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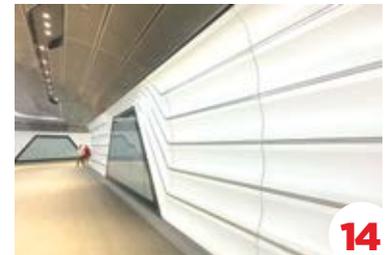
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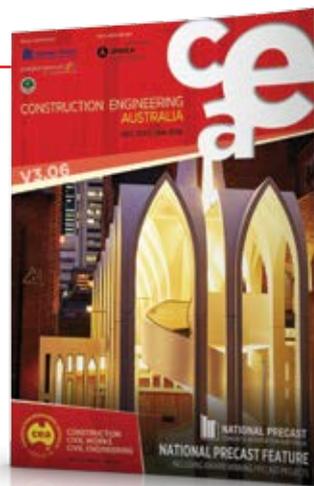
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About the Cover

Having recently won the prestigious award at the biennial Concrete Institute of Australia's *Awards for Excellence* - the coveted *Kevin Kavanagh Trophy* - as well as the prize for its Commercial Buildings category as an outstanding contribution to the quality of concrete in Australia, the striking \$4.8 million Song School project is a magnificent example of architectural precast concrete.

With its striking white precast concrete façade, two tuning fork spires and lancet-inspired arches, the Song School development is also music for the eyes.

► Turn to Page 10 for the full story.



The first requirement of Public Transport ...somewhere to park all the cars!

Dear Readers,

Even though each of the Australian capital cities like to espouse their individuality and lifestyle benefits, as one who is fortunate enough to traverse our beautiful country on a regular basis, I can confirm that there is one thing that they now sadly all have in common - traffic congestion.

Whilst we could probably argue the levels of congestion on a comparative case-by-case basis, these degrees of measure and severity are largely a moot point. The more obvious point is that whatever the city, it is clear that a large percentage of the road network infrastructure is now choking under strain of demand, and it is costing us a fortune - both as individuals and as a nation.

The inability of our transport networks to cope with demand is costing billions of dollars in lost productivity, fuels, operating costs and negative environmental impacts. And this is not a problem which is going away...

Increasing populations, a growing economy and the associated increased demand for freight will only make things worse for our already overstretched transport infrastructure - and I'm not only referring to the road network. In most cities, the public transport networks are also massively overstretched and sadly inadequate in terms of meeting the needs of our growing population and rapidly expanding cities.

That said, I believe that as a nation, one of our most critical future transport imperatives is to get people out of individual vehicles and onto public transport - even if it's only for a portion of the journey.

Unfortunately, from the current state of affairs, it would appear that one of the hurdles to achieving this goal (and there are several), is the lack of parking availability for commuters.

In short, if our aim is to get vehicles off the roads, we need to provide commuters with somewhere to park them. And before I invoke the wrath of any public transport 'idealists' who might consider that previous sentence as a personal invitation to send me an email informing me that "...in an ideal world, individuals would not possess 'planet killing' automobiles" (what me, facetious?), I will take this opportunity to point out that in the 'real world' immediate and easy accessibility to public transport without the assistance of a private vehicle for the first/last kilometre(s) of the journey is, for the majority of the population, never going to happen.

So, with that in mind, the only realistic option currently available is to provide suitable, secure parking for commuters.

Sadly, in the majority of cities (and for the majority of public transport networks) the parking that is available is sadly lacking - both in terms of the number of spaces, security and in some instances, permitted parking durations. Yes, I must admit, I found it more than a little surprising to drive into

a railway commuter car park in suburban Melbourne only to find that the parking duration was a maximum of 5 hours. And that was at a station where the average train trip into the CBD is over 45 minutes!

Sadly, the result of this lack of parking availability was that I ended up driving into the CBD rather than taking public transport.

Better Roads (a well-designed, expanded and improved road network) WILL reduce congestion and increase efficiency and productivity. Better Public Transport WILL reduce congestion, lower emissions and remove commuters from the road network.

These are both facts that are supported by hard evidence from across Australia and around the world. Be that as it may, I don't believe that we can sacrifice one mode of transportation for the other.

We need an efficient public transport network that attracts commuters. However, in reality, the size and expanding nature of our cities, together with people's work and travel habits, and issues such as 'door-to-door' transport requirements, mean that for many people, public transport is simply not an option without commuter parking.

Without parking, they will have no choice other than to use a private vehicle for the entire journey.



Anthony T Schmidt
Managing Editor



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LIVING GREEN STAR: GOOD FOR PEOPLE, PLANET AND THE PURSE-STRINGS

A new website, *Living Green Star*, is set to guide the growing number of home buyers on the hunt for sustainable apartments, communities and retirement living villages.

The *Green Building Council of Australia* (GBCA) launched the new online resource at a series of member evenings during late November. According to the GBCA's Chief Executive Officer, Romilly Madew, the website responds to growing consumer demand for sustainable apartments, communities and even retirement living developments.

"The number of residential developments with the Green Star tick of approval has tripled in the last three years, and we now have more than 100 around Australia," says Ms Madew.

"Increasingly, people of all ages want to live in homes that are good for their health and wellbeing, and good for the environment."

"The statistics point to a growing trend. More than 42,000 Australians are already living in Green Star-certified apartments, and a massive 420,000 people are moving into communities with Green Star ratings," Ms Madew explains.

"Even more Australians want to understand the benefits of sustainable homes, and the choices available to them, but they don't know where to start. Living Green Star is that first port of call."

The website explores the human stories of the people who live in Green Star homes and communities, and shares tips and trends on living sustainably.

"If you are thinking about downsizing or upsizing, on the hunt for your first home or wanting to expand with your growing family, Living Green Star is packed full of real world stories of people living in

sustainable homes and communities, and the benefits they've gained," Ms Madew explains.

"Our homes are responsible for half of all building emissions – and we know that Green Star-rated buildings can have an enormous positive impact on that, as they generate just a third of the emissions of non-rated buildings."

"But sustainable living isn't just about carbon. It's about health, wellbeing, affordability and liveability. We want Australian home buyers to understand why sustainable living is better for people, planet and the purse strings."

Visit: www.livinggreenstar.org.au and connect on Instagram (@livinggreenstar), Facebook (search Living Green Star) and twitter (@LivingGreenStar) to get tips on living smarter, more sustainably and affordably.

ABOUT THE GREEN BUILDING COUNCIL OF AUSTRALIA

The Green Building Council of Australia (GBCA) is committed to developing buildings, cities and communities that are healthy, liveable, productive, resilient and sustainable.

Established in 2002, the GBCA is the nation's authority on sustainable buildings, communities and cities. The GBCA's vision is to create healthy, resilient and positive places for people and the natural environment; and its purpose is to lead the sustainable transformation of Australia's built environment.

The GBCA educates industry and government practitioners and decision-makers, promotes green building programs, technologies, design practices and operations, and advocates policies and programs that supports its vision.

The GBCA also rates the sustainability of buildings and communities through Australia's only national, voluntary, holistic rating system – Green Star.

Visit: www.gbca.org.au

ACOUSTICS PROFESSION SLAMS THE NATIONAL CONSTRUCTION CODE

The *Association of Australasian Acoustical Consultants* (AAAC) is calling for the impact sound insulation requirement of the National Construction Code (NCC) Part F5.4 to be changed. Currently it allows owners of apartments to install hard flooring that causes unliveable conditions for residents of apartment blocks.



As property developers increasingly opt for fashionable hard floors such as timber, polished concrete, and tiles, impact generated sounds heard by residents are so harmful that the AAAC has seen people suffering from emotional trauma and overwhelming legal fees as a result. AAAC Treasurer Richard Haydon says the NCC needs to change and also states that Australian Building Codes Board (ABCB) has overlooked their pleas for over a decade.

"We're seeing more and more owners corporations having to engage in costly litigation to deal with complaints and disagreements as occupants report unbearable noise levels."

"Apartment occupants are entitled to peaceful enjoyment of their space. Instead, their stress levels increase and neighbour relations are strained, as poorly insulated hard flooring is installed, which would otherwise be acceptable, based on ever increasing reliance on the NCC standard.

"The AAAC does not consider the floor impact isolation standard required by the NCC to be adequate to protect the acoustic amenity of apartment occupants."

Peter Knowland of acoustics firm, PKA Acoustic Consulting, has filed a submission to change the standards based on AAAC's Guideline for Apartment and Townhouse Acoustic Rating.

"The guidelines should be changed from $L_{n,w} \leq 62$ to $L_{n,w} 50$ or less, which results in 12dB of additional insulation and more akin to residents' expectation of acoustic comfort. That's all we're asking.

"The Australian Building Codes Board has enacted many wise acoustical measures in the last decade, including sound transfer through walls. We believe that a revaluation of the impact criterion will have a dramatic improvement on people's quality of life."



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MAXIWALL® LAUNCHES NATIONWIDE IN AUSTRALIA

Big River Group has launched its MaxiWall® product - a new, cost-competitive Autoclaved Aerated Concrete (AAC) - nationwide in Australia. The national launch follows Big River Group's acquisition of Adelaide Timber & Building Supplies (ATBS) earlier this year, and has ensured the product is available in every region. Previously, the MaxiWall brand was only available in South Australia.

ATBS is a specialised local timber and lightweight building products supplier that has enjoyed substantial growth and success with the MaxiWall brand over several years, primarily in the multi-residential and detached dwelling market. An entire MaxiWall exterior could be completed in a fraction of the time compared to rendered brick or block.

Jim Bindon, Managing Director of Big River Industries, says the cost-effective AAC heralds more masonry choice for builders and consumers, "The popularity of AAC in Australia has grown significantly since its introduction here 25 years ago and all market indicators suggest that this strong growth will continue."

"MaxiWall is a product of the future, and supported by Big River's national distribution network including 11 outlets, we predict it will take a leading position in the Australian AAC market in the next three years," he added.

In Europe AAC has a long history of development, having been in use for more than 70 years. The applications for MaxiWall include Low-Rise External and Party Wall applications as well as Hi-Rise External and Internal Wall Systems. The use of MaxiWall panels leads to faster construction times and decreased site costs, as their light weight makes them safer to work with and easier to install, including cutting, shaving and shaping.

Bindon says it offers a more comfortable home living experience due to superior fire protection, insulation, and soundproofing qualities.

"With four times greater thermal resistance than standard house bricks, the amount of energy required to heat



or cool is greatly reduced, and provides savings to homeowners. MaxiWall also has excellent acoustic insulation - up to seven decibels greater per surface area than other solid building materials of the same weight. This is particularly important in multi-residential housing as well as semi-detached and terraced houses where sound proofing is critical."

With an external render finish, MaxiWall is not affected by the harsh Australian climatic conditions. It is fire resistant and classified as a 100 per cent non-combustible building material. It is resistant to fire up to 1,200°C and achieves a two hour fire rating when installed with approved systems.

MaxiWall is also a pollutant free building material, sourced from world class production facilities using German technology and automated processes to ensure every MaxiWall panel is of optimum quality and consistency. By using reduced raw materials it helps reduce around 30 per cent of environmental waste compared to traditional concrete and 50 per cent of greenhouse gas emissions.

MaxiWall is fully compliant with current Australian Standards and has Australian Codemark Certification.

The registered brand is wholly owned and exclusively distributed in Australia by Big River Group. The company is so committed to driving the growth of MaxiWall in Australia there is a dedicated technical hotline to assist with out of hours support.

For more information, please visit: www.bigrivergroup.com.au



CIMIC RECOGNISED AS A LEADER IN CORPORATE SUSTAINABILITY

CIMIC Group's commitment to sustainability has again been recognised through inclusion in the Dow Jones Sustainability Indices (DJSI) Australia Index, the only construction and engineering company to receive the acknowledgment. Inclusion in the Index, which has a focus on economic, environmental and social factors, is granted to companies that lead their industries in corporate sustainability.

Globally, the Group was one of only 10 engineering and construction companies recognised as an industry leader in sustainability.

CIMIC Group Chief Executive Officer Adolfo Valderas said: "Our focus on sustainability helps support the Group's long-term interests. It helps develop client loyalty and facilitates the winning of new or repeat work; it improves efficiency and reduces waste, thereby lowering our costs; and it helps us to attract, retain and motivate employees."

CIMIC Group has been recognised by DJSI with inclusion in the Australian Index for the past five years.

The Group was also recently included in the FTSE Russell FTSE4Good Index, which measures the performance of companies demonstrating strong environmental, social and governance practices based.

To find out more, visit www.cimic.com.au

ABOUT CIMIC

CIMIC Group Limited is one of the world's leading international contractors and the world's largest contract miner. CIMIC Group has operations that have been in existence since 1899, was listed on the Australian Securities Exchange in 1962 and has its head office in Sydney, Australia. CIMIC provides construction, mining, mineral processing, engineering, concessions, and operation and maintenance services to the infrastructure, resources and property markets. It operates in more than 20 countries throughout the Asia Pacific, the Middle East, North and South America and Sub-Saharan Africa and, as at 30 June 2017, employed approximately 52,300 people directly and through its investments.



RENOVATIONS SET TO BE AUSTRALIA'S NEXT CONSTRUCTION BOOM

The latest *Housing Industry Association* report predicts that home renovations will become an increasingly important aspect of the residential building industry in the coming years. The report indicates that 2016 became the strongest year since the end of WWII for new home building commencements, however this trend may be set to decline over the next few years.

Victorian training institution, *Builders Academy Australia*, which was announced as a finalist for *Victorian Small Training Provider of the Year* is delivering training to students resulting in the skills required for a range of Building and Construction roles including how to complete a high quality residential renovation.

Andrew Shea, CEO of Builders Academy, believes training for residential renovation is important for any young builder learning their trade.

"We're excited to hear about the HIA's prediction on home renovations," he says, "Builders Academy is always reviewing the

way it trains student to ensure that delivery reflects the trends of the industry and required future workforce skills."

Renovations already account for around one third of the Australian residential building industry, and the HIA report predicts this number to increase over the next few years.

By the end of this decade renovations could possibly represent 42 per cent of all building industry activity. With the increase in construction of semidetached homes in between 1985 and 1995 it is predicted that these homes will soon become the target for refurbishment.

This, along with extraordinarily low interest rates and large home equity windfalls in Melbourne and Sydney, it is believed that the demand for renovations is set to steadily increase.

Mr Shea says that the increase in demand for renovations is exciting news for the Victorian construction industry and that Builders Academy looks forward to continuing delivering training that meets this industry demand.

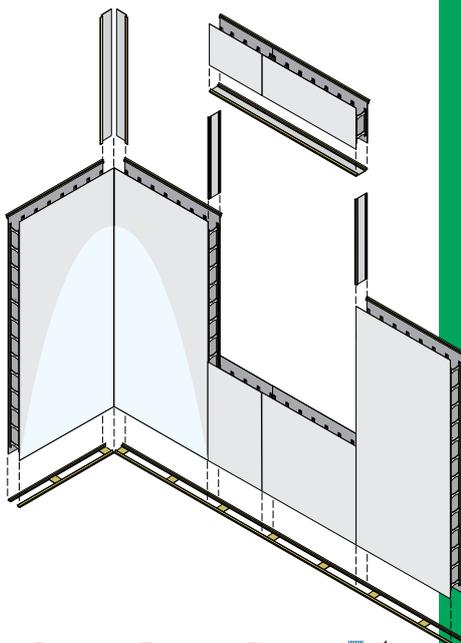
"We're always excited to provide training that we know aligns with current and future industry needs."

"Looking back on the awesome job you've done renovating a home is one of the most rewarding aspects of being in the construction industry.

"We here at Builders Academy are happy to train our students on the necessary skills of providing high quality home renovations."

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combines with the programmatic elements to deliver an exceptional and enriching setting for teaching and research."

Head of School and Dean and Law Professor Sarah Derrington said the awards were a credit to the teams involved and the impact their work has made to transforming teaching and learning for the next generation of legal leaders.

"These prestigious awards acknowledge the success of our partnership with BVN and their in-depth understanding of the law school, the legal profession and our desired outcomes for contemporary teaching and research spaces, partnered with an impeccable attention to detail," Professor Derrington said.

"The building has never been busier, with our staff and students making the most of the building's interactive research spaces, break-out rooms, independent study areas and innovative learning, research and academic facilities."

BVN principal architect Brian Donovan said it was rewarding to see this significant project recognised at the national level.

"The Awards juries have endorsed the University and the School of Law's strategy to adaptively reimagine this historic Queensland building as a memorable, contemporary and globally influential Law School. Implicit in this strategy is the commitment to the capacity for architecture to provide both an identity and a place that benefits the broader community."

"The awards are also an opportunity to engage in a public conversation about architecture and hopefully provide an insight into qualities that good design brings to the built environment," Brian Donovan said.

The UQ Forgan Smith building refurbishment project also won the educational architecture and interior architecture categories at the Queensland State Architecture Awards in June, and has been shortlisted for the *INSIDE World Interior of the Year Awards* in the health and education category.



NATIONAL RECOGNITION FOR UQ LAW SCHOOL REFURBISHMENT

The team behind the transformative refurbishment of The University of Queensland's iconic Forgan Smith building has been recognised at the *Australian Institute of Architects' National Awards* during November.

National architecture firm BVN received the national awards for educational architecture and interior architecture for reimagining and refurbishing the heritage-listed UQ Forgan Smith building, which is home to the TC Beirne School of Law and Walter Harrison Library.

The judging panel noted that the project team went to great lengths to ensure every detail of their design reflected the traditions and substance of the legal profession while creating a state-of-the-art and collaborative space for teaching and research.

The design was also informed by the three legal pillars of knowledge, learning and inquiry, with each pillar visually represented throughout the building by particular colours and details.

The result according to the jury is, "...the remarkable quality of finishes and furniture enhances the sequential spatial order and

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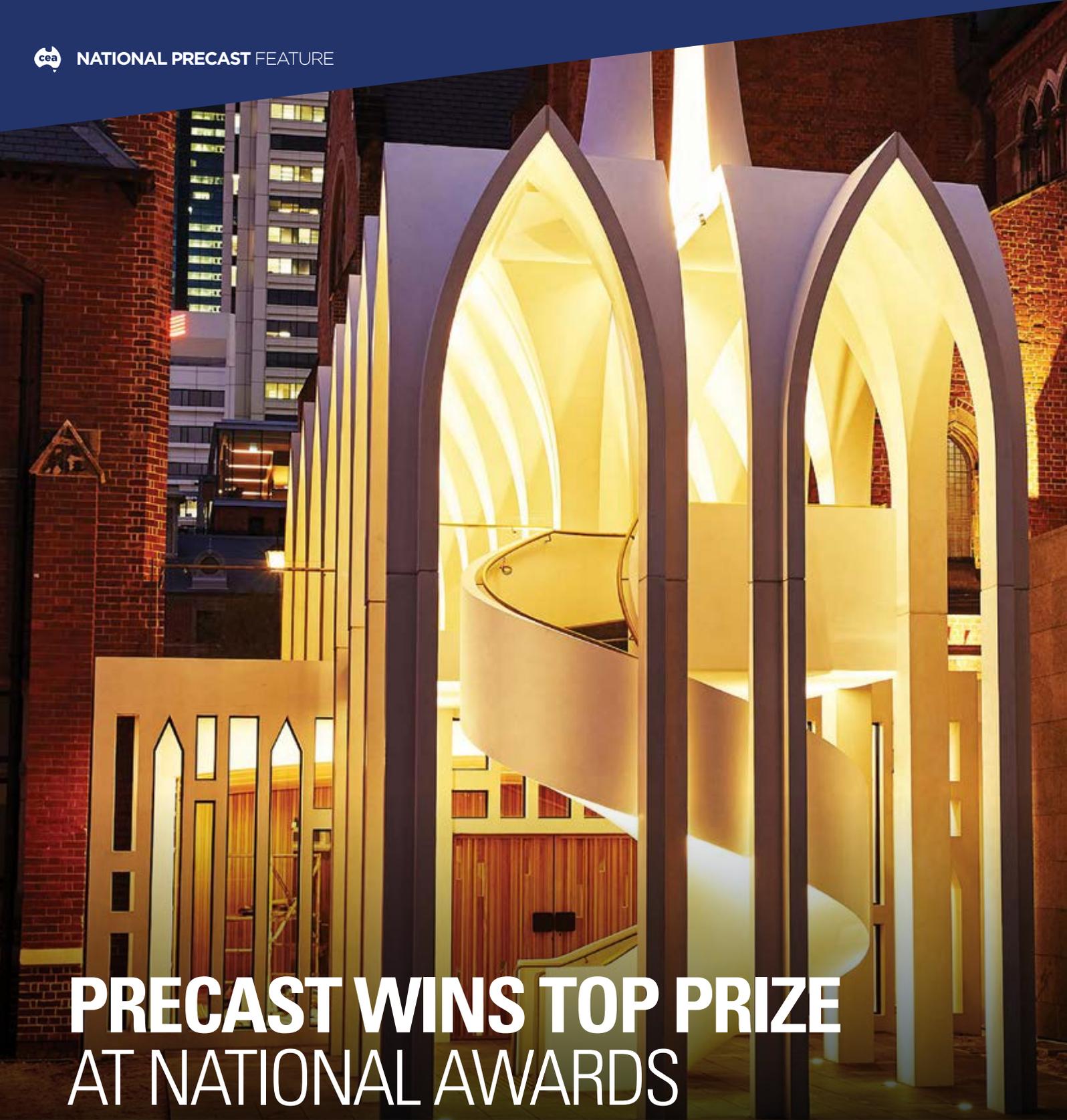
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PRECAST WINS TOP PRIZE AT NATIONAL AWARDS

PROJECT: SONG SCHOOL

PRECASTER: SA PRECAST

ARCHITECT: PALASSIS ARCHITECTS

ERECTION ENGINEER: J WOODSIDE CONSULTING

BUILDER: PACT CONSTRUCTION

Perth's internationally-renowned St George's Cathedral choirs have a new home that is befitting of their eminent reputation.

Set between the heritage Burt Memorial Hall, the 1888 Cathedral and the 1859 Deanery, the Cathedral's new Song School is a stunning two-storey precast concrete structure designed by Palassis Architects that isn't just a treat for the ears.

Having recently won the prestigious award at the biennial Concrete Institute of Australia's Awards for Excellence – the coveted Kevin Kavanagh Trophy – as well as the prize for

its Commercial Buildings category as an outstanding contribution to the quality of concrete in Australia, the striking \$4.8 million development is also music for the eyes.

The Song School has a striking white precast concrete façade. The building's two tuning fork spires and lancet-inspired arches mimic the Cathedral's existing lancet windows and preserve the view of the revered Ascalon sculpture in the forecourt. Partly-subterranean, it has a minimal footprint and maximises existing sightlines.

According to National Precast's Chief Executive Officer Sarah Bachmann, winning the awards is a remarkable achievement for Australia's precast concrete industry.

"The Song School project is a magnificent example of the architectural precast we produce in this country and it is befitting that two of our members, SA Precast and J Woodside Consulting have been recognised for their involvement," she states.

ARCHITECTURAL VISION HINGES ON PRECAST

Palassis Architects have been providing expert heritage and architectural design services to the Anglican Diocese since 2007 and the design and documentation for the new Song School is the latest development in their repertoire. As the latest stage within the Cathedral Precinct's Master Plan, the unique brief for the design demanded that the new structure seamlessly fused with its surrounding 140-year-old architecture.

To achieve this architectural vision, Adelaide-based company SA Precast was contracted to manufacture a diverse collection of white precast concrete elements for the project. These included curved beams for the rehearsal room, two precast concrete spires, three lattice feature wall panels, the first storey supporting columns for the second storey shells and the shells for the second storey that form the colonnade. The elements featured a lightly textured off-form finish.

"The finish of this project is simply stunning. The array of white elements creates an almost ethereal landscape and showcases the ability of prefabricated architectural precast to achieve what is a splendid vision that has been imagined by the architect," Ms Bachmann reveals.



CHALLENGES INSPIRE SOLUTIONS

Like any project of such complexity, there were challenges along the way. Where the precast was concerned, the challenges spread across the design, manufacture, transportation and erection of the elements.

Claude Pincin, Managing Director of SA Precast explains.

"For the vaulted units, to achieve the required concrete cover and allow for transportation across the Nullarbor Plains to Perth, the initial 70mm design was amended to a thicker 135mm thickness with revised connections and 10mm reinforcement.

"Special formwork was made in Melbourne using computer-generated profiles."

In order for the spires to be erected and fixed in position before lining and levelling, a semicircular base plate was cast into the slab beneath the spires with bolts and starter-bars.

As well, the restriction of the tight inner-city site posed a challenge for the installation process. This meant that all precast concrete units had to be lifted approximately 60 metres from the truck to be placed in their final position.

As part of the erection design, J Woodside Consulting designed special purpose-made lifting frames for the vaulted units and spires. Principal John Woodside was involved in the temporary bracing and erection of the precast units, and says it was an intricate process.

"This involved designing special lifting frames that allowed the units to hang vertically during erection," he explains.

AWARD-WINNING RESULTS

Ms Bachmann believes the award-winning outcome of the Song School is a testament to the quality of precast concrete that her organisation's members produce.

"Specialty Architectural Precast – known as SA Precast – is one of our oldest members and one of Australia's leading architectural precasters. We are delighted they have won these awards as recognition of their outstanding achievement for the Song School project," she says.

Not only has the Song School enriched Perth's CBD with a beautiful and contemporary structure, but it also showcases precast concrete's ability to create high quality and complex construction.

"There is no doubt the aesthetic beauty of this project is a vision to behold. It has certainly pushed the boundaries of precast concrete and is a testament to what off-site prefabrication can achieve," Ms Bachmann says.



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BUILDER: PARVOY CONSTRUCTIONS

ARCHITECT: PHIL O'DONNELL ARCHITECTS

ENGINEER: VALAIRE AND ASSOCIATES

The specification of offsite manufactured building products in construction is on the rise, with companies growing wise to the advantages of moving the building process off site and into a controlled factory environment. This has certainly been the case for PGAH Constructions—a company who opted for a total precast solution for their new industrial development.

When complete, a new development on Cawarra Road in Caringbah, NSW, will house industrial warehousing, office and carparking spaces. When embarking on the project, the focus was on ensuring expansive column-free spaces and a flooring system that will carry loads of up to 15 kPa.

To achieve this brief, precast concrete floor slabs, walls, columns and beams became the favoured option and National Precast member Alpha Precast, was awarded the contract to manufacture all of these elements. The precaster supplied and erected 49 columns, 39 beams and 2,790m² of V-Slab flooring—a total precast value of \$2,210,000.

A PRACTICAL PRECAST TOPOGRAPHY

The building consists of four levels with suspended floors for carparking spaces and two office levels, as well as warehouse spaces accessible from one street front. The lower level warehouse has

a high ceiling and mezzanine office, accessible from a second street front. A height difference of more than 4 metres is present between the two access roads and the warehouse space has been arranged as a multi-story design—meaning that a practical use of the site topography was required.

Alpha Precast's General Manager, Daniel Nassar, advises that the precast proposition offered a range of benefits that insitu methods could not. Onsite labour, supervision, the need for amenities, waste removal, site clutter and material deliveries were all either considerably reduced or totally removed.

"Using precast prestressed beams and flooring gave greater spans, enabling a reduced number of columns," he details.

"Using conventional insitu concrete would have required a lot of formwork to cater for the 7 meter clearance between the lower ground floor and the main warehouse floor, and a lot of propping would be required to allow trucks to safely access this floor. We eliminated all the insitu formwork and this enabled a large cost reduction of formwork and propping to those heights."

SPEEDY CONSTRUCTION WITH V-SLAB SYSTEM

The flooring system that was used for the project was Alpha Precast's V-Slab system—a product that achieved a structurally integrated floor with a smooth surface finish.

The system was chosen for the Cawarra Road development because it is able to span long distances under construction loading, without the need for propping—meaning that as soon as a slab is erected, it serves as an instant working platform. As well, it eliminates the need for falsework.

Mr Nassar reveals the client chose the system because it offers a highly efficient method of constructing a suspended floor.

"We were able to bring the construction time down considerably because the beams and



columns were prestressed in the factory and we didn't have the usual waiting times before we could access the floor," he explains.

Columns can be installed above the floor, on the day after the floor is topped, and most importantly, the floor below—which is clear of propping and formwork—is ready to for immediate fitout.

"In conventional construction we would have to wait several weeks before fitout could take place. We were able to keep the project rolling over, taking advantage of the fact that the panels, beams and transfer elements were made off site," Mr Nassar adds.

SUPERIOR FINISH

Not only did the precast flooring system achieve cantilevered floors and faster construction times, but it also provided a higher quality of finish.

"This particular system offers a much superior finish to insitu flooring because the elements are cast on steel beds," Mr Nassar says.

"The steel beds give a Class 2, off form finish all round. Minimal formwork joints are required due to the wide slabs and because of the very consistent and minimal deflections of the prestressing system, the finish is much more visually attractive, especially when looking along the soffit."



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THE AWARD-WINNING WYNYARD WALK

A major pedestrian walkway now connects Sydney's Wynyard Station to the bustling Barangaroo waterfront precinct and the CBD. Having recently won the NSW State Award for Infrastructure Projects at the Concrete Institute of Australia's Awards for Excellence, the new Wynyard Walk is a stunning example of precast concrete in Australian infrastructure.

Barangaroo's waterfront development alone attracts up to 33,000 visitors and occupies approximately 23,000 office workers daily. The new 180-metre walkway allows pedestrians to travel from the station to the waterfront in just six minutes, making it a vital part of the NSW Government's commitment to meet transport demands in Sydney.

Adealide-based National Precast member, Asurco Contracting, manufactured precast glass reinforced concrete (GRC) panels for the walls and ceiling of the tunnel. That process involved the framing, mould-making, manufacture, installation and coating of the elements.

Owner of Asurco Contracting, Des Pawelski, says that although the curvature of the tunnel posed challenges, the end result is magnificent.

"The GRC panels feature beautiful stainless-steel strips and are coated in anti-graffiti paint," he explains.

"The panels twist and curve with the bends of the tunnel. It was a really challenging job but the

architects did a brilliant job and the end result is stunning."

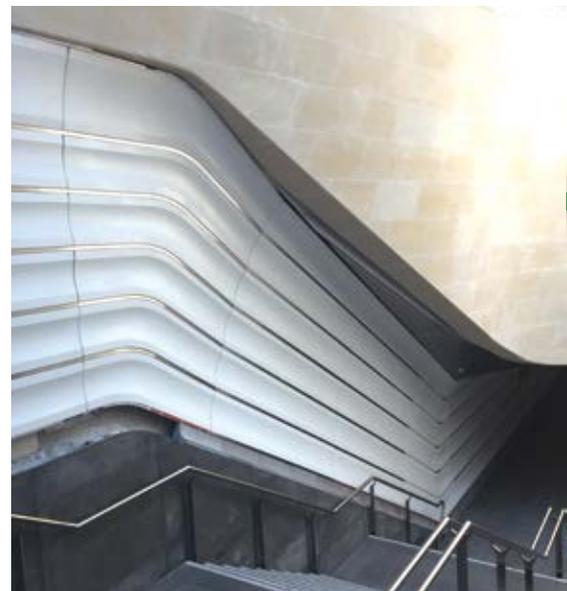
GRC cladding panels are manufactured using a cement-based composite material with alkali-resistant fibres which are dispersed throughout the product and serve as reinforcement. Because the fibres add flexural, tensile and impact strength, the result is a strong yet lightweight architectural material.

National Precast's Chief Executive Officer, Sarah Bachmann, says the use of GRC for Wynyard Walk allowed for exciting aesthetic possibilities.

"Each GRC project is unique in both scope and application and demonstrates the flexibility of the product for custom-made impressive patterns like this one," she explains.

Ms Bachmann says the project winning its category in the Awards for Excellence makes a statement about the local state of play of precast concrete and GRC in particular. The awards celebrate the outstanding achievements in concrete design, construction and materials in Australia.

"Another precast project, the Song School, won its category award as well as the big award – the coveted Kevin Cavanagh award. Wynyard Walk winning this award category as well really says something about what can be achieved with precast."



Precast concrete provides a range of advantages over cast-on-site (insitu) concrete, and Ms Bachmann says Wynyard Walk is merely one example of this.

"Precast has such versatility when it comes to realising an architect's vision. Any shape, colour and texture can be achieved. With finishes that cannot be matched by insitu concrete, and other properties that position precast streets ahead of competing building products, precast is one to be reckoned with" she details.



anything is possible with

GRC



What is GRC?

Glass Reinforced Concrete, otherwise known as GRC, is factory-made precast concrete which uses glass fibres as reinforcement, instead of steel reinforcement that is used in conventional precast.

Why use GRC?

GRC is known for its light weight, strength, durability, fire safety, sustainability fast erection times and excellent acoustic properties. It is an incredibly versatile product that can be moulded into any shape, with any pattern or colour.

Where is GRC used?

GRC has been around in Australia for 40 years and has been used in a wide range of applications such as building facades, arches, tunnels, pits, monuments, sound barriers, planters and furniture.

For more information on GRC or to discuss your next GRC project, please contact: Asurco Contracting

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PRECASTER MEMBER

CONCRETE PRODUCTS AUSTRALIA

From initially specialising in tramway sleepers to now offering an array of civil, building, and landscaping products, Concrete Products Australia (CPA) is a company on the rise. Located in Proserpine on Queensland's central coast, CPA is a manufacturer of quality engineered precast and prestressed concrete products.

Bought by business power couple in 2015, Peter and Katrina Faust, CPA has become an integral business in Queensland's construction space. Their central location allows them to service a widespread area—from nearby regional zones to metropolitan centres. Supplying nationally, but mainly to Queensland-based projects, CPA services the civil, government, mining, public and private sectors, and the agricultural and building industries.

A ONE-STOP-SHOP

Committed to maintaining invaluable working relationships with both their clients and staff, CPA strives to consistently provide a strong level of service and premium products. With all products manufactured to a high standard with the utmost precision, Mr and Mrs Faust endeavour to only use the highest quality materials.

From culverts, headwalls, and ramps to troughs, car stops and lane separators, CPA is a one-stop-shop. The sugar mill tramway sleepers manufactured at CPA's factory have been servicing Queensland's sugar milling industry since 1996, and this service is still going strong.

WELFARE OF EMPLOYEES ESSENTIAL

CPA places special emphasis on the welfare

of their employees, and Mrs Faust, believes that holding training workshops and encouraging staff input is an invaluable aspect of the business.

"Watching our team learn, progress and thrive has been a highlight for me personally," she reveals.

"Establishing that relationship and mutual respect between employer and employee means that our staff feel more valued, better qualified and happy to give back to the company."

Mrs Faust is directly involved with the training and inner-workings of CPA's quality management.

"Continual improvement of quality management is important for success in our industry," she states.

"I love seeing personal development in our staff."



The Bracing Experts



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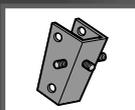
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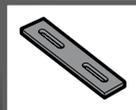
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community, particularly within the business,” Mrs Faust explains.

“It has other benefits too. We can cover a wide area of Queensland, which is a positive for us.

“As well, being a business in the rural area that places emphasis on the welfare and training of our employees, means that we have reliable staff.”

CPA prides itself on its strong and reliable service. Major importance is attached to its competitiveness based on consistent quality of product, which has traditionally led to customer satisfaction and repeated business.

SUSTAINABILITY AT THE HEART OF OPERATIONS

Precast concrete manufacturing naturally has intrinsic sustainability benefits, and CPA takes environmental sustainability, specifically, to the next level by striving to reduce their carbon footprint and employ sustainable work practices.

“We are committed to respecting our environment and conserving its resources, and strive for continual improvement in the area of environmental sustainability,” Mrs Faust details.

This focus on environmental sustainability

has seen CPA install solar panels. This dedication to managing and minimising their environmental impacts has resulted in the company reducing their CO₂ emissions by more than 15 tonnes each year - an outcome that is equivalent to planting 75 trees annually.

CHALLENGES AND REWARDS

With their country location comes challenges and benefits alike.

“We’re not in the city, we’re country based. I find the benefit of this is the great sense of

WHAT THE FUTURE HOLDS

As a young company on the rise, CPA endeavours to continue to meet customer and employee satisfaction.

“We’re happy with the direction we’ve been taking, and we’d like to do more of the same,” Mrs Faust reveals.

“Improving our products, developing our product range and evolving the business further are at the heart of our future goals.”



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VITAL LINK CONNECTING SYDNEY'S RADIALS

PROJECT: SCHOFIELDS ROAD
UPGRADE AND EXTENSION – STAGE 3

PRECASTER: HANSON PRECAST

CLIENT: NSW ROADS AND MARITIME
SERVICES

BUILDER: BMD CONSTRUCTION

ENGINEER: HYDER CONSULTING

National Precast member Hanson Precast is supplying prefabricated concrete elements which are integral to Stage 3 of the Schofields Road upgrade and extension in Western Sydney.

When the Schofields Road upgrade and extension is complete, it will form a tree lined transit boulevard linking the Rouse Hill and Marsden Park town centres. Aiming to help meet the future transport needs of the North-West Priority Land Release Area, the project is set to connect pedestrians, cyclists, public transport and vehicles with the surrounding urban land use.

Stage 3, the final phase, is an upgrade of the 2.5km extension of Schofields Road between Veron Road and Richmond Road. Expected to be completed by mid-2018, it includes extending Schofields Road from Veron Road, across Eastern Creek, to Carnarvon Road and widening the South Street alignment.

FLOODPLAIN DEMANDS A PRECAST SOLUTION

The Schofields Road upgrade involves the construction of twin bridges over Eastern Creek (422 metres long) and Bells Creek (175 metres long).

Hanson Precast's Estimating Manager, Richard Lorenzin, says the project's flood-prone area meant that precast concrete was the exemplary option.

"The existing single-lane road was in a floodplain that needed to be elevated to create a four-lane flood-free access across Eastern Creek and Bells Creek," he explains.

Given the required number and complexity of the precast elements, the client needed to award the project's precast package to a company that had the ideal expertise, precision, and manufacturing capabilities—qualities that Hanson Precast undoubtedly exhibits.

1,071 prefabricated concrete bridge planks and 560 bridge parapets were manufactured for the project. The bridge planks are 17.5 metres and 7.95 metres long, and they form a critical approach to the twin bridges.

DELIVERY RUNS LIKE CLOCKWORK

Despite the precast elements only needing to be transported from Riverstone (a local suburb not far from the site) the delivery of such a large volume of units posed a potential challenge.

Hanson Precast's Logistic Manager, Will Dean, comments, "the co-ordination of deliveries was a critical challenge, with 25 extendable semi-trailer delivery vehicles usually required for each normal delivery day".

"On a couple of the delivery days the site required 34 loads in 8 hours, which demanded that the whole exercise of loading, driving to site, unloading and returning to the factory for reloading run like clockwork—and it ultimately did!"

With the precast planks weighing between 15-18 tonnes, the units were transported on an extendable trailer, one at a time.

CAPABILITIES FOR THE FUTURE

Hanson Precast has recently upgraded their prestressing casting facility, which Mr Lorenzin says perfectly positions the company to supply to such high-volume projects. The timely design, installation and commissioning of the upgrade was critical to the project's success and ultimately satisfied all of the Roads and Maritime Services' requirements.

"The doubling of manufacturing capacity has now given Hanson Precast the capability to provide similar projects in the future," he details.



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Building:

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Precaster:

CPC Precast Panels

Architect:

i2C Design, Melbourne,
Australia

Solution:

Graphic Concrete

A birch tree forest inscribed on the 8 metre high exterior walls of Coles Drysdale, in Geelong, dwarfs shoppers on their amble along the pedestrian walkway that verges the building.

The handiwork of Australian architectural firm i2C Design, the project used Graphic Concrete to translate a simple visual idea into a permanent large-scale design feature, without adding concrete or weight to precast panels.

When Zachary Marshall, construction architect at i2C Design, first heard about Graphic Concrete, he liked the idea of inscribing a permanent graphic solution onto the precast concrete walls of new supermarket, Coles Drysdale.



“When I looked at Graphic Concrete, I thought: can I cast image detail into a 150mm thick pre-cast panel? I could. It’s not scary technology,” said Marshall.



Graphic Concrete eliminated paint – and the inevitability of it peeling off. And when Marshall took a closer look at Graphic Concrete’s inscription process, he imagined a certain visual ‘pop’ rising from the contrast between the panel’s smooth face and exposed aggregate surface.

He was right. And even though a silicon-based sealant used to protect the birch tree inscription from graffiti blunted the contrast slightly, he says the visual detail on the panels brings a rich dimension to the ‘tree’ aesthetic of the building and pedestrian-scape. At the outset, Marshall’s appraisal of Graphic Concrete’s system answered questions about panel weight and integrity.

Historically, inscribing large images and patterns onto concrete panels has been difficult and expensive, with form liners and moulds adding concrete

and weight to precast panels. Graphic Concrete’s combination of pattern membrane and retarder solves the problem, imprinting detailed artwork in the top 1-2 mm of the panel surface.

“When I looked at Graphic Concrete, I thought: can I cast image detail into a 150 mm thick pre-cast panel? I could. It’s not scary technology,” said Marshall. “There are no worries about integrity, because the process only affects the first 1-2 mm of exposed concrete – you’re not affecting the structural integrity of the panel.”

While Graphic Concrete added expense to panel manufacture, Marshall said Coles, like most clients, liked the cost-benefit. “Longer term there’s no need to repaint every five years; we’ve got something on permanent display; and it can’t be altered,” said Marshall.

Pass or fail?

Marshall’s a fan of Graphic Concrete. “It has added interest to the building along a wall that would have been quite featureless, otherwise. The walkway has additional amenity for users of the space,” said Marshall. “Graphic Concrete is an easy sell once the development team realises that it doesn’t affect the integrity or weight of the panel, and when the client understands the cost-benefit of a permanent solution over paint and maintenance costs. It’s a recommendation from us.”

For more information:

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SUSTAINABLE INNOVATION

AWARD-WINNING RECYCLED FIBRE REINFORCEMENT GOES FROM STRENGTH-TO-STRENGTH

The innovative *Emesh* range of 100% recycled plastic fibres for concrete have been recognised with the Concrete Institute of Australia Queensland Award for Sustainability & Environment - a category developed specifically to recognise advances in the environmentally sustainable use of concrete.

Developed in Australia by concrete fibre specialists Fibercon, *Emesh* fibres have also previously won the prestigious Shell and The Australian Department of Industry, Innovation & Science Innovation Challenge Award – Construction Category; whilst in 2016, the man behind *Emesh*, Fibercon Director Mark Combe, was named by Engineers Australia as one of the 60 Most Innovative Engineers in Australia.

Manufactured using 100% recycled industrial waste, *Emesh* Macro polypropylene fibres are added to concrete during the mixing stage to provide internal reinforcement – offering an environmentally friendly alternative to shrinkage steel mesh and/or non-recycled plastic fibres.

As well as helping to speed construction by eliminating the need to cut and place shrinkage steel mesh, comprehensive life cycle assessment shows the production of recycled plastic fibre produces 90% less CO₂(e) emissions and eutrophication (contamination of water bodies with nutrients)

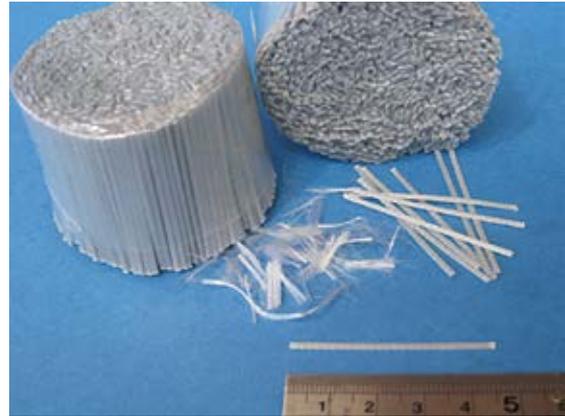
compared to the equivalent steel. *Emesh* fibres are independently audited and certified to the *International Environmental Product Declaration ISO4040* as being manufactured using 100% fully recycled raw stock and are globally recognised by ‘green ratings’ schemes for reducing the environmental impact of buildings and other structures.

In addition to the macro fibres, the *Emesh* Plus fibre blend also incorporates 100% recycled micro poly fibres to assist with the reduction of early age plastic shrinkage cracking.

Over the past 12 months alone, *Emesh* has been used in over 20,000m² of paths and pavements, reducing the CO₂(e) footprint by over 200 tonnes, while also delivering significant cost savings in implementation and ongoing durability.

One recent project to incorporate *Emesh* is James Cook University’s \$80 million “The Science Place”. Interestingly, the technology was originally developed at James Cook University through PhD student Shi Yin’s research under the supervision of Dr Rabin Tuladhar and in collaboration with Fibercon.

Awarded *Project of The Year*, by the Master Builders Association Queensland in their 2017 Awards, “The Science Place” project uses Fibercon’s *Emesh* in the concrete for the footpaths leading up to the Science Place and Douglas Campus Buildings.



“Although they look like any other footpaths, we believe that this technology may hold the key to one of the construction industry’s most pressing environmental problems – how to reduce CO₂(e) emissions,” Fibercon Project Manager, Tony Collister said.

“As well as eliminating the time, effort and costs associated with having to cut and place steel mesh – and the problems that can arise as a result of incorrect placement of the steel mesh within the concrete - using recycled plastic fibres in concrete can save significant amounts of CO₂ associated with steel production.” Tony Collister said.

These sentiments were echoed by Daniel Kallis from the project’s architects HASSELL; “By using *Emesh*, we got to keep an environmentally-friendly product in the project without it costing the client any more, which has been a great win for the project.”

For further information, please visit: www.emesh.com.au



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FIELDERS ENHANCES THEIR LEADING FINESSE RANGE IN THE MARKET

Leading Australian steel manufacturer, Fielders, has enhanced their distinguished Finesse range of exterior cladding profiles as an outcome of ongoing product development and testing. This has provided Fielders with the opportunity to update the capabilities of the Finesse product and amplify its presence in the market.

Fielders National Specification Manager, Tony Jamieson, says these capabilities have provided opportunities for enhanced performance ability in addition to material and installation savings.

“The construction industry is always looking for ways to streamline the construction process without compromising result and quality. This consequently involves re-testing and re-developing products to maintain ongoing confidence in the performance, manufacture and product advocacy in the market,” Mr Jamieson said.

“It’s important to us that Finesse continues to be recognised as a leading steel façade among our industry networks and customers, while also having this product recognised among prospective stakeholders as a desirable option for their future projects.”

This exterior cladding solution has been a market leader for years and incorporated across various commercial and residential projects across Australia, including Aria Apartments and B Apartments in South Australia, National Anzac Centre in Western Australia as well as Old Government House in Brisbane.

Fielders Finesse offers a versatile, innovative and striking wall-cladding option that transforms monotonous walls into stunning steel designs, with the product earning its reputation as one of Australia’s leading exterior cladding options made from Australian steel and that can be tailored to various project requirements.

The range has also been rigorously tested to ensure compliance with Australian Standards for both Cyclonic and non-Cyclonic conditions, while Fielders’ unique, full scale, NATA accredited laboratory testing

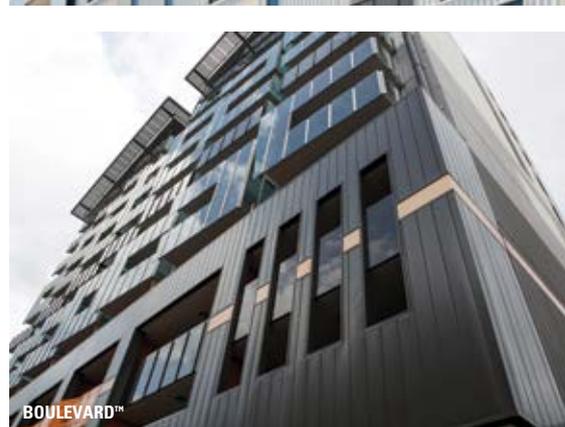
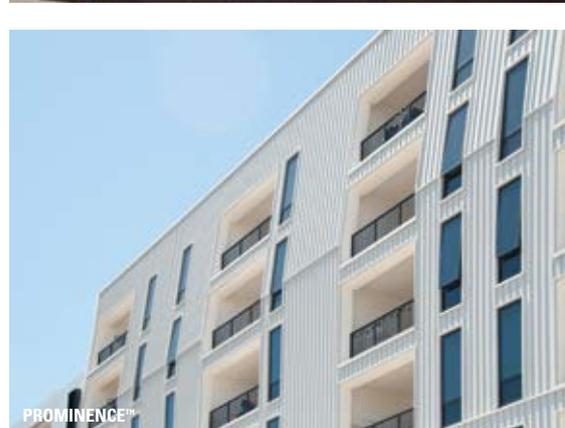
guarantees confidence in not only Finesse’s striking visual results but with its constant performance and compliance with BCA and Australian Standard requirements.

Further, Fielders has taken the opportunity to distinguish the Finesse range through recently introduced trademarked names for three of the profiles in the range – Boulevard™ (previously Interlocking Panel), Prominence™ (previously Nailstrip) and Grandeur™ (previously Millennium), with profiles Neo Roman and Shadowline 305 remaining unchanged. This ensures that specifiers and customers have total confidence in the manufacture and performance capabilities of the Finesse range.

The Fielders Finesse range consists of the following five profiles:

- **Neo-Roman:** Available in 275mm to 475mm cover width, Neo Roman is a traditional profile expertly designed and suited to contemporary structures and on stately heritage buildings.
- **Shadowline 305:** available in 305mm cover width, the deep pans of Shadowline delivers both style and strength. It can also be installed both vertically and horizontally as a smooth roofing or walling façade.
- **Prominence:** Available in 265mm to 465mm cover widths, Prominence offers a bold and striking appearance, coupled with easy installation.
- **Boulevard:** Available in 285mm to 485mm cover widths, the Boulevard flat, wide panels, coupled with the recessed joints, delivers a contemporary walling façade design solution that is available in a wide range of colours and finishes.
- **Grandeur:** available in 325mm to 525mm cover widths, Grandeur is unique due to its curving capability, allowing for exceptional results while also encompassing clean lines and striking finish to offer a stylish solution.

For further information on the revamped Fielders Finesse range, please visit: www.fielders.com.au/products/platinum-portfolio/finesse



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KING OF THE SINGLE PHASE SUBMERSIBLES

A new heavy duty, single phase, high head submersible pump has been released by Australian Pump. Manufactured by Tsurumi and based on the extremely successful KTV range of dewatering pumps, the new 3" (80mm) pump is a breakthrough in single phase pump design.

The new Tsurumi pump, model NK3-22, offers heads of up to 24 metres combined with flows of up to 525 litres per minute.

"This new pump really pushes the boundaries for performance of a single phase submersible," said Neil Bennett, Aussie Pumps Product Manager.

"We've christened it the 'King' of the Tsurumi single phase range. It makes an ideal emergency dewatering pump as it's quick to set up, will run on normal 240volt circuit and pushes out a huge amount of water," he said.

Aimed at the plumbing, hire and construction markets, this new portable pump has been designed to handle abrasive liquids. It has a ductile cast iron impeller and vulcanised wear plate.

"Tsurumi claim this pump will last three times longer due its hard-wearing internal components," said Bennett.

"The low life-cost of owning a Tsurumi submersible is due to the no-compromise design features that cut maintenance and extend pump life," he said.

Tsurumi is the world's biggest manufacturer of electro submersible pumps for dewatering and drainage applications. Their state-of-the-art robotised factory in Kyoto has a manufacturing capacity of over 1 million units per year. Combined with their other automated factories, Tsurumi has the capacity to build up to 1.5 million submersible pumps annually.

The new model, called the NK3-22 features a 2.2 kW dry type submersible induction motor encased in aluminium pump housing. The dry weight of the pump is only 29 kilograms.

The heart of the system is a semi vortex impeller that allows the passage of small solids up to 6mm. The unique impeller design accelerates the water passing through the pump casing, creating a vortex that assists the smooth transit of solids in suspension.

The pump features a double mechanical seal of silicon carbide located in an oil chamber. The oil chamber features a patented "oil lifter" that provides forced lubrication to the mechanical seal. This unique Tsurumi design provides real advantages to the user in extending seal life.

Water incursion through the cable entry is the main source of failure in submersible pumps. All Tsurumi pumps are fitted with an anti-wicking cable entry block. It protects the motor from moisture wicking inside the cable in the event of the cable being damaged or the end submerged.



The new slimline single phase dewatering pump from Tsurumi offers high heads and big flows normally only found in a 3 phase pump.

The new Tsurumi NK3-22 features a 3" top discharge port and a "slimline" body design.

"This provides a double benefit to users" said Bennett.

"The first is that there is no side discharge elbow to be damaged in the tough treatment

that pumps like this get on construction sites."

"The other is that the pump's motor is automatically cooled by the water running through the housing. That adds up to longer life, more consistent performance and overall long-term cost savings," he said.

Like all Tsurumi pumps offered by Australian Pump Industries the new NK3-22 single phase pump comes with a unique 3 year warranty. The pump is expected to be a big hit with the rental industry, plumbers and drainers and the construction machinery business generally.

Further information including a free comprehensive Tsurumi Pump catalogue on dewatering pumps is readily available from Australian Pump Industries or authorised distributors throughout Australia. Visit www.aussiepumps.com.au for more information.

NEW LONE STAR DRILLS FEATURE AUTOMATIC HAMMER FOR PRECISE DEPTH CONTROL

The Lone Star LST1G+HDA Geotechnical Drill from Little Beaver provides engineers and soil technicians with a precise and easy-to-operate drilling solution for standard penetration tests and soil sampling in nearly any soil. Lone Star designed the drill to address the growing demand for automatic hammers that deliver improved depth control compared to manual hammers.

The LST1G+HDA comes standard with a 140-pound (63.5kg) automatic safety hammer. The heavy-duty rig is mounted on an easily manoeuvrable, single-axle trailer that can be towed behind a small or standard sized truck.

"Automatic hammers help to ensure accurate depth control compared to manual hammers. This has even led some states and jurisdictions in the USA and other countries to require automatic hammers for conducting standard penetration tests," said Joe Haynes, Little Beaver president.

"The LST1G+HDA eliminates user error and makes it easy for drill operators of any experience level to take samples quickly and accurately."

The LST1G+HDA is capable of drilling 150mm boreholes down to a depth of 30 metres. The versatile drill can also be used

with Little Beaver's split spoon samplers and AWJ drilling rod for obtaining core samples or conducting geotechnical testing and environmental soil sampling.

Little Beaver offers a wealth of auger options to adapt to varying applications. Solid stem augers are available in 75mm to 200mm diameters and hollow stem augers are available in 150mm and 200mm diameters. The hollow stem augers, which can drill to 18.5 metres, feature a 70mm or 95mm internal diameter for collecting samples without the risk of contamination from surrounding soil.



Top: Lone Star LST1G+HDA Geotechnical Drill from Little Beaver provides engineers and soil technicians with a precise and easy-to-operate drilling solution for standard penetration tests and soil sampling in nearly any soil.
Above: Lone Star also offers a specially designed frame for mounting the LST1G+HDA to a one-tonne flatbed truck.

The LST1G+HDA's standard configuration allows for dry auger boring with the use of a solid or hollow stem auger. The drill is also capable of mud rotary boring using an optional mud pump, swivel and bit. The drill's bypass flow control system allows the operator to make simple adjustments to achieve and maintain ideal push-down force when drilling in challenging conditions.

Additionally, an optional anchor kit enables the LST1G+HDA to deliver push-down force up to 8,500 pounds (37.8kN), far exceeding the weight of the trailer. The drill is also capable of an 8,500-pound (37.8kN) lifting capacity for the hassle-free removal of augers and extensions. The hinged shuttle plate provides easy access to the borehole by allowing the operator to swing the rotary out of the way.

A 27-horsepower Kohler EFI gas engine powers the drill, which includes a powerful 3,000-psi hydraulic system that enables the drill's hydraulic power pack to achieve a rotary speed of 100 rpm. The system also provides the drill's hydraulic winch with power for raising the automatic hammer.

Little Beaver designed the LST1G+HDA for longevity and ease of use. The frame, rotary and swivel are constructed of high-strength welded steel for enhanced durability, and all crucial maintenance and greasing points are easily accessible.

Weighing in at 1360kg, the unit is mounted on a rugged yet lightweight single-axle trailer equipped with a standard 50mm hitch, levelling jacks and spare tyre.

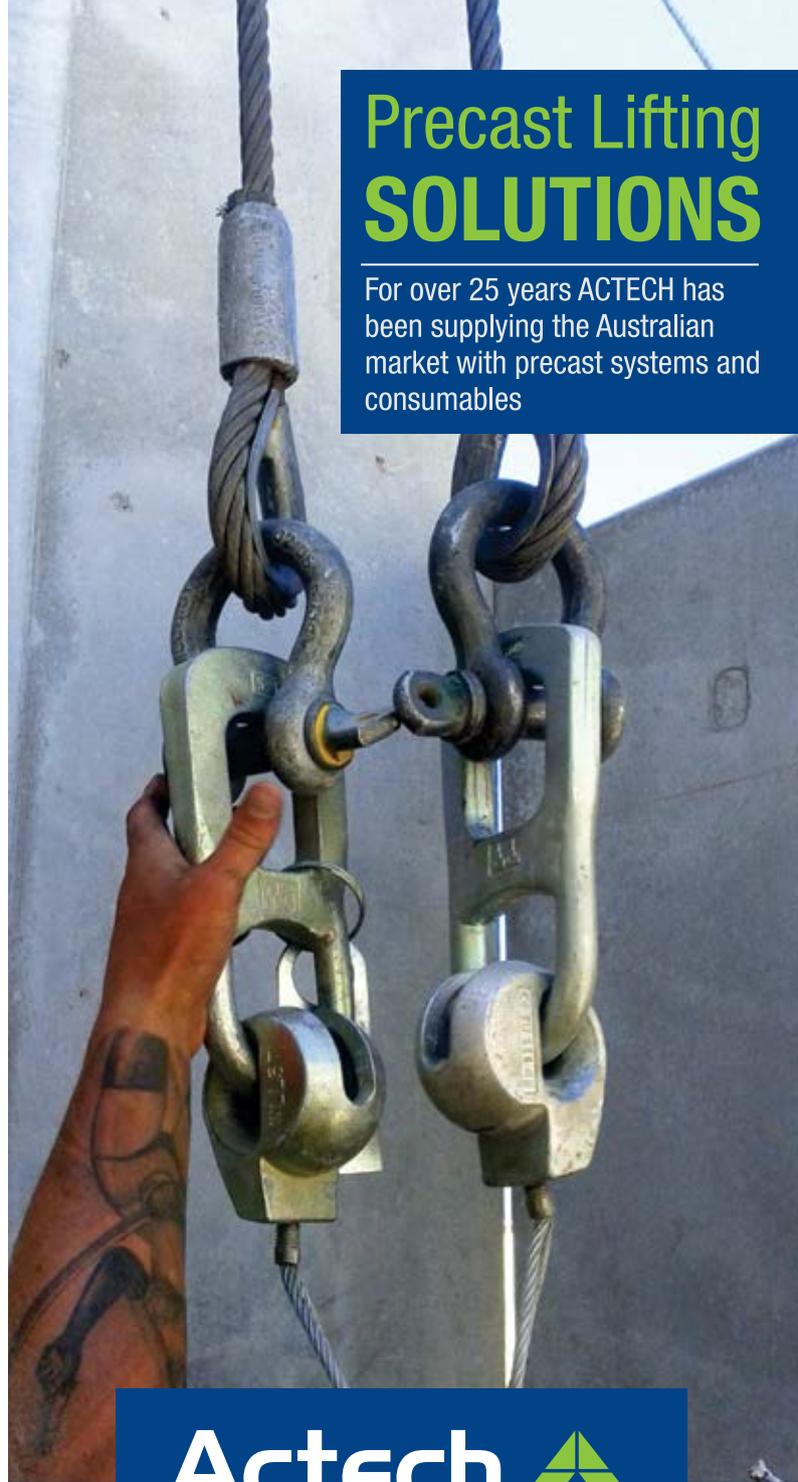
For improved manoeuvrability, Little Beaver also offers a specially designed frame for mounting the unit to a one-ton flatbed truck.

The LST1G+HDA can be shipped fully assembled in a 20-foot container by standard truck or internationally. The drill comes with assembly tools for fast and easy setup.

For further information, please email: sales@littlebeaver.com or visit either: www.littlebeaver.com or www.lonestardrills.com

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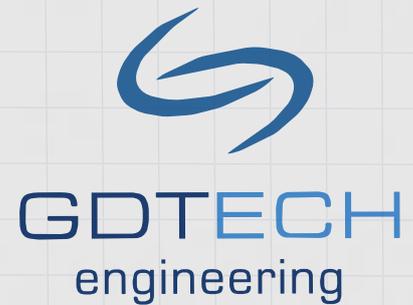
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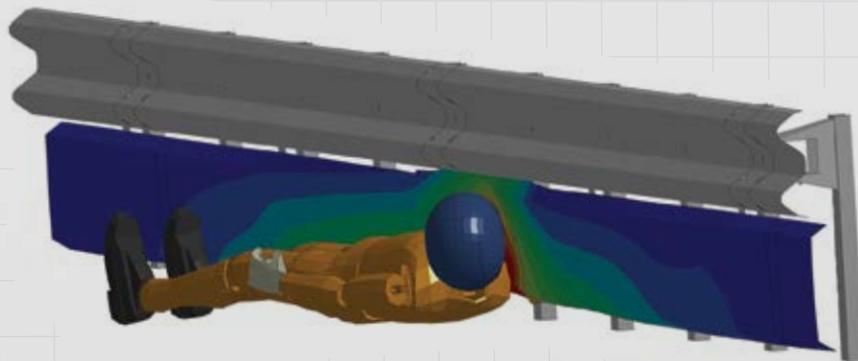
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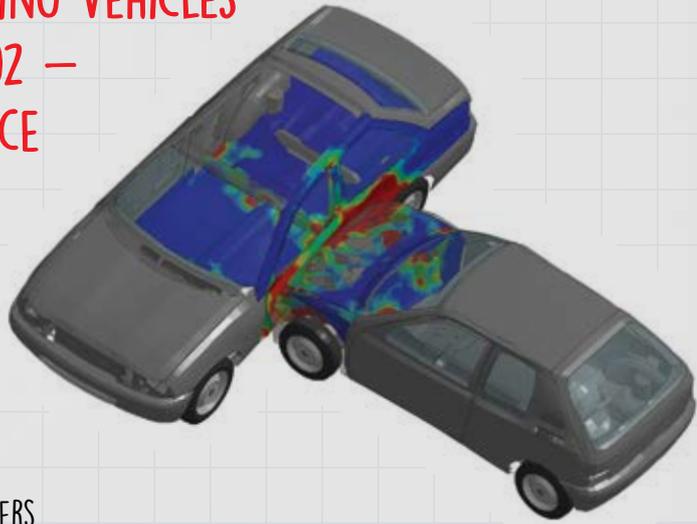


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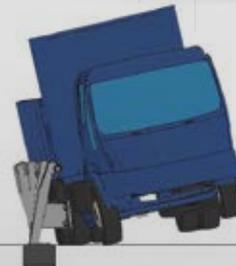
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CONCRETE 2017 AN OUTSTANDING SUCCESS

The Concrete Institute of Australia's 28th Biennial National Conference, *Concrete 2017*, held in conjunction with the *3rd International Congress on the Durability of Concrete (ICDC)*, can only be described as an outstanding success!

Concrete 2017 brought together over 540 delegates from 24 different countries around the world to Adelaide for a week of learning, discussion, networking and fun! With a program that focused on advances in concrete materials and structures, delegates were presented with an amazing opportunity to learn about latest trends, network with leading global influencers, and develop worldwide contacts in the industry. The conference exemplified its position as a truly international event, particularly with the involvement of ICDC, and many overseas delegates who were attending as speakers, exhibitors, sponsors, or delegates.

The secret to the success of the conference organisation was the dedication and experience of the Organising Committee. Conference Chairs, Professor Julie Mills and Associate Professor Rebecca Gravina, guided the team with great diligence and professionalism, but also provided experience and networks to build a great framework for the conference. Alongside them, Technical Chair, Mr Tom Benn, along with his wonderful team of local state committee members, developed a program that was not only diverse and interesting, but was of excellent quality. ICDC Chair, Mr Rodney Paull, did a superb job in working with the Concrete 2017 team, whilst putting together a durability technical stream that showcased world leading experts in this field, as well unearthing new local talent.

With Organising Committee Members Mark Gobolos (Sponsorship & Exhibition) and the perennial John Woodside, the Technical Paper reviewers, the South Australia State Committee, CIA staff members, and of course the Conference Organisers, Arinex, it was a huge team effort.

Whether you attended the technical sessions, sat in on multiple committee meetings, or networked with friends and colleagues, Concrete 2017 provided

everyone with ample opportunity for educational growth and professional and development.

TECHNICAL PROGRAM

The technical program was wide and varied, covering streams such as durability, materials, structures, repair and retrofit, innovations, precast concrete, sustainability, project reviews and case studies, and history and special interest. Within these streams there were over 150 technical papers presented over 4 parallel sessions. The technical program however was headlined by 5 plenary presentations, delivered by 6 key note speakers, and 2 invited speaker sessions. Highlights of the key note and invited speakers were:

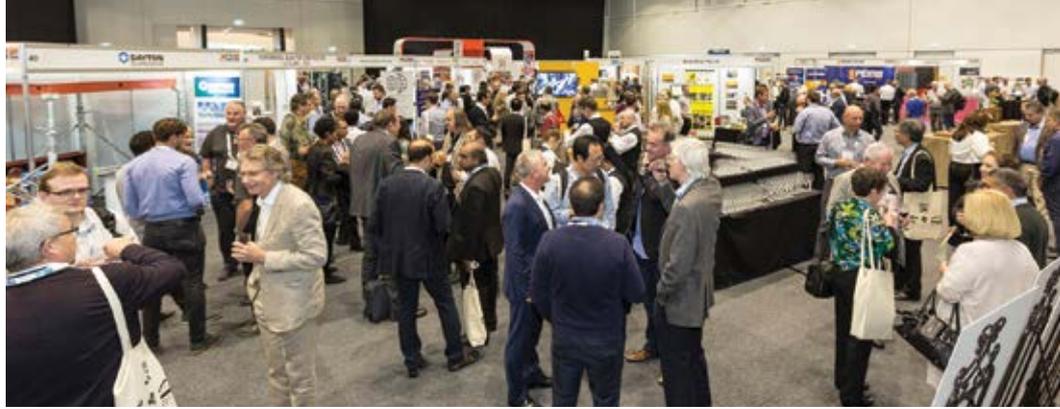
- **Mrs Louise Adams**, from Aurecon set the tone for conference at the opening plenary session with her thought provoking topic *"Disruption and technology - is the consulting/design/construction industry moving forward quickly enough?"* Louise posed the question to the delegates - is the lack of movement partly due to the lack of diversity within the profession which is holding back new thinking?
- **Professor Tim Ibell**, University of Cambridge, UK, presented on *"Extraordinary Possibilities for Concrete Structures"*, which resonated beautifully with Louise's opening plenary when he showed the delegates incredible examples of using fabric as formwork for concrete structures, an amazing new way of thinking when it comes to mouldability.
- **Professor Karen Scrivener**, from EPFL in Switzerland, stirred up the crowd with her presentation *"Eco-efficient Cements: Potential Solutions for a Low CO₂ Eco-efficient Cement Based Materials Industry"*.
- **Professor Des Bull and Mr Peter McBean**, combined to present on *"Seismic Design in Australia Post Christchurch"* where they provided a most informed account of the current issues in seismic design in both Australia and New Zealand, and what can be done in codes and standards to reduce further risk. Des also provided delegates with a first-hand account of what occurred when the earthquake hit in Christchurch.



- **Professor Doug Hooton**, University of Toronto, Canada, gave us an overview of the *"Different Forms of Sulfate Attack for Provision of Sulfate Resistant Concrete"* and compared the types and rates of damage due to sulfate attack occurring in North American field structures, and in outdoor exposure sites, to those in laboratory studies.
- **Professor Stuart Matthews**, BRE, UK, introduced the delegates to the machinations of the *fib Model Code 2020* preparation, and discussed the foreseen developments on durability provisions in the code. MC2020 will for the first time include provisions for existing structures and will bring repair and restoration design in step with reliability and performance based design concept, as included in MC2010.
- **Mr Mike Schneider**, Baker Concrete Constructions, USA, enlightened the audience with a practical presentation on the work involved in constructing the National Veterans Memorial and Museum in Columbus, Ohio. How does a contractor put together a concrete construction of that magnitude without being provided any dimensions by the client? Many delegates remarked that this lineup of key note and invited speakers, and their specific topics and themes, were the best they had seen in many conferences.

EXHIBITION

The much sought after Exhibition for Concrete 2017 was sold out 6 months in advance of the conference! This meant that all the exhibitors were keen to make the most of their time in Adelaide. With so many local and international delegates in front of them, and with the large array



of new technologies and information on show, they certainly were able to achieve this. The exhibition is a traditional part of the Institute's conference and is always an excellent setting for networking, break outs, and of course, the Conference Welcome Reception.

SPONSORS

Concrete 2017 is most grateful for the support provided by all the sponsors of the conference. In particular, Conference Partners, Fosroc, continue to be great supporters of the Institute and the concrete industry in general, along with conference Platinum Sponsors, BASF Master Builders.

ICDC

The Institute was proud to host the 3rd ICDC serves as an international forum for exchanging current research results and information, displaying how concrete can ensure durable buildings and structures for sustainable development, and providing the latest in trends and innovation from around the world.

The 3rd ICDC commenced with an opening address from the ICDC Chair Mr Rodney Paull, who is also Chair of the Institute's Durability Committee, and Professor Harald Justnes, International Scientific Chair and Caretaker of ICDC. Both noted the importance of durability considerations in a concrete structures life, and that this starts from the planning stage of a new structure right through to the end of its life.

Professor Justnes also presented Karen Scrivener with the Dr. V.M.Malhotra Award at the Institute's Gala Awards Dinner at the conference. This is awarded at each ICDC in honour of Dr Malhotra and his outstanding

contributions in the vast field of concrete technology and durability. His contribution to the concrete industry has had major economic, energy, and sustainability implications globally.

CONCRETE 2017 SOCIAL EVENTS

The Institute played host to the many overseas delegates and guests on the Sunday before the conference at an International and ICDC Delegates Reception. The reception, held at Adelaide's 2KW, was a wonderful way for all the international travellers to meet fellow delegates and members of the Institute prior to the conference beginning.

The traditional Welcome Reception, held on the evening concluding the first day of the conference in the exhibitors' hall, was a wonderful evening. With over 500 people networking, socialising, and collaborating, it was a great way to work into the conference.

The premier event as always was the Gala Awards Dinner held on the second night of Concrete 2017. At the dinner we recognised our new Life Members, Liza O'Moore and Craig Heidrich, three new Honorary Members in Priyan Mendis, Jay Sanjayan, and Tony Thomas, and the 2017 National Engineering Bursary winner Ali Amin. We also celebrated the winners of our "Awards for Excellence in Concrete" medallions in the categories of Residential Buildings, Commercial Buildings, Infrastructure, Repair & Rehabilitations, and Technology & Innovation, as well as our overall Kevin Cavanagh Trophy winners, J. Woodside Consulting and SA Precast, for their entry Prefabricated Concrete for the Song School.

WORKSHOPS

Concrete 2017 was enhanced by two quality workshops held on the Sunday proceeding

the conference. Cement Chemistry for Engineers, presented by Professor Karen Scrivener, was a full day session. The course was a one day version of Professor Scrivener's widely acclaimed more detailed course on cement chemistry that is conducted through RILEM, and was tailored for engineers, materials specialists, and cement & concrete practitioners. Over 50 people attended the course and the topics included - options for sustainable development of concrete to meet the world demand and implications for cement chemistry; basics of cement hydration, physical structure of cement paste, the impact of supplementary cementitious materials (SCMs) on hydration and microstructure, and the impact of SCM on durability, particularly ASR.

The other workshop held was titled "fib Model Code 2020 and World Durability Practices". This special session reviewed the development of the next fib Model Code (MC2020) and the durability requirements within the code. In particular the workshop considered the following question - "How do we move forward with design of new concrete structures and the through-life care of existing ones?" It included several international durability experts, such as Dr Stuart Matthews, Professor Phil Bamforth, Professor Doug Hooton and Dr Joost Gulikers, as well as Institute durability technical committee members, Rodney Paull, Frank Papworth, Daksh Baweja and Professor Ian Gilbert, who provided updates on the critical work being undertaken by the CIA Durability Committee. The interactive session was an eye opener to the local delegates who were given an introduction to depth of work and knowledge involved in the fib Model Code 2020, but also gave the delegates the opportunity to contribute.



AWARDS FOR EXCELLENCE IN CONCRETE

The Concrete Institute of Australia's *Awards for Excellence in Concrete* program recognises the many impressive examples of concrete structures and projects undertaken across Australia every two years.

This year's Awards for Excellence in Concrete program included new categories featuring commercial buildings; infrastructure projects; technology & innovation; repairs and rehabilitation; and residential buildings.

As always, the winners are outstanding concrete projects across this country. Congratulations go to all the State Awards winners who progressed to the National event, who were in with a chance of winning the Medallion of Excellence for their category, and the overall Excellence in Concrete Award – the Kevin Cavanagh Trophy. The winners of the National Awards found below were presented with their awards at the Institute's Gala Dinner in Adelaide as part of *Concrete 2017*.

EXCELLENCE IN CONCRETE – COMMERCIAL BUILDING PROJECTS & WINNER OF KEVIN CAVANAGH TROPHY

Prefabricated Concrete for the Song School – J Woodside Consulting and SA Precast

The Song School is a two-storey concrete building, designed by Palassis Architects for the choirs of St George's Cathedral and the Anglican Diocese of Perth.

SA Precast and J Woodside Consulting (JWC) combined to produce a workable solution to the architect's concept and its final shape, form and erection has been admired by all involved.

The building is partly underground to minimise the footprint and maintain existing sightlines. The prefabricated concrete elements for the Song School at the cathedral are made with a white concrete with an off-form sandblasted finish. They represent excellence in prefabricated concrete and the ability to achieve the shape and form the architect specified.



EXCELLENCE IN CONCRETE – INFRASTRUCTURE PROJECTS

Jubilee Bridge – ARUP

Measuring 220m in length, 6m in width, 3000 tonnes in weight, the curvilinear Jubilee Bridge forms the final link of the barrier-free 3.5km Marina Bay waterfront loop. With its timely completion to celebrate Singapore's 50th year of independence, the bridge, part of an 8km heritage trail around the Civic District, has become linked to the nation's history.

Set in a busy maritime environment, the design team was challenged to achieve the aspiration of a simple, elegant and slender bridge form, with careful consideration of safety and minimal disruption to the public during construction. The slender depth of the bridge at mid-span is also an unorthodox feature made possible by the use of high strength concrete and a field of post-tensioned tendons.





EXCELLENCE IN CONCRETE — RESIDENTIAL BUILDING PROJECTS

Manly House — Partridge Structural

This beachfront residential project in Manly, Sydney, involved the construction of an all-new, freestanding three-storey house. Its construction consisted of suspended, conventionally reinforced concrete slabs at all levels, supported on a combination of load-bearing masonry, structural steel columns, and reinforced concrete blade walls.

Engineering features and challenges evident in the project are exposed Class 1 off-form concrete finishes; an aggressive exposure environment just 40m from breaking surf; large cantilevers with thin profiles; slender supports; large open spans, highly bespoke concrete detailing; highly stressed torsion beams; suspended beams and slabs with large rebates and recesses for architectural features plus a curved concrete shell ‘column’ that was matched to adjacent curved brickwork shells and actually worked as a strut-and-tie beam.

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EXCELLENCE IN CONCRETE – TECHNOLOGY & INNOVATION PROJECTS

Condition Investigation, Remaining Life Assessment and Inspection Maintenance and Repair Plan for Wandoo B Concrete Gravity Structure – GHD, Vermilion Oil, and Gas Australia

Vermilion Oil & Gas (VOGA) oil production in Western Australia's north-west shelf, 75km offshore from Karratha, relies on the Wandoo B Concrete Gravity Structure (CGS) to structurally support its oil facilities and provide oil storage.

The CGS' original operational life was 20 years (from 1997) and an extension of 20 years was required. The exposure condition is aggressive offshore marine.

Inspection and testing of concrete was challenging and key constraints for an operational offshore oil platform above water included limited accessibility to surfaces, maintaining site operations during survey works, working at heights and over water, with safety as a priority. Inspections below water were conducted using Remotely Operated Vehicles (ROV), where sea level tides and currents provided significant challenges during inspection.

EXCELLENCE IN CONCRETE – REPAIR & REHABILITATION PROJECTS

The Adelaide Convention Centre Plenary Building – The Aggressive Relieving of an Existing Structure – Aurecon

The new Adelaide Convention Centre Plenary building replaces the original (1986) plenary building with a larger, heavier, highly functional and adaptable state-of-the-art facility.

Similar to the original plenary, the new building is atop the existing northern car park, rail corridor and plaza buildings that were retained and provides the new construction structural support. This involved both re-rating and strengthening the existing concrete structure and working with the architect to position the new building where the greatest structural capacity existed.

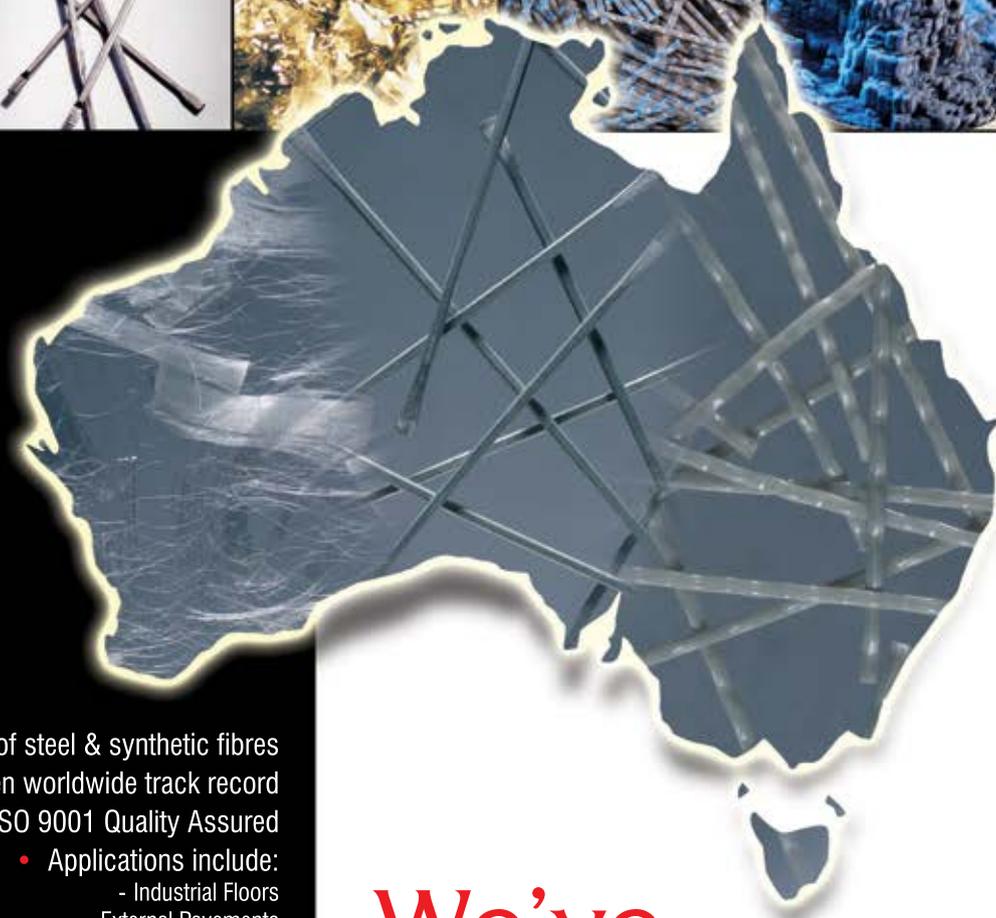
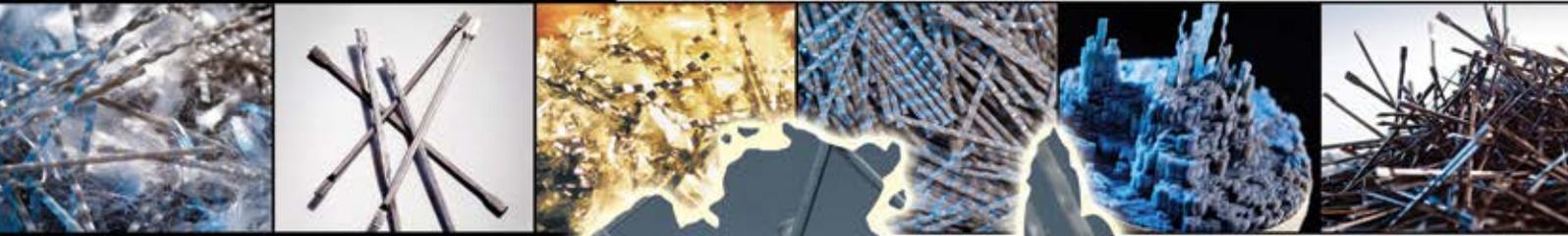
To achieve this, the team undertook detailed inspection, testing, analysis, calculation and creative design to increase and manipulate the capacity of the existing concrete structures and foundations to suit the new facility, minimising the substructure works and avoiding new piling altogether.



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LIFE AND HONORARY MEMBERS

Life Member - Dr Liza O'Moore

Dr Liza O'Moore, currently Senior Lecturer and Deputy Associate Dean at University of Queensland, has given exemplary service to the Concrete Institute of Australia at local, state and national levels. For many years she has been an outstanding role model, particularly for female engineers, for those in concrete engineering. Liza has served on the Queensland State Committee since 2003 holding the office of President from 2007 to 2009. She also served on National Council from 2007 to 2017, including time as Education Chair, Planning Committee Chair, and Membership Chair, as well as being the first female National President of the Concrete Institute of Australia in 2011. In all those roles Liza has provided strong leadership, sound judgement, and excellent guidance.

Liza also took over as National President at a time of financial stringency in the industry. She steered the Institute through difficult times, made more difficult by the absence of a permanent CEO in 2013, a conference year. This required increased personal involvement to ensure financial success of the conference and ongoing financial viability of the Institute, objectives that were achieved.

Life Member - Craig Heidrich

Craig has been a Member of the Institute since 2001. He became actively involved when he was co-opted as a member of the NSW Branch Committee, and that same year, and became part of the branch executive in 2003, serving as Vice President, President, and Immediate Past President until 2009. Craig also joined the National Council in August 2005, and from July 2007 took over the Executive role of Secretary/Treasurer for the Institute, a position he still holds today. Craig has played a significant part in advancing the Concrete Institute of Australia to a level that befits a professional association in today's world. He has had a major hand in:

- Leading and developing reform in the Constitution to modernise the governance model required for an NFP of the Institute's size and type.
- Consolidating the Institute's finances through some turbulent times.
- Developing strategic governance policies and charters to steer the Institute in the right direction.



Inducted as Life Members of the Concrete Institute of Australia, Liza O'Moore and Craig Heidrich at the Concrete 2017 Gala Dinner.



Honorary Member Professor Jay Sanjayan (left) and Michael van Koeverden, Immediate Past- National President at Concrete Institute of Australia.

Honorary Member – Jay Sanjayan

Professor Jay Sanjayan, currently Director – Centre of Sustainable Infrastructure, Swinburne University, has contributed to the concrete industry at sustained level for over 30 years in the advanced use of concrete in Australia through education and research. Jay has published extensively in journals and conferences, including more than 300 publications, and they have been cited more than 5000 times in Google Scholar. All his publications are about the advancement of concrete, particularly on geopolymers concrete, use of supplementary cements, fire resistance of concrete, and 3D printing using concrete. Jay has also published a book on Low Carbon Concrete, promoting sustainable use of concrete.

During his teaching career Jay has taught concrete technology and concrete design to more than 3000 Bachelors, 30 PhDs, and 100's of Masters Graduates, many of whom are now in leading positions in Australia. Jay has also been active contributing to the activities of the Concrete Institute of Australia in various capacities including as a State Committee member for over 25 years, President of Victoria state committee, as an elected National Councillor, Chairman of editorial committee for Concrete in Australia, and more recently, as Chair of our previous conference, Concrete 2015.

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Tony Thomas (left) receiving his Honorary Membership from Michael van Koeverden.

Honorary Member – Tony Thomas

Tony Thomas, recently retired as Chief Engineer, Boral Concrete, has contributed more than 40 years of outstanding service to the concrete industry within Australia. His work in the concrete industry has touched a diverse range of areas including research, construction, advocacy and education, through his many work roles and industry memberships.

His contribution to the industry has been long and distinguished through his involvement in various industry bodies and being a key representative in various Technical committees through groups such as CIA, CCAA and Standards Australia. This has included involvement on the Institute’s durability committee since 2007 and acting as lead author for Z7/04 “Good Practice Through Design, Concrete Supply, and Construction”, being a member of the National Cement Concrete Aggregates Australia Technical Liaison Committee from its inception in 2004 until retirement in 2017, and being active on several Australian Standards committees including BD002 for AS3600 and BD010 for AS1379.

Tony has always been willing to share the expertise and experience he has in concrete through committee work, publications, technical papers, conferences and seminars. His knowledge in the concrete area has improved design mixes, driving improvement in strength, sustainability and durability performance for the entire industry.

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Honorary Member – Priyan Mendis

Prof Priyan Mendis, currently Professor of Civil Engineering and Director of the Australian Research Council Centre for Prefabricated Housing, University of Melbourne, has had a 30 year involvement within the concrete industry, with outstanding contributions as a specialist design consultant, an educator and researcher and as a member of local and international concrete standard committees. During this time Priyan has provided invaluable contributions to the development and continued efforts to advance the use of concrete in Australia by: Providing research, design and innovation in the advancement of concrete, significantly contributing to AS3600 through the introduction of high strength concrete beyond 50 MPa, leading education and research for over 25 years at Melbourne University, contributing to several standard committees, such as BD002 since 1991 as well as tall buildings committees, and publishing extensively in journals, conferences and scholarly books (more than 300 publications in total) with more than 2800 citations in Google Scholar.

Priyan’s life work has revolved around the advancement of concrete, particularly in high-strength/high performance concrete, tall buildings, sustainable buildings and materials, fire behaviour and protective technology (blast performance) of structures, geopolymer concrete, use of fibres and phase change materials and more recently on prefabricated buildings, using concrete elements.



Priyan Mendis accepting his Honorary Membership.

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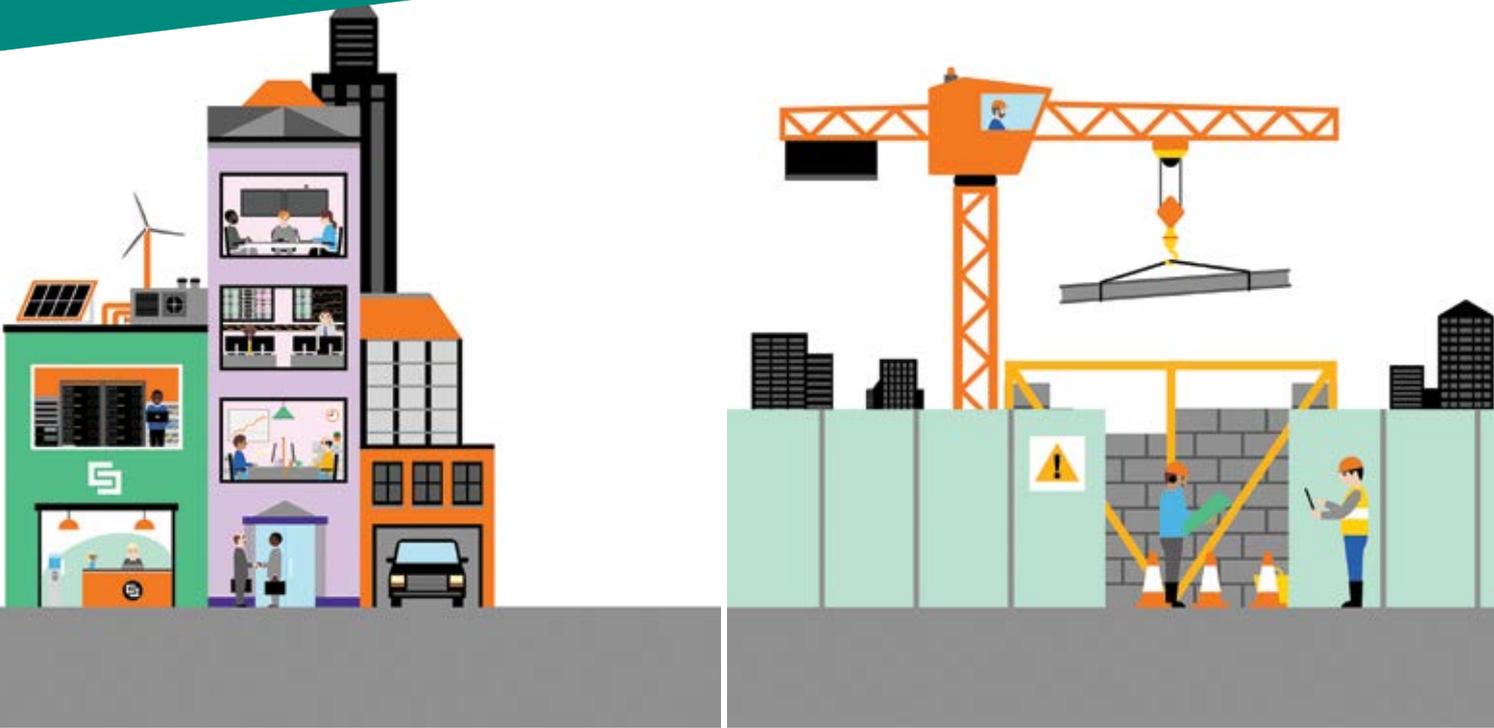
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THE EVOLUTION OF SMART CITIES

HOW TECHNOLOGY IS TRANSFORMING CONSTRUCTION

BY KEVIN GRIFFEN, MANAGING DIRECTOR, AUSTRALASIA, ORANGE BUSINESS SERVICES

In the 1960s, the world was introduced to the futuristic realm of *The Jetsons*. With their robot maids and flying cars, the sci-fi cartoon seemed implausible at the time. But just over half a century later, many of the show's technologies have become the norm; video chats, smart watches, and automated vacuum cleaners.

We've embraced technological advancements across all aspects of our lives and now we're seeing this transformation take place on a larger scale. We're moving from smart phones to smart homes and now, to smart cities; the next phase will be entire metropolises that can be constructed, connected, and managed through technology. As we move into the future, towards building these smart cities, no industry is more integral to our transformation than the construction industry.

CONSTRUCTING SMART CITIES

In Australia and throughout the world, there is a need to build smarter, and more environmentally-friendly buildings. Using smart technology in construction and maintenance, will result in better and more efficient utilization of infrastructure, and clean energy. And technologies such as Building Information Modelling (BIM) and

Internet of Things (IoT) are key to driving this transformation.

THE FUTURE OF BIM

Building Information Modelling (BIM) is a process for creating and managing all the information on a project. The information is accessed by architects, engineers and construction managers alike so they can work cohesively across the lifetime of the building's construction.

In 2012, the Australian Government released the National Building Information Modelling Initiative (NBI), which found that the Australian economy could be better off by as much as AU\$7.6 billion by following the NBI guidelines. Since then, BIM has become increasingly popular in Australia. It is completely transforming the construction industry by allowing companies to collaborate in a way they never could; sharing knowledge and information about building projects to enable better decision-making during its lifecycle.

Much more than 3D design, each project stakeholder can also input their specific data into a single, shared project model, which delivers improved savings and greater collaboration for entire projects. Recent Australian projects such as the Royal Adelaide Hospital Project, the Barangaroo

development, the Sydney CBD light rail early works and Perth Children's Hospital have all used BIM in some capacity.

Despite its growing popularity, BIM is still not being used to its full potential. While BIM has been adopted by most players in the construction industry, it's mainly being used on the structural and architectural finishing aspects of the building process. There is a whole area of asset management and facility management which hasn't yet been fully.

There's a huge opportunity to better utilise the data captured within BIM systems. For example, using unique reference tags which can be applied to all Monitoring and Evaluation (M&E) equipment to provide an efficient and accurate lifecycle estimate for building owners/operators. Tags can also be used for schedules of preventative maintenance, replacement schedules & records, and more efficient stock of spare parts and equipment. This is the next step for BIM, and if Australia's construction industry can utilise this technology at its full potential, we can set ourselves apart from the rest of the world, positioning ourselves as leaders in this space.

IOT AND SMART BUILDINGS

Another technology integral to the digital transformation of the construction sector is



IoT. In addition to the on-site efficiencies IoT provides, embedding IoT technology into buildings, and rendering them “smart buildings”, can completely transform facility management. This takes us one step closer to building the smart cities of the future.

While smart buildings were once deemed impossible, they’re now a very real, very plausible option – and one that is more affordable than it’s ever been. Installing smart technology enables better energy management, and better respect to the environment. This translates to cost savings for building owners and makes it more affordable for potential tenants.

A CLEANER FUTURE

Energy efficient smart buildings aren’t exclusive to new constructions – we’re also seeing older buildings installing smart technologies and reaping the benefits. According to a whitepaper by Price Waterhouse Cooper, commissioned by Orange Business Services, in Canberra, a 50-year old building was retrofitted with a host of new technologies, completely transforming its performance . For an investment of just US\$750,000, the installation of a modern building management system (BMS) resulted in an annual cost savings of US\$100,000. It also increased the building’s value estimate to \$1.1 million. The retrofit also enabled a 70 per cent reduction of annual greenhouse gas emissions, equating to a reduction 786 tonnes of carbon dioxide, ultimately improving its NABERS energy rating from 2 to 4.5 stars. Imagine the impact we could make if all Australian buildings can reduce their emissions so significantly?

Given the recent uplift in construction activity in Australia, with more commercial buildings and increased growth for multi-level apartments , there’s never been a better time to embrace BIM and IoT in construction. As we move towards building the smart cities of the future, there’s no reason why Australia can’t be at the forefront, finding new and exciting ways to make the most of these technological advancements. The future is now a reality. And the possibilities are endless.

ABOUT KEVIN GRIFFEN

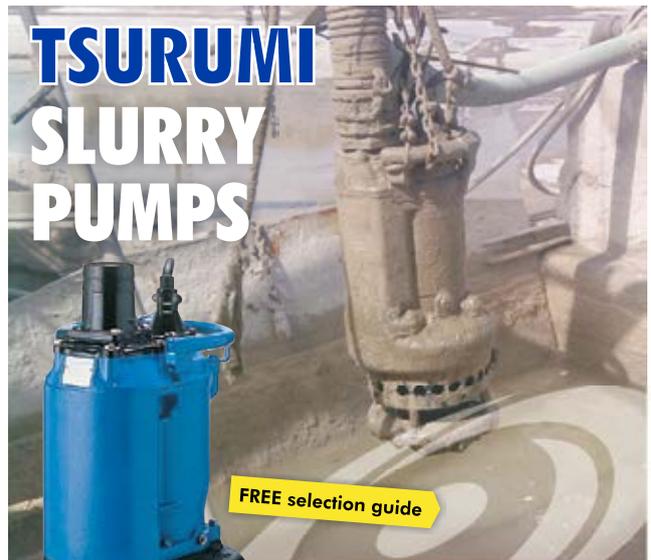
Kevin Griffen is the Managing Director, Australasia for Orange Business Services. He is a member of the Orange Leadership Team Asia Pacific and his experience spans 30 years in the Communications and IT Industry.

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- Happier motorists: Fewer lane closures, less blockages and faster repairs.
- SMART DESIGN, SAFER SITES FOR ROAD CREW and SAFER MOTORING

ROAD SAFETY DESIGN AT ITS BEST

The SMART CUSHION spare parts detailed record to date for the first 54 resets.

sci01	Jul-15	sci02	Jul-15	sci03	Sep-15	sci04	Oct-15	sci05	Oct-15	sci06	Nov-15	sci07	Nov-15
1st	SP												
sci08	Nov-15	sci09	Nov-15	sci10	Dec-15	sci11	Dec-15	sci12	Apr-16	sci13	May-16	sci14	May-16
1st	SP+DP	1st	SP	1st	SP+DP	1st	SP	1st	SP	1st	SP	1st	SP+DP
sci15	Jun-16	sci16	Jul-16	sci17	Jul-16	sci18	Aug-16	sci19	Oct-16	sci20	Nov-16	sci21	Nov-16
1st	SP+DP	1st	SP+DP	1st	SP	1st	SP+DP	1st	SP	1st	SP	1st	SP
sci22	Nov-16	sci23	Nov-16	sci24	Feb-17	sci25	Feb-17	sci26	Feb-17	sci27	Feb-17	sci28	Mar-17
1st	SP	1st	SP	1st	SP	1st	SP	1st	SP+Sd	1st	SP+Sd	1st	SP+DP
sci29	May-17	sci30	May-17	sci01	Sep-15	sci06	Dec-15	sci08	Dec-15	sci10	May-16	sci15	Jul-16
1st	SP	1st	SP	2nd	SP+DP	2nd	SP+DP	2nd	SP	2nd	SP	2nd	SP
sci07	Jul-16	sci02	Feb-15	sci21	Mar-17	sci25	Apr-17	sci26	Apr-17	sci11	May-17	sci01	Nov-15
2nd	SP+DP	2nd	SP	2nd	SP+DP	2nd	SP+DP	2nd	SP+DP	2nd	SP	3rd	SP
sci06	Dec-15	sci10	Dec-16	sci15	May-17	sci01	Dec-15	sci06	Sep-16				
3rd	SP	3rd	SP	3rd	SP	4th	SP	4th	SP+DP				
sci01	Dec-15	sci01	Dec-15	sci01	Jan-16	sci01	May-16	sci01	Jun-16	sci01	Jun-16	sci01	Aug-16
5th	SP+DP	6th	SP	7th	SP	8th	SP+DP	9th	SP+DP	10th	SP	11th	SP

Code for SCI unit / reset date / reset sequence	
sci-XX	unique Smart Cushion Number
MM-YY	Month reset / repaired
1st / etc	Reset sequence per unit

Spare Part details for each reset		Qty	%
SP	Shear pins only required	35 of 54	65%
SP+DP	Delineator panel plus Shear pins	17 of 54	31%
SP+Sd	Sled panel plus Shear pins	2 of 54	4%

GAME CHANGER

To date 30 Smart Cushions have been impacted, one of these has been impacted 11 times. **The total cost of all Spare Parts used in 54 resets is \$7,438.00 at an average of \$137.74 per reset.**



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NSW ENGINEERING TALENTS PROUDLY DISPLAYED AT IPWEA NSW EXCELLENCE AWARDS 2017

This year we saw another record high number of nominations - 91 projects and profiles were nominated. Highly commended and winners were announced on Thursday 9 November 2017 at the Engineering Excellence Awards Gala Dinner at Crowne Plaza Hunter Valley.

The IPWEA NSW Division presents the Engineering Excellence Awards each year to promote and recognise excellence of Local Government and Public Works Projects. This is achieved through inspiration, innovation, development and completion of projects and technical management by our Members. Each project nominated for an award showcases the individual and team aspirations to improve the community in which we live.

This is what the Judges, Geoff Fowler, Henry Wong, John O'Connor and Greg Moran said about the 2017 run: *'...Due to the substantial increase in the number of submissions in 2016, it was decided to split the judging for 2017 into Regional and Metropolitan. As this year's numbers were in excess of 90 submissions it was appropriate that the judging was split to allow for thorough inspections.'*

Judges John O'Connor and Greg Moran inspected the Regional submissions and Judges Geoff Fowler and Henry Wong inspected the Metropolitan submissions. Again, the quality of submissions was of a high standard covering a wide range of activities encountered in the Public Work Sector. Congratulations to those listed as Winners and Highly Commended.

Some of the winners include, Todd Clarke, Coordinator Projects at Randwick City Council. He was awarded the David Abbott Award which was presented to him by late David Abbot's wife Gladys and son Todd.



Todd Clarke, Coordinator Projects at Randwick City Council (on right) was presented with the David Abbott Award by David's widow Gladys and son Todd.

Todd Clarke has been employed at Randwick City Council for ten years, for seven of these he has been studying part time for his Bachelor of Civil Engineering and Diploma in Engineering Practice at the University of Technology. He is now completing his MBA.

Todd is quick to dedicate his fast progression through Council to the mentorship of peers and members of senior management. He is taking the opportunity to mentor students within his department on their journeys from internship to graduate positions.

Part of Todd's leadership success can be put down to having worked in both the administrative and operational environment enabling Todd to bridge the gap between office staff and employees on the ground.



Bega Valley Shire Council's , Manager Strategy & Asset Services, Jason Deller (on right), accepted the award for New or Improved Techniques for The Network Operation Centre from Gary Hemsworth, Portfolio Director of Roads and Transport Directorate.

Bega Valley Shire Council won the award for New or Improved Techniques (Partnered by Roads and Transport Directorate) for The Network Operation Centre. Jason Deller, Manager Strategy & Asset Services, accepted the award from Gary Hemsworth, Portfolio Director of Roads and Transport Directorate.

Bega Valley Shire Council has developed a Network Operation Centre enabling data mining between Council's separate Corporate Information Management Systems. The concept originated from a need to manage and utilise Council's intellectual property so that staff in the organisation do not duplicate or miss opportunities.

The viewing platform of the Network Operation Centre uses cutting edge technology to display and provide access to voluminous quantities of data compiled through the use of drones, video and photographic evidence.

Public Works Leader (Partnered by Boral Asphalt) was awarded to John Maretich. As the Asset Section Manager for Port Stephens Council, John leads a team of more than 30 people and he is accountable for the full breadth of engineering areas from Road Safety and Transportation to Civil Assets Planning, Project Management and Assets Systems through to Community and Recreation Planning and Capital Works.



Mr Warren Sharpe OAM, President of IPWEA NSW (on left) and Rick Jones, Business Development Manager of Boral Asphalt (on right) congratulate John Maretich, Assets Section Manager at Port Stephens Council on winning the Public Works Leader award.



Considering his background, it is not surprising that he has developed his own unique approach to asset management. John has coined the phrase *"asset service delivery practitioners"* to describe how all of his diverse teams focus on delivering outcomes for customers.

John takes his knowledge transfer responsibilities seriously. He combines technical capability with business excellence which ensures he takes a natural leadership role in varied multidisciplinary groups and projects.

With his passion for music, his fascination with people and his self-confessed love of concrete, John is a unique and worthy IPWEA NSW Leader of the Year.

To the other entrants who submitted projects, your projects were also of a high standard. Remember, the concept of the Engineering Excellence Awards is to showcase what is being achieved in the Public Work Sector. It allows others to be aware of what is being achieved and this showcasing may help others to gain good results for their employers.

Not only was the Gala Dinner a massive success but so was the overall Conference.

The 2017 IPWEA NSW State Conference was held at Crowne Plaza in the Hunter Valley between November 8-10. More than 375 delegates, sponsors and guests attended the event, which promoted the theme *"Engineering: Taking NSW Forward"*.

The conference grew in size again this year and the Conference Committee wishes to thank everyone who participated in this most successful event and contributed to a couple of unforgettable days.



Delegates were welcomed by the Mayor of Cessnock Cr Bob Pynsent as well as NSW Shadow Minister for Finance Clayton Barr MP and Auntie Cynthia - an elder of the Wonnarua People. Mr Kevin Anderson MP, Member for Tamworth, attended on behalf of the NSW Premier Gladys Berejiklian.

Some of the highlights includes: -

- 40+ exhibitors showcasing their products inside and outside
- The NSW Police Force's Highway Patrol Concept Car
- ABC Journalist Fran Kelly creating some interesting discussion on 'how to manage infrastructure and community safety' with a wide range of panellists.
- Dan Gregory took us through 'how to lead the change', when it comes to Innovation and Disruption.
- 40 presentations in six different streams.
- The AGM introduced the incoming IPWEA (NSW) Board.
- Close to 400 people attended the Awards Gala Dinner where 91 projects and profiles were celebrated by peers, key stakeholders.
- The Minister for Local Government's Award was presented by Mr Scot MacDonald MP on behalf of the Hon Gabrielle Upton.
- Wendy Matthews and her band took care of the entertainment.

Additional photos of the conference and events are available on the IPWEA (NSW) website (www.ipwea.org/newsouthwales/nswevents/excellence-awards-2017) and a detailed report and booklet on Highly Commended and Winning entries is also available.

IPWEA (NSW) looks forward to seeing you all again at Crowne Plaza Hunter Valley between November 7-9 for the 2018 State Conference.



2018 REGIONAL FORUMS – HITTING FORUM NUMBER 100!

In 2018, IPWEA (NSW) will once again be hosting their Regional Forums and also celebrating a massive milestone; Forum number 100!

For nine consecutive years IPWEA (NSW) has conducted regional forums across the State; informed thousands of public works professionals, created networks across the industry, helped maintain and grow networks as well as assisting in bringing innovation, cost effective and efficient products to the corners of New South Wales.

The Regional Forums are a state-wide program delivered to rural, regional and metropolitan public works practitioners.

They are one-day events with technical presentations, case studies, site tours and networking dinners and are usually held

across 11 different locations throughout the State, but 2018 will see 12 locations with the anniversary Forum taking place at the National Maritime Museum in Sydney.

This 100th Forum will celebrate the success of these events that offers a dynamic program focusing on current issues and key technical information.

2018 Presenters and Partners are Boral, Vantage Pipes, Concrete Masonry Association, Local Government Procurement, Slasherteck, Food Recycling Pty Ltd and the Roads & Transport Directorate.

The Regional Forums will kick off on the North Coast Monday 5th March and finish in Sydney Friday 20th April. All dates, venues and registration links can be found on the IPWEA (NSW) website at: www.ipwea.org/newsouthwales/nswevents/regionalforums

IPWEA NSW ANNOUNCES NEW BOARD OF DIRECTORS

The IPWEA NSW Annual General Meeting was held during the State Conference on 9th November at the Crowne Plaza, Hunter Valley. 135 IPWEA NSW Members attended with a number of Non-Members also observing. During the Annual General Meeting the new board of Directors 2017-2020 were announced. Mr Warren Sharpe OAM will be completing his second term as IPWEA NSW President and we have two new board members.

The Board of Directors are:

- Mr Warren Sharpe OAM (President)
- Mr Peter Shields (Vice-President)
- Mr Gary Woodman
- Mr Garry Hemsworth
- Mr Paul Gallagher
- Mr Will Barton
- Mr Bill Woodcock
- Mr Mark Roebuck
- Mrs Nicola Daaboul

We welcome our new board members and would like to formally acknowledge our two outgoing Board Members, Grant Baker and Ken Halstead.

Grant Baker joined the IPWEA NSW Board in 2014 and it has been a pleasure seeing an already passionate and forward-thinking engineer with an interest in surveying and engage fully in the Institute’s affairs. Grant has from day one as a Director been hands on in the role and with the entire team at IPWEA NSW and as a result, he has as the Events Portfolio Director been a big part of growing the Institute’s annual events in size and reputation.

Ken Halstead was first elected onto the IPWEA NSW Board in 2000, and in 2014 he also took a seat on the IPWEA Australasian Board. During that time Ken has been a loyal advocate for local Government engineering; at UTS, in short courses for IPWEA in local politics, a councillor and as a mayor, (on more than one occasion). Ken is a keen advocate for recognition of engineers and has always been a strong advocate, educator and inspiration. 17 years of service is an incredible achievement and Ken’s contribution to IPWEA NSW is immeasurable.



DATES AND REGIONS

Monday 5 March	North Coast	Lismore
Wednesday 7 March	Mid North Coast	Diamond Beach
Friday 9 March	Hunter	Lake Macquarie
Monday 19 March	Central West	Orange
Wednesday 21 March	Orana	Warren
Friday 23 March	New England	Tenterfield
Monday 9 April	South West	Wentworth
Wednesday 11 April	ACT	Canberra
Friday 13 April	South East	Pambula
Monday 16 April	Illawarra	Bowral
Wednesday 18 April	Metro West	Penrith
Friday 20 April	Metro North/South	Sydney



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WHY WOULD YOU BUILD BRICK BY BRICK?

SAVE TIME AND SPACE WITH PERMANENT FORMWORK

Australia's tradition of high density construction with the block and brickwork method is losing favour with developers and builders as more modern, faster and efficient methods are becoming increasingly popular.

Permanent formwork offers many benefits over other methods of construction, saving time as well as valuable floor space, which in turn means the resulting building structure can be sold for additional profit.

"Permanent formwork provides the opportunity for faster cycle times compared to traditional block and brickwork," says Steven Terzian, General Manager of James Hardie Systems. "We believe in technology enabling increased efficiency on construction sites, and we believe the Ritek XL Wall is the superior technical choice when it comes to permanent formwork."

Block and brickwork has difficulty matching the speed in which permanent formwork solutions are erected, with the potential to save days per floor on construction – that equals savings not only in time but with labour costs. "Building brick by brick requires more time, labour and the space required to store the bricks," says Mr Terzian.

The design of Ritek Wall Systems permanent formwork solutions allows for simple set-up and rapid concrete pour; there's minimal interference from weather, resulting in very little downtime. Ritek Wall Systems are also designed to enable water drip to be directed away from the building through a rebated track.

Robert Morrison of J Hutchinson Pty Ltd, used permanent formwork in The Garland, a 7-storey apartment tower located beachside at Coolangatta, which comprises of 24 apartments.

"As always, we had strict building timelines to maintain and this wall system provides much faster floor cycle times compared to traditional building methods," says Mr Morrison.

Building with permanent formwork reduces wall thickness, leading to savings in overall floor space.

"The result is an opportunity for greater profits within the same overall building dimensions," says Mr Terzian.

"For a typical building of 100 lineal metres of outside wall, replacing a double brick wall, plus insulation and plasterboard, with a Ritek XL Thermal Wall, results in improved floor space of 11 square metres," he adds.

SOLVES COMPLEX CONSTRUCTION CHALLENGES

Ritek Wall Systems provide a permanent formwork wall system that solves complex construction challenges, and are suitable for use in single residential, multi-storey residential and commercial buildings as load bearing and structural walls up to 25 storeys.

The efficient Ritek XL Thermal Wall is a pre-fabricated wall panel system that is manufactured specifically to the architect's drawings and is delivered complete with an insulation layer bonded to the inside of the exterior facing panel. Electrical and gas services, windows and fire door frames can be cast in, removing the need to line walls.



Permanent formwork was used in The Garland, a 7-storey apartment tower located beachside at Coolangatta on Queensland's Gold Coast.

For exterior walls, Ritek XL Thermal Wall is manufactured specifically to the architect's drawings and engineer's specifications, with built-in insulation allowing for a high thermal rating of up to R-value 4.8. No need for additional trades and materials in providing insulation, batten and lining while achieving BCA thermal, fire and sound transfer specifications.

"We believe in efficiency," says Steven Terzian. "With a construction project using Ritek walls, there's no need to punch access holes onsite, all corner sections remain open for reinforcement placement and engineer inspection, ensuring a streamlined approval process."

SAVE TIME AND COST

Ritek permanent formwork wall systems are faster to erect than traditional block and brickwork, reducing time and onsite labour costs by up to 5 days per floor on construction. Savings in construction time has the potential to reduce associated site costs such as site management, crane and scaffolding hire.

The design of Ritek walls allows for simple set-up and rapid concrete pour, with minimal interference from weather, resulting in minimal downtime.

Ritek walls also minimise reliance on cranes compared to precast concrete. Panels are custom-made for the build project and ready to be installed for rapid concrete pour.

Permanent formwork is a leading technology that addresses the challenges of building on urban redeveloped sites. Ritek XL Wall and Ritek XL Thermal Wall products are thinner than traditional block and brick, which is a clear advantage on tight construction sites, reducing

wall thickness by up to 27 per cent compared to block. Installed and unbattered, Ritek walls also create an opportunity for additional floor space with the same building footprint.

In addition, the sanded surface is ready for direct setting by finishing trades to a level four finish, removing the cost and time to batten out and plaster line walls.

To minimise traffic disruption in high traffic areas, wall panels can be delivered on small trucks and lifted into place using a Manitou or small crane. Panels are custom-made for the build project and ready to be installed for rapid concrete pour.

HIGH PERFORMANCE PERMANENT FORMWORK

With non-rusting aluminium internal components, Ritek walls are the ideal solution for build projects in coastal areas with a need for withstanding harsher climate conditions. Ritek Wall Systems offers a 25 year warranty, including in coastal areas, and the system has been successfully installed in coastal areas for the last seven years.

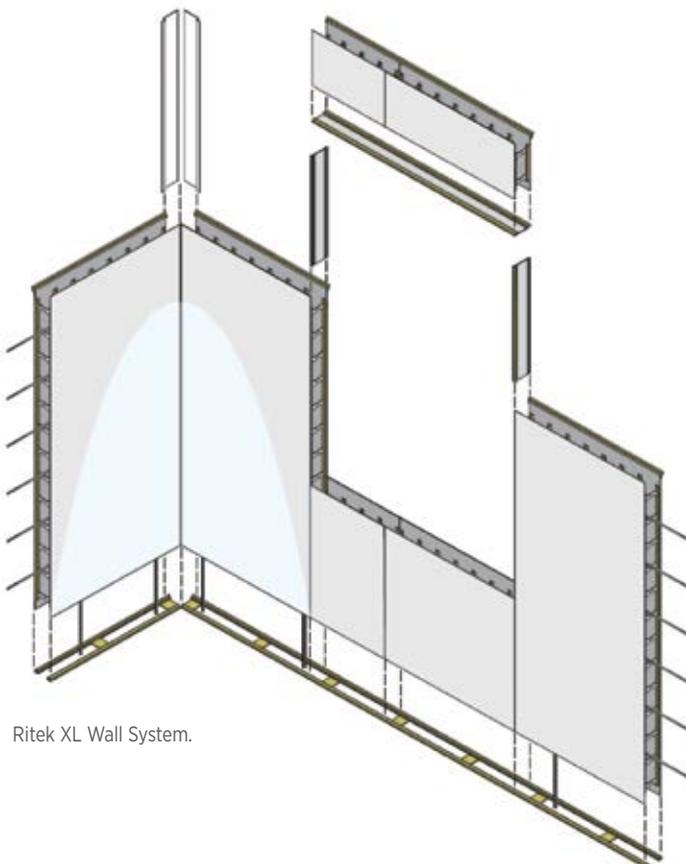
Ritek® XL Wall and Ritek® XL Thermal Wall, also complies with the *BCA 2016 Volume One: Spread of fire, Fire-resisting construction, Fire separation and Protection*. The Ritek XL wall has also been tested by CSIRO, Materials Science and Engineering to *AS 1530.4:2005 - Methods for fire tests on building materials, components and structures*.

Ritek walls can be used as columns, blade and shear walls, stair and lift shafts. With an impact resistant durable fibre cement surface, it is perfect for high traffic areas with high occupancy and activity levels, such as multi-residential, social housing, hotels and aged care.

For peace of mind, James Hardie Systems provides its customers with support for every project.

“Our goal is to enhance our customer experience,” says Mr Terzian. “So we provide a committed technical services team, in-house drafting and scheduling services, on-site project co-ordination assistance and a dependable customer service and sales support team.”

For further information, please visit: www.jhsritek.com.au



Ritek XL Wall System.

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SPECIALTY MAGNETIC FORMWORK FOR FOREST CITY IN MALAYSIA

SUCCESS IN MEGAPROJECT WITH GERMAN ENGINEERING

Just a few kilometres from Singapore, in Johor in southern Malaysia, the starting signal for an extremely ambitious development project has sounded: Forest City.

The venture is Asia's largest urban development project, one that will not only provide 700,000 people with a new home in a sustainable 'smart city' with extensive green areas, but that will also provide high-tech industry, a large commercial and banking quarter, expansive conference and exhibition space as well as tourism offers and a large number of jobs. About 33 million US dollars are expected to flow into the project from developers Country Garden Pacific View and four artificial islands with a surface area of 1,400 hectares will be built in the strait between Singapore and Malaysia. The limited supply of premium residential space in the region means that a significant share of the apartments have already been sold.

For construction of the greened, architecturally demanding residential buildings, several prefabricated components are to be used, of which the first only began operation recently. RATEC magnetic formwork technology will be applied here. In addition to robot-compatible standard formwork for the production of wall and roof components, the RATEC engineers have also developed a new formwork solution in order to meet the specific customer requirements.

"German engineering and quality products are in demand across Asia, and that is really the key to our international success", said Jörg Reymann, Managing Director of the RATEC/Reymann Group.

With the new *Easy Form* formwork system, even the most difficult formwork challenges can be easily and quickly solved.

Different ridges allow the free adjustment of the formwork height. The flat foundation allows

continuous and protruding reinforcements from 25mm in height to be achieved.

Easy Form is designed as a building block, which can be effortlessly expanded and supplemented and can be flexibly applied with few components. Thanks to the wide range of component parts, the system has a solution for all formwork issues. Even complex forms with upstands and reinforcement ends can be easily achieved. A patent application has been submitted for the system.

ABOUT RATEC GROUP

RATEC/Reymann group is one of the leading suppliers and service providers for the precast concrete industry, including magnetic formwork technology complex 2D and 3D formwork solutions. With own offices in Germany, Spain, the United States and Singapore as well as a wide network of distribution partners, the company is present on all continents.



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CORROSION CONTINUES AS COMPLEX CONCERN

The degradation of private and public assets and infrastructure continues to have a major economic impact on industry and the wider community: it is estimated that governments and organisations spend approximately three percent of GDP—the equivalent of billions of dollars each year—mitigating and repairing corrosion damage.

In November, the Australasian Corrosion Association (ACA) hosted a major forum where the management and prevention of corrosion was the focus. The ACA's annual Corrosion and Prevention Conference and Trade Exhibition was held in the International Convention Centre Sydney (ICC) with nearly 500 delegates from every continent (except Antarctica) attending lectures, seminars and workshops.

The conference brings together corrosion practitioners and researchers, as well as asset owners and operators, from around the world in order to promote a better understanding of corrosion mitigation.



Professor Maria Forsythe and P F Thompson's son, David



Professor Maria Forsythe delivering the 2017 P F Thompson Memorial Lecture at C&P2017

C&P2017, enabled all corrosion stakeholders to meet and discuss a wide range of topics. In particular, the conference brought together a panel of industry experts to discuss the challenges and the importance of maintaining vital infrastructure. The diverse technical streams showcased the latest developments in corrosion prevention, management and mitigation. The main themes of the technical seminars covered coatings, concrete & asset management, the oil & gas and offshore industry, and research. Topics ranged from fundamental corrosion science to hands-on application including advances in sensing & monitoring; asset management; cathodic protection; concrete corrosion and repair; corrosion mechanisms, modelling and prediction; materials selection and design, and protective coatings.

The design, construction and operation of facilities and infrastructure represent major investments by companies, organisations and governments. Corrosion affects all structures at varying rates over time, depending on the material used, the types of corrosive agents in the environment and the physical processes and mechanisms

involved. How to manage this degradation is a challenge for designers and engineers, as well as asset owners, managers and operators.

In the continuing efforts to minimise the impact of corrosion, new materials are being developed to build structures and procedures implemented that have been designed to protect both new and existing facilities.

The keynote address of the conference - the PF Thompson Memorial Lecture - has been delivered at every C&P Conference since 1951. The presenter for 2017 was Professor Maria Forsyth, Australian Laureate Fellow and Chair of Electromaterials and Corrosion Sciences at Deakin University. Professor Forsyth's lecture - Controlling Corrosion with Chemistry - related how using chemistry to control corrosion ranges from designing metallic coatings through to creating oxides on a metal substrate or protective polymeric coatings and using chemical additives in a given environment to produce inhibited surfaces.

A special guest at C&P2017 was David Thompson, son of Percival Thompson in whose honour the lecture is named. A



ACA Executive Officer, Wes Fawaz, addressing delegates at the C&P2017 Welcome Reception

renowned metallurgist in his own right, David Thompson said the reception he received at the conference was almost overwhelming.

“So many people approached me to say they knew people whom I had either trained or worked with during the course of my career,” he said.

Thompson stated he had, like so many others over the years, had a good teacher in his father.

“However, being the sixth child in the family, I wasn't supposed to know anything,” he added wryly. Thompson said his father spent a lot of time away from home inspecting mining leases and that as a result, the family home had one of the largest collections of ore samples in the country.

“He was also an umpire assayer and so had to visit every gold mine in the country in order to counter fraudulent ‘salting’ of a site to increase its potential value.”

An ‘umpire assay’ is an independent assessment of the value of an ore sample where there is disagreement between the values given by the buyer and seller. When a mine is ‘salted’, most commonly gold or silver is added to a sample in order to give a greater value to the mine deposits.

“My father regularly marked university exam papers,” Thompson added. “A big truck would arrive at our house and a massive load of papers would be unloaded.” Thompson senior’s study often had inorganic and organic chemical samples that were used as part of the university exams he set.

P F Thompson established the School of Metallurgy at the University of Melbourne and oversaw its development, growing from a handful of students to more than 200 before moving to RMIT to set up a similar school at that institution. Named after

the revered Michael Faraday of the Royal Society in London, Thompson’s father taught in a similar manner to his namesake.

“He was a demonstrator and believed that if you showed a student a process or reaction, they would remember it better,” he added. “If they could show they really understood the basic principles, my father would be lenient towards them when marking their papers.”

Thompson stated that his father was a master of many disciplines, such as general science, astronomy and music in addition to his main passion of metallurgy.

“We had one of the largest reflective telescopes in its day at our house and the Victorian Field Naturalists Society used to meet in our backyard.”

P F Thompson worked with the CSIRO but a lot of the projects were very secretive, especially during the Second World War. One investigation involved US warships at the time of the Battle of the Coral Sea; ships would have to head to port with heavily corroded condenser tubes that impacted the marine steam engines. It was discovered that the American navy had used brass alloy that had phosphorous added and that this additive enhanced the corrosion.

Another wartime investigation involved the catastrophic failure of aircraft engines.

“Many aircraft had glycol-cooled engines but some maintenance staff added a corrosion inhibitor to the mix, which my father and his team discovered deposited copper onto the aluminium cooling tubes causing the engines to overheat.” Thompson said.

David Thompson himself was also called on for advice. The company he worked for received an order from the operators of the Sydney Opera House with a design that utilised copper pipes under load.

“I knew from my research that the proposal would fail very quickly due to corrosion fatigue and advised them accordingly.” Wanting a second opinion, the operators approached another metallurgist, Rupert Myers - the first Australian to be appointed a University Vice-Chancellor.

“Rupert was a friend of mine and he told them that if David Thompson said it, you had better believe him as he knows more about the subject than anyone else.”

The annual Corrosion and Prevention Conference is just one aspect of how the ACA collaborates with industry and academia to research all aspects of corrosion mitigation in order to provide an extensive knowledge base that supports best practice in corrosion management, thereby ensuring all impacts of corrosion are responsibly managed, the environment is protected, public safety enhanced and economies improved.

The integral trade show consisting of 72 exhibition booths, attracted more than 200 additional people to the event. The range of exhibitors included materials suppliers, equipment vendors, specialist contractors and consultants. Delegates were able to browse the stands throughout the conference and take the opportunity to discuss products and services with the exhibitors. Exhibitors benefited from broad exposure to corrosion industry practitioners from around Australia, New Zealand and the world.

The ACA’s conference continues to be the premier corrosion event in the Asia Pacific region, with its extensive program of keynote speakers and technical presentations.

In 2018, South Australia’s capital, Adelaide, will once again host the ACA conference.

ABOUT THE AUSTRALASIAN CORROSION ASSOCIATION

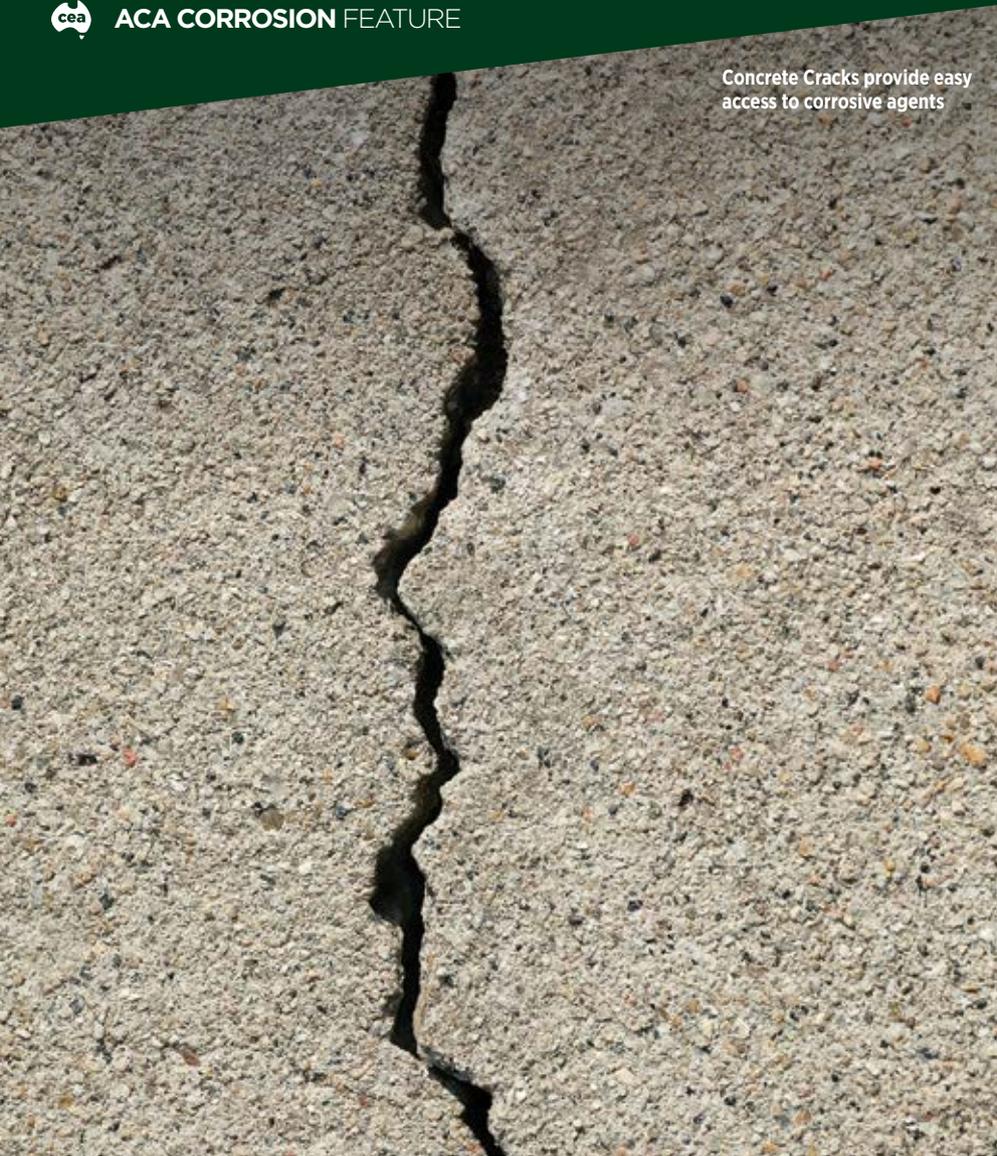
The Australasian Corrosion Association Incorporated (ACA) is a not-for-profit, membership association, that disseminates information on corrosion and its prevention through the provision of training courses, seminars, conferences, publications and other activities.



The vision of the ACA is that corrosion is managed sustainably and cost effectively to ensure the health and safety of the community and protection of the environment.

For further information, please visit: www.corrosion.com.au or www.membership.corrosion.com.au

Concrete Cracks provide easy access to corrosive agents



multifactorial; it often stems from obscure reasons. Like the cause of a common headache that is often attributed to a pathological cause leading to expensive and often needless investigations and treatments, whereas, the actual cause may be a stress-triggered tension headache. Similarly, stomach infections are common during monsoons in Asia, which are due to the 100 year old corroded sewage pipes leaking into the parallel running municipal water pipes. A point to ponder here is whether treating the gastro patients with medicine or changing water filters would make the situation better without addressing the root cause of the problem?

Corrosion of steel generates iron oxides and hydroxides, resulting in the increase of volume 5 to 8 times of its original size. This increase in volume causes expansive forces to accumulate within the concrete around reinforcement and results in cracking and in areas with low cover, concrete spalling.

Cracks provide easier access to oxygen, moisture, chlorides and other corrosive agents that create conditions suitable for accelerating the electrochemical corrosion process.

CONCRETE PROBLEMS TODAY ARE MULTIFACTORIAL - ROOT CAUSES

BY HAMID KHAN

Regular and planned asset maintenance is vital for reinforced concrete structures. Such maintenance should not be a 'cosmetic repair' but rather a proper root cause analysis that must be carried out to identify and understand the actual source of the problem. Material selection is an important step in asset maintenance and refurbishment projects though only after the root cause has been addressed.

Conducting proper root cause analysis in

restoration and refurbishment projects will prevent one from falling into a vicious cycle of 'repairing the repair'.

A study conducted by Jingmond and Ågren (2015) has highlighted the importance to look at the root causes of the defects in concrete from the organisational perspective as well, instead of only at the operational level.

A defect or problem in an existing reinforced concrete structure is



Linear Transverse cracks on new bridge deck due to plastic shrinkage. The open face of the crack and surrounding surface is ground and sealed with epoxy resin.



Cathodic protection to bridge piers affected by cracks, corrosion and spalled concrete, using embedded galvanic anode units (top) and distributed galvanic anode system (bottom).

Prestressed concrete bridge girders may exhibit unexpected end cracking upon prestress release. These cracks may propagate into the bottom flange of the girder where strands are located and can increase in width with increased traffic loads. Leakage from the bridge expansion joint could penetrate the bottom flange cracks and trigger severe corrosion. In this case expansion joint leakage must be arrested prior to the crack and concrete repair activity.

A common form of cracking at an early age on new concrete decks is known as transverse cracking which may appear over the length of span above transverse reinforcement. These cracks can accelerate corrosion rates, reduce the service life of the asset and increase maintenance costs.

When a mass of concrete that shrinks as it ages is restrained, cracks will occur. For example, restraint of a concrete deck by an integral support girder against its volume change initiates cracking. Multiple factors such as concrete materials and mix design, ambient temperature changes, humidity, bridge design characteristics and construction practices can all contribute to volume change and/or to degree of restraint of concrete mass. However, transverse cracking cannot be attributed to all of the above factors. It is therefore important to identify the major contributing factor(s) to address the root cause of cracking.

A crude approach while examining the corrosion induced damage in bridge structures, particularly in the marine environment, is to assume the presence of chlorides as the main cause of failure.

Chlorides might be the reason of corrosion but not the actual cause of the bridge defect. The root cause of failure of the bridge structure cannot be simply corrosion.

There are many factors involved that could lead to corrosion and ultimately lead to failure of the bridge, such as, cracks in bridge girder web and flange, poor bridge drainage system, failed bridge deck waterproofing membrane, inappropriate bridge joints, void in the prestressed or post tensioned cable ducts due to excessive grout bleed. Other factors at macro level are related to design, material, environment and construction practices.

It is important to address the main contributing factor(s) of the defects in bridge structures affected by corrosion. It is quite common to observe local white patch of efflorescence that appears like a chalky powder at ground floors due to rising or penetrating dampness inside institutional buildings, hotels and residential apartment buildings. This phenomenon occurs due to number of factors. For example, one of the factors is the absence of or damage to the damp proof course which allows entry of moisture from the ground below, or from unsealed landscape planters outside hotel rooms, which seep through the external walls and result in white patches of dampness along the perimeter of the internal wall.

Treating the damp patch from inside would only solve the problem temporarily as it could recur unless the damp proof course is repaired.

Concrete repairs conducted without considering the actual source are 'cosmetic repairs' and may last only for few months. For instance, repairing the spalled concrete of a balcony with quick-fix patch method, even applying the best quality repair mortar, would not solve the problem unless the root cause has been identified and addressed. It could be attributed to more than one cause such as leakage due to failure of waterproofing membrane, a broken drain pipe, leaking concealed pipe joints or a combination of these factors.

Corrosion of reinforcement that has caused spalling of balcony is not the root cause here.

Roof leakages in buildings result in seepage into the rooms below. This causes discomfort to the occupants and frequent disputes between the landlord and the tenant in regard to the liability for repair.

The failure of roof waterproofing is often attributed to the poor workmanship. Based on this notion, the roof refurbishment is carried out but the leaks appear again after some period of time.



Repair of balcony concrete corrosion and spalling due to multiple factors.



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