connection between the residential Lachlan Line's development to North Ryde Metro Station, spanning the M2 Motorway and Delhi Road without interruption to traffic.

PROJECT COOPWORTH LOCATION BRUNY ISLAND, TASMANIA

Accepting the Elements

ARCHITECT FMD ARCHITECTS

WORDS MICKY PINKERTON

PHOTOGRAPHY DIANNA SNAPE

Clad in roofing and walling made from COLORBOND® steel in LYSAGHT CUSTOM ORB® profile, in the colour Terrain®, Coopworth house has been influenced by the traditional agricultural sheds of the area, but teleports the typology into the 21st century with its exceptional level of detailing and technical resolution.







PREVIOUS Located in the middle of a paddock on a working sheep farm, the design responds to the weather and fire extremes with a resilient exterior shell

LEFT The footprint of the house was kept compact for a number of reasons: to maximise arable land, minimise build cost and in acknowledgement that at most times there would only be two people using the house

RIGHT The triangular dormer window was a late addition to the design once construction had commenced and its resolution drew on the generations of skill in the building team

Situated in a paddock at the far edge of Tasmania, there's nothing between this house and Antarctica except a few penguins. An incredibly robust material solution was therefore always going to be needed to withstand the unforgiving climate.

In the words of the architect, the winds on Bruny Island are "ferocious, some of the strongest in Australia", and the rain is "relentless". Add Bushfire Attack Level (BAL) compliance and a remote location to the list of constraints, and this was never going to be an easy build. Throw in a once-in-a-century pandemic, which locked the architect in Victoria for the duration, and the project's challenges take on Herculean proportions. And yet the Coopworth team pulled together, enthusiastic and unfazed, to deliver this contemporary country home which has exceeded all expectations and celebrates the versatility of steel.

The building's practical response to the weather and fire extremes is expressed in a resilient exterior shell, which, in an area where deliveries are limited by ferry access and country roads, needed to be made from an easily transportable material. Meanwhile, the design's aesthetic response to the site sought to complement the original agricultural sheds on the farm. Steel was fundamental to both solutions. "We needed something that is extremely

hard wearing," explains architect Fiona Dunin, of FMD Architects. "We used COLORBOND® steel because it's lightweight, easy to transport, highly durable, easy to install and the colour is a strong reference and direct connection to the existing red-lead shacks on the island. It was always going to be steel."

The need to limit penetrations on the roof to eliminate leaks and leaf build-up was an overriding functional concern that has contributed to the signature clean lines of the building. With extraneous elements stripped away, and gutters relocated to trenches in the ground, attention is focused on the pure geometry of the building. This geometry is further accentuated by pushing the pergola area to one side of the house rather than wrapping it around, so as not to obstruct views out from – or back to – the house.

Apart from an extruded brick bath house on the south-western side of the residence, the building is entirely clad, including the doors, with roofing and walling made from COLORBOND® steel in LYSAGHT CUSTOM ORB® profile, in the colour Terrain®*. It's a flawless effect that required complete attention to detail.

"The geometry was particularly challenging," says Dunin. "It does look simple from the front but then you get

around the sides and you see all the complex angles going on. So that was the first challenge, and then the detailing for the steel needs consideration, so it's all about those custom details and custom flashings to make it look really crisp on every edge. That was what was challenging – all those really fine details to really elevate this innately humble material to something really special."

Helping Dunin raise that bar was an experienced team of builders, consultants and trades. In2Construction had been sought-out by FMD on the recommendation of another architect who had built a house nearby. The In2Construction team included a father and son who were the fourth and fifth generation in a family of builders, as well as a highly regarded carpenter who lived on the island and who had been apprenticed at 15 to his father. As project manager Mark Singleton says, there were "generations of skill" on the project which were called on throughout the build.

"So, completely clad in steel means, in some ways, you're limited as to where you can hide things," says Singleton. "And so there's a lot of forethought right from the time you're digging your hole, essentially the whole way through to the finish, that you're always thinking about how that thing is going to look and how it's going to be finished at the end.



“It’s all about those custom details and custom flashings to make it look really crisp on every edge ... to really elevate this innately humble material to something really special”

FIONA DUNIN FMD ARCHITECTS



“We used COLORBOND® steel because it’s lightweight, easy to transport, highly durable, easy to install and the colour is a strong reference and direct connection to the existing red-lead shacks on the island. It was always going to be steel”

The pre-planning and documentation phase of the project was intensive and intensely cooperative despite the distance between FMD in Melbourne, In2Construction in Hobart and the builders on site – a number of whom opted to live on Bruny Island during construction and lockdown.

“There were probably 20 to 30 sheets of details on every single juncture, down to how those big sheets of glass come together and putting a capping made from COLORBOND® steel on the edge of those,” says Dunin. “All those little details – even the bin storage area was extremely detailed – nothing was left to chance. And so we don’t tender jobs, we negotiate with the builder through the documentation phase. They can review the details with us, have a look at them, and then they get reviewed again on site. When the builder looked at them he had other ideas and then we’d rework them. They were probably re-worked two or three times with the builder, to get them right and still achieve the look that we wanted. It’s a very collaborative process.”

In particular the resolution of the junctions where steel meets glazing drew on all the knowledge of those generations of skill and the strong relationship between builder and fabricator, Central Roofing Supplies.

The structural steel elements of the build were more straightforward, using standard-sized SHS, PFC and UB members and predominantly bolted connections.

Internally, a large open-plan lounge-dining-kitchen area, which is flanked by two bedrooms, bathrooms and a small rear protected porch. The footprint of the house was kept compact for a number of reasons: to maximise arable land, minimise

build cost and acknowledging that at most times there would only be two people using the house. Having said that, Coopworth would nonetheless need to occasionally accommodate an extended family. To avoid having to add bedrooms that would be used only once or twice a year, bunk beds are set into pocket walls and daybeds into the floor of the main living area, where space has been augmented and steel was called on to provide the structural strength required.

“Over the dining area is a very large span of roof that you can see and so that has some fairly substantial steel beams through there,” says Dunin. “It had to be done in steel to get that span, most definitely.”

Singleton agrees, citing further reasons for the decision to use steel. “Structurally, it gave us the ability to do long spans, so that long beam that’s in the living room, it’s holding up half of the roof load, essentially. It gave us that ability to go that long span without having a huge, big bulky member in there. If it was timber or LVL or something like that, or a glulam beam, the size of it would have been huge. So steel meant that we could do that economically.”

While economics did not define this build – landscape and materiality are the lasting takeouts – it was nonetheless a concern owing to the expected time-cost associated with building in a more remote location. In the end, however, the project compared well financially.

The ongoing efficiency of the house has been addressed via a number of sustainability initiatives, resulting in a building consisting of double glazing, substantial insulation, LED lighting throughout, low VOC paints and local or recycled furniture. Recycled timber from the one of the owner’s

childhood family farm has been used in key furniture pieces such as the dining table and the kitchen island.

This is the third time that the clients have commissioned Dunin to create a home for them, so it’s no surprise that their feedback is effusive: “FMD smashed the brief and created something super special,” the clients said. Dunin is quick to deflect any individual praise and says the project is a reflection of an outstanding, resilient and collaborative effort across the project team which delivered a beautiful outcome in spite of the challenging and unique circumstances of the build.

Unable to see the project take shape in the flesh, she has since visited Coopworth and her favourite thing about the home is how it sits in the landscape and how the occupants can intimately experience the environment through the large expanse of windows in the open-plan living area.

“The glass basically butts right into the edge of the roof so when it rains; it’s like a waterfall running down the glass. The thing with Bruny Island is you need to just accept the elements. It rains so much that you need to get used to it; we wanted to kind of embrace that so that you always feel the weather, you’re not really sheltering from it, you’re standing there with your arms wide open like Kate Winslet on the *Titanic* [laughs] embracing the weather. So, when it’s rainy and you’re sitting inside, you feel that rain, you’re part of it. And when it’s a sunny and peaceful day it’s the most serene place in the world, it truly is.” SP

LEFT The building is clad, including the doors, with roofing and walling made from COLORBOND® steel in LYSAGHT CUSTOM ORB® profile, in the colour Terrain®*



Architect Fiona Dunin has a thing about triangles and it's an itch she hasn't yet fully scratched. "I think it's about the geometry and capturing light, and the way the angles work. So we follow the angles of the sun and for some reason that ends up being sculpted into triangular forms," says Dunin. "[But] the thing with triangles is they come to zero. There is no tolerance. Everything has to be perfect."

Working with triangles in steel – and in particular the junction between steel and glazing – presents its own set of considerations, as Dunin had explored on an earlier residential project, CLT House, featuring a dramatic saw-tooth roof made from COLORBOND® steel with integrated windows to capture the changing light throughout the day. That experience informed the design of Coopworth.

The owners had imagined Coopworth as more of a weekender. However, it took on a new dimension during lockdown as a more permanent second residence.

As a result, they requested a mid-build change to include an operable window in the roof to allow more light and air into the second-level study space, to be able to more

comfortably work from home in the future. Dunin proposed a triangular dormer window to meld with the overall aesthetics of the project, and the builder and fabricator rose to the challenge.

"How do we build that in so that it looks like it was always meant to be there and get some uniformity across the whole building? So how do we make a little ventilation flap, how do we make that open and close but also remain weathertight as that faces south and southwest, which is exposed to the roaring forties winds? The window had to be made watertight and all seemingly effortlessly with that whole minimalist idea, the flashings and all the elements that make it work."

As with the junction where the long glass wall meets the roof and where the absence of roof guttering to mask irregularities might otherwise be met with consternation if adequate planning was lacking, Singleton said this was counterbalanced by the ability to pull the sheets of COLORBOND® steel in LYSAGHT CUSTOM ORB® profile up and down to allow the fixing of the custom flashings and ember proofing as they were refined and manipulated during this dormer-design-on-the-hop process.

"When the glass came we managed to be able to get the glass in underneath the steel sheets without taking the sheets off, but then to fit the flashings and the ember-proofing, and all the other little bits of detailing that happened, that meant we were unzipping and zipping those steel sheets on and off. Definitely the ability to reuse the screws and screw holes, and steel is quite stable.

Custom flashings were manufactured from COLORBOND® steel in the colour Terrain®* by Central Roofing Supplies at their Hobart workshop and then transported to Bruny Island.

"It was an easy job from our perspective because Mark Thiessen [a member of the building team] is a good operator," says Garth Bealey of Central Roofing Supplies.

On a job like this, with transportation and time being clear constraints, those generations of skill and experience were essential and really came to the fore in the precision of the drawings and the accuracy of the finished products. These exacting fabrications respected not only the power of the elements, but also helped achieve the architect's vision for a form with powerfully clean lines.

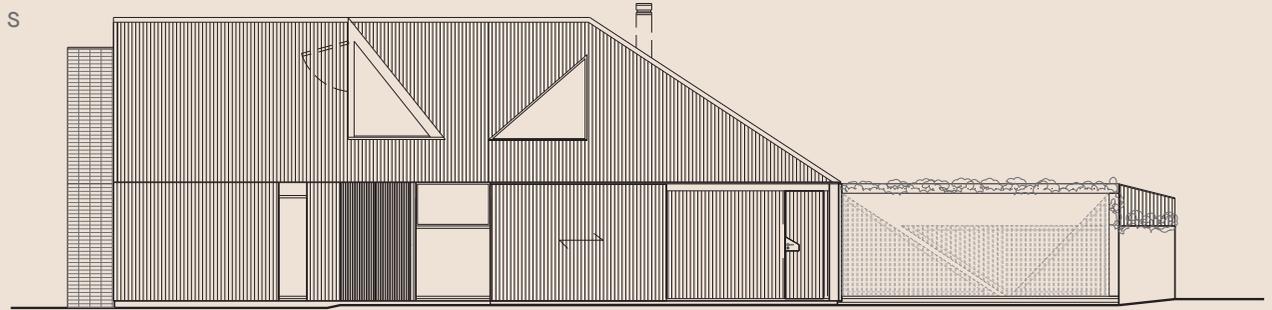
Principal Steel Components

Roofing and external walls:

- COLORBOND® steel in LYSAGHT CUSTOM ORB® profile, in the colour Terrain®*

Structural steel:

- 89 × 3.5mm SHS for columns and beams, 125 × 75 × 8 UA for Lintel, PFC for beams: 125mm, 180mm, 230mm, 250mm, 200mm UB for columns and beams



PROJECT INFORMATION

Architect

FMD Architects

Client

Pam and Arthur

Project

Coopworth, Bruny Island, Tasmania

Awards

2021 Australian Institute of Architecture Tasmania Chapter Esmond Dorney Award for Residential Architecture – Houses (New)

Builder and Cladding Contractor and Shop Drawing Contractor

In2Construction Services

Structural Engineer

Aldanmark Consulting Engineers

2021 MBA Award for excellence in Dwelling Construction \$750,000-\$1 million

Steel Fabricator

DRV Welding and Fabrication (Structural) & Central Roofing Supplies (Other)

Project Timeframe

2017-2020 (construction February 2020 to November 2020)

2021 HIA- CST Tasmanian Home of the Year

Building Size

263m² (199m² +64m² deck and bin store)

ABOVE LEFT The need to limit penetrations to the roof to minimise leaks and leaf build-up was a key functional concern. Guttering is located in trenches in the ground, allowing the pure geometry of the roof to shine

*Contact your local roll former or visit the COLORBOND® steel STUDIO to order a colour swatch

Sturdy History

ARCHITECT HASSELL + OMA

WORDS LUCY SALT

PHOTOGRAPHY PETER BENNETTS

Beneath its pleated metal façades, shimmering surfaces and glassed bridges, the bones of this building, predominantly made from BlueScope's XLERPLATE® steel (450 grade), has managed to literally unify and reinforce the old and the new in the remarkable WA Museum, Boola Bardip.





AWM

Back to Work
Stay Safe



WA Museum Boola Bardip was always intended to be locally inspired, globally admired, and designed by world-class architectural teams drawn from international and local talent pools. For the design-competition-winning team, Hassell and OMA, led by managing contractor Multiplex, the site would prove extraordinarily complex, but close collaboration has yielded a remarkable new public place that establishes fresh connections to Perth's Cultural Centre, while also giving new life to its existing heritage fabric.

At once a multi-layered celebration of Western Australia's unique features- its diverse landscapes, particular light quality, its interconnected and sometimes conflicting stories of people and culture; here we contemplate the 'how', and in this story, structural steel lies at the centre of how this project has been made possible.

"As you walk around, you get to see the complexity of the relationships between the old and the new, and the way the architecture responds to that, but it's also supported by steelwork," says Peter Dean, design director at Hassell. Elevated walkways

and bridge structures traverse open spaces to form links between, around and over the old, while the new building's voluminous gallery space, minimal vertical structural elements have given the museum new flexible accommodating spaces. "They're no mean feats, and once explained, people are in awe as to what was achieved within a very tight timeframe and a very tight budget" says Dean.

For Paul Jones, regional director at OMA, this project is a continuation of the practice's relationship with steel. "Steel has played a significant role in the work of OMA and in some ways this project continues that lineage of OMA's exploration of architectural structural expression," says Jones, pointing out that the trusses inside the building are not hidden, which makes them an important part of the architecture. "And part of the expressive nature of the architecture comes through the use of that material and that structural system," he says.

"Our design thinking and process are very similar, there's a synergy about working together," observes Dean. The combined design teams worked from a central project

office in Perth for the duration, which helped reinforce the collaborative nature of the project. "The team was chosen around skill sets and individual qualities," says Dean, in what proved to be a seamless process to bring to life a "very challenging project".

As its name suggests (Boola Bardip means many stories in local Nyoongar language), the competition design brief called for an architecturally significant building to showcase the diverse stories of Western Australia. "The key words in the brief were people, place and culture, so therefore we were looking for the design to respond to those themes," says Jones.

"The brief was comprehensive in terms of its technical requirements and its functional need, and vague in terms of the built form and urban design outcome...so it was a good document to respond to," explains Dean.

The functional needs of the museum included column-free gallery spaces with high load capacity. Additionally, the existing heritage buildings needed to be reconciled from a disparate bunch of historic architectural buildings to a cohesive, navigable whole. Achieving this latter



ambition would be no simple matter: “Even their frontages misalign, so they all have different presences to the street, and then also in section they have different [floor] levels between them,” says Jones.

The heritage buildings would also need significant restoration to bring them up to the Australian National Construction Code. “We were keen not to just preserve those buildings, but actually upgrade and revitalise them so that they would become a very important part of the cultural precinct,” says Dean.

Straddling an entire city block, the new museum provides eight new galleries, while also creating clear connections to the existing heritage buildings, and the City Room, which is a new public open space that wraps around the Old Perth Gaol building. “By stacking the program on top of itself we made space around the gaol, which then made it like a piece of content within the museum,” explains Jones.

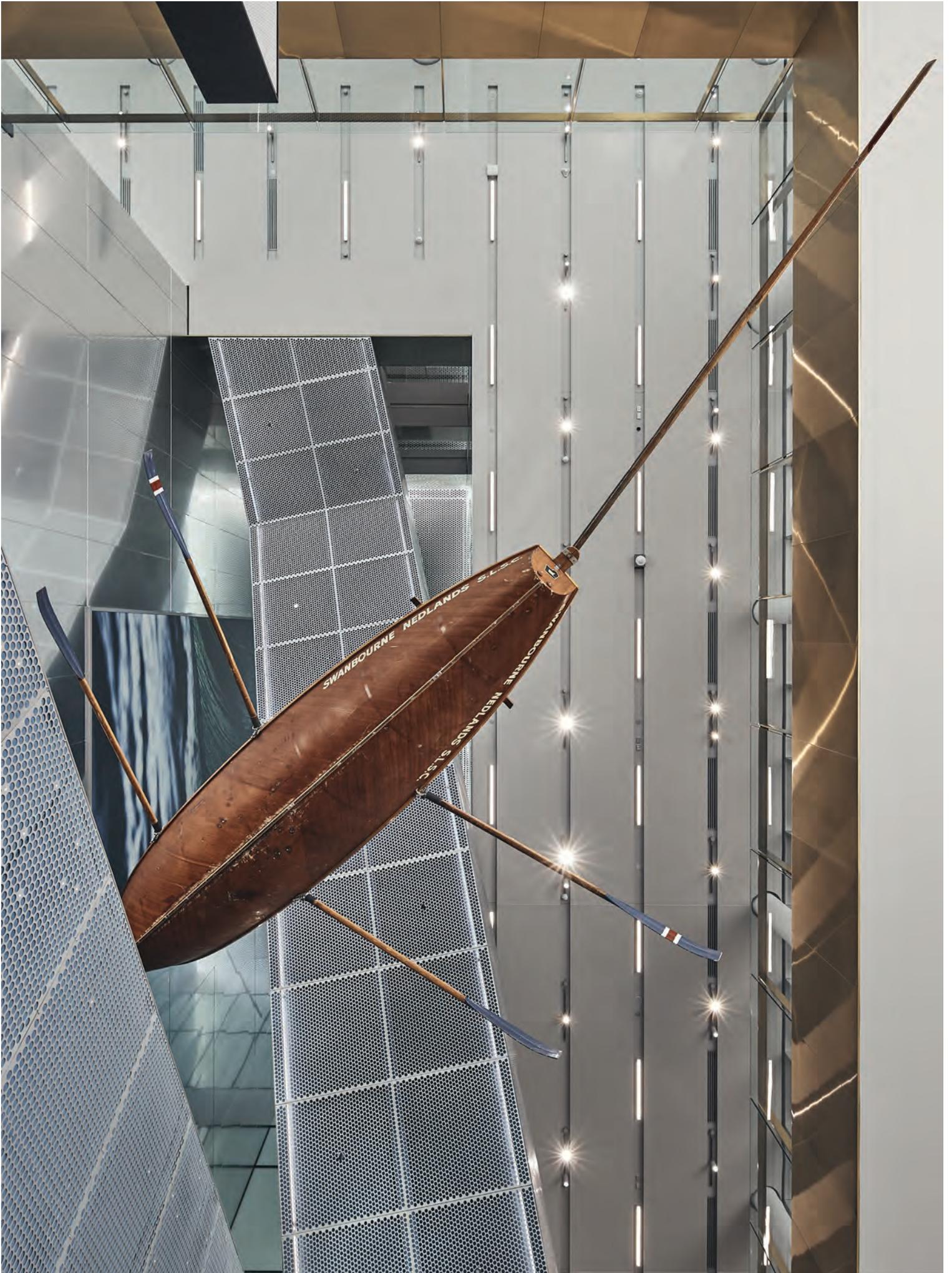
Dean adds that, “for us it was always a challenge between the existing heritage aspects and the challenges of the stories not told of the gaol on the site,

“As you walk around you get to see the complexity of the relationships between the old and the new, and the way the architecture responds to that”

PETER DEAN HASSELL

ABOVE LEFT Programmed spaces are stacked on top of each other to create new street frontages and solid connections to Perth’s cultural precinct

ABOVE RIGHT The dramatic new main entrance and cantilever over Hackett Hall was made using XLERPLATE® steel (450 grade). The material palette for the new building, shown here in the new City Room, provides a shimmering contrast to the heritage fabric





and then trying to embrace and express the Aboriginal heritage of Western Australia,” says Dean.

Two key moves inform the logic for organising the public space in the site. There’s the aforementioned City Room, which along with providing generous and protected public space, also forms a shimmering and dramatic main entry to the museum. Secondly, the so-called narrative loops, which Dean describes as “circulation devices in the vertical and horizontal sense” are the solution to some tricky site conditions. “Because work with the heritage buildings was a significant design driver, for us one of the key conceptual moves was having that City Room as a big public space that allowed people to be in the museum and engaging with it, without necessarily entering the museum itself,” says Dean.

As for the narrative loops, while they allow visitors to seamlessly explore the museum in any number of ways, they also open up opportunities for further dialogue between the new and the old. “Wherever you go on the site there’s always a view from within or over the new buildings,” says Dean. And here is where the architectural steel framework made from XLERPLATE® steel (450 grade) has been used with a great deal of expertise and design consideration. Perhaps most dramatically, there’s the two levels of gallery space which cantilever over Hackett Hall. Here, the roof of the building below has been physically removed, framed with steel and

suspended above. A new steel structure made from XLERPLATE® steel (450 grade) provides a glass-floored bridge to allow visitors to see into the gallery below, while also getting a closer look at the heritage ceiling. New bridge links utilise large spans of structural steel through the City Room to facilitate the horizontal circulation loop. “That’s a bridge structure that spans from new to new and doesn’t touch the old building,” explains Dean.

Elsewhere, gable ends of heritage buildings have been removed to open up vistas to the gaol, while new steel columns and beams have been spliced into the heritage buildings to provide a seismic upgrade and bring them up to code. “I always thought that it was a bit frightening, the idea that we would insert pieces of steel into the [masonry] buildings, to give them the rigidity and all the support needed in a seismic mode,” says Jones, who muses now that such interventions happened seamlessly during construction.

Some twelve months on from being opened, Dean, who is Perth-based, has observed how well received the museum has been by the West Australian public – who, for now at least, have had the place all to themselves. Reflecting on its success, he signals the 2021 Walk for Reconciliation, which used the museum as its starting point. “That’s testament to all the hard work the museum is doing, but also the way the landscape responds to the Indigenous cultures and the way we are able to come from a place

of sorrow around the gaol, to one of celebration and coming together. I really think it’s testament to everybody involved in the project that we actually managed to see that level of engagement and public acknowledgement.”

For his part, Paul Jones says that being involved in public buildings brings its own form of satisfaction. “It’s for people, it’s not a private place, that’s the nice thing about a public building – a lot of people get enjoyment out of it. Projects like this often take years, but once finished, it’s time for it to have its own life. As we understand, the museum has exceeded expectations and it’s one of those places where people go and just hang out.”

Reflecting on the project now, Jones appreciates the level of Western Australian expertise when it comes to working with steel. If the museum is a place for many stories, then surely the steel industry is a big story for WA, he says. “The builder and structural engineers really carried out the installation of the local steel with a level of finesse,” he says.

LEFT An upwards view. Clever use of structural steel has made it possible for the museum’s collections to be displayed, and circumnavigated, to full effect

ABOVE RIGHT The pleated metal façade, mirror-like soffit and extensive glazed areas have helped create a world-class museum inspired by Western Australia’s unique landscapes and particular light quality

STEEL DETAILS | A TECHNICAL DIVE INTO WA MUSEUM



Everywhere you look, the structure made from XLERPLATE® steel (450 grade) has a presence in this building, from the cantilevered galleries to huge spans across open space, to the detailed work found in the spiral “Beaufort Stairs” and glassed openings in the heritage buildings. Clearly there are “Structural gymnastics” going on, as Peter Dean puts it: “From an architectural perspective, all that detail work relating to being able to go inside and outside, over and above buildings, and keeping everything aligned to those [allowed] degrees of movement and tolerances between the old and the new is a big challenge,” he says.

“I was interested in the way that the steel frames and trusses have a potentially low impact on the site,” says Paul Jones, noting that steel prefabrication solved the tricky problem of meeting tight deadlines, of being able to be transported through tight city streets and finally erected quickly and with minimal disruption on site.

While the structural steel and all its tricks may not immediately be apparent for the average visitor, for Jones, it’s the hero: “Steel has a

presence in the building because it clearly hovers over [Hackett Hall] and makes a huge span across the City Room.” Those large spans were made possible using lightweight steel trusses, made from XLERPLATE® steel (450 grade).

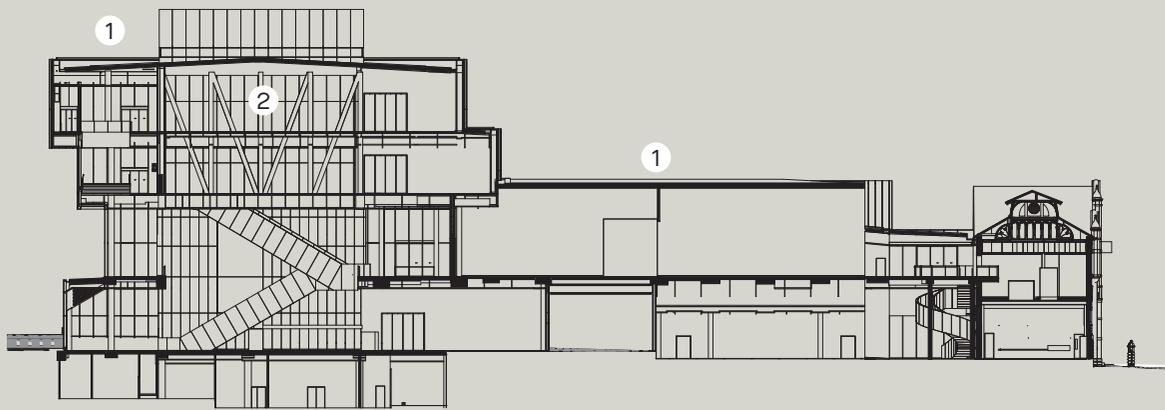
Two main cores support the horizontal spanning structure, which were designed as the equivalent of two 30-storey buildings. “What you see when you first approach the building from the street is those two big architectural moves which enable a lot of the structure, which is steel supplied by BlueScope,” says Paul Jones. The choice of structure made from high-strength XLERPLATE® steel (450 grade) helped overcome some very particular design challenges. “The live load for the [elevated] gallery is 8 kPa, that structure had to be very stiff, with very flexible heavy loading zones, without bearing any weight onto the heritage buildings,” explains Peter Dean. Here, the lightweight steel trusses span 54 metres between the two main cores. “By using the higher strength grade XLERPLATE® steel (450 grade), we could get the structural capacity and rigidity that we needed, but also reduce

the overall weight of the steel frame,” says Dean. Along with a 25 percent weight reduction, the XLERPLATE® steel (450 grade) also delivered a 15 percent cost-saving.

Elsewhere, the steel work has played a significant role in being able to connect to and support the existing fabric, and in doing so, overcoming the challenges presented by differing floor levels found in the heritage buildings. “We have effectively fused on to the back of those buildings with this horizontal loop in the new build, which means you can circulate between all these buildings almost as one,” says Dean.

Again, he says, steel is the construction material of choice, enabling the design “To open up those connections and do it in a way where you can get more light and better circulation into the buildings.” It’s on this last point that Dean strongly agrees: “We could really express the view to the heritage building by having very lightweight structural steel elements,” he says.

ABOVE Steel is the construction material of choice, enabling the design to open-up connections to get more light and better circulation



Principal Steel Components

- 1 Steel cladding:**

 - Roof cladding to upper areas and cores (main roof and gutters) made from COLORBOND® steel
- 2 Steel trusses:**

 - Prefabricated steel trusses and steel beams made from high strength XLERPLATE® steel (450 grade)

PROJECT INFORMATION

Architect

Hassell + OMA

Client

State Government of Western Australia

Project

WA Museum Boola Bardip, Perth
Western Australia

Project Cost

\$400 million

Project Team

Hassell Project Team: Mark Loughnan, Peter Dean, Brenden Kelly, Anthony Brookfield, David Gulland, Benjamin Rees, Reuben Bourke, Hannah Galloway, David Hunt, Annika White, Katherine Arrigan, Callum Chute, Patrick O'Neil, Philip Davies, Ricky Frazer, Sarah Gaikhorst, Wayne Greensill, Aysen Jenkins, Kaine Jenkins, Mark McKenna, Irene Payne, April Pine, Douglas William Pott, Thomas Proctor, Simon Rich, Michael Ruehr, Patrick Sims, Samuel Travers, Jill Turpin, Lucy Elizabeth Wilson

Cladding Contractor

Carters Roofing

Landscape Architects

Hassell + OMA

OMA Project Team

David Gianotten, Paul Jones, Fred Awty, Mirai Morita, Christopher Hing Fay, Thorben Bazlen, Marina Cogliani, Jack Davies, Haram Hong, Eunjin Kang, Alan Lau, Fedor Medek, Marcus Parviainen, Paola Provinciali, Yash Ravi, Takehiko Suzuki, Shinji Takagi, John Thurtle, Elizabeth White, Polina Zhalniarovich

Steel Fabricator

Pacific Industrial Company

Structural & Civil Engineer

BG&E

Project Timeframe

2016 - 2019

Building Size

19,000m²

Awards

2021 WA Australian Institute of Architecture Awards

The Jeffrey Howlett Award for Public Architecture

The John Septimus Roe Award for Urban Design

The George Temple Poole Award

Commendation for Steel Architecture and Commendation for Heritage

2021 WA AILA Awards: Award of Excellence for Civic Landscape and Landscape Architecture Award for Cultural Heritage

IN PROFILE

Fiona Dunin

WORDS JAN HENDERSON
PHOTOGRAPHY DIANNA SNAPE





As an architecture and interior design practice, FMD Architects is original and dynamic. Led by principal, Fiona Dunin, the studio is creating a new vision for Australian design through an innate understanding of the intrinsic values of steel.

ABOVE FMD's CLT House, covered in roofing and cladding made from COLORBOND® steel matt in a custom-folded standing seam profile from Unlimited Roofing, in the colour Monument®

As an architect of note, Fiona Dunin has forged her place as an exemplar practitioner within the Australian architecture and design community, creating projects that are both sensitive to place and genuinely fulfil clients' briefs.

Through an innate understanding of materials and design, the projects that her practice, FMD Architects, undertakes are innovative and unique, pushing the boundaries of form and function.

Dunin's signature style was formed through the intersection of two very complementary learning paths: interior design and architecture. She completed a Bachelor of Arts (Interior Design) at Royal Melbourne Institute of Technology (RMIT) in 1993 and then achieved a Bachelor of Architecture (Honours) at the University of Melbourne in 1998.

After graduation, Dunin worked for Geyer, Jackson Architecture and John Wardle

Architects, and then established her own studio, FMD Architects, in 2006. And so, with her very first residential project in the seaside town of Lorne in Victoria on the drawing board, the practice was born.

Over the next 15 years, FMD Architects and Dunin have achieved myriad accolades and awards, and the practice is renowned for its bespoke creativity and incredible attention to detail.

With a team of six architects and designers and a plethora of completed commissions, the studio focuses on varying scales and types of projects that encompass residential architecture and interiors, the commercial and cultural sectors, and competitions.

Strongly differentiating Dunin, her team and their work, is that materiality forms the very heart of the FMD approach to architecture and interiors. Steel is favoured in the practice's material palette and acknowledgement of the values of



The architects carefully considered their selections in order to best represent cultural narratives and the ensuring Country theme. But while embedding the materiality with a high level of symbolism was important to the overall design, so was performance

Australian manufacturing is ingrained in its consciousness. Progressive and curious, and ready to examine and investigate how various materials can be used and adapted, Dunin and Co's projects reinterpret and transform materials into new and original designs.

"I would say that the materiality of a building is not necessarily immediate at the beginning of the concept, but it's something that evolves as we start developing the design into 3D," says Dunin.

Her passion for one of those 'humble' materials is ongoing: BlueScope's steel is a part of the FMD Architects' DNA and has truly been defined in its latest weather-hardy residential project, Coopworth.

"Coopworth's exterior was created from a really simple, material – being made from COLORBOND® steel in LYSAGHT CUSTOM ORB® profile, in the colour Terrain®*," said Dunin.

"Yes, it is very economical and durable but it's all in the detail so that we can achieve those really fine connections with really complex geometries, which was a great design challenge."

Dunin's knowledge and appreciation of steel detailing came from her experience, working with Daryl Jackson and John Wardle. She acknowledges that both architects use steel in very different ways, but each is a master of their craft. And so, the love of steel began at the outset of her career and she is following in the footsteps of Jackson and Wardle, but crafting the material in her own individual style.

Attesting to the many benefits of using steel in her work, Dunin says: "Firstly, I think it's because there are so many different forms of steel to start with – thinking about it from the structural

skeletal design of a building. Obviously, it gives us great opportunities for maximum spans with minimum depth and steel allows us to keep quite fine profiles. Secondly is the incredible durability and longevity of steel, allowing our buildings to stand the test of time, as my designs are intended to last at least a century. So, the use of steel helps with that longevity."

In fact, steel has been used in many FMD projects, such as CLT House, where the exterior timber was fully covered in roofing and cladding made from COLORBOND® steel matt in a custom-folded standing seam profile from Unlimited Roofing, in the colour Monument®, to give strength and protection against the elements. There are also new projects planned for the future.

One, a heritage house in the suburbs of Melbourne that will have a custom-folded extension made from COLORBOND® steel and another residence in a coastal region, where COLORBOND® Ultra steel has been selected for its durability, economy, ease of maintenance and adaptive versatility.

While the pandemic has brought to the fore many ideas, Life Cycle Assessment (LCA) and buying local have become paramount in process for many architects and Dunin is mindful, wherever possible, of specifying and buying products that are environmentally conscious and locally made.

Buying local also aligns with broader ideas of sustainability- however information on the provenance of materials could be improved, as Dunin comments. "I think there actually needs to be more government support in creating a standard. At the moment there's no necessity to find out what the carbon footprint and embodied energy are of a material. There are so many building

materials that you don't really know where they're from or how they're made and I think that requires government input and support, to start enforcing this."

While there's always room for improvement within general process, FMD Architects' role as architects and designers is streamlined and encompasses both yin and yang. "We oscillate between the pragmatic and the poetic on every project. We start very pragmatically."

"When we design, when we think about the brief and the arrangement of spaces, we explore the climate and the ventilation before we even consider what it's going to look like. And then we start thinking about the aesthetics. So, there is this constant oscillation between the pragmatic and the poetic and when we have a rapport with the client and an understanding of the site, the architecture starts performing the poetry."

Through visionary thinking, Dunin and her team create projects that, while best practice, also utilise materials that contribute to authentic design. Dunin shows that a ubiquitous material such as COLORBOND® steel is integral to creating outstanding projects when thinking outside the box and exploring possibilities.

TOP LEFT Coopworth sits well in the landscape with the material complementing the rural surrounds. The materials used in Coopworth echo the Australian vernacular of the homestead with all roofing and cladding made from COLORBOND® steel in LYSAGHT CUSTOM ORB® profile, in the colour Terrain®*

BOTTOM LEFT The architecture of CLT House features an Australian narrative emulating the saw tooth roofs of factory buildings





PROJECT ARTS WEST, UNIVERSITY OF MELBOURNE **LOCATION** PARKVILLE, MELBOURNE, VICTORIA

Collective Experience

ARCHITECT ARM ARCHITECTURE & ARCHITECTUS

WORDS MICKY PINKERTON

PHOTOGRAPHY JOHN GOLLINGS

There's an abundance of innovation to be found in this ground-breaking project where steel has been imaginatively used to unite a number of physical elements and conceptual ideas with striking effect.

“One of the practical considerations was that where the images lived on the façade controls the amount of daylight that you get into the spaces”

AARON POUPARD ARM

This story about Arts West, the University of Melbourne’s Faculty of Arts building, is a story about collections – we’ve got time for three, here. Let’s start with the building’s signature steel fins: four-and-a-half-thousand of them, in fact, all made from 8mm XLERPLATE® steel (250 grade) and the vast majority of them individually unique.

Each fin made from XLERPLATE® steel (250 grade) is a thing of beauty in its own right, from its shape and patina, to its strength and durability. Gather these fins together as a group and it’s an impressive amount of steel; arrange them in a curated way into the collection that you see here, and 4,500 fins transform into something else altogether. To say that these fins are greater than the sum of their parts is to reduce this achievement in materiality to cliché and gives no sense of the scale of the task. But let’s move on...

Next are the collections of objects. At the micro level, we have the University’s esteemed compendium of artefacts dating back three millennia: paintings, books, bronzes and ceramics representing the attitudes and identities of the past that are now being re-interpreted through contemporary curricula. Whereas at the macro level, this is a collection of buildings and built elements: an efficient, steel-beamed new commercial structure and two smaller existing buildings that have been consciously swathed in the sculptural façade generated by all those precisely arranged fins. These micro and macro collections of objects combine at a meta level to deliver no less than the audacity of architecture, where art meets science, and a building has become a physical representation of how ideas are forged into new learning.

And finally, there’s the collection of knowledge that made it possible. The University of Melbourne and its stakeholders wanting to recognise both a rich past

and a changing world. ARM Architecture and Architectus, helping the University to translate that vision into the built environment, ensuring that education is integral to the teaching spaces, informal spaces and even the façade.

Also Kane, Inhabit and Fabmetal, amongst many others, combining years of experience in construction and skill in working with steel to push those ideas into reality working with [builder] Kane on the buildability side, to working with [steel fabricator] Fabmetal on modifying the detailing. It is almost unnecessary to mention that this project won the Australian Institute of Architects National COLORBOND® Award for Steel Architecture. Of course it did. That it has won a dozen more awards tells you that Arts West is a project of lasting significance.

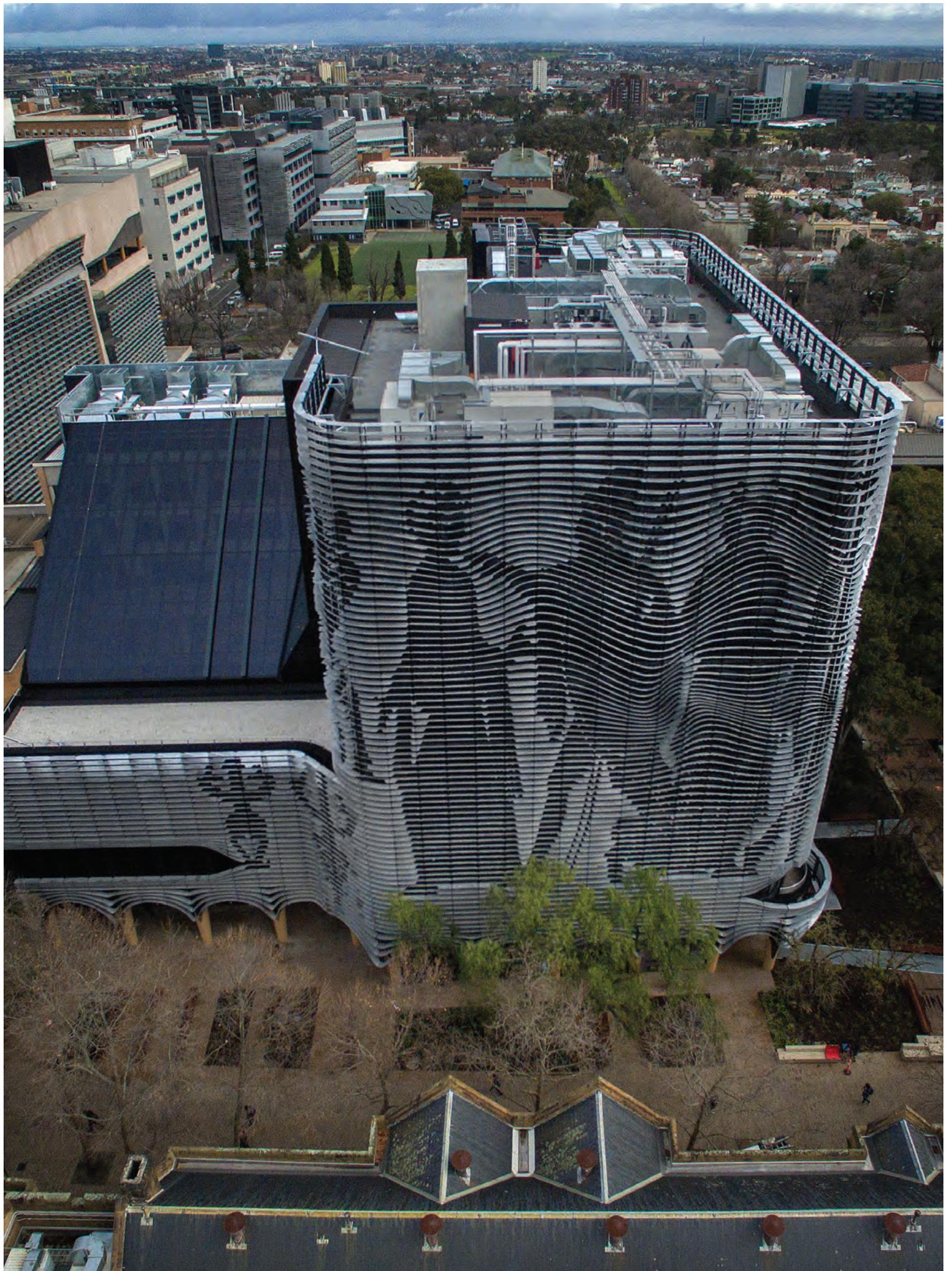
Its façade solution occupies a vital point in ARM’s oeuvre: building on the conceptual ideas explored in the William Barak building, and then being a pilot for the steel innovation taken a few steps further in the more recent Monash Chancellery project.

These collections of materials, objects and knowledge interweave and overlap in Arts West, beginning with the decision to use a double façade. “The reason we do this is it means that the inner façade can do all the things it needs to do, thermally, and just from a vision point of view, it can be cost-effective, it doesn’t have to do a whole lot of decorative things so it can be absolutely commercial,” says ARM’s founding director, Ian McDougall.

“If you make a highly specialised façade, you get two or three tenders, so by making it an absolutely standard, high-performance exterior, lots of people can tender, and you therefore get a competitive inner skin and then the outer skin can do what it needs to do.”

PREVIOUS A swirling outer façade of 4,500 steel fins made from XLERPLATE® steel (250 grade) provide shading for the inner glass façade. The 8mm steel’s fine gauge allows light in and views out

RIGHT The figures and images from the Faculty’s collection were chosen by the University for embossing on the façade on a giant scale including a 19th century bronze sculpture, an ancient Greek vase and a painting by 19th century Indigenous artist, Tommy McRae





In this case, what that outer skin needed to do was function-shading for what is essentially a large glass building, via a form that reflected the substance and contribution of the scholarship that was occurring within the Faculty of the Arts. The representative figures and images from the Faculty's collection that were chosen by the University for embossing on the façade in a giant scale included a 19th-century bronze sculpture, an ancient Greek vase and a painting by 19th-century Indigenous artist, Tommy McRae.

Steel was selected for the fins for various reasons.

"The fins, being steel, provided us with the opportunity of keeping them thin and rigid with spacing which lets in as much light as possible, but also seeing out through them," explains ARM senior associate Aaron Poupard. "One of the practical considerations was that where the images lived on the façade also controls the amount of daylight that you get into the spaces. That was really important because classrooms and direct light shouldn't ever mix."

In addition to delivering the desired shading requirements, which contributed to the building's sustainability credentials and 5-star Green Star rating, the fins made from 8mm XLERPLATE® steel (250 grade) steel were chosen for their aesthetic properties. "We could make it out of aluminium, but steel

has a more natural quality and, particularly when it's galvanised, it's got a pattern on it, like a swirl, and that is actually textural," says McDougall. "It's quite beautiful, unlike the super refinement that aluminium brings. The actual mass and texture of it is just a beautiful, visceral thing. So when you look at it from afar, or look at it on your iPhone, you see the tattoos, the embossing, and when you look at it straight up, it's completely abstract, and that's another beautiful thing that texture adds."

With the University having selected those six artefacts from its 23 cultural collections to press into the façade, it was left to the architectural team to then determine how to generate these two- and three-dimensional objects using the chosen medium of the fins made from XLERPLATE® steel (450 grade). The architects used a number of industry-standard software packages in their process but were finding the depth element challenging, until they tried displacement mapping techniques used in gaming software to create the look of three dimensions from a two-dimensional image.

Specifically, *3D Studio Max* enabled them to take the University's chosen artefact pieces and physically imprint that in a three-dimensional way. More than 60 different spatial arrangements of the artefacts were produced for the University to choose from, which, quite apart from having to be visually balanced, had to also be positioned in a

way that controlled the amount of daylight into the teaching spaces. The deeper, sculptural forms are therefore on the eastern façade – where only early, diffuse light would penetrate – while the northern façade uses large sections of less indented steel fins to limit the direct sun throughout the day. It sounds terrifically complicated, but greater challenges still lay ahead.

"The 3D model is pretty easy to get your head around, once you understand the process," says Poupard. "But then, when you start to get into the 'How do you actually build all that with accuracy so that every single thing lines up on each panel – so that they're lifted into place without breaking glass?' - There's so much precision that goes into the steel fabrication."

One-to-one models were made of some sections to be able to demonstrate to the client that there was sufficient visibility through the screens, but also to understand some of the other challenges of translating the design from theory to reality. For example, testing panels of fins made from XLERPLATE® steel (450 grade) for strength in wind tunnels and also to eliminate any harmonics produced in high wind, or understanding the possible distortions that galvanising causes to steel, and then being able to accommodate this modelling in the final design. "The process going from, essentially, detailed design drawings and concepts around the detailing,



to working with Kane on the buildability side, to working with Fabmetal on modifying the detailing so they could make it the way they want it to manufacture it – that is absolutely crucial, that triumvirate, and it was really good in the process,” says McDougall.

For Kane project manager, Paul Christian, the façade was one of the most complex components of the overall project and generating the models was key to addressing the concerns that arose. “Prototyping eked out a number of design issues, which we then fed back to the design team to maybe adjust or tweak, but it also eked out the challenges for the contractor that we then listened to and help solve, such as welding and jiggling,” says Christian.

From his perspective, the project was a ‘once-in-a-lifetime opportunity’ to see steel used in such a way. “It’s amazing to think about a piece of steel and how that translates in the process,” he says. “That façade turns the steel into an experience. I don’t know of another product with which you can achieve both those aspects; where you plasma-cut something in plan to a CAD file, and then roll it in elevation, and that’s absolutely critical to the way that it behaves and then projects the images. There’s a super sense of pride associated with that building.”

Despite the challenges associated with the project, the architects have many fond and fun memories of the wider project team

workshopping problems in the Fabmetal office, and then the huge benefit of being able to go straight to the shop floor, to look at the issues in-person and discuss solutions directly with the fabricators. It’s a working relationship with an embedded material information repository that has been drawn on and consolidated for the benefit of other projects, since.

“Obviously, we thought steel was fantastic, because we then used it in the Monash Chancellery [also with Kane and Fabmetal] and using a similar method, and so we learned a lot about the process,” says McDougall. “It’s a kind of cumulative knowledge that you gain. I mean, other architects ask us ‘How did you do that?’ And I’m thinking ‘It’s just easy’. And then I think, ‘Oh no, actually, we take years to get this knowledge’. But it’s not arcane, it’s not so specialised that people couldn’t also work out how to do such things. There is a bit of bravado in it, you have to say, a bit of courage. Courage on the part of the client, courage on the part of the contractors,” McDougall concludes.

Now filled with students and alive with learning, the courage of many has been rewarded with a building that has become a landmark for the University and beyond. Arts West celebrates the act and art of collecting in both self-evident and oblique ways, through the power of collective experience and via the masterful use of BlueScope’s steel.

“It’s amazing to think about a piece of steel and how it translates in the process. That façade turns the steel into an experience”

PAUL CHRISTIAN KANE

ABOVE From a ground level vantage point the façade reads as abstract shapes. It was assembled from ‘modules’ eight metres long by 1.5 metres wide

OPPOSITE LEFT The building re-used the ground level concrete arches of the original 1960s building, with the lower fins fabricated to echo its curves

STEEL DETAILS | A TECHNICAL DIVE INTO ARTS WEST



The teamwork and collective spirit that went into the design, fabrication and installation of the Arts West façade made from XLERPLATE® steel (450 grade) reflects one of the dictionary definitions of collaboration: ‘unity of labour’. However, it’s pretty clear that if the project group was asked to vote for a ‘player’s player’, that Fabmetal would get the gong, hands-down. “It would have been impossible to do if it weren’t for Fabmetal,” says ARM’s Poupard. “They were just fastidious, absolutely fastidious.”

Fabmetal managing director, Gordon Heald, is matter-of-fact to the point of modesty about the experience that informs the company’s high standard of work. “I’ve been doing this a long time. Nothing’s insurmountable – the metal is metal and its first principles always apply. So really, that stuff I learned when I was a kid still applies, it’s just a bit more complicated.”

‘Just a bit more complicated’ on this project involved the fabrication of fins made 8mm XLERPLATE steel (250 grade) that are both rolled and profile-cut, which meant having to address the different tensile strengths within the various fin shapes that made up the overall pattern. The fins were fabricated as raw mild steel, and each plate had a standard dimension of 400mm and a maximum indentation of 300mm.

“As you’re rolling it, you can imagine if the material is 100mm wide, and then it changes to 300mm wide, what happens is the roll is tighter, because of the yield,” explains

Heald. “If you’ve got a 300mm part, and then the tensile strength of the 300mm part is reduced to 100mm, the radius is getting tighter on the 100mm parts. So we tried to cut things either back-to-back and with little bridges in them, or leave it in a square plate with bridges in so it was 300mm wide all the way through, roll it back through and then broke out the part,” he says.

The next challenge was having to build every panel of steel fins next to its partner in the pattern, both horizontally and vertically, to ensure that they matched when finally brought together and attached to the outriggers pre-built into the inner glazed skin of the building. The panels, or modules, were six to eight metres long and 1.5 metres wide, and the façade itself was six modules by 40 modules. Assembly occurred in Fabmetal’s workshop in blocks of six or eight or modules, using a special jig devised for the process, to deliver the accuracy required.

“Fabmetal came up with a jiggling system,” says Poupard. “It’s a purpose-made linear track system with individual metal cars on bearings, with flag indicators that travelled inside the track to pre-set locations identified on the fabrication drawings.

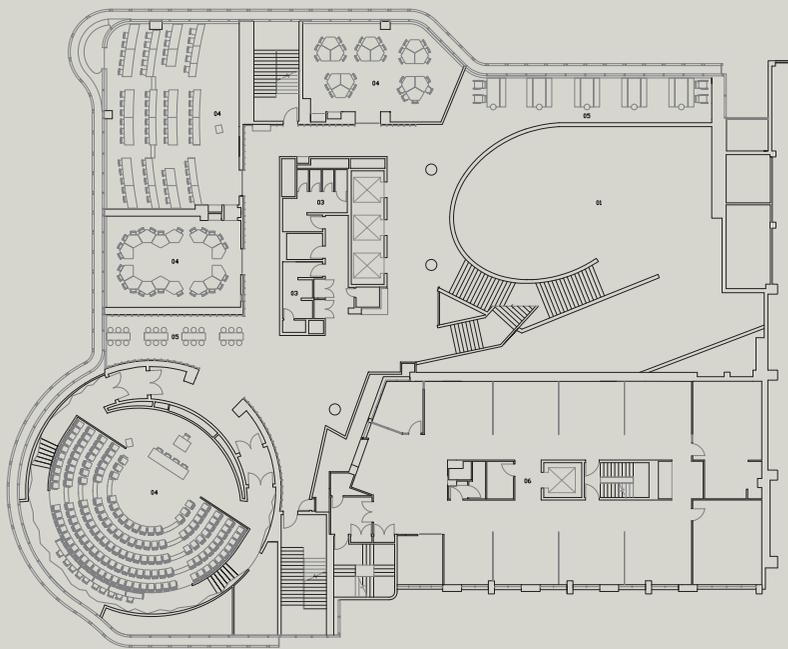
“They would move this little flag to the exact dimension that would locate where each of the fins are meant to line up. So they’d shuffle that along the car to the right spot and then, when they bring in the fin to get welded on there, that little flag would ensure

the two adjoining panels were touching, so that when they welded off each of the bits of steel, they would be in the exact location. And they did that for every single panel,” Poupard says.

Despite these challenges, Fabmetal’s Gordon Heald easily saw the advantage of steel over other materials for this project. “Steel’s easier to weld than, say, aluminium; and it’s more economical. And I think the practicality of putting a galvanised finish on it was a really good idea. It should be good for at least 50 years.”

Complexities did not end with fabrication, and included the basic logistics of storing so many modules. Heald says the galvaniser’s patience in having their yard taken over by 100-plus panels was much-valued and their overall attention to quality was ultimately acknowledged with an International Galvanising Award. In all, it was a four-month turnaround for fabrication and assembly prior to installation on-site, which Heald says still had its complications, however went relatively smoothly. He attributes this to the decades of knowledge within his own company and across the broader project team. “I’ve had a very stable workforce and I really appreciate my people and their abilities,” he says. “I think a collaborative effort is a really important thing.

ABOVE LEFT Students ascend through the naturally ventilated atrium to educational spaces which accommodate and represent the concept of object-based learning. The project has won numerous educational design awards



Principal Steel Components

Four-and-a-half-thousand individual exterior large-scale mural and sun-shading fins made from 8mm XLERPLATE® steel (250 grade)

PROJECT INFORMATION

Architect

ARM Architecture and Architectus in partnership

Project

Arts West

Client

University of Melbourne Australia

Project Cost

\$77 million

Builder

Kane Constructions

Awards

2017 Australian Institute of Architects National Architecture Awards
 COLORBOND® Award for Steel Architecture

2017 Master Builders Australia National Commercial/Industrial Construction \$50m - \$100m

Façade Steel Fabricator, cladding contractor and Shop Drawing

Contractor

Fabmetal

2017 Australian Institute of Architects, Victorian Chapter, COLORBOND® Award for Steel Architecture

2017 Master Builders Association of Victoria Excellence in Construction of Commercial Buildings \$30m - \$80m

Façade Engineer

Inhabit

2017 Australian Institute of Architects, Victorian Chapter, Educational Architecture Award

2017 International Design Academy Golden A Design Award - Interior Space and Exhibition Design Category

Landscape Architects

Oculus Landscape Architecture & Urban Design

2018 Intergalva Global Galvanizing Award

2017 Learning Environments Australasia Awards for Excellence, New Construction / New Individual Facility – Commendation

Galvanisers

Industrial Galvanizers

2017 National Australian Institute of Building, Professional Excellence Awards, National Winner

2017 Australian Interior Design Awards, Public Design, Commendation

Structural Steel Contractors

GFC Industries

2017 National Australian Institute of Buildings, Commercial Construction \$25m to \$100m

Structural Engineer

Irwinconsult

2017 Learning Environments Australasia Awards for Excellence, Overall Winner

2017 Learning Environments Australasia Awards for Excellence, An Education Initiative or a Design Solution for an Innovative Program

Project Timeframe

2014 - 2016

2017 Association for Learning Environments Excellence in Education Facilities

Building Size

10,000m²

PROJECT YAGAN SQUARE **LOCATION** PERTH, WESTERN AUSTRALIA

Cultural Narrative

ARCHITECT LYONS IN ASSOCIATION WITH IREDALE PEDERSEN HOOK AND LANDSCAPE ARCHITECTS ASPECT STUDIOS

WORDS LEANNE AMODEO

PHOTOGRAPHY PETER BENNETTS

Yagan Square is a dynamic public space in the heart of Perth that respects and represents Country through strong symbolism and a robust material palette showcasing cladding made from REDCOR® weathering steel.



“Using steel that was sourced from local suppliers was vital to the overall design and its great strength-to-weight ratio means we used less material to achieve more”

NEIL APPLETON DIRECTOR, LYONS



PREVIOUS Yagan Square's buildings embody the theme of Country through their geological forms, robust materiality and organic colour palette

ABOVE In the Market Hall, a robust palette of steel, brick and concrete adds to the project's textural grandeur

RIGHT The site's complicated levels are softened with landscaping



In terms of urban renewal and redevelopment in Australian capital cities, it doesn't get much more ambitious than Western Australia's Perth City Link. The mighty infrastructure venture is managed by the Metropolitan Redevelopment Authority (MRA) – currently Development WA after merging with LandCorp in 2019 – and reconnects the CBD and Northbridge, which were previously separated by the Fremantle railway line. Undertaken in stages and still ongoing, it includes the sinking of a small section of the Fremantle line and the demolition of Wellington Street Bus Station prior to the construction of a new underground bus station in the same location.

The CBD has essentially been extended to the north and what is a refreshed network of infrastructure has greatly improved the commute to and from. Generous allowance has been given for the creation of some exciting new public precincts too, including the still relatively new Yagan Square. At 1.1 hectares, the square is situated between the CBD and Northbridge, bounded by the refurbished Perth Central Station, heritage Horseshoe Bridge, Wellington and William Streets and the Perth Cultural Centre.

A joint architectural commission by Lyons in association with Iredale Pedersen Hook and landscape architects ASPECT Studios has given rise to an incredibly attractive public space that's interactive and accessible.

Significantly, the site sits on the land of the Whadjuk people of the Noongar nation and was traditionally a meeting place for First Nations Peoples, particularly women who gathered food from lakes that were once in the area. For the MRA and architects, expressing the convergence of Indigenous and non-Indigenous peoples and cultures was crucial, with the project's name itself paying homage to a Noongar Warrior, Yagan.

As Lyons director Neil Appleton explains, "This is one of Australia's first public spaces designed collaboratively with First Nations Peoples. Whadjuk Elders, including Dr Richard Walley OAM, a Noongar Man, contributed to the project, authorising cultural narratives to bring deep Country experiences to the design conceptualisation." The seamless integration of architecture, landscaping and public artwork in turn ensures that the Country theme is prioritised cohesively across the project.

During the development of Yagan Square's plan, the project team was faced with the constraint of building over the live rail dive tunnel that runs beneath the middle of the site. As a result, the project's three buildings are positioned towards the boundary, with the main amphitheatre, or Meeting Place, located centrally. The site's complex level changes have been cleverly reconciled via landscaping decisions that offer connections between all facets of the project, generating a topography that adds a sense of dynamism to the overall scheme. A Walking Track loop gives definition to the amphitheatre space, leading from the William Street Mall, under the overpass bridge and into the Meeting Place. It also leads to Horseshoe Bridge and the café on the roof of the Market Place that showcases small cafés along its perimeter.

Yagan Square has ultimately been articulated through a strikingly bold material palette and key to this is the use of steel that facilitates the project's narrative expression. Layers of Country are represented as a stratum of materials across the buildings' façades: granite, limestone, sandstone and the top-most band made from REDCOR® weathering steel.



“With its deep oxidised hue signifying Western Australia’s red earth, you couldn’t get a better product for referencing the identity of the state,” says Lyons principal Paul Dash. “We worked with BlueScope specialists early on in the project who showed us samples of the original weathering steel panels used in Wood Marsh’s Australian Pavilion at Shanghai Expo 2010 and they were a beautiful chocolate colour. It has its own inherent finish that becomes richer over time and so the panels’ appearance just gets better with age,” says Dash. In the case of Yagan Square, there’s the added poignancy of the BlueScope REDCOR® weathering steel having local provenance, highlighting Western Australia’s natural resources and how integral they are to its economy.

Mechanically fixing the 5mm-thick panels made from REDCOR® weathering steel to the façades wasn’t without its challenges though, especially considering there are some 2,297 square metres of them. The panels are different shapes and had to be laser-cut and formed to fit the buildings’ geologically styled configurations.

Dash recalls a suggestion during construction to use aluminium composite panel instead, to which the architects responded with a resounding ‘no’. “If we’d done that the outcome would have looked very flat. Not to mention we required the malleability

and versatility that steel affords, as well as its durability and longevity, because the client wanted something that doesn’t need replacing every five years and the REDCOR® weathering steel may still be there in 50 years’ time,” he says.

Selected to withstand harsh climatic conditions, the cladding made from REDCOR® weathering steel punctuates the project’s robust material palette. Each material also projects a strong sense of place, from the Astral Verde granite, which is widely associated with civic spaces in Perth, to the limestone, which is a building material commonly used across Western Australia and particularly in Fremantle.

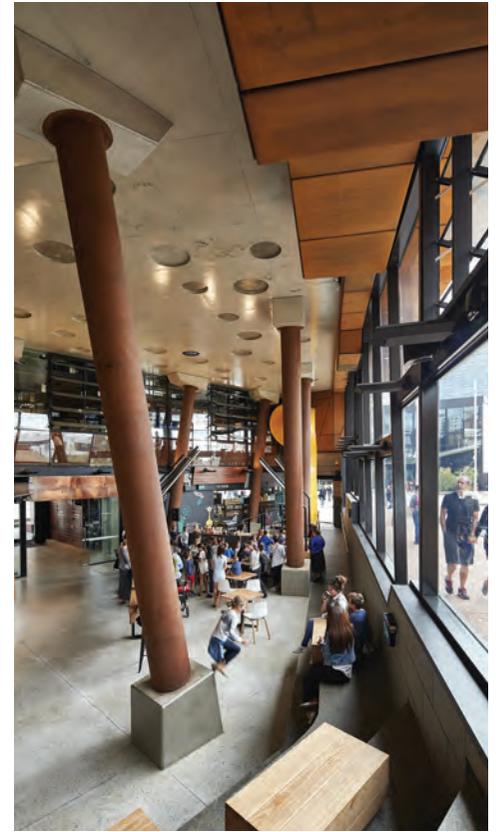
Recycled jarrah, used for the upper levels’ decking and balconies that cantilever towards the Meeting Place, softens the palette, while Pilbara Red marble creates visual interest in the smaller building’s tapered tower. This bright marble, along with the structure’s black granite cladding, symbolises the red-tailed black cockatoo and is a nod to the feather Yagan wore in his headband.

The symbolism continues with the Market Hall’s upper level, where perforated raw metal shade canopies represent the site’s original lakes.

Dark bands of cladding made from COLORBOND® steel Matt flat sheet in the colour Monument® demarcate the buildings’ material strata and while they add a strong graphic element to the design their purpose is not a purely aesthetic one. “The fact weathering steel does age is something we had to consider in the architectural design,” explains Dash. “And we were very conscious that we needed to detail the façades to control the rainwater run-off, so the weathering steel doesn’t stain any of the stonework that sits below it.” The top band made from COLORBOND® steel cleverly conceals gutters that capture the run-off, channelling it back into the stormwater system to avoid any chance of staining or marking.”

Lyons’ Neil Appleton appreciates the COLORBOND® steel Matt flat sheet’s finish because it subtly contrasts with the REDCOR® weathering steel and quarried stone materials, while at the same time providing the project’s junctions and flashings.

The roofing made from COLORBOND® steel in LYSAGHT KLIP-LOK 700 HI-STRENGTH® profile – a wide-cover concealed fixed cladding offering long spans and excellent uplift performance – and Stramit Longspan® – a profile offering excellent strength and water-carrying capacity and



weather-tightness allowing very low roof pitches – also made from COLORBOND® steel, both in the colour Monument®, offer contrast and also complemented the project's landscaping. "Steel provided the structure that allowed us to design amazing urban landscape experiences on top of the buildings," explains ASPECT Studios' director Kirsten Bauer. "It made a play space and water play area three storeys up in the middle of the city possible. You need excellent structure to achieve those types of outcomes and without steel neither of these elements would exist." Certainly, the landscaping is key to Yagan Square's success as a public space. It not only defines the programme and expresses narrative at every turn – for example, the children's play area represents rock formations of regional Western Australia – but genuinely stirs real engagement, interaction and curiosity.

The use of steel as reinforcements in concrete and as supporting structural elements also enabled the landscape architects to incorporate deep soil zones, trees and sculpted stone in the upper levels' design. BlueScope supplied the project with a whopping 335 tonnes of structure made from XLERPLATE® steel (450 grade). "Yagan Square's materials were sourced locally from the south-west of Western Australia, which reduced transportation costs and

emissions," says Lyons' Appleton. "Using steel that was sourced from local suppliers was vital to the overall design and its great strength-to-weight ratio means we used less material to achieve more." Shade canopies are supported by steel columns and the digital tower itself made from 155 tonnes of XLERPLATE® steel (450 grade) at the project's south-western entrance features 14 steel 'reeds' that represent the language groups of the Noongar Nation. This feature is a particularly eloquent manifestation of steel's capabilities, with each reed rising thin and tall into the sky, cantilevering over 25 metres above the last lateral support. The tower's verticality provides a nice counterpoint to the central elevated footbridge made from XLERPLATE® steel (450 grade) and REDCOR® weathering steel, which references the geology of the Darling Range Batholith that forms part of the Yilgran Craton.

These elements have an artistry to their form and engineering that complements Yagan Square's public artworks, providing a framework for a number of specially commissioned pieces by Australian artists. Envisioned at the beginning of the project and not as an afterthought, they address the Noongar Nation, its People, culture and traditional land, and include Tjyllyungoo – Lance Chadd's nine-metre statue, Wirin, that faces William Street, Paul Carter's seven text-

based artworks titled Passenger and Sharyn Egan's Balga plant resin wall, Liquid Fire.

The architects used steel in the form of circular columns sleeved in 32 tonnes of oxidised raw steel, echoing the aged hue of the façade's REDCOR® weathering steel. As a bustling food hall, its interior extends the exterior's geological formations with a scheme that references a cave or mine. Polished concrete flooring adds to the robustness of the material palette, as does the concrete soffit, which is rock-like in appearance. Yagan Square's welcoming accessibility and effortless flow belies the project's architectural complexity and rigour. With many of the key features not able to be realised in a material other than steel, a materiality rich in texture and colour is integral to its successful outcome. The project itself functions as a vessel through which the themes of Country are compellingly narrated and as a built precinct, it is nothing short of diverse, fun and entertaining.

OPPOSITE PAGE In the evening, the canopies become a stunning lighting display illuminating the main amphitheatre space or meeting place

ABOVE LEFT Yagan Square's robust material palette overtly showcases cladding made from REDCOR® weathering steel

ABOVE RIGHT The Market Hall's concrete columns sleeved in oxidised raw steel bring a strong verticality to the generous interior

STEEL DETAILS | A TECHNICAL DIVE INTO YAGAN SQUARE



So much of Yagan Square's success as an engaging public space comes down to its material palette. The architects carefully considered their selections in order to best represent cultural narratives and the ensuring Country theme. But while embedding the materiality with a high level of symbolism was important to the overall design, so was performance. Each material is absolutely robust and its strongly tactile finishes guarantee durability and longevity, not to mention compelling visual impact.

The cladding made from REDCOR® weathering steel is perhaps the project's most striking material, for its rich oxidised hue, which has already deepened and will continue to do so over time. Its malleability was advantageous when forming it to fit the façade's top geological projections and while installation came with a necessarily high degree of skill, the distinguished outcome could not have been achieved with any other material.

Part of working with weathering steel is factoring in its inherent aging properties and how they might affect other materials in the palette. Rainwater run-off was a factor flagged in the initial stages of Yagan Square design, as this had potential to leave marks on the stonework beneath. To avoid this, the architects incorporated concealed

folded gutters and downpipes directly below the REDCOR® weathering steel cladding to capture the rainwater run-off. The downpipes channel the run-off back into the stormwater system, leaving the exterior free of any ochre-coloured markings.

The gutters and downpipes were also covered with flat sheet made from COLORBOND® steel in the colour Monument® Matt, so they appear as a layer, or band, in the material stratum. "The REDCOR® weathering steel part of the façade also projects beyond the stone cladding below and emphasises the geological or tectonic nature of the building," says Lyons' Paul Dash. "From the perspective of the project's design narrative, the gutters represent as cracks, or fissures, in the surface."

Another two bands made from COLORBOND® steel in the colour Monument® Matt are incorporated into the façade below – one between the limestone and sandstone layers and one between the Astral Verde granite and limestone. These don't feature the concealed gutter detail, rather they assist in visually articulating the material stratum in a way that's graphic, lending a bold sense of cohesion to the façade's overall treatment.

The architects incorporated concealed folded gutters and downpipes directly below the REDCOR® weathering steel cladding to capture the rainwater run-off

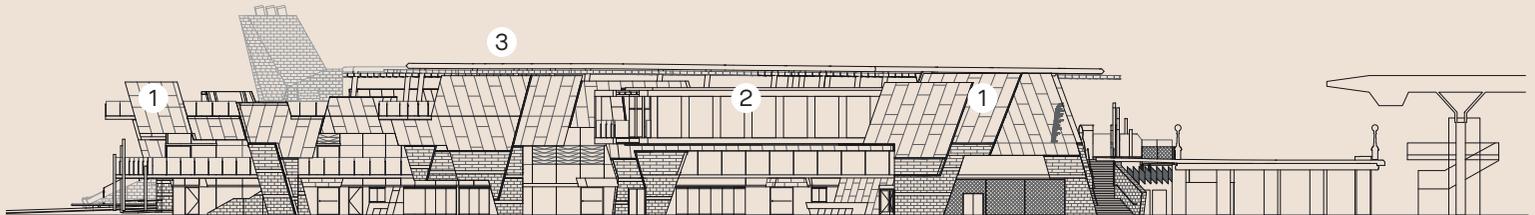
ABOVE A Walking Track loop gives definition to the amphitheatre space, leading from the William Street Mall, under the overpass bridge and into the Meeting Place

Principal Steel Components

- 1 Façade and wall cladding:
- REDCOR® weathering steel
 - Stramit Longspan® profiles, in the colour Monument®

- 2 Wall cladding, junctions and flashings:
- COLORBOND® steel flat sheet in the colour Monument® Matt

- Roof sheeting:
- 3 – COLORBOND® steel in LYSAGHT KLIPIK 700 HI STRENGTH®



PROJECT INFORMATION

Architect

Lyons in association with Iredale Pedersen Hook

Client

Metropolitan Redevelopment Authority

Project

Yagan Square, Perth, Western Australia

Project Cost

\$73.5 million

Project Team

Lyons Architecture – Neil Appleton, Corbett Lyon, Carey Lyon, Paul Dash, Alex Gibson, Caillen Hassall, Devon Osborne, Elliot Wong, Francisca Rodriguez, Grant Trewella, Michael Mel, Montgomery Balding, Nick Bourns, Sam Gardiner, William Brouwers; Iredale Pedersen Hook – Adrian Iredale, Finn Pedersen, Martyn Hook, Rebecca Angus, Tom See Hoo, Jason Lenard, Charles Dewanto, Jordan Blagaich, Khairani Khalifah, Joel Fuller, Nikki Ross, Mary McAree; Aspect Studios – Kirsten Bauer, Warwick Savvas, Marti Fooks, Joey Hays, Dermot Egan, Christian Riquelme

Contractor/Builder

Doric

Steel Fabricator

Fremantle Steel

Structural & Civil Engineer

Aurecon

Project Timeframe

30 months

Landscape Architects

ASPECT Studios

Building Size

19,000m²

Awards

The National Colorbond® Award for steel architecture™

Australian Institute of Architects – Western Australia Chapter; Commendation for Public Architecture

Australian Institute of Architects – Western Australia Chapter; The COLORBOND® Steel Award for Steel Architecture

WE-EF After Dark People's Choice Award – Regional Winner (WA/SA)

Australian Institute of Landscape Architects; WA Landscape Architecture Award

Australian Institute of Landscape Architects; The John Septimus Roe Award

West Australian Award for Urban Design; Winner Steel Clad Structures – National Steel Excellence Awards

Australian Steel Institute; Winner Steel Clad Structures – Western Australia Steel Excellence Awards

Australian Steel Institute; President's Award, Urban Development Institute of Australia (UDIA) National Awards; Urban Renewal

Urban Development Institute of Australia (UDIA) National Awards; Government Design Award Silver (Architecture, Public Realm)

Good Design Awards; Architectural Urban Winner, Good Design Awards; National Tourism Award of Excellence

Australian Institute of Landscape Architects; National Civic Landscape Architecture Award

Australian Institute of Landscape Architects; National Award for Urban Design.

IN PROFILE

Sobi Slingsby

WORDS JAN HENDERSON

PHOTOGRAPHY ALEJO DE ACHAVAL

As a young architect in the making, Sobi Slingsby has already been recognised by BlueScope and the Australian Institute of Architects for her work. This rising star is building a name for herself in the architecture and design community, climbing the industry ladder at record speed.





With a love of design and a growing understanding, Slingsby is well on the way to reaching her potential and uncovering her architectural motif

It seems that Sobi Slingsby was always destined to become an architect. For someone who admits to being indecisive, becoming an architect was one thing Slingsby definitely knew she wanted.

With parents who are both potters, form and the handmade were intrinsic to everyday life. And then there was also an uncle who happened to be an architect. Not to mention a childhood fascination with space planning through a game played with her sister, imagining where people might sleep and eat in the rocky outcrops of the beaches in the mid-north coast of New South Wales.

From childhood aspirations to the present day, Slingsby has indeed followed her passion and in 2021 completed her NSW ARB accreditation. There has been quite a journey in between that has helped mould and define her in the exploration and meaning of architecture and design.

Studying architecture at Griffith University was a pathway for her fledgling career and a supportive relationship with her tutor, Dr Henry Skates, provided guidance that helped shape her architectural thoughts. Concurrently, in the last two years of her course, she was working with architect Rob Norman, director at Symbiosphere,

LEFT Portrait Sobi Slingsby. Image by Alejo de Achaval

ABOVE: An overview of the project created by Sobi Slingsby that was awarded the BlueScope Glenn Murcutt Student Prize from the Australian Institute of Architects in 2019. Image by Sobi Slingsby

Slingsby's master's thesis on elevated tent typologies is a response to the rising sea level at the southernmost tip of the Great Barrier Reef

on a project on Lady Elliot Island in the Great Barrier Reef. This project further developed Slingsby's interest in the environment and she was able to see first-hand the changing climate as she mapped the island using a cloud port scanner supplied by the University.

Able to consider nature and weather patterns, she developed a project for her master's thesis: a design of elevated tent typologies, in a response to the anticipated impact of climate change and sea-level rise on a coral cay at the southernmost tip of the Great Barrier Reef.

Not only has the study for her thesis provided definitive information on changing weather patterns, her proposal was unanimously voted the best submission by the judges who awarded the prestigious BlueScope Glenn Murcutt Student Prize from the Australian Institute of Architects (AIA) in 2019.

Through her exploratory design of land-based and over-water architectural shelters, Slingsby further created her conversation about climate change through

an architectural response and also claimed a much-lauded accolade.

"Winning the Glenn Murcutt award was pretty amazing. It's an incredible honour. In my position as a student, it was very special," says Slingsby.

Upon graduation, Slingsby joined the esteemed practice, Peter Stutchbury Architecture, placing her in the very centre of the vibrant Sydney architecture community, working at an exemplar practice where every day was, and still is, an incredibly valuable learning experience.

Peter Stutchbury is a fine mentor and through his work has achieved countless awards and a stellar reputation. In the past, houses such as Invisible House have stretched the boundaries of design through the use of steel and it is apparent this is still the case today.

One residence near the coast that Slingsby is working on in the studio will have a roof made from SUPERDURA® Stainless steel in LYSAGHT CUSTOM ORB® profile, that will set the scene for beauty, durability and longevity.

"I've seen some really impressive things come together with steel in the office and following them being designed is remarkable," she says. "Steel can simplify the construction of a design in a way which is quite lovely, it doesn't have to be a consumptive build because, as a material, steel brings flexibility."

Spending time at Peter Stutchbury Architecture has also opened ways of learning. "There's a huge focus on and importance of passing on information, educating and sharing knowledge, which is a fantastic way to work," says Slingsby. Alongside respect, the practice is immersed in the ethos and values of sustainability.

This of course also relates to materials made by BlueScope. As Slingsby comments: "I think this discussion around durability and recyclability is very important".

"I know Peter Stutchbury and the studio have been doing this for a really long time, and it's good to see such principles integrated, and more broadly accepted."



Also, the idea of buying local is fundamental in Slingsby's mind. "The idea of us being in Australia, this big island, it was easy to not question where something came from before the pandemic. But now, you start to question; 'Where does it actually come from? What's in it, that means I can't get it made here? So, I think the idea that people have slowed down because they're not travelling all the time allows time to question the origins of their purchase, especially in construction," she says.

"And also, I think working with more durable, flexible and lightweight materials such as steel is good. As I'm sitting here, looking at a steel frame balustrade at the office, it has the ability to be recycled and reconfigured."

For this advancing architect, working at a pedigreed architecture studio – gaining knowledge of design, process and materiality – is helping to form an exceptional practitioner.

"I've always admired the lovely big sheds that you see in the country and I think there's something beautiful about

the simplicity of using material such as COLORBOND® steel," she says. I think it can be a very Australian aesthetic and growing up in an old house where you can hear the rain on the roof, is such a wonderful timeless memory" she reflects.

Memories are powerful; they can inform future actions.

With a love of design and a growing understanding of steel in her sights, Slingsby is well on the way to reaching her potential and uncovering her architectural motif.

This is a star on the rise and a bright light to follow, however it seems almost that for Sobi Slingsby, the future has already arrived.

ABOVE LEFT Through her exploratory design of land-based and over-water architectural shelters, Slingsby created her conversation about climate change through an architectural response



PROJECT CHRISTOPHER CASSANITI BRIDGE **LOCATION** MACQUARIE PARK, NEW SOUTH WALES

Sky Line

ARCHITECT KI STUDIO
WORDS LEANNE AMODEO
PHOTOGRAPHY LANDCOM

In the Christopher Cassaniti Bridge, engineering and architecture come together to produce a striking double-helix structure fabricated from XLERPLATE® steel (250 grade).

The diversity of pedestrian bridges across Australia reveals an infrastructural typology where design innovation reigns. Engineering considerations are always foremost to ensure safety and accessibility, but there's so much scope for aesthetics. It's little wonder the end result often divides public opinion and gets people talking.

From the sweeping curve of the Adelaide Riverbank Pedestrian Bridge to the colourful explosion that is the Koolangka Bridge (The Kids' Bridge) in Perth, there's no shortage of new statement-making pedestrian bridges enlivening the urban landscape.

Add to this list the recently completed Christopher Cassaniti Bridge in Sydney's Macquarie Park and expectations for what can be achieved design-wise have been elevated. Initially known as the Lachlan Line Bridge, the 170-metre structure was formally renamed to honour a young apprentice formworker who died on a nearby unrelated construction site. The Christopher Cassaniti Bridge is Australia's first double-helix bridge and provides the connection between the residential Lachlan Line's development to North Ryde Metro Station, spanning the M2 Motorway and Delhi Road without interruption to traffic. The project involved a close collaboration between engineer Arup, architect KI Studio, contractor Arenco Daracon Joint Venture (ADJV) and fabricator S&L Steel.

In regards to the aim of client Landcom (the New South Wales Government's land and property development agency), their brief was straightforward. As developer of the ambitious Lachlan Line urban regeneration project, which includes a proposed 2,700 new homes for 5,000 residents, they needed an efficient piece of infrastructure that would allow pedestrians and cyclists safe access across to the train station. However, the brief's simplicity belied the bridge's extreme complexity. Not only did it have to span two roads, there was also limited available space for the entry points and piers.

The bridge's overall geometry was initially driven by an engineering assessment that involved a parametric study to find the shortest possible bridge length. So the

ensuing design was conceived and led by Arup, in conjunction with KI Studio.

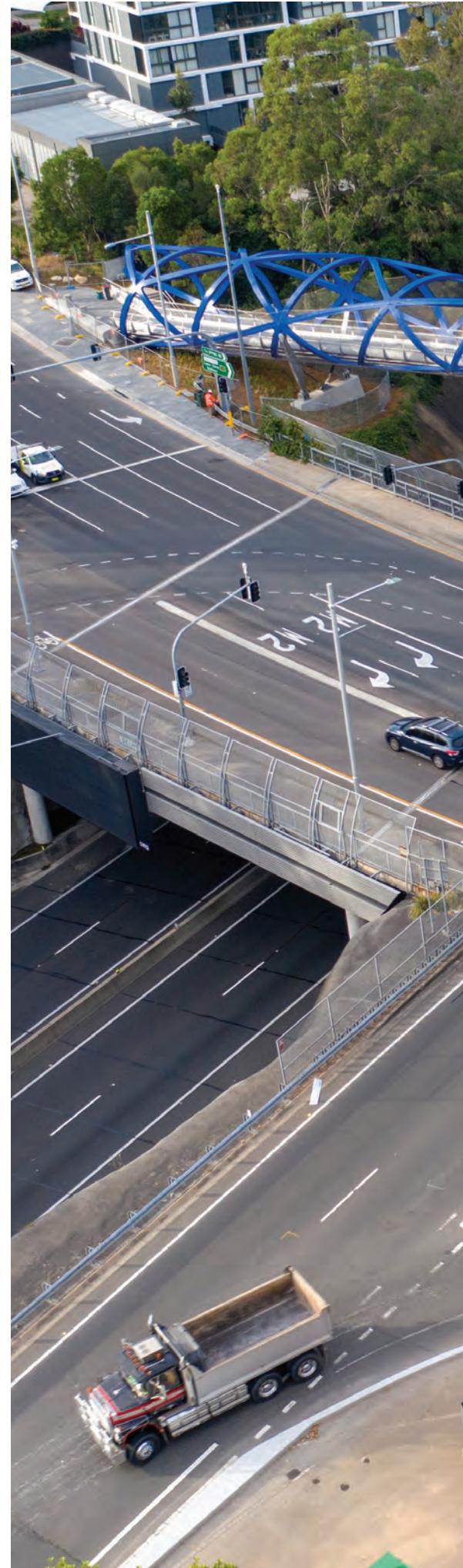
As Arup structural engineer, Xavier Nuttall, explains: "We wrote our own computer code that found the alignment of the bridge, and once we set that alignment we could work out the minimum feasible length and pier locations, given the surrounding topography, the levels of the land and how high the bridge needed to be," Nuttall says. Indeed, Arup captured the design process in an entirely digital workflow connected by computational code, which allowed for greater efficiency. When something in the design changed, for example, the software would automatically update all other aspects of the design accordingly.

With the line on the map drawn, so to speak, the engineers then had to determine what the right type of structure would be to support this type of bridge. "And that's when the idea of an enlarged tube-like or tubular structure came into play," says Nuttall.

"Because of the alignment's curves, there's a lot of tension in it and a tubular-type structure is very good at resisting tension." The resulting double-helix form is not purely about aesthetics, then, although its sinuous curves, which are finished in an electric blue paint colour, do eloquently snake across Delhi Road and the M2 Motorway to dramatically striking effect. Rather, the helix structure is a response to the types of forces at play in the bridge's alignment.

With regards to its construction material, the only viable option was mild (low carbon)¹ steel, in this case BlueScope XLERPLATE® steel (250 grade). Put simply, the design could not have been achieved using any other material because the bridge needed to reach spans of up to 72 metres between piers and this requires a very light material, as anything heavier could not be accommodated. Steel is easily manipulated from a fabrication perspective, too, and this was important to achieve the different necessary-forced capacities.

1. The terms 'low carbon' and 'medium carbon' steel refer to the carbon content of the metal alloy and not to the carbon dioxide (CO₂) emissions associated with the product.







“We really did want to create a sculpture in the landscape... And the bridge itself combines form, texture, colour and motion, making the end users’ journey all the more engaging and unique”

MIGUEL WUSTEMANN DIRECTOR, KI STUDIO

Hollow box sections were used, instead of the traditional circular section, in order to enable each side of the section to be optimised with different plate thickness in response to structural demand. “If you can imagine a typical concrete beam has the same shape all the way along the span. Well, that’s not the case here,” says Nuttall.

“The XLERPLATE® steel (250 grade) mild steel plate thickness could be adjusted at any point on the bridge to make full use of the material’s properties and that was the main reason we used it,” he says. This makes for a sustainable outcome because no steel plate is any thicker than it needs to be – the box sections range in thickness from 8mm to 32mm – thus eradicating excess consumption, minimising steel tonnage and reducing embodied energy of the structure.

Arup also required a construction material they knew would perform well. The engineers had very strict deflection criteria in terms of how they defined the geometry of the bridge through an understanding of how much it would sag under its own weight. Bridges that are 70 metres long (some 100 metres shorter than the Christopher Cassaniti Bridge) can move anywhere up to 200mm due just to their own weight. It was therefore paramount the engineers were confident in the way the material behaved, so that the 5.5-metre vehicle clearance envelope would not be encroached upon. A tight 50mm tolerance was built into the design and the steel has behaved exactly as they predicted, achieving the necessary clearance to the road.

Over 3,600 steel plates were used to form the 335-tonne double-helix and each one is unique. They were initially laser-cut, then rolled into a particular shape and finally welded together to create the twisted, curved box sections. This resulted in 260 beams of different shapes and thicknesses that were in turn welded together at the connections to create the double-helix. It was a challenging undertaking successfully accomplished by S&L Steel, who fabricated the structure in their workshop at Glendenning, approximately 50 kilometres west of the bridge’s site. S&L Steel also assembled the helixes off-site, before dismantling and transporting to site

in four separate spans. This was no mean feat, and Arup developed and designed transportation, and lifting assemblies for each segment so as to not overstress the permanent elements. One of the spans was 70 metres long and weighed 130 tonnes. It was lifted in one piece using a 500-tonne crawler-crane from Delhi Road, which had to be closed for the lifting.

The installed double-helix measures 7.8 metres in diameter at its widest and 5.5 metres at its smallest. It comprises the bulk of the bridge structure in its entirety and so the rest of the material palette is relatively pared back. Stainless steel was used for the deck in a decision driven entirely by practical requirements.

“Stainless steel doesn’t need regular maintenance and so we used it in areas that are difficult to access and inspect,” says Nuttall. “Of course, anywhere that needs regular access has been constructed from BlueScope mild steel.” The piers and foundations are concrete, as are pavers which punctuate sections of footpath at the bridge’s entry points.

Much consideration was given to the Christopher Cassaniti Bridge’s surrounds and both the engineers and architects were mindful to emphasise a connection with the natural environment, specifically a reserve south-west of the structure.

The bridge very much unfolds into its entry points where thoughtfully configured landscaping prioritises accessibility. These schemes are light, bright and thoroughly modern and also serve to embed the bridge in its broader context.

As architect and city and regional planner and KI Studio director, Miguel Wustemann, explains, “We really did want to create a sculpture in the landscape. The helix’s fluid form gives the structure a sculptural quality both from within and from the outside. And the bridge itself combines form, texture, colour and ‘motion’, making the end-users’ journey all the more engaging and unique, while delivering a memorable landmark.”

This sense of connectivity is implicit when walking or cycling on the bridge, too. At no point is there a dark spot and at all times there’s good visibility. While this was driven

by a safety requirement that ensures clear sight-lines for cyclists, it also maximises the bridge’s experiential qualities. Pedestrians can feel secure making the journey from one side to the other and, because of the structure’s openness, they have a visual connection to the sky, which helps to keep their eyes off the road below.

The helix structure’s electric blue finish also works to reiterate this sky connection, however Nuttall admits the colour choice was not intentional from the very beginning. “I’d chosen the colour blue in our digital model as a way of differentiating it from all the other elements,” he says. “The columns were pink and so it wasn’t about reflecting the structure’s actual colour. But the architects thought it worked really well and when we presented a few colour schemes to the client, everyone agreed on the blue.” The lighter colour means the bridge doesn’t heat up too much, whereas a darker colour would have made it get very hot, causing the bridge to expand and contract a lot more.

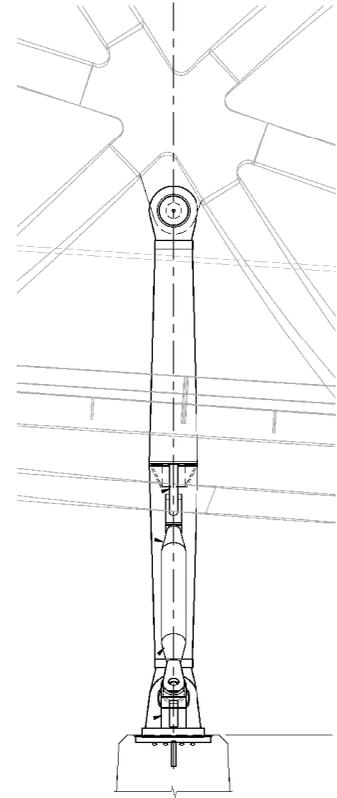
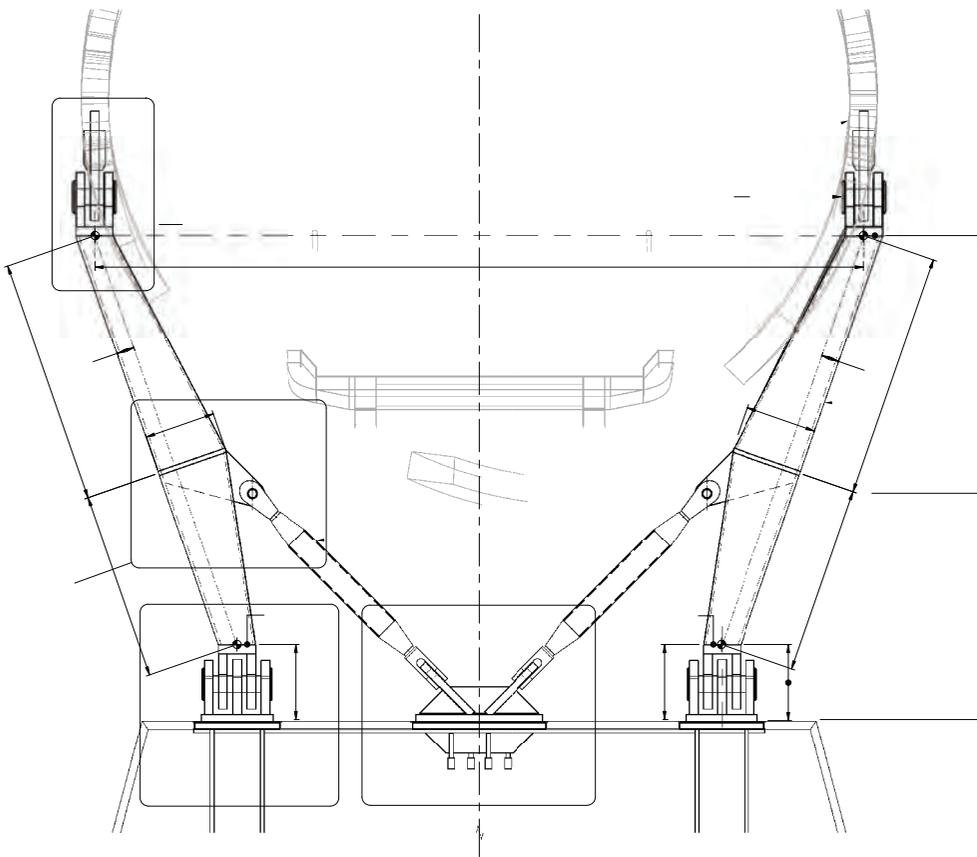
Thorough peer and independent reviews by different engineering companies and contractors ensured the structure’s design was correct from every conceivable angle. This guaranteed a smooth construction process with no unforeseen dramas and when it came to the official opening, the local community couldn’t wait to see it.

Nuttall was in attendance and recalls the overwhelmingly positive feedback. “I remember one of the first people to cross the bridge had been watching it being constructed for a year and they were so excited to walk across it,” he says. “Since then, it’s also received industry recognition with multiple national and international awards.” It’s a hugely successful piece of infrastructure that will stand the test of time, bolstered as it is by a robust BlueScope steel structure that’s as aesthetically pleasing as it is high-performing.

PREVIOUS It was also necessary to produce a 3D model of the over 3600 steel plates in order to assist the fabricator, S&L Steel”

LEFT Lighting illuminates the bridge at nighttime for easy and safe access

STEEL DETAILS | A TECHNICAL DIVE INTO THE CHRISTOPHER CASSANITI BRIDGE



Principal Steel Components

BlueScope XLERPLATE® steel
(250 grade mild steel)

The Christopher Cassaniti Bridge is one of Arup's first projects to use an entirely digital workflow, so the engineers didn't produce drawings. Rather, everything was communicated in a 3D model. While this digital approach initially allowed the engineers to determine the shortest alignment for the bridge, it also let them innovate during the design process, with changes updating in a matter of minutes instead of weeks.

As Arup's Xavier Nuttall explains: "We could change the shape of the helix and the orientation of the diagonals within it to best suit the demands of the structure.

So where we would see higher forces within the structure, which is near the piers, we could use our digital tools to make it bigger and then shrink it where the forces were lower. It meant we could use less steel for a more sustainable outcome."

Overall, this digital workflow produced greater efficiency, as it created architectural surfaces, defined the set-out and centre-line geometry for analysis and fabrication, and built and analysed a series of models, amongst other functions.

It also updated *Revit* documentation and saved *BIM* models that contained all the BlueScope mild steel data.

When it came to the bridge's verification, a point-cloud-scan was used, which was then compared to Arup's digital model. This involved generating a contour map depicting where the point-cloud indicated the structure was, and compared it to where Arup had predicted it should be.

Each of the points were colour-coded, making it easy to identify in real-time if the structure's positioning was accurate.

It was also necessary to produce a 3D model of the over 3,600 steel plates in

order to assist the fabricator, S&L Steel. So Arup developed a software that analysed 164 unique doubly-curved node surfaces and identified their individual best-fit equivalent cylinder.

This in turn generated the simple roll radiuses and roll directions, which allowed the fabricator to unroll the geometry and laser-cut the shapes from the BlueScope mild steel plate.

Arup's digital approach to geometry, engineering and design sets a new benchmark for future infrastructure works across the country, especially pedestrian and cyclist bridges such as this close space.

It also highlights the positive confluence of engineering and architecture in giving rise to an impressive structure that owes as much to one skill set as it does the other for its intricate, striking form.

RIGHT In opening the form up to the sky and green surrounds, the bridge is thoughtfully integrated with its natural environment



PROJECT INFORMATION

Architect

KI Studio

Client

Landcom

Project Team

Arup, KI Studio, Landcom, Arenco
Daracon Joint Venture (ADJV)

Landscape Architects

KI Studio

Contractor/Builder

Daracon Group and Arenco

Project

Christopher Cassaniti Bridge,
Macquarie Park, New South Wales

Project Cost

\$40 million

Steel Fabricator

S&L Steel

Structural & Civil Engineer

Arup

Project Timeframe

6.5 years (concept to completion)

Project Size

170 metres

Awards

ASI National Steel Excellence
Awards – Engineering Projects 2020

ASI Steel Excellence Awards NSW
Division – Engineering Projects 2020

Master Builders Association NSW
Excellence in Construction Awards –
Best Use of Steel 2020

Master Builders Australia National Excellence in
Building & Construction Awards – National Civil
Infrastructure Award over \$25m 2020

Master Builders Association NSW
Excellence in Construction Awards –
Open Price Category 2020

Good Design Australia Good Design
Awards – Architectural Urban 2020,
Good Design Australia Good Design
Awards – Engineering 2020

STEEL PROFILE

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