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JUL/AUG 2020

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**CONSTRUCTION
CIVIL WORKS
CIVIL ENGINEERING**

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**EXPERT, INDEPENDENT,
THIRD-PARTY STEEL CERTIFICATION
TO AUSTRALIAN AND
NEW ZEALAND STANDARDS**



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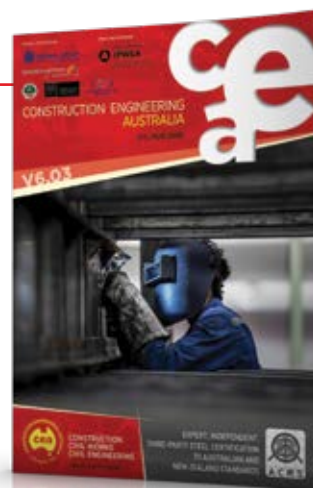
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Philip Sanders, CEO of ACRS, explodes four dangerous myths recently encountered in the supply of structural steels and structural welded sections misstating ACRS certification to AS/NZS 5131, which has resulted in unverified and nonconforming steels arriving on construction sites.

► Turn to Page 10 for the full story.



REIMAGINED

RETHINKING CITY DESIGN... AND THE WAY WE LIVE AND WORK

Dear Readers,

While I don't wish in any way to appear flippant about an event which has devastated so many lives and, for all intents, laid a large proportion of the global economy to waste, it is also clear that the COVID-19 pandemic has presented us with a unique opportunity to reassess the way in which we interact with both each other and the planet from this point forward.

For example, prior to the COVID-19 pandemic, the majority of people in Australia's capital cities (and an alarming number of major regional centres) were faced with an ever-increasing daily commute to their place of employment.

For commuters in our five major capitals, a daily commute time of 30 minutes would be considered 'a dream run', with 2019 research showing daily average commute times of 60 minutes or more. That's a minimum of 5 hours per week (or 200+ hours per year for an average work year) just to get to and from work.

Unfortunately, for many it's considerably more than that, with daily commutes of 45-60+ minutes each way not uncommon. That was until COVID-19 restrictions arrived.

With a strict mandate of *'those who can work from home, MUST work from home'* we suddenly (yet perhaps not surprisingly) discovered that a significant percentage of the population didn't really have to attend a centralised workplace every day to keep working.

Almost instantaneously, traffic congestion was all but eliminated in most areas, commute times for those who could not work from home dropped to unprecedented

levels, and in many cities and regions around the globe, air pollution levels dropped to those not seen since prior to the industrial revolution. Indeed, some cities were waking up to vistas of mountains, oceans and other natural landmarks that had remained shrouded in pollution for so long, that no one could ever recall them being visible!

Now, before I continue, I do recognise that for many people, having to work from home was both onerous and challenging on many levels, and as such, I do not wish to suggest that eliminating office space altogether is desirable, or for that matter, even an option.

There is also the matter of existing buildings and infrastructure. One can not simply 'abandon the cities!' As well as being completely wasteful and pointless, it would also result in an economic crisis for the building, construction, and real estate sectors.

What I am suggesting, however, is that the experience of the COVID-19 restrictions (both across Australia and globally), especially in terms of reducing traffic congestion, pollution and wasted commute time, should provide us with a major catalyst for rethinking the way many of us live and work – especially in terms of how far we travel to and from our primary place of employment.

While the concept of *'The 15-minute City'* (where cities are designed so a large percentage of residents can live within 15 minutes of their workplace, essential shopping and recreation facilities) is not new, the glimpse of a less polluted and less congested world offered by the COVID-19 shutdowns has once again brought the

concept back to the fore, with many arguing that it delivers a significant amount of benefits for residents and the planet alike.

Reduced pollution, reduced carbon emissions, an increased opportunity to move to Electric Vehicles, improved localised transport options such as shared Maas (*Mobility as a Service*) models, reduced 'commuter stress', improved work-life balance, expanded economic opportunities... the list goes on.

For Australia, I believe *'the 15-minute City'* concept also presents us with a valuable opportunity to start decentralising our population growth away from the major east coast capitals.

While it's clear that there are many more things to be considered when it comes to rethinking the design of our cities and regions than a simple one-page editorial will allow, I believe that as long as it's not developed as a 'prescriptive control' – rather encouraged through favourable land-use, planning and zoning cooperation, with tax incentives for home and/or hub offices, Electric Vehicle purchases and choosing MaaS services over private vehicle use – the *'15-minute City'* model can play a significant role in improving many peoples' quality of life, while at the same time significantly reducing our impact on the planet.



Anthony T Schmidt
Managing Editor

Whether it's a TL-2 or TL-3 attenuator, your first question should always be: **IS IT MASH APPROVED?**



With the Austroads Safety Barrier Assessment Panel (ASBAP) 'Transition to MASH' final transition date of 31st December 2020 looming large, there's never been a more important time for equipment purchasers to ask the critical question: "Is it MASH Approved?"

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AUSTRALIAN-FIRST ONLINE TOOL FOR DEVELOPING A GREENER CITY

An Australian-first online tool will help architects and developers create more sustainable communities by introducing a consistent and simple way to assess a building's environmental impact.

Environment portfolio Chair Councillor Cathy Oke said the City of Melbourne's voluntary *Green Factor Tool* would help developers measure the green credentials of their design at the planning stage.

"Green Factor is the first online tool of its kind developed in Australia. It will help build more sustainable buildings and communities by measuring the quality and quantity of green infrastructure, such as green roofs, walls and gardens," Cr Oke said.

"We had more than 650 people register for an information session on how to use



the voluntary Green Factor Tool as well as an opportunity to test it on their future projects."

"We're responding to the Climate and Biodiversity Emergency with a range of actions,

including encouraging greening on private and public land."

"There is a clear business case for green buildings in terms of limiting global warming, but also because these are places where people want to live and work. People that live and work in well-designed environments are more likely to be happy and healthy."

The Green Factor Tool assesses proposed developments against set criteria including cooling, habitat, stormwater, food supply, recreation, place and aesthetics.

It has the potential to work in with other rating systems such as GreenStar, which was launched by the Green Building Council of Australia in 2003.

Planning portfolio Chair Cr Nicholas Reece said the voluntary online tool has been tested by stakeholders including Landscape Architects, Ecologically Sustainable Development consultants, developers and the Green Building Council of Australia.

"We've tested the tool with industry and have received fantastic feedback. We're now asking developers who submit a planning application in the City of Melbourne to consider also submitting a green factor scorecard," Cr Reece said.

"To maintain Melbourne's liveability we need to consider green architecture and building design much earlier in the planning and development stage.

"This tool is free and can be used to measure the green infrastructure credentials of different types of buildings, from residential to retail, commercial offices and warehouses."

To use the Green Factor Tool visit: www.greenfactor.com.au

CEA COMMENCES DISTRIBUTION OF DITCH WITCH AND KOMPTECH

As a leading agriculture and construction equipment distributor CEA officially commenced operations as the Australian and New Zealand distributor of *Ditch Witch* underground construction equipment and *Komptech* waste recycling equipment from the 2nd July, 2020. CEA agreed earlier this year to purchase the well-known distributor, ELB Equipment, which distributes Ditch Witch and Komptech equipment.

As part of the acquisition CEA will also become the distributor of *Diamond Z*, *Screenpod*, *TrackStack*, *Hammerhead*, *Ring-O-Matic* and *Subsite* adding to its



(L-R): ELB Managing Director Christopher Malan and CEA CEO Hylton Taylor

expanding portfolio of products for clients operating in the infrastructure construction, utility maintenance, waste management and recycling sectors.

As the distributor of JCB construction and agricultural machinery; Dynapac compaction and paving equipment; and Atlas Copco generators, portable air compressors, and lighting towers, the addition of Ditch Witch and Komptech to the CEA portfolio will strengthen the business's well-established footprint across the country.

"We are really pleased to add these strong brands to our product portfolio," said CEA CEO Hylton Taylor. "As a growing business we are continually looking at how we better meet the needs of the ever-evolving market. Adding strong, well established brands to our portfolio strengthens our ability to support our diverse range of existing customers and provides the opportunity to interact with a whole new client base."

As part of the acquisition 55 employees from ELB Equipment will transition to CEA, ensuring key product knowledge and strong customer relationships are retained within the business.

"We're excited to be joining CEA," said ELB Managing Director Christopher Malan.

"CEA is well known for its professionalism, extensive focus on core product lines, and supporting its staff to carry out their integral roles within the business. The ELB team is really looking forward to coming together with CEA to collaborate and build on the Ditch Witch and Komptech brands here in Australia and New Zealand."

The ELB Equipment head office and administrative commence relocating to CEA's head office in Horningsea Park (Sydney) in July, 2020, and ELB's operations in Sydney, Adelaide, and Brisbane will commence consolidating with CEA's facilities over the coming months. It is anticipated that all ELB Australian facilities will be consolidated with their CEA counterparts within 18 months. It is a priority of the business to ensure minimal disruption and downtime as the transition takes place.

"There will be a period of transition over the coming months as we move the ELB team in to the CEA premises but I am confident we can complete this quickly and with minimal disruption," Mr Taylor said. "Since first announcing the acquisition, we have received extremely positive feedback from the market and we are looking forward to the future opportunities this will present to the CEA business."

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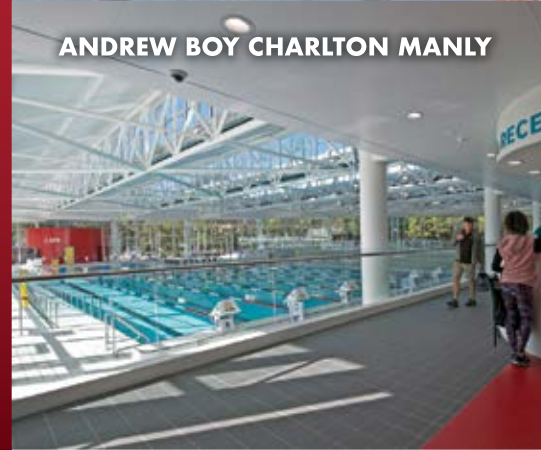
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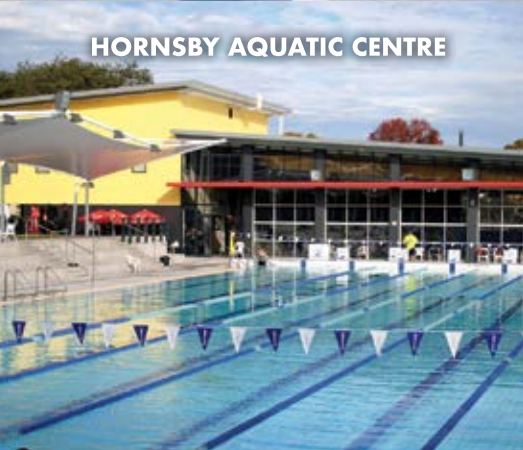
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TURNING ONE VENTILATOR INTO MULTIPLE ENGINEERED VENTILATION STATIONS

Combilift, best known for its range of space-saving forklifts and other handling solutions, has drawn on its expertise in engineering and software design to develop the Combi-Ventilate, a splitter device which turns one ventilator into multiple ventilation stations.

Designed to address the requirements of medical professionals in the current Covid-19 emergency the Combi-Ventilate was developed by a team of mechatronic and software engineers.

Martin McVicar, CEO and co-founder Combilift said: "Certain countries and cities are struggling to get enough ventilators and many governments and health authorities are encouraging manufacturers to come up with a solution, as did the HSE in Ireland."

"Instead of actually developing ventilators, we analysed what is really required, as we do in our usual business models," he said.

The Combi-Ventilate uses standard pipes and fittings for easy assembly and its individual patient filters prevent cross contamination. Each patient has a dedicated screen which allows medical professionals to individually monitor their vital information.

This includes live values, data on patient history and statistics and adjustable alarm settings. Features include non-return valves, HEPA filters, flow sensors and an automatic flow control valve. Any abnormalities that occur are detected and will only trigger that specific patient's alarm.

The Combi-Ventilate has automatically adjustable flow control valves which allow the health service professional control the tidal volume to each patient electronically without having to make manual adjustments.

"We have made Combi-Ventilate under the same ethos and with the same objective as we do with all our the Combilift products - which is all about doing more with less," said McVicar.



Pictured at the launch of the Combilift-Ventilate are Antonio Patacho, Combilift Engineer; Martin McVicar, Co-Founder & CEO, Combilift; Dr Michael Power, National Clinical Lead, Critical Care Programme, Irish Health Service; & Christopher Carragher, Combilift.

"We have undertaken this non-profit endeavour in order to meet and facilitate the demands of the global crisis for health services around the world, the lack or shortage of ventilators. The medical device sector is not our core business but making critical equipment which keeps people safe and alive has always been our focus and this latest project, driven by our desire to help during these difficult times, mirrors what our research and development has done for the last 20 years," Mr McVicar said.

"If our product can save lives, if we can make a difference during these hard times then we are making the world a better place for everyone," he added.

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CBUS SUPER INVESTS \$49 MILLION IN NHFIC ISSUANCE TO SUPPORT COMMUNITY HOUSING PROVIDERS

Cbus Super, a long-standing advocate for a housing bond aggregator, has invested \$49 million in the latest *National Housing Finance and Investment Corporate* (NHFIC) bond issuance.

The bond will fund a number of large construction programs through Community Housing Providers (CHPs) in Victoria,

Tasmania, NSW and South Australia. This is their 3rd bond issuance. Cbus Super has invested in all three of NHFIC's issuances, bringing its total investment to \$88 million.

Cbus Super Chief Investment Officer Kristian Fok, said the success of the three rounds of NHFIC issuance showed the value of the innovative financing model.

"Cbus is delighted to once again support NHFIC as a cornerstone investor in their successful third affordable and social housing bond issuance," Mr Fok said.

The issue today of \$562 million is for 12 years, to include provision for construction funding of up to 2 years and term funding of 10 years. The issuance was well over-subscribed.

Mr Fok said, "It is fantastic to see the tangible impact that NHFIC is having for CHPs by creating savings through lower interest costs and delivering construction of social and affordable homes. The 12 year timeframe will provide certainty to allow for some larger construction projects."

The funds raised by the bond will be loaned to community housing providers (CHPs) to support the financing for properties across Australia, including supporting the supply of new social and affordable dwellings.

Mr Fok said, "As the leading super fund for the building and construction sector we are pleased to invest in NHFIC bonds that meet our investment risk-return criteria and fund new housing construction for Australians in need."

"Cbus is pleased to be maintaining an ongoing commitment to the NHFIC programme and continues to explore other opportunities to partner with NHFIC," Mr Fok noted.



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Historic new laws to regulate engineering in NSW

Excerpts of this article written by Rachel Brown and first appeared in *create* magazine.

Edited by EA Marketing Department

New laws to reform the NSW building sector to introduce a registration scheme for professional engineers have passed NSW Parliament. Following strong advocacy from Engineers Australia (EA), it will become compulsory for professional engineers to become registered to practice. The law initially applies to professional engineers in the fields of civil, structural, electrical, mechanical and fire safety engineering. The new laws are expected to take effect on 1 July 2021.

“Australia’s three largest states now have laws which make it compulsory for engineers to be registered and there is no reason why the remaining five states and territories should not introduce similar laws as soon as possible,” said Engineers Australia Chief Executive Officer, Dr Bronwyn Evans.

“It will lift professional standards for the 60,000 engineers who work in NSW who are vital to the state’s economic recovery from the coronavirus pandemic. The passage of the Design and Building Practitioners Bill through the NSW Parliament is a history-making



Engineers
Australia Chief
Executive Officer,
Dr Bronwyn
Evans

development in the regulation of professional engineers in Australia and one which will significantly benefit the community and the engineering profession,” she said.

“The fact that Victoria and Queensland already had systems in law that applied to engineering practice across all industries added weight for NSW to do the same. The catalyst for NSW was the Shergold-Weir report and its recommendations. It became obvious that NSW couldn’t be stuck in the middle with no checks and balances on professional practice,” said Jonathan Russell, Engineers Australia National Manager for Public Affairs and Policy Advocacy.

Engineers Australia acknowledges the Berejiklian Government, notably the Minister for Better Regulation and Innovation, Hon Kevin Anderson MP, for pushing forward with the reforms. Shadow Minister for Building Reform and Property, Ms Yasmin Catley MP is also acknowledged for her efforts.

“Compulsory registration of engineers will help to minimise the risk of more major incidents, such as Opal and Mascot Towers - or bridge collapses as seen in Australia and around the world. Our members overwhelmingly support the reforms for compulsory registration of engineers,” Dr Evans said.

HOW WILL THE LAWS BE APPLIED?

The laws will apply to anyone wishing to provide professional engineering services, unless if doing so under the direct supervision of an appropriately registered engineer, or if only applying a prescriptive design.

Although embedded in the NSW Government’s building sector reform legislation, the new laws for engineer registration will apply to engineers working in any industry.

It will become an offence for a person to falsely claim to be registered as an engineer unless they are registered and have the right qualifications and level of competency. Engineers Australia will advocate for strong minimum standards in terms of qualifications, experience and commitment to “Continuing Professional Development.”

WHAT DOES IT MEAN FOR ENGINEERS?

If you’ve already obtained your Chartered credential (CEngA, CEngT, CPEng) or are registered on the National Engineering Register (NER), then it’s likely good news for you.

“One of the big tasks for Engineers Australia during the next phase is to make sure that anyone who’s registered on the National Engineering Register (NER), or is Chartered with EA, will also be able to use their status on those two systems as a pathway to statutory registration,” Russell said.

EA’s argument is that NER and Chartered should be enough to satisfy the government that they should be registered on their system too. The Bill also makes it very clear that mutual recognition applies, so for anyone who is already registered in Queensland, and if people get registered in Victoria first, costs will be kept low because they’ll be entitled to be registered in NSW without any significant hoops to jump through.

And while five areas of engineering practice are initially covered by the Bill, additional areas of engineering might later be added via regulation.

"It provides for more [areas of practice] to be added down the track," Russell said.

WHY BECOME CHARTERED

Earning status as a Chartered Professional Engineer (CPEng) is a major professional milestone.

Dr Evans says, "Chartered credentials are internationally benchmarked and recognised, demonstrating that Australian engineers are at the global forefront and meet world-class competency standards."

"Achieving Chartered status demonstrates an extra level of commitment. Registration is about regulatory compliance and minimum standards to practice. Chartered is about best practice."

"It's a mark of trust, skill and expertise — of competence, experience and judgement displayed at an advanced level. Chartered engineers commit themselves to ethical practice and further professional growth and development," Dr Evans added.

Credentials like Chartered status are important for the role they play in public trust in the engineering profession, Evans added. It's also essential to ensure engineers are prepared to address the increasingly complex challenges faced by Australia and the world.



Alex Radulovich,
Chartered
Engineer,
Douglas Partners

Alex Radulovich is a Chartered engineer with Douglas Partners. She said the accreditation helped gain her a promotion - and reinforced how much good engineering matters. She believes Chartered engineers will become increasingly prevalent – and requested by employers.

"More engineers are going to be expected to become Chartered," she said. "And clients are going to be looking for work to be undertaken by Chartered engineers."

"Now that I've been through the Chartered process, my advice to people starting out is to start working towards the credential from early in their career," Alex added.



Dean Helm,
Chartered
Engineer,
TransDev Sydney
Ferries

Dean Helm, also a Chartered Engineer, of TransDev Sydney Ferries says, "...when you start looking into the Chartered qualification, it can seem quite overwhelming, but in the end it is a very rewarding process."

Chartered status can be achieved in 24 areas of practice, including major engineering disciplines such as aerospace, biomedical, chemical, civil, electrical, environmental, mechanical and structural. Other pathways are also available, such as asset management, cost engineering, heritage and conservation, leadership and management, project management and risk engineering. Engineers with five years or more of experience are candidates to become Chartered.

Interested in learning more about the Chartered credential? You may already have what it takes to become Chartered. See the standard you've reached be recognised by your peers.

Find out more and start your Chartered self-assessment today. The entire process can be managed online.

For more information, please visit: www.engineersaustralia.org.au/ Chartered or call Engineers Australia on Phone: +61 2 6270 6555 Toll Free: 1300 653 113

Scan the QR Code or visit: <https://i.ead.me/bbeSAL> to see what Alex, Dean and other engineers say about becoming Chartered.



SCAN ME

ACRS CERTIFICATION OF WELDED STEEL SECTIONS TO AS/NZS 5131

EXPLODING THE MYTHS



PHILIP SANDERS, CEO, ACRS



With growing use of structural steels, it is understandable that misconceptions might arise about different types of certification, the role of product certification in particular, and comparative acceptability of steel and steelwork certified by different schemes applicable to structural steelwork construction. ACRS is receiving an increasing number of inquiries about ACRS 2-stage certification system and its role in steel fabrication.

Here Philip Sanders, CEO of ACRS, explodes four dangerous myths recently encountered in the supply of structural steels and structural welded sections misstating ACRS certification to AS/NZS 5131, which has resulted in unverified and nonconforming steels arriving on construction sites.

Do you know
if your welded fabrication
complies with AS/NZS 5131?
(HINT: Check the fabricator's
ACRS Stage 2 certification)

MYTH 1: "ACRS only certifies steel mills, so I used other certification for the structural welded sections.", or "I only use ACRS certified steels in fabricating my welded sections, so I don't need ACRS Stage 2 certification."

FACT: ACRS certifies both steel mills and the structural welded sections made from that steel to AS/NZS 5131 and other associated standards, and both certificates are required.

ACRS has issued certification for welded beams since 2012, and other fabricated welded sections (e.g. to AS/NZS 5131) since 2018, as part of a fully integrated, 2-stage system designed to ensure conforming steels are used in the as-built structure. You cannot do this by only certifying "at mill gate" (What ACRS calls "Stage 1"), as fabrication of welded sections may turn even ACRS Stage 1 certified steels into nonconforming steel. ACRS "Stage 2" certification of welded sections is therefore essential.

Any break in the ACRS "chain of certification" of Stage 1 and Stage 2 certification means the welded sections cannot claim reliance on ACRS certification, and breach supply requirements if ACRS certification is specified.

(Note: ACRS Stage 2 certification is not required in general steelwork fabrication not involving structural welding. In that case, ACRS Stage 1 (mill) certification is valid on its own, as there is no change to metallurgical properties.)

MYTH 2: "ACRS is not JAS-ANZ accredited to certify to AS/NZS 5131, so I used other certification to AS/NZS 5131.", or "I've been given welded steel sections with other certification that's equivalent to ACRS".

FACT: ACRS is JAS-ANZ accredited to AS/NZS 5131. Also, different certification schemes assess to different scopes and levels of rigour. You need to verify any claim of "equivalence" very carefully and specifically accept the differences. So does the engineer and customer.

So, whilst this myth looks like a valid technical reason which might seem persuasive at first sight – after all there are different means of certifying steel – the argument is false for two reasons.

Firstly, the ACRS Scheme was accredited by JAS-ANZ to AS/NZS 5131 in January 2018 – the first scheme to be accredited, and AS/NZS 5131 is listed on the relevant ACRS certificates - all of which show the JAS-ANZ logo.

Secondly, providing any "third-party certification" (e.g. to ISO 9001) with supplier test certificates is not product certification, and is not independent verification of steel to any Standard. Also, whilst other schemes may certify to AS/NZS 5131, none do what ACRS does, nor does ACRS do what these schemes do, because AS/NZS 5131 is a unique standard covering the full range of structural steelwork supply from steel manufacture to delivery and erection.

Just as the ACRS independent, expert, product verification scheme for welded sections does not replace broad-range, fabricator schemes, these in turn do not replace ACRS Stage 1 certification (steel mill) and ACRS Stage 2 certification (welded sections).

ACRS' consumer-oriented scheme includes in both stages, independent sample selection, testing, reporting, and verification of sites, processes, and products by ACRS' qualified, technical assessors, and independent review of every report by an expert panel.

MYTH 3: "I can't find ACRS certified steels (or, "ACRS steel is more expensive"). So, I used other steel the supplier said meets AS/NZS Standards."

FACT: ACRS certified firms are reported to supply over 70% of structural steels supplied to AS/NZS standards. So, ACRS certified materials are widely available.

ACRS issues 200 certificates, covering almost 300 sites, in 24 countries, and over 80 steel companies. ACRS certification includes local suppliers including Infrabuild and Bluescope, and premium overseas suppliers such as Nippon Steel, Posco, and Hyundai.

Additionally, ACRS certification does not increase the “cost” of steel supply; quality does. So, whilst you might find cheaper steel, will you accept steel that may be non-compliant?

MYTH 4: “My project uses just-in-time procurement. So, even though ACRS certification is in the specification, I have to take whatever steel I can get to keep the project moving.”

FACT: With ready availability of ACRS approved steels, there is no expected delay in supply.

JIT procurement offers many advantages. However, JIT is not an excuse to ignore the specification.

If the specification issued months ago requires ACRS certification, then looking to source steel only at very short notice is not meeting a reasonable duty of care.

Putting steel procurement on the critical path and locking-in suppliers with a proven capacity to deliver ACRS certified steels is both a realistic option and a reasonable expectation – especially when, as noted above, most steel available locally is ACRS certified, and ACRS certification does not add to the cost of conforming steels.

For more details about ACRS Stage 2 certification of welded sections, contact ACRS at: info@steelcertification.com

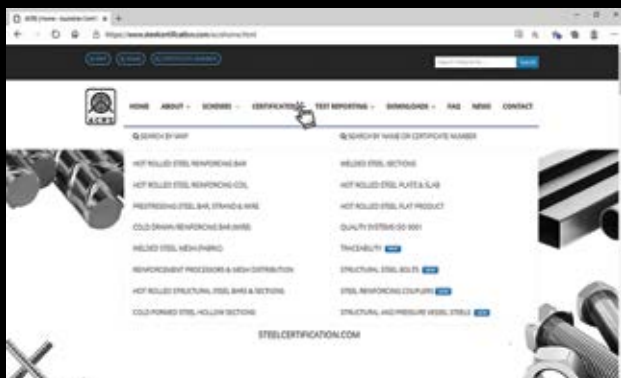
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Just because your supplier was previously ACRS Certified, don't take it for granted that they still are. Their ACRS Certification status may have changed due to factors including:

- Changes in ownership
- Changes in manufacturing locations
- Additional products
- Discontinued Products

That's why ACRS' comprehensive program of annual audits and rigorous 3-monthly data analysis is so important. It ensures that standards and quality are maintained, so you can have confidence in your construction steel supplies.

Importantly, checking and confirming that ACRS certificates for products/suppliers are current is quick and easy on the ACRS website. Visit: www.steelcertification.com for full details of all current certificates.





ACRS 2020 CERTIFICATES AMENDED FOR ADDITIONAL CLARITY AND AVOIDANCE OF MISUSE

ACRS 2020 certificates have some important changes to protect builders, engineers and steel purchasers

ACRS not only certifies steel at manufacture (Stage 1) and then the rebar processing/welded section fabrication of that steel (Stage 2), but also assesses materials' traceability between the two certificate holders. ACRS Stage 2 certificate holders can only source and use ACRS Stage 1 approved materials, and this is regularly checked by ACRS.

To assist Builders personnel make their determinations, from 1 January, 2020 the wording on ACRS certificates was amended to state clearly that "ACRS certified" may only be applied to steel that arrives on the project with both ACRS Stage 1 (mill) certificates and ACRS Stage 2 (rebar processor, or structural welded section) certificate.

Ensure your staff are aware of these important changes to ACRS certificates and make sure your specifications call up ACRS certification not only for Stage 1 (mill manufacture) but also Stage 2 suppliers (processing and welded section fabrication) to manage your risk of inadvertently accepting non-ACRS approved materials.

If your staff have any questions, get them to email ACRS for assistance at: info@steelcertification.com



HOW DO I SPECIFY ACRS CERTIFIED STEELS?

The easiest way to manage and minimise the risk of non-conforming construction steels, is to specify ACRS certified steels.

FOR STRUCTURAL STEELS

"Structural steels shall comply with AS 1074, AS 1442, AS 1579, AS/NZS 1163, AS/NZS 1594, AS/NZS 3678, AS/NZS 3679.1, or AS/NZS 3679.2, as appropriate. Structural bolts shall comply with AS/NZS 1252.

Where applicable, materials shall be fabricated in accordance with the "Fabrication" requirements in Section 14 of AS 4100 or Appendix G of AS 5100.6, or AS/NZS 2327, or NZS 3404, and the requirements of AS/NZS 5131.

Acceptable manufacturers of structural steels, structural bolts, and the fabricators of structural welded sections must hold a valid certificate of approval issued by the Australasian Certification Authority for Reinforcing and Structural Steels Ltd (ACRS), or to such other accredited product certification system as shall be demonstrated by the supplier to be directly equivalent in scope and technical rigour to ACRS and approved as such in writing by the specifier.

Evidence of the supplier's compliance with this clause must be obtained when contract bids are received.



FOR STEEL REINFORCING MATERIALS

"Steel reinforcing and steel prestressing materials for concrete shall comply with AS/NZS 4671 or AS/NZS 4672, respectively.

Where applicable, materials shall be cut and bent in accordance with the requirements of the "Material and Structural Requirements for Reinforcing Steel" clauses in AS 3600 or AS 5100.5, or the "Reinforcement" clauses of NZS 3109.

Reinforcing couplers shall comply with RMS specification RMS SF2013/184115 Approval of Mechanical Reinforcing Bar Splices, or NZTA SP/M/022 Bridge Manual (technical approval sections), as specified.

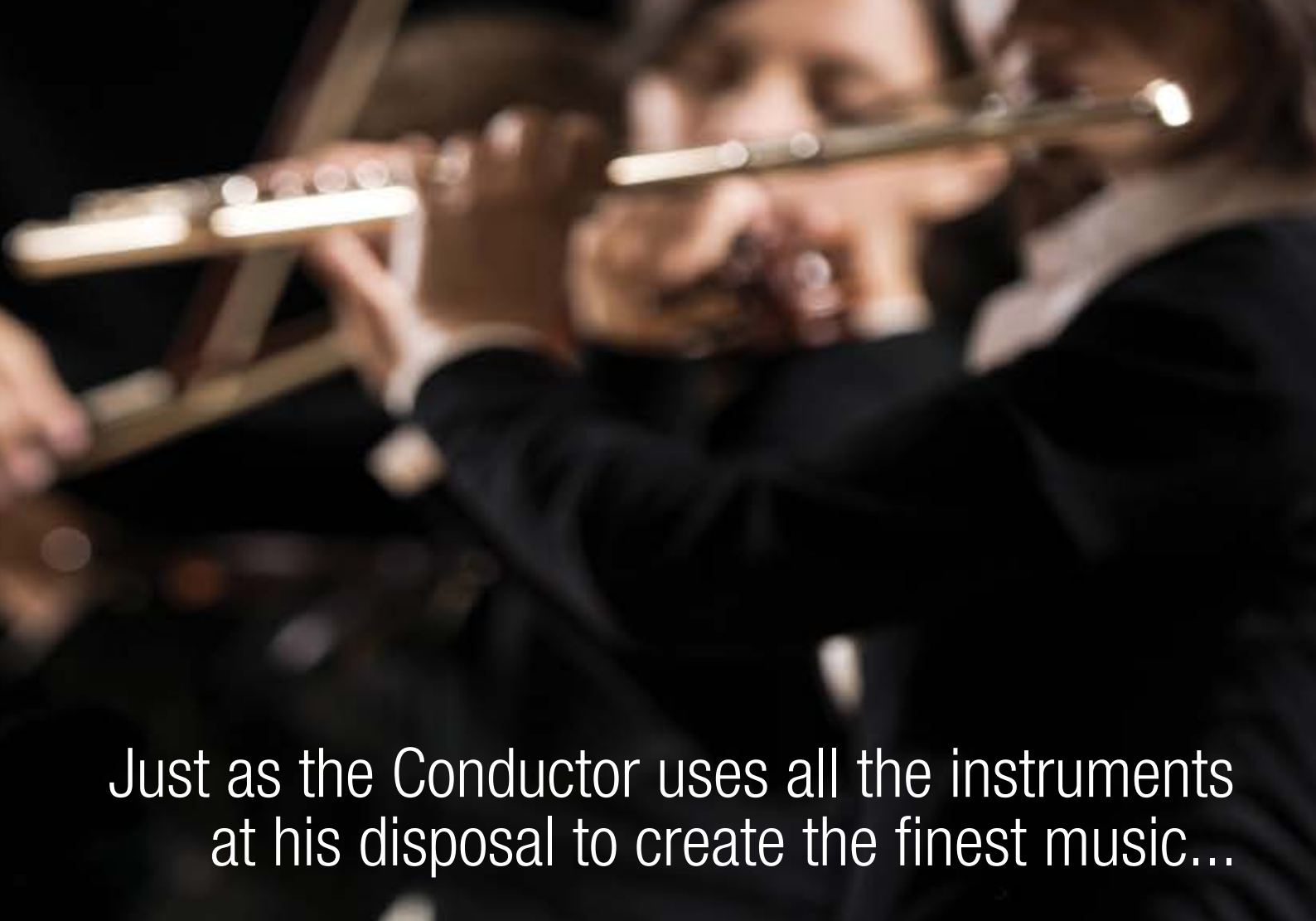
Acceptable manufacturers and processors of steel prestressing and steel reinforcing materials, including both manufacture and application of reinforcing couplers, must hold a valid certificate of approval issued by the Australasian Certification Authority for Reinforcing and Structural Steels Ltd (ACRS), or to such other accredited product certification system as shall be demonstrated by the supplier to be directly equivalent in scope and technical rigour to ACRS and approved as such in writing by the specifier.

Evidence of the supplier's compliance with this clause must be obtained when contract bids are received.



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Just as the Conductor uses all the instruments at his disposal to create the finest music...



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Causes of tiling failures in concrete swimming pools

THE REAL FACTS FROM THE AQUATIC ENGINEERS PERSPECTIVE

by Geoff J Ninnes CP Eng MIE Aust NER and Brad Fong CP Eng MIE Aust NER

There are countless examples of beautiful tiled pools many decades old, and new, throughout Australia and all over the world.

Over the past few years there has been instances of delamination of pool tiling in several aquatic centres. These have, in the main, been reasonably new aquatic centres in which the tiling delamination has commenced within the first 4-7 years of the pool's life.

This type of tile failure is a recent phenomenon and it has been blamed by the tiling trade on many issues including concrete shrinkage, as well as tiling too soon after the concrete has been placed, being forced to apply tiles in wet/dusty/hot situations, filling pools too soon after the tiles have been laid, and thermal shock to the tiles caused by significant temperature differences between the tile surface and the water used to fill the pool.

It should be appreciated that there are a great number of tiled pools in Australia, built over many decades that have stood the test of time without tile failures as have been recently occurring. These pools were tiled using good adhesives and a correct application system which is why they have given such an excellent service life.

This paper has been written to address the numerous, and in our opinion, incorrect reasons, being offered as the cause of these

tile delamination failures in concrete pools. The reasons for failure suggested by the tiling trade are obscuring other, more valid potential causes for tile delamination, such as poor tile application technique and the use of lower strength tile adhesives.

We believe there are significant trade related issues leading to this problem that are being ignored and these include; lack of skilled supervision of tile fixing workers, failure to apply the adhesive to the tiles to a pretested method to achieve the required adhesive coverage and failure to “back-butter” tiles even where the tile supplier has required it.

In addition, from tests that have been undertaken on some of the adhesives used in projects where tiles have delaminated, it has been found in many cases that the adhesives have only just been able to satisfy the Australian Standards for submerged tensile strength under ideal laboratory conditions. If these adhesives are applied with less than 100% coverage, they would most probably achieve an average tensile strength less than the Code requires.

Other potential causes of tile delamination listed in this paper cannot be allowed to be ignored, as to do so, would discredit pool tiling when it is, in fact, an excellent, well proven and durable pool interior finish for concrete pools.

The paper will also discuss methods of onsite checking of tile systems to achieve a 10-year warranty from tile supplier and installer.

The following section is a discussion of the issues offered by some members of the tiling trade as the cause of their delamination failures:

A. Concrete Shrinkage

This has been identified by some members of the tiling trade as the most significant factor leading to tiling delamination, however there has been much misinformation about how shrinkage in concrete affects tiling. It has often been recommended by the trade that a membrane should be used between the concrete and the tiles to prevent delamination due to concrete shrinkage by absorbing the effects of lateral movement of the concrete on the tiles.

The authors of this paper do not consider concrete shrinkage to be of sufficient magnitude after the application of tiles and filling of the pool to cause movement resulting in the tile delaminating. Nor do we consider the membrane to be necessary. We make the following points: -

(1) Concrete shrinkage occurs due to two components being chemical shrinkage and drying shrinkage when the concrete loses



Left: Typical view of failed tiles with trowel grooves of variable direction, many gaps for water migration, glue fragmenting and insufficient adhesive coverage.

moisture or dries out over time. Chemical shrinkage is usually complete after about 60 days and is approximately 10% of the total shrinkage. Any remaining shrinkage is solely due to drying shrinkage. Drying shrinkage can only occur if the concrete is able to lose moisture and dry. If it cannot, then drying shrinkage will not occur.

(ii) Pool structures should not be tiled until at least 42 days (as required by AS 3978), or sometimes 90 days, have elapsed from the last concrete pour of the structure being tiled depending on the Aquatic Engineer's specifications. This allows most chemical and some drying shrinkage to occur before tiles are applied.

(iii) A calculation of ongoing concrete shrinkage using a final drying shrinkage strain of 700 microstrain as is usually associated with the 40 MPa concrete mix used for swimming pools designed to water retaining structures code, and based on a typical concrete section with an effective thickness of 300mm and the typical reinforcement content of 0.73%, shows the actual shrinkage, or reduction in length, of 10 metre long concrete wall or slab during the period of 56 to 1000 days in the life of the structure would be 1.4mm. The shrinkage is pro-rata for other lengths.

As the standard distance between tiling expansion joints is between 4 and 5 metres, the actual total concrete shrinkage that could be experienced within any one panel of tiling is approximately 0.7mm dispersed over the length/width of the tile panel.

A good quality C2TES2 tile adhesive would easily tolerate that amount of substrate movement without allowing tile delamination.

Claims of significant changes in dimension of the pool walls and floors through delayed concrete shrinkage causing shear induced delamination are simply not correct, even if the concrete is

able to undergo drying shrinkage. Note: shrinkage reducing admixtures should not be used in pool structures.

(iv) Once the tiles are installed and the pool is filled, for an in-ground pool, ongoing drying shrinkage of the concrete is very limited and is very unlikely to occur because the concrete is unable to lose moisture due to the pool water preventing loss of moisture and also the ground or backfill largely preventing moisture loss.

(v) When drying of the concrete is severely limited and most likely wetted to almost saturation because it is underwater for a significant length of time, it is difficult to accept that the concrete would, under these conditions, lose moisture and shrink. In fact, the concrete may expand slightly. It has been known for decades in the field of concrete technology that concrete expands when saturated and will not undergo drying shrinkage when the ambient relative humidity of the surrounding air is 100%. Hence pool tiling would not experience the effects of significant concrete shrinkage because the concrete cannot lose moisture to any significant degree.

B. Tiling Too Soon After Placing Concrete

(i) This should not be a factor, as all tiling specifications for commercial swimming pools require a minimum of 42 days delay between the time of the last concrete pour of the pool being tiled and the application of tiles. This is based on Appendix E2 of AS3958.1 Guide to Installation of Ceramic Tiles. The majority of the concrete shrinkage may or may not have substantially taken-up by this stage.

The responses by the tiling trade and other parties to this matter is based on their assertion that there is significant ongoing shrinkage beyond 42 days therefore

they believe the tiling should be delayed for a significantly longer period than is contemplated by most specifications, to the point where it becomes unworkable within the project construction program. Their answer appears to be to recommend the use of a membrane between the tiles and the concrete.

(ii) What occurs to the concrete in terms of drying shrinkage prior to tiling is largely irrelevant to the performance of the tiles. The majority of the concrete drying shrinkage may not have occurred prior to tiling due to site curing conditions such as wet weather, high humidity, and water testing which will limit moisture loss from the concrete and therefore stop or limit drying shrinkage.

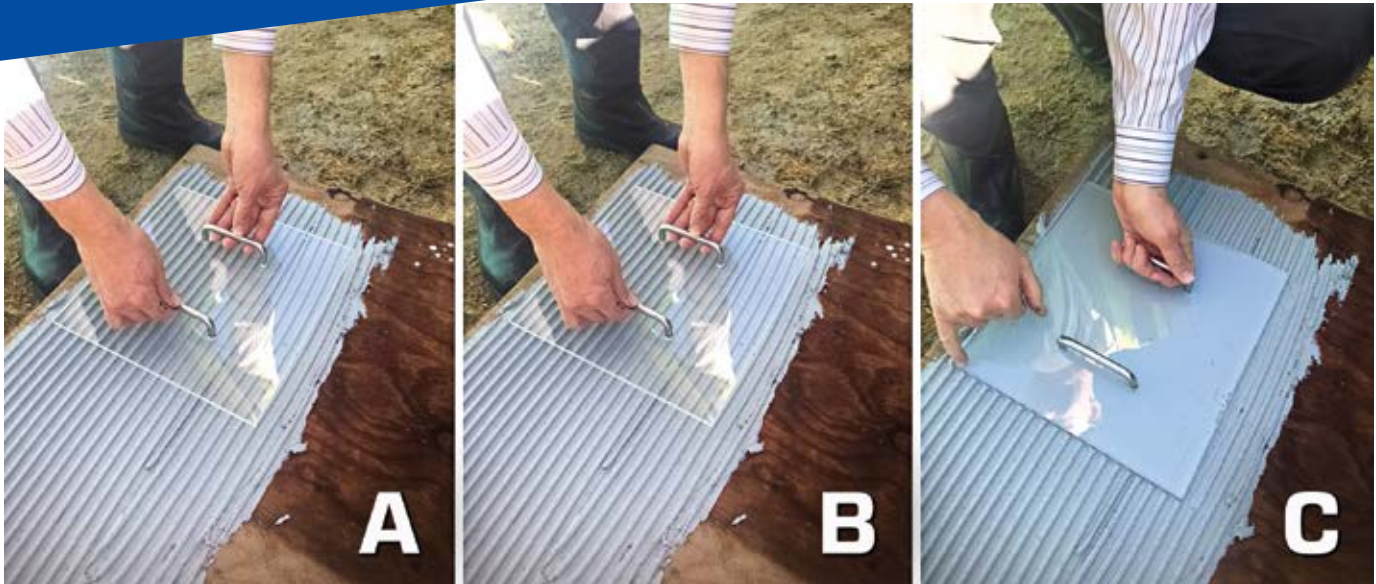
(iii) Some tilers and other parties make reference to site shrinkage testing of concrete in an attempt to explain that because the shrinkage has not occurred before tiling it is assumed to shrink after tiling (delayed shrinkage) even when the pool is full of water. This is difficult to comprehend as once the concrete is underwater and against ground it therefore cannot lose moisture and shrink. Claims of delayed shrinkage are contradictory, because they contend that the concrete may not shrink due to these site conditions prior to tiling as demonstrated by shrinkage testing, but somehow will shrink later when the concrete is immersed in water after tiling.

C. Membranes

(i) As noted above, some firms are recommending a membrane to prevent the effects of concrete shrinkage movement on the tile system but as this shrinkage is unlikely to occur when the pool is filled, we see little reason for its use. In fact, the membrane has a negative effect on the tile adhesive bond to the structure as will now be discussed.

(ii) A membrane will lessen the bond of the tile system to the concrete substrate. A membrane by its design is needed to take up movement and remain waterproof and has typical adhesion to concrete of about 0.5MPa. The adhesion of adhesives like Metz 27 or Laticrete Platinum have been tested for adhesion 4 times as great as membrane bond and at 2MPa to a concrete shell.

Hence tiles have much more ability to bond to a concrete shell without a membrane.



(A) The Tarver System with transparent tile showing how to achieve maximum adhesive coverage. About to laterally move the tile. (B) Tile moved laterally up and partial collapse of notches. (C) Tile moved down to completely collapse notches giving 100% coverage to tile.

(iii) A membrane is just another layer that can fail between the tiles and the substrate as the tiles are relying on the membrane to grip the concrete surface and then the tile adhesive to bond to the membrane.

It is considered a minimisation of risk if the tiles bond directly to the pool shell.

It is also important that the tile to shell bond is optimised by ensuring a good rough sandpaper-like concrete surface. This will provide a mechanical key by introducing a profiled surface roughness which increases the surface area for the adhesive to bond to.

It is also preferable not to have a render layer between tile and concrete as the render is also just another layer that can fail. If render is required because the pool shell is not dimensionally correct it is required to have a high bond strength, dense, strong, and with flexibility.

(iv) A membrane is often used where complete waterproofness is required and the consequence of even a small leak cannot be accepted. (e.g. pools above habitable spaces or car parks). For an in-ground pool the consequences of a very small leak are insignificant as it will generally allow self-sealing by autogenous healing.

A membrane may also be used to minimise efflorescence emanating from above water level hobs or raised pool concrete walls and mortar beds next to pools.

D. Other Claimed Causes of Tiling Delamination

Other causes mentioned such as tiling in adverse weather conditions need to be manageable by the tiling contractor. Tiles

should not be applied in extreme weather conditions of cold temperature (usually less than 5 degrees) or hot weather (usually more than 30 degrees). Likewise, filling the pool too soon or too fast after completion and heating the pool too quickly can induce thermal shock and delamination and require site management.

E. Inspection of Failed Tiling Systems

Inspection by the authors of several failed pool tile systems has shown that none of them have been due to concrete shrinkage.

The failures are generally due to poor workmanship in the tile installation process, lack of adequate tile movement jointing, lack of substrate preparation to ensure maximum adhesion of tile adhesive, contamination of the substrate by airborne dust or dirt or other deleterious materials and not removed before tiling, and tiling in rain or onto wet surfaces, and not allowing full curing of glue or joint systems.

A major problem noted with all failed pools is lack of coverage of the tile with adhesive as this will have a dramatic effect both on the average adhesion strength and allow the ability for moisture movement under the tile layer and degradation of the adhesive itself. It is even more relevant when the adhesive used has minimal acceptable adhesion strength.

There is some evidence that excessive tile growth may also be a contributing factor.

F. Steps Towards Achieving a High Quality Tiled Surface.

(i) Aiming for 100% tile adhesive coverage and the Tarver system of tile placement:

Current Australian Codes require a minimum coverage of adhesive on tiles of 90% while aiming for 100%. This requires the notches in the adhesive caused by the notch trowel process of tiling to be collapsed by lateral tile movement, twisting, or impact. The current adhesive used in pool tiling is a thin set adhesive and the tiles must be moved across the adhesive notches by at least one notch to ensure collapse of the adhesive ridges into the notch resulting in more than adequate coverage and then moved back. This system was promoted in Australia many years ago by a well known tiling consultant to the tiling industry and about the same time in the USA in the "TCA Handbook for ceramic tile installation" where it is called the Tarver system. There was also a push for the concept of 100% coverage of tile with adhesive. This was in the 1990's.

Unfortunately, in every tile failure we have inspected the general tile adhesive coverage is poor and the notches still evident with gaps between adhesive strips visible.

This lack of adhesive coverage coupled with adhesive strengths that only just meet the Australian Code requirement of submerged tensile adhesion strength of 1MPa, gives a substantial reduction in bond strength to the tile system and is coupled with a low shear strength, which is often the way tiles fail. As noted by the tile consultant in his paper "therefore poor installation practices of the installers, which leave voids behind tiles, are contributing significantly to the level of delamination and impact damage occurring to tiling worldwide."

It should also be noted in the British Code of Practice BS5385-4 it is recommended that tiles should be solidly bedded so no voids exist behind them.

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There's no such thing as a 'one size fits all' solution for commercial pools and aquatic centres. From pool design, construction, heating, filtration, HVAC and any other number of factors, EVERY pool and aquatic centre design needs to take into account not only the clients specific needs, but also the very specific engineering requirements of the site.

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Back buttering a tile on-site prior to laying tiles, using the Tarver method. Note: notches are unidirectional on tile glue surface.

The German DIN Standard also recommends the combined buttering-floating method of tile installation (where the back of the tile is back buttered and the tile moved across the notches to collapse and fill the entire bed).

Australian Standard AS3958.1-2007 Part 1, Guide to installation of ceramic tiles, Section 5.6.2, also specifies the floating method and the buttering method of tile installation.

In Section 5.6.4 Adhesive Coverage, there is a section dealing with good tiling practice and it notes in 5.6.4.5: -

- (a) Use correct notch
- (b) Spread adhesive to leave horizontal ribs on walls and unidirectional ribs on floors
- (c) Occasionally remove a tile to check coverage
- (d) Butter the adhesive on the back of the tile where difficult access.

In our opinion, tiles should always be back-buttered and installed following the Tarver system to obtain maximum coverage with no or minimal voids.

(ii) Adhesives and Grouts:

There has been substantial work done in the formulation of adhesives to enable them to have high adhesion (immersed) and high shear strength and increased flexibility.

Formulations of adhesives without the addition of sufficient polymer have shown very low shear strength test results which is often a mode of failure for tiles. C2S2 adhesives with higher polymer content

showed almost no loss of performance in shear. Thus the most important ability of adhesives is to have a high bond strength but also be highly flexible and able to absorb shear stresses, this requires adequate polymer inclusion into the adhesive.

Also important is polymer/cement ratio. It is suggested that a polymer/cement ratio of 0.4 and dispersible polymer powder of 12% will provide both an acceptable immersed tensile adhesion strength at 28 days of 2MPa and a shear adhesion test of 1.4 MPa and be in accordance with AS ISO 13007.2 (2013).

To achieve these results requires a high quality adhesive and there are adhesives in Australia that easily meet these requirements. There are also some that don't.

Adhesives may require a minimum 21 days to attain full strength.

G. Quality Assurance (QA)

There is a need to show the client that there has been QA applied to the tile process to show an excellent long lasting job has been undertaken. Some Codes have suggested that tiles be selectively removed to prove that coverage close to 100% is being obtained and the writers agree and suggest that one tile/4sq.m be removed up to 30 minutes after placing and photographed and located on a plan of the project. If it fails 100% coverage, then tiles are progressively removed until 100% coverage is achieved.

The composite of test photos and location are forwarded to the client and tile supplier as proof of coverage.

Both the tile supplier and tiler should warrant the project for 10 years.

In addition tiling cannot commence until the tile supplier has approved the roughness of the concrete substrate in writing to the client. Also, the tile supplier must approve the tiler's method of tile installation and checking their ability to obtain maximum adhesive coverage by way of trial laying perspex tiles and observing the coverage will quickly make all aware of this.

Summary

The following points summarise the author's experiences in producing a high quality pool tiling outcome:

1. Ensure the correct curing times for the concrete shell are adhered to, and concrete mix is to specification.
2. Ensure tiles conform to BSEN 1441-2012 Extruded Ceramic Tiles with low water absorption are used
3. Ensure the concrete pool surface is adequately prepared and roughened to tile supplier approval in writing (equal to ICRI-CSP4/5 which is similar in profile to coarse sandpaper). Undertake onsite pull off tests to prove tile adhesion to the substrate. Any render required must have high compressive strength, flexible and compatible with the tile adhesives.
4. Use a C2TES2 adhesive with polymer/cement ratio min 0.4 and dispersible polymer powder 12% with minimum immersed tensile strength at 28 days of 2MPa and shear adhesion strength of 1.4 MPa and to ASISO 13007.2. Use a CG2WA cementitious grout to AS3958-1-2007.
5. Wet deck and raised hobs should have epoxy grout joints over a compatible membrane to minimise efflorescence.
6. Only tile in approved temperatures and weather conditions.
7. Lay tiles by Tarver system plus back buttering with QA system by tiler, approved in writing by tile supplier. Allow system to sit for 3 weeks after completion of joints, grout, tiling, and CJ's and use tile joints at close centres.
8. Send QA to client with warranties.
9. Obtain advice on rate of filling pool and rate of heating pools that are tiled.

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Opportunities not Barriers for the Australian Construction Industry:

Yes, wheelchair users can work in construction. Let's see this as an opportunity

by Jonathan Fritsch

James* has always been interested in construction. His interest stems from his family's involvement within the industry. He wants to follow in his family's footsteps and study Construction Management. However, James is in a wheelchair, born with a physical disability called Spina Bifida. He fears that his disability will be a barrier to employment and preclude him from working in the construction industry. He wonders if it's at all possible to work in the industry as a wheelchair user.

For an industry that is heavily reliant on job functions that need you to climb up ladders, work in confined spaces and from heights, it would seem an inaccessible industry for James to work in.

This image of the construction industry not suited to people with disability is constantly put forward. But it's false - there are many opportunities in construction industry for people with disability.

In 2018, it was estimated that construction industry employment reached over 1,130,200, and of these, only 91,600 people with disability were employed (*ABS 2018*). Current data fails to show a more specific employment picture but remember, disability is not black and white, not everyone with Spina Bifida uses wheelchairs, and not everyone who uses a wheelchair has Spina Bifida. This number would cover types like sensory, intellectual, mental and on topic physical disabilities.

The underrepresentation of people with disability in the Australian construction industry suggests that there's room for improvement.

Research into disability and construction are scant, but a 2019 study sheds some insight into the barriers that people with disability face when trying to find employment in the construction industry.

The study surveyed those who make recruitment decisions in construction subcontracting firms. It revealed that people who recruit prioritise those they perceive to have the lowest barriers. People with disability were ranked second highest in perceived barriers among the six disadvantaged groups in the sample. Construction employers perceived people with disability to be incapable of working long hours, needing a modifying workplace, having health needs and adding costs to training.

Because of these perceived barriers, people with disability were ranked second to last in order of hiring priority among the six disadvantaged groups in their sample (*Loosemore et al. 2019*). Construction employers perpetuated the view that people with disability are incapable of contributing productively to the labour force.

Underestimating the experiences and capabilities of people with disability creates an unjust barrier to employment and is one of the primary reasons for the lower participation rates and underemployment of people with disability in the workforce (*Bonaccio et al. 2019*).

In Australia, there are very few construction industry firms actively involved in breaking down these barriers. Australian construction firm Lendlease appears to be leading the way when it comes to diversity and inclusion in the industry. Showing a huge focus on

providing meaningful work opportunities and removing barriers to employment for people with disability.

Alysha Abbott, diversity and inclusion manager at Lendlease, highlights that of the Lendlease employees who have been identified, there are a range of disabilities present.

“We are open to accommodating different needs and to support a diverse workforce.”

She said that if there is a way that the company can reasonably accommodate the needs of people with disability, it will.

“But it does come down to the inherent requirements of the job and the complexity of any barriers,” Ms Abbott added.

She said that the company has successfully accommodated one of its site offices for an employee who recently became a wheelchair user after a non-work-related accident.

This is a unique challenge, especially considering the physical and temporary nature of a construction site and the associated health and safety obligations involved. However, this is a positive step forward and needs to become the norm, rather than a special effort only made by those who have the time, resources, inclination, or legal requirement to do so.

As the construction industry evolves and technology advances so do the roles and environments. A career in construction doesn't have to be spent on a construction site. There is a huge range of work opportunities where environments are accessible. Some of these roles include estimator, contract administrator, scheduler/planner, BIM coordinator/Revit designer and quantity surveyor. Many of these roles require you to use innovative software programs and work out of a head office or a field office on a construction site.

Also, when it comes to access, mobility and inclusion in the built environment, there is a growing SDA sector (Specialist Disability Accommodation) and public access (AS 1428). Involving more people with physical disabilities in the design and decision-making processes about our built environment, would not only be empowering but would influence better practice to inclusive design.

As a result of these changes, the industry is now needing a lot more people with different experiences and capabilities. The industry needs to start being proactively involved in recruitment programs, to encourage people with disability to explore the industry as a career path.

For James, he can work in the industry as a wheelchair user.

The construction industry offers an enormous variety of opportunities in different environments, it is arguably the most diverse of all industries in terms of career paths. The industry needs to start addressing this underrepresentation by harnessing the experiences and capabilities of people with disability to these opportunities. There is no doubt still a lot of bias that the industry needs to breakthrough, but let's see the opportunities, not the barriers.

***Student's name has been changed to maintain confidentiality.**

.....
Jonathan Fritsch is a Construction Academic and Online Course Facilitator of Construction Management at UniSA Online, University of South Australia.

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While COVID-19 social distancing has become a part of the day-to-day lives of most people on the planet, few would argue that in some situations, achieving the recommended 1.5 metre minimum spacing between people can be extremely difficult to achieve. This is especially true for large production and processing facilities, where a move to the 'new post-COVID normal' can be significantly

hampered by the amount of available floorspace.

Thankfully one company, Combilift, has come up with an innovative solution that's allowing factory owners and operators to rethink their floorplans and optimise the design of their facilities to meet the new distancing standards – for a fraction of what it would cost to either relocate or expand their current facilities.



Combilift forklifts and stackers only requires around half the aisle space of a standard forklift to operate, allowing for a significant reduction in aisle widths.

SWAPPING COST CENTRES FOR PROFIT CENTRES

Most production and processing facilities generally comprise three key areas, namely: materials receive and storage/warehousing areas (which are cost centres); and the production / processing / packaging area which is the profit centre for the facility.

Unfortunately, the latter is also usually the area where the majority of employees are located, and where the new social distancing requirements will have the biggest impact.

Given the high cost per-square-metre of floorspace, most facilities are designed to utilise every available square metre.

In practical terms, that means that any required expansion of the production / processing / packaging area, would usually come at the expense of either the materials receive or warehousing/storage areas. And if all the available floorspace in a facility is being utilised (as is usually the case), that means one of two things: expanding the existing building; or constructing/relocating to an additional building – both of which carry a significant cost.

With that in mind, Combilift's approach focuses on optimising the existing receives and warehousing areas (the cost centres) to free up additional room for the production / processing / packaging area (the profit centre).

REDUCING THE STORAGE FOOTPRINT BY UP TO 50%

The key to this reutilisation of existing floorspace lies with Combilift's state-of-the-art range multi-directional forklifts and stackers.

Renowned globally for both their unique design and robust, reliable performance, Combilift forklifts and stackers feature smart, multi-directional technology which enables the operator to change the direction of travel by 90 degrees at the flick of a switch. This allows them to manoeuvre even long loads down narrow aisles, through standard doorways and around obstacles safely and with ease.

Together with the safety and manoeuvrability benefits, the other major benefit of Combilift's unique design is that it only requires around half the aisle space of a standard forklift to operate.

In practical terms, this enables racking to be placed much closer together, significantly reducing the amount of operational space required for storage. In fact, for the majority of locations, replacing traditional forklifts

with Combilift units will double warehousing and storage capacity - simply by reducing the width of the aisles.

RETHINKING THE FLOORPLAN

Not surprisingly, in the post-COVID world, Combilift's unique performance capabilities are proving extremely valuable, even in facilities where storage capacity isn't an issue. By allowing facility owners to reduce the floorspace required for receivals and warehousing by up to 50% - with no reduction in capacity – they're able to repurpose the previously wasted aisle space to provide room for post-COVID distancing in the production / processing / packaging areas.

Put simply, rather than having to build or purchase additional floorspace, it basically just becomes a case of rethinking the floorplan of the existing building to optimise the existing available space.

As well as providing room to expand the building's 'profit centre' to deliver the required space for employees, reducing the overall floorspace required for receivals and warehousing activities has the added benefit of reducing the overall operating costs for these areas.

“...Combilift’s approach focusses on optimising the existing receivals and warehousing areas (the cost centres) to free up additional room for the production, processing or packaging areas (the profit centres).”

RAPID RESPONSE REMOTE DESIGN SERVICE

While in the past, Combilift's free warehouse design service would also generally involve a site inspection by a member of the company's team, COVID restrictions and quarantine requirements have also meant that like many other companies, Combilift has had to rethink the way it does business. Combilift Managing Director, Martin McVicar, explained:

“To overcome the issues associated with site visits, we developed an in-house virtual site survey system. This means that rather than the traditional method where a



Above: By allowing facility owners to reduce the floorspace required for receivals and warehousing by up to 50% - with no reduction in capacity – changing to Combilift units allows previously wasted aisle space to be repurposed to provide room for post-COVID distancing in the production / processing / packaging areas.

Combilift product manager walks through the site, taking measurements and coming back with a proposal, we can now have a direct conversation with the customer.”

“Interestingly, as most owners and managers are not travelling at the moment, we've found that this 'remote' service is allowing us to achieve an extremely quick turnaround in terms of getting plans and proposals back to clients,” he said.

“What's more, we found that using technology such as MS Teams and Google maps can give us even more accurate data than before for warehouses and yard areas,” Mr McVicar added.

By using the customer's floor plans in combination with a 'virtual site visit' (including a video walk-through of the facility with the customer) the Combilift team are able to gain an excellent insight into the facility, including any issues they may not be immediately evident on a printed floorplan.

This information is used to create compelling 2D and 3D visuals demonstrating Combilift's ability to optimise their storage and warehousing areas to free up space for production areas.

Importantly, this system allows the customer to view a detailed simulated solution before they invest in new equipment or start moving heavy plant or racking – thereby providing them with the confidence of knowing that the new optimised design will be able to deliver the expected benefits.

For further information, please visit: www.combilift.com



Tankers in demand

The construction industry and local government bodies are gearing up for the boom in infrastructure after the green light to increase the economy after Corona. Dust suppression is a major environmental site problem with Workplace Health and Safety keeping strict rules in place.

Australian Pump Industries are a supplier of pumps to tanker manufacturers. They have seen an increase in demand recently through their dealer network Australia wide.

Hindmarsh Shire Council, located in the Wimmera region in western Victoria, uses several trucks a week on a rotational basis. Their ability to perform roadwork tasks is provided by galvanised steel tankers holding up to 22,000 litres.

The tanks are equipped with an Aussie high volume, high pressure, 3" diesel drive pump. The big 3" pump has excellent self-priming characteristics enabling the tanker to load from creeks, streams or dams where necessary.

"These pumps will suck through a vertical lift of up to 8.4 metres," said Aussie Pumps' Brad Farrugia. "The pump boasts flows of up to 1,100 lpm. Maximum head is 50 metres, that's 75psi, providing loads of pressure for spray heads and dribble bar," he said.

The pump is powered by a Kubota 0C95 9.5hp air-cooled diesel engine with integrated solenoid. A remote control is used for each sprayer.

The pumps and tanks are aligned in terms of capacity, size and suitability, adding to the overall effectiveness and efficiency of the system.

"We wanted equipment that won't fail in the field and were impressed by Aussie Pumps' five-year pump end warranty," said Hindmarsh Council's Joel Schulze.

"We knew we needed a 3" pump that would be able to provide fast fill capability and consistent pressure when required," he said.

"We wanted equipment that won't fail in the field and were impressed by Aussie Pumps' five-year pump end warranty."



Further information is available from Australian Pump Industries' website: www.aussiepumps.com.au

THE CHOICE IS YOURS!

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SET UP &
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At A1 Roadlines we understand that our customers have a range of preferences when it comes to fleet vehicles. That's why we fit and service the Scorpion II TMA across a full range of suitable host vehicles from world-leading manufacturers including **ISUZU, UD, FUSO** and **HINO** to name a few.

So, when it comes to selecting a fully MASH tested, passed and eligible TMA that has also been **ASSESSED, APPROVED & RECOMMENDED FOR ACCEPTANCE** throughout Australia by ASBAP (Austroads Safety Barrier Assessment Panel), the only name you need to remember is **Scorpion II® TMA** from **A1 Roadlines**. When it comes to the brand of host vehicle... that's up to you!



THE EQUIPMENT YOU NEED – THE SERVICE YOU EXPECT

A1 Roadlines Pty Ltd | 89 Rushdale Street, Knoxfield, Victoria 3180 | www.a1roadlines.com.au

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INFINITY TESTING

'Infinity Testing' is without a doubt the harshest method of testing the performance of a Truck Mounted Attenuator (TMA) during an impact.

NO RELIANCE ON ROLL-AHEAD DURING AN IMPACT

Rather than relying on some of the impact energy being absorbed by the forward movement of host vehicle on which the TMA is fitted, with 'Infinity Testing' the host vehicle is anchored to the ground to prevent any forward movement during an impact.

'WORST CASE' SCENARIO TESTING

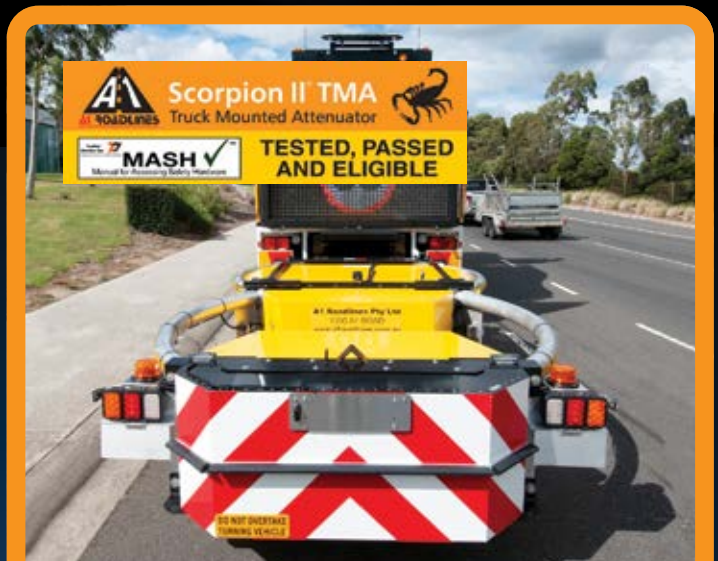
Compared to standard testing with an unrestrained host vehicle, Infinity Testing a much tougher testing regimen. It is considered 'worst-case scenario' testing which makes it much more difficult to meet the pass criteria for IS values, as all of the Ridedown Acceleration must be provided by the TMA absorbing the energy from the impact.

TMA ABSORBS & DISSIPATES 100% OF THE IMPACT ENERGY

Testing the TMA on a host vehicle which is anchored in place, tests – and for both the Scorpion II® TL-3 and Scorpion® II METRO® TL-2 TMAs – confirms the capacity of the TMA to absorb/dissipate 100% of the impact energy - without the benefit of the host vehicle roll-ahead.

NO UPPER LIMIT FOR HOST VEHICLES

From a practical standpoint, the fact that both the Scorpion II® TL-3 and Scorpion® II METRO® TL-2 TMAs were successfully tested to MASH Standards using the 'Infinity Testing' method, means both units are MASH certified with no upper weight limit for the host vehicle.



THE ULTIMATE TEST OF ATTENUATOR PERFORMANCE

HOW IT'S DONE

With 'Infinity Testing' the host vehicle is anchored in place during the impacts to assess the TMAs capacity to absorb/dissipate 100% of the impact energy without the benefit of roll-ahead.



WHAT ABOUT ROLL-AHEAD DISTANCES?

Importantly, to emulate 'real world' operating conditions, both the Scorpion II® TL-3 and Scorpion® II METRO® TL-2 TMA have also been successfully tested and MASH certified using standard 'non-anchored' host vehicles, with both units posting impressively low roll-ahead distances.

Scorpion® II TL-3 TMA

Crash Test: MASH Test 2-53 Impacting Vehicle Weight: 2266kg
Impact Angle: 10.3 Degrees Impact Speed: 103.8km/h
Roll-Ahead Distance: 5.1m

Scorpion® II METRO® TL-2 TMA

Crash Test: MASH Test 2-53 Impacting Vehicle Weight: 2295kg
Impact Angle: 9.9 Degrees Impact Speed: 81.6km/h
Roll-Ahead Distance: 12.4m



THE EQUIPMENT YOU NEED – THE SERVICE YOU EXPECT

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WELCOME TO CONCRETE 2021



The 30th biennial conference of the Concrete Institute of Australia, *Concrete 2021*, is coming to Perth in September 2021.

The conference is dedicated to bringing together global leaders in the concrete industry, covering all aspects of concrete materials, design, construction, repair, and maintenance, to discuss and share

information on how innovation and smarter thinking will allow us to deal with disruption. The conference will offer participants from all around the world the opportunity to connect face to face, sharing research information, innovative and interesting ideas, and practical know-how, with a wide variety of industry

experts in the world class facilities of the Perth Convention and Exhibition Centre and the beautiful state of Western Australia.

Obviously there have been some significant changes in recent times to our usual social and commercial norms, and the *Concrete 2021* conference organisers will continue to be guided by the health and travel advice as provided by the Australian Government which is changing on a regular basis. In line with the conference theme “*Smart and Innovative Concrete from Disruption*”, COVID-19 will no doubt lead to some interesting innovations in the concrete field.

Keep an eye out for the *Concrete 2021* Sponsorship & Exhibition prospectus that will be released soon, and note that abstract submissions which will open on 4 September 2020.

We look forward to meeting you at *Concrete 2021* in Perth.

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

2021 AWARDS FOR EXCELLENCE

The Concrete Institute of Australia’s *2021 Awards for Excellence in Concrete* program will open for entry submission in September 2020.

Entries will be accepted in 5 categories – Residential, Commercial, Infrastructure, Repair, Rehabilitation & Retrofit, and Technology & Innovation. All entries for the *2021 Awards for Excellence in Concrete* will go in the running for local State Awards, with these winners progressing to be eligible to take out their respective categories nationally, as well as the overall *Kevin Cavanagh Trophy*.

The overall winner will follow in the footsteps of our past winners including the first *Kevin Cavanagh Medal* winner in 1991, the Sydney Harbour Tunnel Immersed Units.

Winners of the *Awards for Excellence in Concrete* will be judged first at a state level, and the major awards will be presented at the 30th biennial conference of the Institute, *Concrete 2021* in Perth in September next year.

To register your interest for the 2021 program contact Marketing Coordinator, Pooja Srivastava at: communications@concreteinstitute.com.au

Below: One of the Sydney Harbour Tunnel Immersed Units being towed into position. These innovative concrete components were awarded the inaugural Kevin Cavanagh Medal in 1991.





R-L: Dr Shan Kumar with John Connell

SHAN KUMAR: JOHN CONNELL MEDALLIST 2019

The Concrete Institute of Australia's National President, Dr Shan Kumar, has been awarded the *2019 John Connell Medal* from Engineers Australia. The medal is awarded to an eminent structural engineer and is named after John Connell, principal and founder of John Connell and Associates. John Connell is considered to have made an outstanding contribution to the practise of structural engineering in Australia and to exporting Australian engineering skills to Asia in the 1970s and 1980s.

The recipient must be (or have been) a practising structural engineer who has made a significant contribution, preferably nationally and internationally, to the standing and prestige of the structural engineering profession. The recipient must have reached a senior position and be widely recognised as holding eminent standing within the profession.

Shan's engineering career is extensive, and Engineers Australia outlined the reasons for his recognition with the following:

Shan Kumar is a senior structural and innovation engineer in Melbourne and has over thirty years' experience working on a range of building & Infrastructure projects. His major involvement has been with high rise commercial, residential, sports venues and industrial projects in reinforced and prestressed concrete and steel structures.

He has led the Design and Construction Advisory Teams at Hickory for the seven-story modular Stella Apartment building in Cockburn, the 17 story Peppers King modular construction in Perth and the 44 story HBS modular construction in Latrobe Street, Melbourne. He also led the Structural Innovation team for the development of the new HBS system. Shan led this team in the design and construction of number of high-rise buildings including the National Award-winning project 45 story student accommodation in Latrobe Street and CTBUH award winner 60 story Collins House (4th Slimmest tower in the world).

In his previous role Shan worked with John Connell Associates, Connell Wagner and Aurecon for more than 20 years, involved with a number of Melbourne iconic projects such as Crown Casino, Eureka Tower & Marvel Stadium.

In recognition of Shan's 30 years plus contribution to Construction industry The Swinburne University of Technology has awarded Shan with honorary doctorate in engineering. As well as being a Professional Fellow at Swinburne, he is also a visiting lecturer & honorary fellow at the University of Melbourne, and is the current National President of the Concrete Institute of Australia.

Shan has also been recently recognised as one of most innovative engineers in 2017 by the Institution of Australia for his involvement with the La Trobe tower in Melbourne Australia.

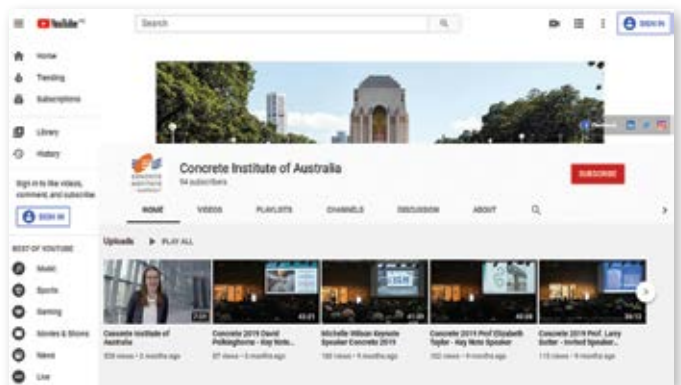
Shan joins a number of prominent Concrete Institute of Australia members as a winner of this prestigious award including Prof Bob Warner, John Woodside, Mike Fordyce, John Hilton and John Nutt.

CIA ON FILM

When the Institute began in 1970 the key objective for the organisation was to develop concrete technology and practice through the transfer of knowledge and information. I'm very proud to say that 50 years on, in the middle of our current challenge, this remains our key focus as we attempt to continue providing updated information via new platforms that our founders would be amazed to see.

The Concrete Institute of Australia's YouTube Channel has become an important tool for online learning and information sharing in the current climate. If you have never visited the site before, start your CIA YouTube experience by viewing the new Concrete Institute of Australia video. It's available on demand to watch at your leisure, and takes a look at where the CIA has come from, what it is doing now, and most importantly, where it is heading.

You will also find all our *Concrete 2019* and *Concrete 2017* key note speakers and presenters. It is worth listening to our lead plenary speakers for both of these conferences, Anne Ellis (Sydney 2019) and Louise Adams (Adelaide 2017) as their presentations resonate with the current changing landscape around the world.



CHECK OUT THE CIA YOUTUBE CHANNEL

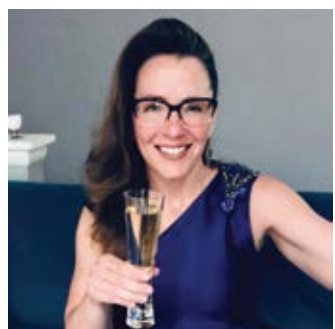
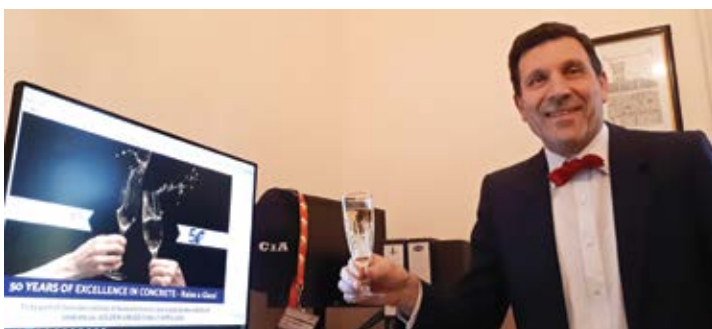
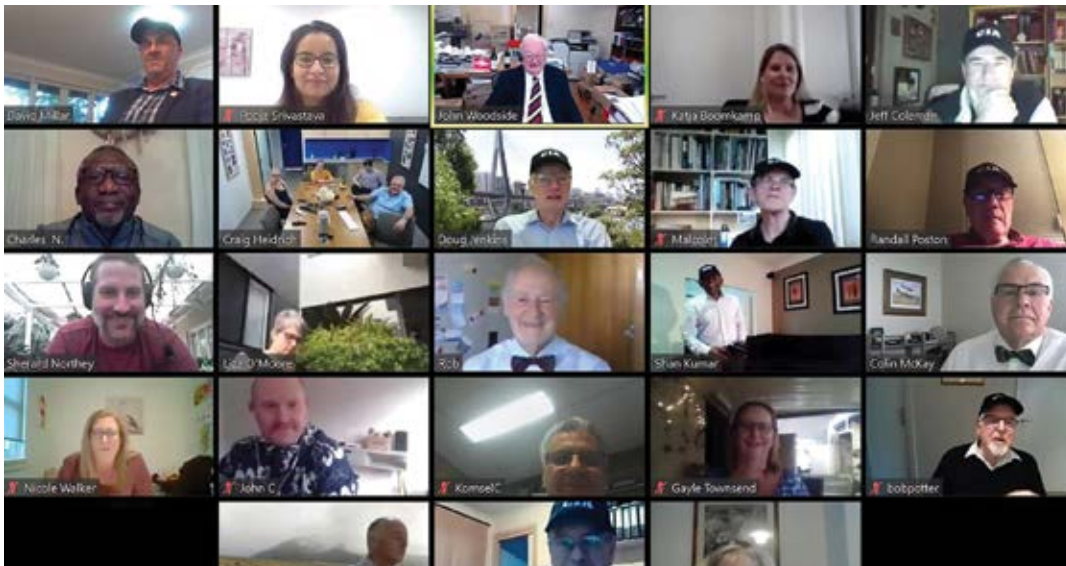
Scan the QR Code or visit:
<https://l.ead.me/bbeZQz>
to access and subscribe the Concrete Institute of Australia YouTube channel



RAISE A GLASS TO 50 YEARS



On the 17th April the Concrete Institute of Australia was meant to hold a nationwide birthday party to celebrate 50 years of excellence in concrete. Unfortunately, due these challenging COVID-19 times, it was not to be. However, this did not dampen our spirits! To recognise this momentous occasion CIA members and friends around the world were asked to raise a glass wherever they may be. The Institute will now be celebrating this wonderful occasion at *Concrete 2021* in Perth next year, but in the meantime, here's a few of the images taken on the 17th April 2020 in lockdown!



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CRASHWORTHINESS RULES HAVE CHANGED...

DO YOUR CRASH CUSHIONS COMPLY?

The new rules requiring MASH tested & approved crash cushions came into effect across Australia on January 1st, 2020

In accordance with the Austroads / ASBAP 'Transition to MASH' process, crash cushions installed on Australian roads are now required to be tested and approved under the AASHTO MASH guidelines, rather than the superseded NCHRP350 guidelines.

Both the **SMART CUSHION SC100** and **SMART CUSHION SC70** have been successfully tested to MASH-2016 Standards, with both models **ASSESSED, APPROVED & RECOMMENDED FOR ACCEPTANCE** throughout Australia by ASBAP (Austroads Safety Barrier Assessment Panel).

SMART CUSHION speed dependent crash attenuators have been used in the USA for almost two decades and in Australia for over 5 years – delivering outstanding life-saving performance and significant savings on repair costs in many thousands of impacts.



SMART CUSHION
Speed Dependent Crash Attenuators

SMART CUSHION

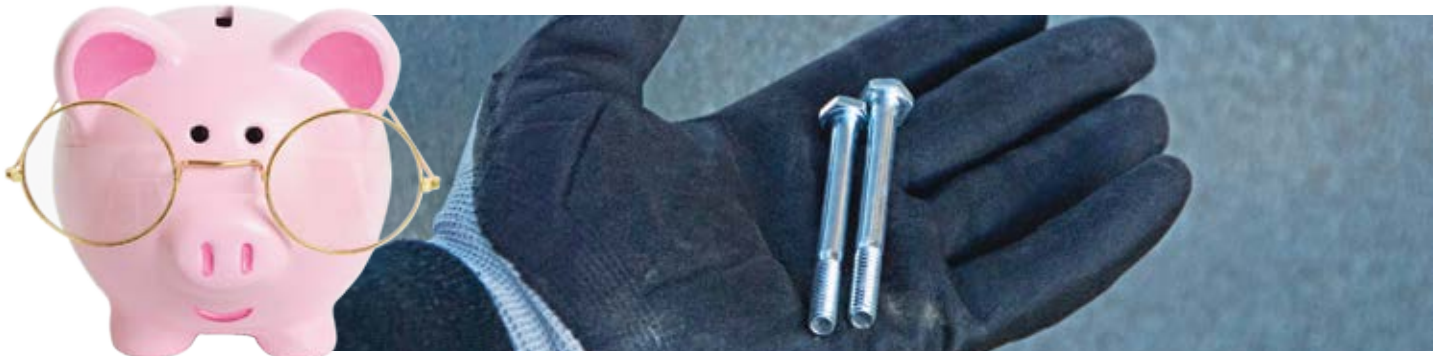
Speed Dependent Crash Attenuators

MASH TESTED & APPROVED



SAVE TIME...

For most impacts up to 100km/h (by vehicles up to 2,270kg) the SMART CUSHION can usually be repaired and reinstated into service in under 60 minutes.



SAVE MONEY...

In 90% of all impacts in Australia, the only spare structural parts needed for repairs are 2 shear pins (COST <\$5). After 59 impacts in Australia, the average cost for each reset was \$169.



SAVE LIVES...

After more than 20 years of successful service internationally and over 5 years successful service in Australia, SMART CUSHION has been directly credited with saving numerous lives and significantly reducing the severity of injuries in literally thousands of impacts.



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A message from the IPWEA NSW CEO

History was made recently when the NSW State Government announced the passing of the *Design and Building Practitioners Bill 2019* registering and regulating NSW engineers. IPWEA NSW's members strongly endorsed the need for compulsory *Professional Engineers Registration* scheme across all engineering disciplines and have been a key stakeholder in what has been a long journey. This is an important step in aligning with other states and building confidence within the NSW communities particularly in the Public Works industry.

With the large number of public infrastructure programs within NSW and the continued Government funding to stimulate our economy, this initiative will further build on engineering as a key profession and the need for qualified and skilled engineers working in these areas.

Whilst the focus at the moment is within the residential and construction industry, we will continue to contribute and be part of the conversation for Public Works industry. Engineering practices are multi-faceted in nature and we still hold concerns for the long-term supply of appropriately qualified engineers into the Local Government sector, who provide critical infrastructure that every NSW resident uses and relies upon each and every day.

Stay safe all,



Fran Binns
CEO IPWEA NSW

BRIDGEdesign Guide

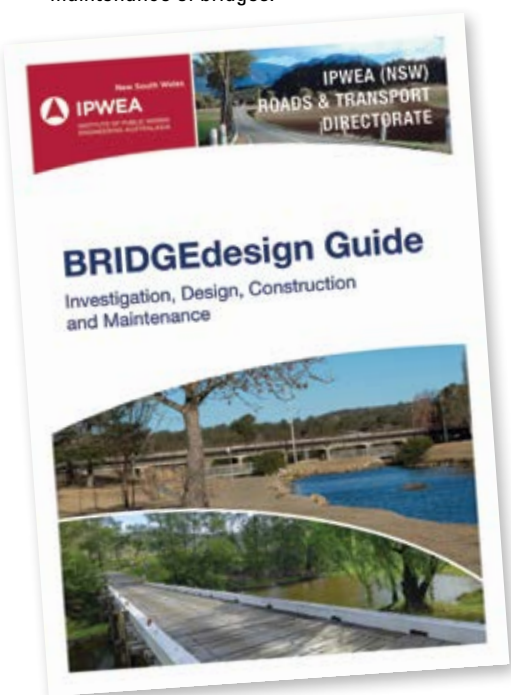
Investigation, Design, Construction, and Maintenance

The Roads & Transport Directorate has recently published a bridge design guide for the investigation, design, construction and maintenance of bridges.

The *BRIDGEdesign Guide* is a compilation of best practice guidelines based on the 2016 Roads and Maritime (now Transport for NSW) documentation supporting the Country Bridge Solutions modular bridge system and condensed generic documentation prepared to assist local government bridge engineers through the necessary critical steps to investigate, design, construct and maintain any type of bridge.

This Guide will also form the basis of a one-day training module which could be delivered to local government through the IPWEA (NSW) Professional Development function.

The guide is available to all RTD members for download at: <https://www.roadsdirectorate.org.au/resources/bridgedesign-guide>



New improved supervisors handbook

The seventh edition of the once Gangers Handbook has been edited to consider the many changes in legislation, regulations, practices and procedures that have taken place since the last edition.

The handbook is for use by field staff in city, urban and country situations and we also believe it is a valuable guideline to younger engineers as they gain experience in the field.

It should be used by members of the workforce to find out what "teams" do and to open up opportunities for workers to seek advancement in their careers. The Institute can provide assistance to staff to seek recognition for the experience they have gained and develop their skills - in an appropriate environment, such as 'on the job'.

The Supervisors Handbook is now available to purchase. For further information, please visit the website: www.ipweansw.org/supervisors-handbook



A message from the IPWEA NSW President



The demands on local Councils continues to outstrip the funding available. IPWEA NSW have asked for help from all to advocate for a new paradigm where emergency management is moved to a NSW Government responsibility. This includes removing the \$120m annual contribution to emergency services and transferring ownership of Rural Fire Services and State Emergency Services infrastructure from local Councils to the NSW Government.

We know the NSW Government is exploring improved ways to tackle emergency management through the NSW Bushfire Inquiry, including liaising with other NSW Government agencies, Councils and the community. The Australian Government is similarly investigating a better way through the Royal Commission into National Natural Disasters.

IPWEA NSW would recommend a new way forward. One where emergency management is treated as the profession that is needed to serve our communities going forward, and where the key roles sit within an appropriate NSW Government agency, supported by other professionals in that space. And one where local Councils can still have a powerful voice, and will still play a key role through the services we deliver to our communities.

Our recommendation would include:

- Decentralisation of emergency management roles to regional NSW providing employment in the regions and stronger local knowledge
- Improved capacity for resilience and recovery planning with that resource capable to transition directly into leading recovery (instead of Local Government)

- Significant efficiency gains in the emergency management space with a greater capacity for more on-the-ground professional emergency management personnel in each Local Government Area, or agreed combined areas
- Far more consistent emergency management outcomes regardless of the size or capacity of the Council (which is of itself highly variable)
- Vastly improved strategy and delivery of emergency services infrastructure through integration
- Vastly improved alignment by allowing local Councils and the NSW Police to focus on their core roles
- Improved facilities, support and training for emergency services volunteers
- A significant boost to the financial sustainability of all Councils in NSW
- A greater capacity within local Councils to develop and implement permanent resilience improvements (eg on critical infrastructure)
- Local Councils still having a critical role to play in emergency management planning and response, through a 'seat at the table'.

My professional view is that any proposal to simply insert a paid Local Emergency Management Officer into Local Government is a short term and fragile mechanism that will not serve our communities nor Government well into the future, either in the response or recovery phases of natural disasters. To train, have back-up and proper career pathing in the emergency management space requires a robust emergency management organisation with appropriate depth and breadth of expertise and experience.

Our humble request of you and your profession is that you support our calls by writing to the NSW and Australian Governments in support of these reforms

Yours Sincerely,

Warren Sharpe OAM
President IPWEA NSW

Director Infrastructure Services
Local Emergency Management Officer
Eurobodalla Shire Council

ABOUT IPWEA NSW

The Institute of Public Works Engineering Australasia (IPWEA) NSW Division is the professional membership organisation who provides services and advocacy for those involved in and delivering public works and engineering services to the community.

IPWEA has been established as a charity with the purpose of advancing the public works sector in Australia, particularly in NSW. Our mission is to enhance the quality of life of NSW communities through excellence in public works and services. We seek to inform, connect, represent and lead public works professionals in NSW.






Many of our members are engaged in local government, the tier of government that has at its heart the provision of public infrastructure, works and services, management of roads, bridges, community health, road safety, sport and recreational facilities, water and sewer, emergency management which are all key areas of responsibility for local government engineers.

To become involved in this prestigious membership organisation, go to our website: www.ipweansw.org and sign up via our new system and membership portal or contact us via email at nsw@ipweansw.org

Don't miss out on the opportunity to be a part of something special.



MEMBERSHIP HAS ITS REWARDS DON'T MISS OUT ON...

Being part of a prestigious Membership Organisation who have been supporting public works professionals for over 100 years	
Being part of 24,000 users in 'Ask Your Mates' online forum, ask professional questions outside the workplace	
Complimentary Regional Group Conferences	
Being eligible for State/ National Excellence Awards	
Attending best networking opportunities at popular events throughout the year	

- Access to Best Practice Manuals and Templates to Assist in the Workplace
- Access to a Registered Training Organisation offering member discounts on training
- A strong voice in setting policy and direction of public works through advocacy
- Unique chance to join special interest panels such as Road Safety, Asset Management and Innovation
- Staying informed of the latest industry trends and advancements through our E-Bulletin

To find out more go to www.ipweansw.org



Huffcutt Concrete Inc. manufactures solid wall elements in the new plant and can offer them with an extremely short delivery time.



Massive modular construction on the advance in the USA

In addition to septic tanks, the American company Huffcutt Concrete Inc. primarily manufactures individually-designed restroom facilities constructed using precast concrete components. Specifically designed for use in motorway and highway rest stops, Huffcutt now supplies the units for locations across the USA.

The manufacturer was able to significantly increase its production capacity by investing in a circulation plant made by the renowned manufacturer Ebawe Anlagentechnik GmbH, a Progress Group company. Since then, it has been able break into new markets and begin manufacturing structural and architectural wall panels. The new equipment will assist in providing the shortest possible delivery time, while also offering impeccable, extremely stable and durable buildings and panels with architectural designs.

SUCCESS BUILT ON QUALITY

Founded in 1945 in Chippewa Falls, Wisconsin, Huffcutt Concrete Inc. started out as a small company that mainly supplied septic tanks to nearby municipalities.

From those relatively humble beginnings, Huffcutt extended its product range to include several important product sectors. Building on the success of its precast septic tank business, the company shifted its focus to include wall panel production, which resulted in the development of a variety of modular buildings and sanitary blocks, as well as park and leisure facilities that are sold throughout the entire country.

Not surprisingly, the company's focus on innovative manufacturing techniques, smart designs, and the production of durable modular buildings made using high quality precast concrete elements, has not only earned it an enviable reputation for quality, but has also resulted

in a strong demand for its products. Indeed, Huffcutt has grown to become one of the USA's leading precast concrete companies - supplying quality products to public and private sector customers throughout the USA.

Huffcutt pays special attention to individual customer requests, be it coloured concrete, architectural designs or sustainable energy options – supplying unique, custom-made products that are 100% tailored to the customer requests.

In keeping with its focus on innovative manufacturing and quality products, Huffcutt invested some 26 million euros (approx. AUD \$42.5 million) in the construction of a completely new production hall at its Chippewa Falls site. The aim was to increase the speed and efficiency of solid precast concrete wall segment production. Huffcutt chose the German company Ebawe Anlagentechnik, one of seven subsidiaries of the Progress Group, as its supplier.



The levelling beam attached to the concrete spreader draws off the concrete and compacts it according to the depth of the concrete layer.

NEW CIRCULATION PLANT REVOLUTIONISES PRODUCTION PROCESS

The new circulation plant consists of 20 production pallets measuring 4.5 x 12.5 m. Each pallet can carry a weight of 22 t and is equipped with fixed edge shuttering and shuttering attachments. The solid wall shuttering supplied directly by Ratec is placed precisely on the shuttering surface using the Form Master shuttering robot.

The scope of delivery also included a state-of-the-art M-System BlueMesh mesh welding machine from progress Maschinen & Automation, also a subsidiary of the Progress Group. However, this machine was installed at the related company Stein Bros. Steel in Saint Paul, Minneapolis. Stein Bros. Steel is a manufacturer of steel products for the construction industry, and supplies Huffcutt with reinforcement meshes for their precast components.

The reinforcing steel is unwound from the coil and cut and bent according to the data supplied by the ebos® software. This work step is performed by the MSR 16 machine. The mesh welding machine produces the reinforcement meshes just-in-time and precisely for each solid wall. It is the first of its kind in the USA and enables Huffcutt as well as Stein Bros. Steel to efficiently produce tailor-made meshes.



With the aid of the tilting device, the wall elements are tilted and can be conveniently stored in the subsequent installation position.



Above: The pallet stacker serves the two racks and stores and retrieves the pallets with the freshly concreted solid wall elements.

Below: The mesh welding machine M-System BlueMesh is a flexible production plant for welding bespoke mesh from coil according to individual specifications for each solid wall.

The concrete spreader with screw discharge system discharges the concrete evenly on the pallet surface according to the data provided by ebos®. The vibrating levelling beam attached to the concrete spreader draws off the freshly discharged concrete, brushes it to the desired height and then smoothes it. External vibrators are used to assist with compaction according to the concrete layer depth.

After a resting phase and curing of the concrete surface, fine smoothing is carried out using a power trowel. These work steps result in a very finely smoothed, paintable surface - without the need for subsequent post-processing.

The solid walls are cured in the stacking rack, which consists of two towers of eleven levels each. Once cured, the pallets with the cured concrete elements are moved out via the pallet stacker. Using a combination of fixed rollers and friction wheels, they are driven to the tilting device and brought into an almost vertical position. This assists with the de-moulding and lifting process, and enables the walls to be stored in the subsequent installation position.

After completion of the production cycle, the removed solid wall shuttering is cleaned by means of a set down-cleaning device. The pallet passes through a stationary cleaning unit, where the pallet surfaces are cleaned thoroughly using spatula and brushes in readiness for the next production run.





The combined compaction equipment moves the pallet vertically and horizontally, giving the customer maximum flexibility in the final product.

The entire circulation plant is controlled via the *ebos*® control system, thereby eliminating complicated interface problems. The Huffcutt utilises a number of master computer modules, including *PalBel*, *WorkPrint* and *SubLink*. *PalBel* takes over the automatic allocation of the production pallets with concrete parts and allows very simple manual changes afterwards. With the *WorkPrint* module, worksheets can easily be printed while *SubLink* provides the connection to the shuttering robot through which the data for the allocation of the pallet surface with shuttering is supplied directly by *ebos*®.

CONCRETE MODULES INDIVIDUALLY DESIGNED

Huffcutt uses the solid walls produced on the new German-made circulation plant primarily for the construction of sanitary houses especially for motorways. These are designed in an architecturally sophisticated way and individually according to the customer requests by the use of form liners.

The producer works with different surface designs such as wood, concrete or tile optics, with colours and structures. The small buildings are assembled directly in the plant and completed with the sanitary facilities. The prefabricated modules can thus be transported directly from the plant to the building site and set up there.

Thanks to the new production line, Huffcutt is able to offer its modules with the shortest delivery times in the industry. Production is now much faster than the previous manual method, while also requiring less manpower to complete. Huffcutt still has an older production hall in which settling tanks continue to be produced, so that no personnel had to be laid off.

Thanks to the new production plant from the Progress Group, the company was also able to make its product range more flexible, which has resulted in it securing a number of additional orders for the construction of schools and warehouses with solid and sandwich walls.

AMERICAN CONSTRUCTION METHODS ON THE TEST BENCH

The Huffcutt plant is configured in such a way that it is also suitable for the manufacture of semi-precast elements through expansion with some components.

This double-wall plant could help revolutionise construction methods in the USA, because the construction of properties differs significantly from European construction methods.

While in Europe, construction is mainly carried out with concrete and stone, the USA relies largely on timber-frame construction with

outer walls made of thicker chipboards. The roofs are mostly tacked with roofing felt and walls as well as doors and windows are hardly insulated.

For this reason, the houses are mostly equipped with air conditioning systems, which run around the clock in summer. In addition, there are the increasingly frequent hurricanes that uncover entire roofs or completely collapse houses.

Precast concrete construction not only offers benefits associated with strength and durability when compared to traditional lightweight clad timber construction, precast concrete's excellent thermal properties also offer significant benefits in terms of insulation and climate control. Indeed, with precast concrete construction growing in popularity across both the commercial and residential sectors, it seems only a matter of time before the European solid construction method is applied more widely across the USA.

Needless to say, thanks to its new state-of-the-art production precast plant and its high quality architectural elements, Huffcutt looks set to remain at the forefront of precast concrete in the USA, as an ever-increasing number of construction companies discover the stable and sustainable concept precast concrete construction.

For further information, please visit: www.ebawe.de



Huffcutt manufactures sanitary houses from solid concrete elements and assembles them directly in the plant, already completed with all sanitary facilities. The small buildings feature designs which utilise coloured concrete and form liners in tile, stone and wood optics.



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www.progress-group.info

Master Precasters such as Delta Corporation in WA can be relied upon to have the right expertise, equipment and experience to be able to deliver the most intricate detail and superb level of finish.



CONDUCTING DUE DILIGENCE WHEN SELECTING A PRECASTER: AN EASY SOLUTION

In Medieval Europe, ‘master craftsmen’ or ‘master tradesmen’ were considered to be at the pinnacle of their craft, belonging to their craft guild. Masters would typically progress through a career chain from apprentice, to journeyman, before being elected to become masters.

Today, the term is still commonplace throughout the world, and Master Builder, Master Plumber and other trade titles are commonplace.

Precast concrete manufacturers are no exception. With precast manufacturing being a highly skilled and complex process, the importance of awarding a precast contract to a suitable manufacturer is critical to ensure the success of a project.

TYPICAL CHECKS INADEQUATE

When checking a precaster’s credentials for a project, the following will often be all that is assessed:

- Their experience with manufacturing the required elements;
- Their location and facilities; and
- Their price.

These are inadequate if the goal is to mitigate any unwanted delays, cost blowouts, safety breaches, quality issues or unexpected finishes.

DUE DILIGENCE IS RESOURCE INTENSIVE

Proper due diligence must be carried out before appointing a precaster to a project. The process of auditing precast manufacturers should be complex and detailed, calling for checks that the required processes and procedures are not only in place, but are actually being implemented on a daily basis.

So much more is required. Just SOME of the checking that is required includes whether the precaster:

- Has an engineer approved shop drawings;
- Undertakes appropriate checks for every element, pre- and post-pour and pre-delivery;
- Has the appropriate technical knowledge, for example, understand relevant Australian Standards and codes;
- Delivers elements only after they have achieved the required strength;
- Delivers with a certificate of compliance;
- Protects elements to prevent damage during transport;
- Understands Chain of Responsibility;
- Uses material safety data sheets where needed;
- Uses high quality steel moulds;
- Actually engages daily practices that are compliant with environmental legislation;

- Has a sound financial record; and
- Engages a corrective actions process.

Unfortunately it is usually because of resource constraints that most of this detailed information is neglected and not checked before awarding a contract to a precast manufacturer.

That increases risk to the head contractor and to the client.

“Not carrying out the right checks of a precaster before awarding a contract increases risk. Because of that, and because of an element of market dissatisfaction with ISO certification, is why we’ve introduced Master Precaster”

Sarah Bachmann, National Precast CEO.

ABOUT MASTER PRECASTERS

Master Precasters supply every state and territory of Australia. They can specialise in a particular type of precast such as flooring or can manufacture a range of precast elements.

Master Precasters can supply precast for large or small residential or commercial projects in the building or civil sector.

They operate to a strict code of conduct and manufacture precast to the highest quality.

According to National Precast's CEO Sarah Bachmann, the new membership category is being introduced to take the hard work out of screening precasters and also because of market dissatisfaction with ISO certification.

"We audit our Master Precasters. It's a day-long exercise. Passing the audit means that while a company might have formal policies and procedures in place, those procedures are actually being implemented," Bachmann comments.

The scope of the audit is broad, covering every aspect of manufacture, as well as financial stability, insurances, expertise and qualifications

of senior employees, awareness and engagement of new technology, HR practices, staff turnover, CSR, supplier referrals, compliance with key Standards and codes, materials' checks, outsourced work, currency of certifications, actual quality of output, documentation and so on.

"Being audited by someone who actually understands precast manufacturing makes a world of difference. It's not so easy to pull the wool over the eyes of someone who is in the know. That is critical to the value of the audit," Bachmann claims.

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

MASTER PRECASTERS TO MITIGATE RISK

Launched on 1st July this year by the national peak body for the Australian precast industry, Master Precaster will be the new term for the best of Australia's precasters who are among the most skilled and experienced. They have been thoroughly audited by National Precast.



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MASTER PRECASTERS BUSY AROUND THE COUNTRY

Take a look at some of the work being carried out by National Precast's Master Precaster members.



Custom wave generation components for Waveswell Energy to generate power off King Island, TAS (Hudson Civil Products)



Acid-washed panels for the University of Sydney's Chau Chak Wing Museum, NSW (Precast Concrete Products)



478 panels and 232 columns are being used in Arnold Apartments, Box Hill, VIC (Walker Panels)



Pump-well pits for Westconnex, Kingsgrove, NSW (Humes)



105 panels were supplied for this precast home at Connells Point, NSW (Alpha Precast, erected by Total Precast)



148 panels, 13.5 metres high using formliners were manufactured for UTAS Cradle Coast Campus, TAS (Duggans Precast)



84 super-tees @ 48 tonnes each for the Next DC Tier 4 data centre in Tullamarine, VIC (Hollow Core Concrete)



Pipes and culverts were recently supplied to the WA Marble Bar Realignment project (MJB Industries)



Precast arch tunnels and L-shaped retaining walls for the Pilbara's Mesa A Grade Separation, WA (Reinforced Earth Co)



Melbourne University's Newman College has a new fountain featuring 3 coloured shards (Otway Precast)

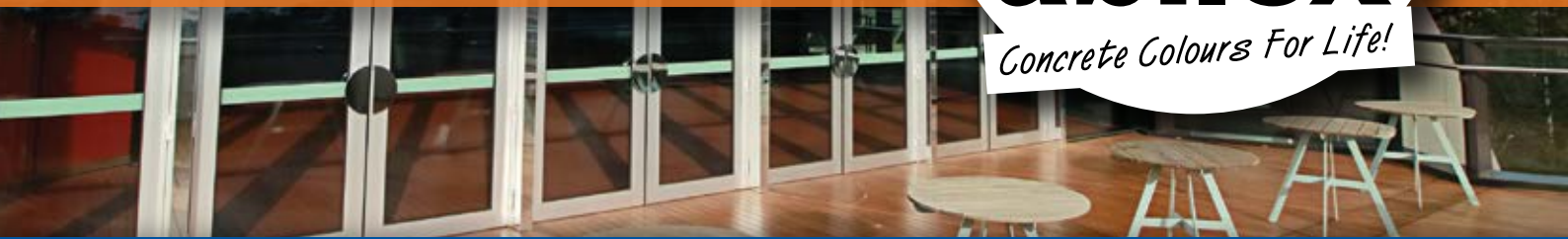


One of 7, 70 tonne, 13 metre headstock units for Smithfield Bypass, Cairns QLD (Stresscrete)



Honed seats manufactured for Barangaroo South, NSW (S.A. Precast)

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HUMES CREDITS ITS PEOPLE AS IT CELEBRATES A 110-YEAR MILESTONE

AN INTERVIEW WITH NATIONAL SALES MANAGER PAUL ADAMS

As Humes clocks up 110-years in business, National Precast's Communications Co-ordinator Kate Moore talks to Paul Adams, the company's Brisbane-based National Sales Manager. Paul is also a National Precast Board member.

KM: Just in case anyone doesn't know Humes, give us a quick overview.

PA: Humes is one of the largest and most established civil precast concrete manufacturers in Australia. Over the last 110 years, we have played an important role in the development of Australia's infrastructure, providing new products, technologies and manufacturing improvements to meet our clients' complex project requirements.

KM: Clearly you've not been with Humes all that time! So how long have you been there?

PA: I have been with Humes for a total of 17 years. That has been spent in 9 different roles all across Australia.

KM: Just how big is Humes people-wise?

PA: Humes has 10 factories across Australia with over 900 employees.

KM: How does your role fit into the company and its goals?

PA: My role fits into the national support team, providing internal and external training as well as contributing to new product development.

KM: What does this 110-year milestone mean for Humes?

PA: At Humes, we believe that we are the supplier of choice to assist any project's needs. We're all incredibly proud of reaching this 110 years of service within Australia's construction industry. It's a tremendous milestone to celebrate, as we have delivered high-quality services to many projects.

KM: What products does Humes manufacture?

PA: All precast elements to supply the civil construction sector. We supply products ranging stormwater solutions, sewage transfer, bridge elements and platforms, tunnels, shafts and walling elements for both large and small infrastructure, rail, ports, mining and resources, airports, subdivisions and defence projects.

KM: What exactly do Humes' products offer in terms of benefits?

PA: Using off-site manufactured precast concrete elements makes projects highly cost and time efficient, as opposed to other materials. They provide a wide range of on-site benefits to the client project team and deliver long-lasting, high quality solutions to communities.

KM: Who is your target audience?

PA: Our target audience mainly consists of civil contractors, state main roads' authorities, local government, as well as design and consult firms.

- KM:** What would you say is the number one reason for Humes' success?
PA: Our people. We believe that having a strong team is vital to any project's needs, as it creates a strong base from the start. Overcoming any challenge is easy when everyone within the team is on the same page, all working together cohesively.
- KM:** What is one of Humes' most successful or most memorable projects?
PA: It's hard to pin-point one specific project as we approach all projects with consistency and quality, providing a high level of service to our clients and their needs.
- KM:** What are some future goals within the business and for the industry?
PA: One main goal for Humes is to continue to be the supplier of choice within Australia's construction industry. We hope to continue to offer precast solutions to the civil market.

INDUSTRY BODY PROUD OF MASTER PRECASTER MEMBER HUMES
 National Precast CEO Sarah Bachmann congratulates Humes on achieving this important milestone.

"Not many companies have been manufacturing precast for as long as Humes. We are delighted to be associated with an organisation of people whose commitment is as strong as the contribution they have made to civil infrastructure," Bachmann says.

As one of the leading civil product suppliers, Humes has mirrored its industry standing with an active involvement with National Precast - the industry's peak body - at a national level.

"Humes has been a long-standing and highly valued National Precast member. The company has been committed to the Association and has been an active participant in National Precast activities by representing the industry on many Standards' committees, participating in working groups, working to achieve beneficial outcomes with state safety and main roads' authorities and by being engaged with other members.

"Humes' involvement has been as impressive as it has been long," Bachmann applauds.

"It's been a delight to work with Humes' management on various matters throughout my seventeen years with National Precast. Individuals such as Chris Ireland, David Wheely, Charlie Breia, Richard Carr and of course current Executive General Manager Guido Dewilde and Paul Adams have all given copious amounts of time to furthering the industry.

"Senior management has shown commitment at another level again, as they have held National Precast Board roles. In years gone by, Richard Carr and Glenn Degenhardt have given their time, and more recently Paul Adams," Bachmann says.

Humes has shown by its actions it is an industry leader and heavily committed to the precast industry."



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Through its predecessor companies Hallweld Bennett and Bennett Engineering, Bennett Equipment has been leading the way in the manufacture and supply of high quality concrete batching equipment since 1957.



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KEEPING OUR FURRY FRIENDS SAFE

Project: RSPCA Animal Shelter

Location: Yagoona, NSW

Master Precaster: Alpha Precast

Client: RSPCA

Builder: Lahey Constructions

Engineer: Trevor Valaire & Associates
and RGH Consulting Group

Architect: RSPCA Design Team

Located in Sydney's South-West, the recently completed Yagoona NSW RSPCA Animal Shelter has become a new home to hundreds of abandoned, injured and neglected animals. Now the state's largest animal rescue and emergency hospital, the new facility expands RSPCA's capability in response to an increasing demand to provide animal care, shelter and veterinary treatment.

As well as providing its core service to care for animals in need, RSPCA is also known for providing additional public services and education opportunities. Run by RSPCA workers and volunteers, some of the additional services include puppy preschool, animal foster programs, barking consultations, student placements, volunteer opportunities and an in-house retail store.

The design solution for the new structure site was developed by the RSPCA Design Team and provides living, exercise and rehabilitation spaces for a range of animals, sizes and temperaments.

Traditional insitu fabrication was initially chosen by the Team before National Precast member Alpha Precast was introduced to the project. The precast solution proposed by Alpha replicated the joint design and structural plan whilst significantly reducing construction cost for the client.

With the precast concrete solution offering a streamlined process and reducing costs, it was

welcomed by the client. A secondary cladding layer was able to be eliminated, which also improved fire safety for the animals in the potential event of a fire.

As well, the RSPCA Design Team knew that using precast concrete would also ease cleaning, reduce the structure's upkeep requirements and improve longevity.

260 precast elements were manufactured and installed by the precaster for the Yagoona Shelter which spanned a total floor area of approximately 2600m². Precast concrete floors, slabs and external surfaces were manufactured by Alpha Precast with an off-form Class 2 finish.

Erection of the 260 elements took only 8 days, easily meeting the client's programme requirements. The quick precast installation also benefited RSPCA's neighbours, by reducing site noise and the quantity of trades on site at any given time.

According to National Precast CEO Sarah Bachmann, total precast structures like this one have massive benefits to everyone.

"A higher quality end result comes into play faster and safer, with reduced costs," Bachmann states.

"And durability is guaranteed. These are robust structures which will stand the test of time for our furry friends."

The new RSPCA Animal Shelter is open to the public, treating, housing and rehabilitating animals daily.



ANCON STEPS UP TO PARTNER

National Precast is pleased to announce a new partnership with Ancon.

In an exciting development, Ancon has reinforced its commitment to the precast concrete industry by upgrading its membership of the industry's peak body National Precast. For the next two years, Ancon will exclusively hold the 'Lifters & Reinforcement Couplers' category within its Industry Partner membership.

As a designer and manufacturer of high quality steel fixings, Ancon is a part of CRH, a Fortune 500 building materials' business headquartered in Ireland. Together with sister company Halfen, Ancon's precast-related products in Australia include reinforcing bar couplers as well as lifting, fixing and anchoring systems. These have been used in a myriad of building and civil structures around the country and are backed by an Australian-based engineering support team.

According to National Precast CEO Sarah Bachmann, the upgrade is welcomed by the Association's Board and members.

"Ancon has been involved with National Precast since 2008 as an Industry Supplier member. Active at member meetings and on committees and working groups, Ancon has been a keen participant in National Precast. This strategic alliance as an Industry Partner confirms their support and positions them as a vital player in what is a growing industry," Bachmann comments.

"Their commitment to innovation, safety and continuous improvement as they excel at customer service, is synonymous with our own underlying values and reinforces the value of the partnership."



GROUTED LOADBEARING JOINTS

NEW GUIDANCE FOR BUILDERS, INSTALLERS, ENGINEERS AND GROUTING CONTRACTORS

According to National Precast Concrete Association, grouting practices are often not adequately detailed in drawings. As well, construction programmes are usually rushed and grouting is often assigned to untrained workers.

If grouting is not adequate, there can be catastrophic results, so National Precast has released a new guide for engineers, builders, installers and grouting contractors.

The new publication, *Understanding Grouted Joints: A guide for engineers and building contractors*, will help them better understand the importance of, and suggested practices for designing and constructing grouted precast joints.

"Loadbearing grouted joints play a critical role in precast concrete structures and need to be treated accordingly," says National Precast CEO Sarah Bachmann.

"Inadequately detailed grouting, poor or even worse, absent grouting, can result in structurally ineffective joints, which can have catastrophic consequences."

"It all comes down to having a better understanding of the critical role that grouted joints loadbearing play and why everyone in the process needs to treat them accordingly," Bachmann adds.

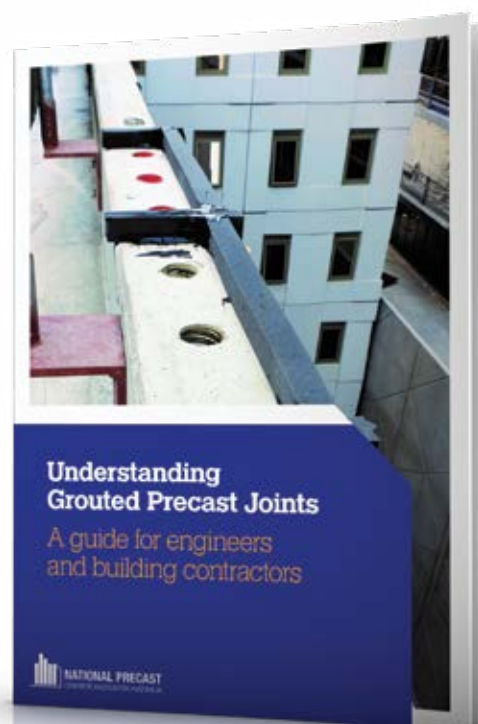
National Precast's *Understanding Grouted Joints* guide offers considerations and outlines responsibilities for In-service Designers (refer AS3850.1:2015 Prefabricated concrete elements Section 1, 1.4 Definitions, 1.4.30 In-service Designer), for Erection Designers (AS3850.1:2015 Prefabricated concrete elements Section 1, 1.4 Definitions, 1.4.20 Erection Designer) and other engineers. As well, the guide provides some guidance on typical grouting design.

Bachmann says the Guide is practical.

"There is information on the different types of joints plus we've outlined typical grouting methods for grouting flat joints, inaccessible joints and ship-lapped joints."

While not exhaustive, the Guide references loadbearing walling elements. Similar principles apply however for columns and other elements, and also for non-loadbearing joints.

The guide is available from National Precast for \$75 (colour printed copy) or \$55 (PDF) (ex GST) plus postage. Email info@nationalprecast.com.au to order. Contents and sample pages can be viewed at www.nationalprecast.com.au/resources/publications.



Greener Concrete Reinforcement for Improved Concrete Sleeper Applications

by Associate Professor Olivia Mirza

Nowadays, Australia's population is over 25 million having increased by almost five times over the last century. As such, huge planning and investment are being made in the infrastructure to further overcome congestion and capacity issues. Accordingly, the railway connectivity will be an important factor towards the integration of regional and metropolitan economies for their mutual benefit.

By 2075, the population is forecast to double putting huge constraints on the railway network which will be required to keep pace with such growing demand. For instance, by 2026 there is already a forecast growth of 19% and 26% in the passenger and freight operations respectively [1]. Therefore, increasingly railway operational conditions characterise faster average speeds and frequency of services requiring the Australian railway infrastructure to be properly maintained towards ensuring

the safety, reliability and efficiency in connecting regions and cities.

One solution to this challenging task was to assess essential track components to ensure they could satisfy the line upgrades. According to researchers [2, 3], one of the critical track components is the sleeper which main function is to maintain the track gauge and redistribute the axle loads to the ballast.

Typically, railway sleepers are made from timber, steel and prestressed concrete despite recent concerns associated to the degradation, durability and high-cost of such conventional materials. For instance, wooden sleepers offer a comparatively cheap, lightweight and easy to install option despite being far more prone to wear and tear particularly with the shortage of high-quality timber.

On the other hand, steel sleepers were often seen as a middle ground between

the wooden and concrete alternatives, offering better load-bearing capacities with reduced dependence on the ballast bed. However, steel sleeper implementation remained fairly limited due to major drawbacks such as susceptibility to corrode and fatigue cracking at the rail seat.

In comparison, the modern prestressed concrete sleeper embodies superior load capacity, track stability and a longer service life requiring on average less maintenance. Other concerns related to the sleeper's material have long been acknowledged, resulting in premature failure of conventional sleepers and their associated replacement cost incurred as shown in Figure 2. In other words, prestressed concrete sleeper is being the preferred option nowadays despite timber historically dominating as a railway sleeper material.

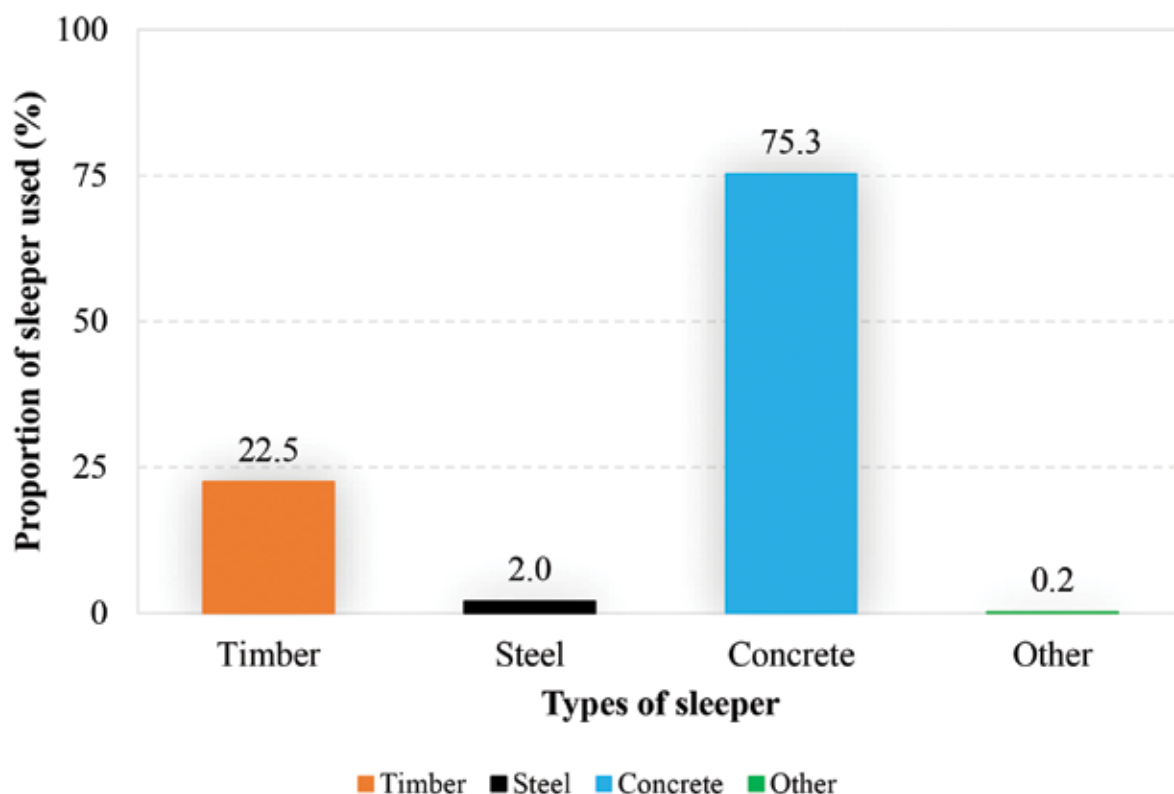


Figure 1: Use of railway sleeper material in European countries [UIC, cited in 4]

The most modern development in the field of railway sleeper highlights the benefits of composite sleeper being made from a combination of plastic, recycled rubber, and fibreglass. These are indeed engineered to possess adequate strength, damping and environmentally friendly characteristics to reduce the disposal cost. Nevertheless, the practical implementation of such sleepers remained fairly limited due to their unknown long-term behaviour and high manufacturing cost.

As a result, the idea was to implement new fibre technologies into the well-known and already mass-produced prestressed concrete sleeper to enhance its structural performances, reduce weight and overall cost while also being more sustainable. This innovative research is a collaboration between School of Engineering, Western Sydney University and BarChip. The Western Sydney University team include Associate Professor Olivia Mirza (the team leader), Mr. Christophe Camille and Ms. Dayani Kahagala (PhDs) and Mr. Todd Clarke from BarChip.

“For over 100 years we’ve just accepted that the best way to reinforce concrete is with steel. That might have been true in 1920, but will it still be true in 2020?”[5].

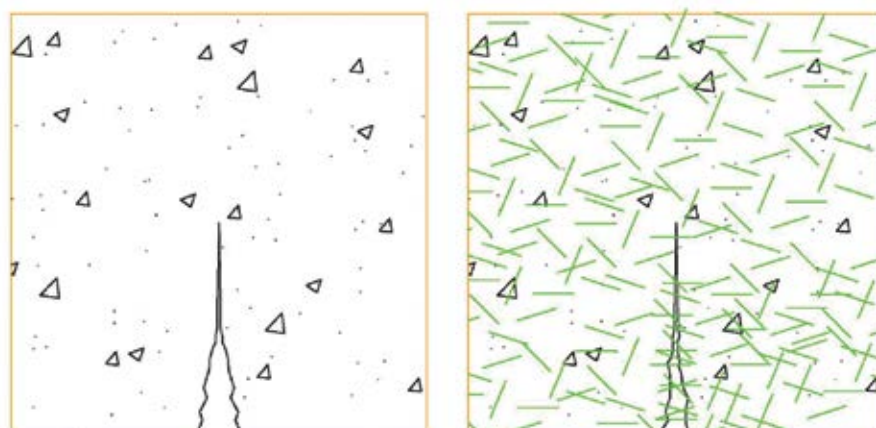


Figure 3: Illustration of cracks with and without the addition of macro-synthetic fibres

The BarChip macro-synthetic fibre concrete reinforcement is predominately made from a high-performance polypropylene base material, providing structural reinforcement in concrete, mortar and grout. This reinforcement system enables the distribution of high-tensile strength fibres throughout the entire concrete mix, intended at improving or controlling the residual strengths, durability and shrinkage characteristics of the concrete. BarChip macro-synthetic fibre technology is ideally suited to a wide range of applications including:

- Precast, paving and flooring works
- High deformation sprayed concrete works (i.e. tunnel linings)
- Railway Trackslab

Research recently conducted highlighted the benefits of BarChip fibres, namely BarChip 48 and BarChip MQ58 tested up to a fibre dosage of 2.0% by volume (i.e. approx. 18.2 kg/m³) which were found to significantly improve the post-cracking capacity and failure mechanism of concrete elements [6, 7]. In fact, these benefits directly result from the addition of fibres which suppress and stabilise the propagation of cracks throughout the concrete matrix.

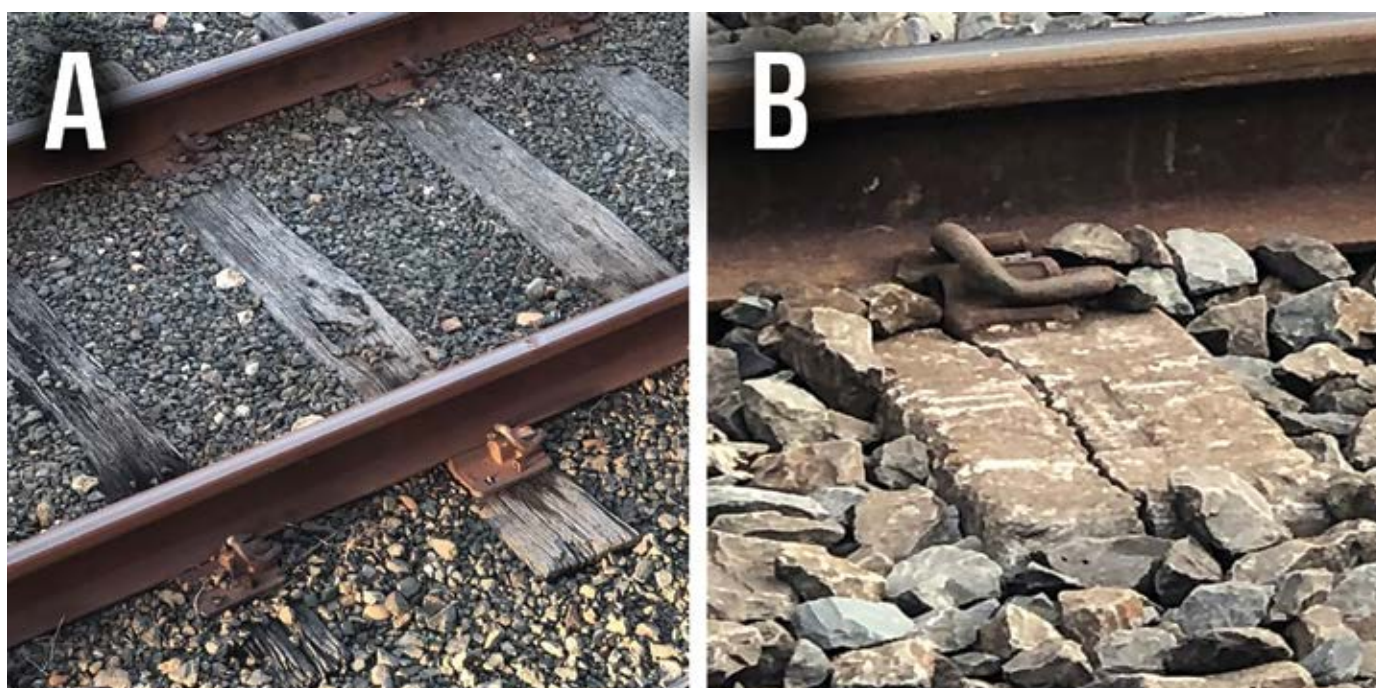


Figure 2: Typical failures of conventional sleeper – (a) timber & (b) prestressed concrete



Figure 4: BarChip macro-synthetic fibre concrete reinforcement [5]

These studies also underlined the fact that such reinforcement system could be implemented in the railway prestressed concrete sleeper as a partial or complete substitute to the steel wires. That is to say, such inclusion of fibres at an optimum dosage could result in a lighter, cheaper, eco-friendly and corrosion-free concrete sleeper.

The prospects of incorporating such BarChip fibres in railway sleepers is encouraging for a sustainable future, yet challenging in achieving the same capacity as prestressing steel reinforcement. As such, research is currently being undertaken at Western Sydney University on macro-synthetic fibre reinforced concrete (MSFRC) sleeper to comprehensively understand the structural behaviour and any associated benefits of such BarChip fibre incorporation. The MSFRC sleeper is reinforced by the synthetic fibres distributed throughout the sleepers..

The benefits of BarChip fibre concrete reinforcement for sleeper applications is assessed to comply with Australian Standard AS1085.14-2012. The essential standard tests for sleepers are (1) Rail seat vertical load test, (2) Centre bending moment test and (3) Development length [8].

Based on the in-situ track and support conditions of the sleeper, it is most likely that the section will experience a positive moment at the rail seat and a negative moment at the centre. This means that the rail seat and centre sections of the sleeper are safety-critical and as such must be assessed prior to

the implementation of BarChip macro-synthetic fibre reinforced concrete sleeper.

Understanding the contribution of BarChip fibres in the sleeper is key. Therefore, macro-synthetic fibre reinforcement was implemented at optimum dosage in the existing prestressed concrete sleeper to further evaluate any benefits as compared to an identical sleeper without the reinforcing BarChip fibres.

The potential implementation of such macro-synthetic fibre (i.e. BarChip) in railway sleeper as a partial or complete reinforcing alternative to steel is particularly in demand to allow for a cheaper, crack resistant, more environmentally friendly and corrosion-free concrete sleeper.

The first observation made in regards to the benefits of BarChip fibres is the cracking and failure mechanisms outlined in Figure 5.

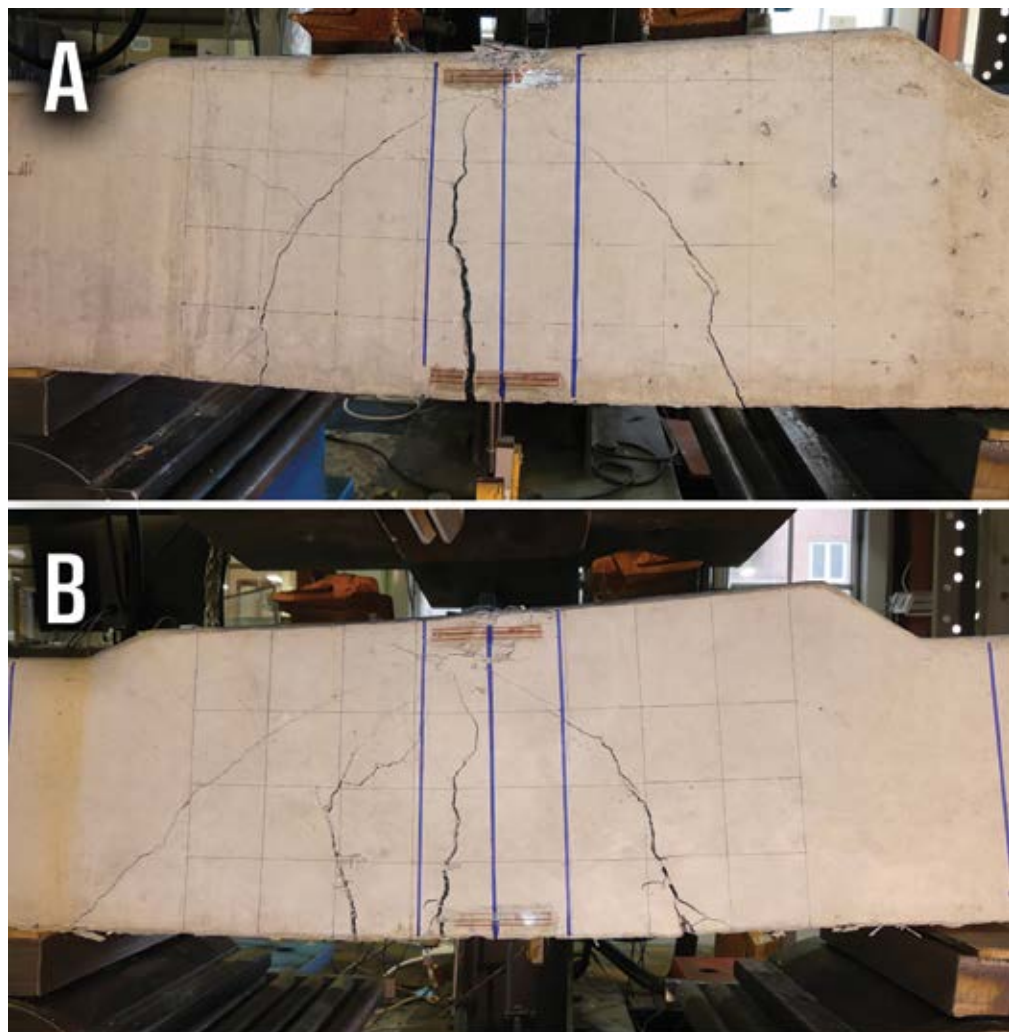


Figure 5: Rail seat positive bending moment test comparison for prestressed concrete sleeper (a) without BarChip fibres & (b) with BarChip fibres

Although both sleepers (i.e. with & without BarChip fibres) experienced flexural-shear cracks in the rail seat positive moment test, the MSFRC one exhibited a better distribution of cracks with smaller crack widths. Similar crack widths reductions are observed through the centre negative bending moment test presented in Figure 6.

It can be justified that conventional prestressed concrete sleeper exhibited mostly a shear-compression failure with local crushing as demonstrated in Figure 6-(a). In comparison, the sleeper reinforced with prestressing steel and BarChip fibres experienced predominantly flexural cracks towards a shear-tension failure with reduced local crushing.

Other benefits of incorporating BarChip fibres in sleepers can be observed through the post-cracking residual capacity outlined in the load versus deflection graphs.

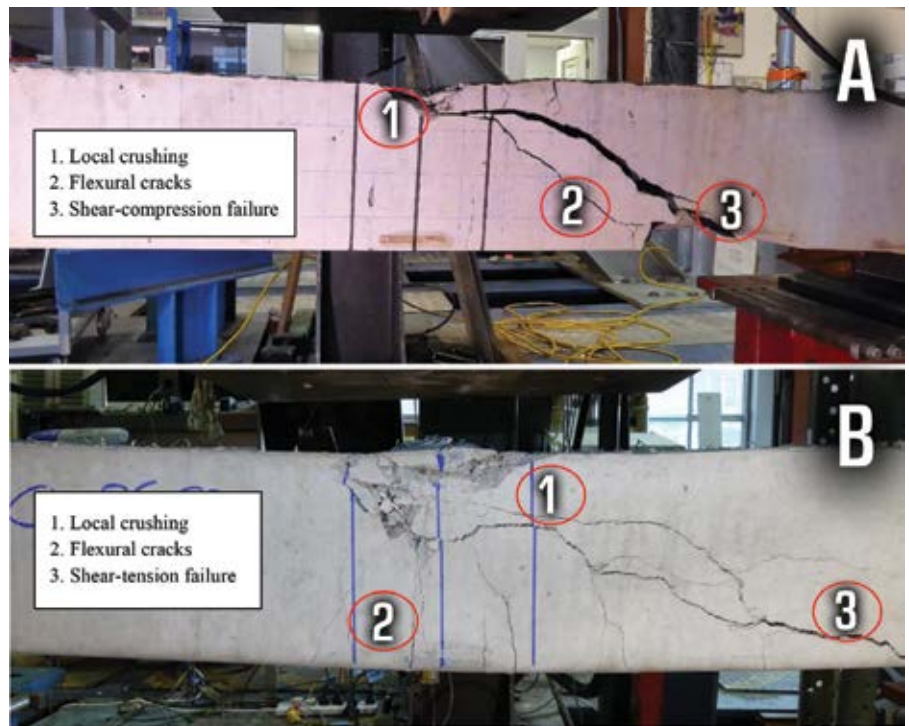


Figure 6: Centre negative bending moment test comparison for prestressed concrete sleeper (a) without BarChip fibres & (b) with BarChip fibres

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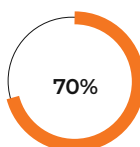
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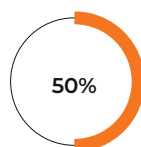
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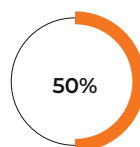
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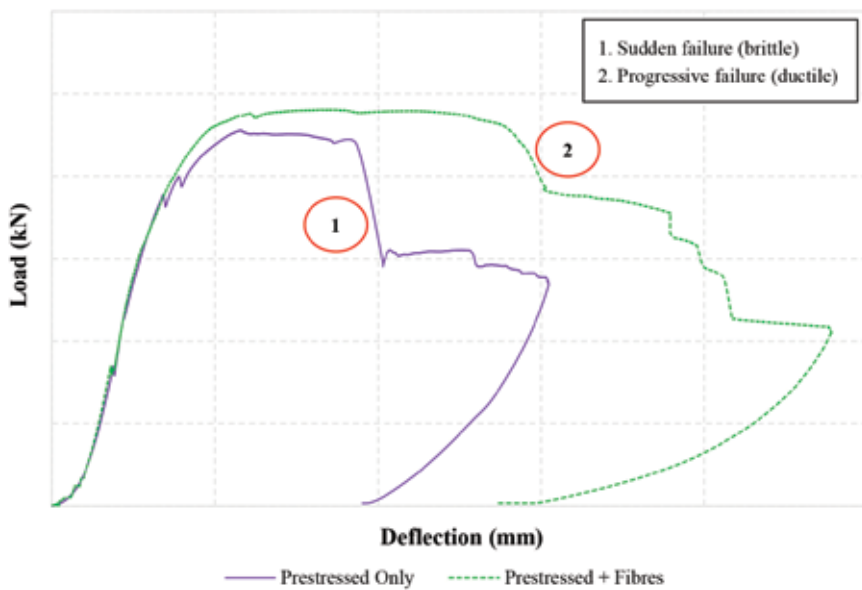


Figure 7: Rail seat positive bending moment test comparison for prestressed concrete sleeper reinforced with BarChip fibres

Figure 7 presents the improved serviceability behaviour of MSFRC sleeper in comparison to the conventional one although the presence of fibres insignificantly affects the ultimate load capacity. In other words, the BarChip reinforced sleeper was structurally sound up to larger deformations characteristically related to the additional ductility induced through the fibre bridging of cracks.

Shortly after the peak load, the conventional prestressed sleeper (i.e. no fibres) experienced a substantial drop in load corresponding to the sudden failure (i.e. brittle) in the bottom layer of prestressing tendons.

Comparatively, the MSFRC sleeper did not exhibit such drastic reduction in capacity through the presence of fibre assisting in the distribution of stresses across the section. As such, the sleeper incorporating fibres displayed a much slower progressive failure mechanism, a property desired in safety-critical railway track component.

Similarly, the centre negative bending moment test (Figure 8) highlighted the serviceability benefits of implementing BarChip fibres in railway sleeper. Indeed, the addition of fibres improved the failure mechanism towards a more ductile fracture with on average a 53% difference in deflection once the failure point is reached.

Such observations from the rail seat and centre tests demonstrate the potential benefits of BarChip macro-synthetic fibre reinforcement in terms of structural stability, serviceability and reduced maintenance (i.e. crack control) for sleeper applications. Further study is required to assess any potential reduction in the number of prestressing tendons while adding BarChip fibres as an eco-friendly alternative reinforcement method.

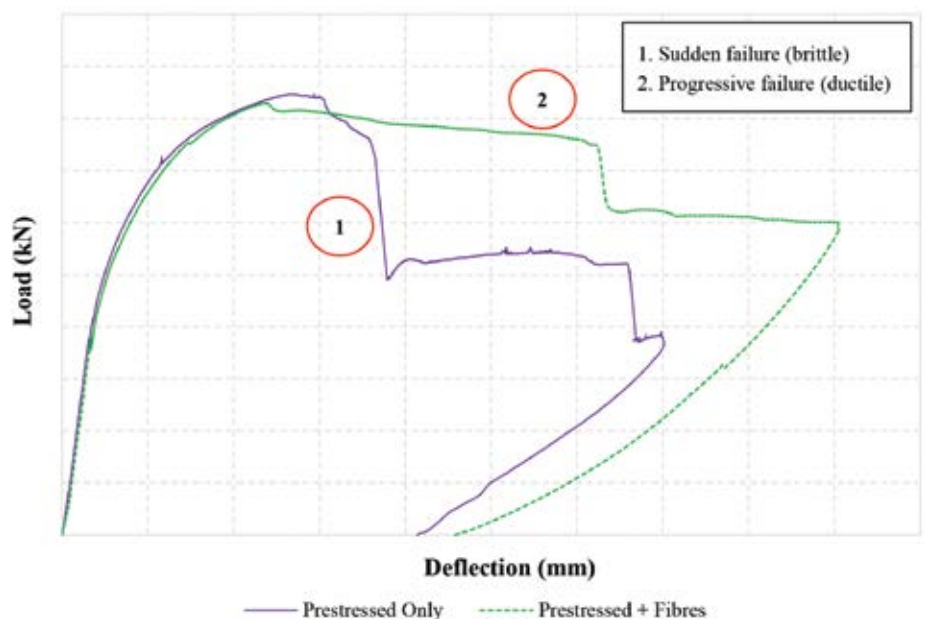


Figure 8: Centre negative bending moment test comparison for prestressed concrete sleeper reinforced with BarChip fibres

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JCB leads the way with first hydrogen-fuelled excavator

JCB has developed the construction industry's first ever hydrogen powered excavator as it continues to lead the sector on zero and low carbon technologies, the company announced recently.

The 20-tonne 220X excavator powered by a hydrogen fuel cell has been undergoing rigorous testing at JCB's quarry proving grounds for more than 12 months. The exciting development means JCB is the first construction equipment company in the world to unveil a working prototype of an excavator powered by hydrogen.

JCB Chairman Lord Bamford said: "The development of the first hydrogen fuelled excavator is very exciting as we strive towards a zero carbon world. In the coming months, JCB will continue to develop and refine this technology with advanced testing of our prototype machine and we will continue to be at the forefront of technologies designed to build a zero carbon future."

Lord Bamford's son Jo Bamford spent 14 years at JCB before moving into the hydrogen sector, setting up Ryse Hydrogen and then buying Northern Ireland bus giant Wrightbus.

He has won contracts to supply the world's first hydrogen double-decker to cities such as London and Aberdeen.

Jo added: "I truly believe hydrogen is the UK's best opportunity to build a world-leading industry which creates UK jobs, cuts emissions and is the envy of the globe."

Power for JCB's prototype excavator is generated by reacting hydrogen with oxygen in a fuel cell to create the energy needed to run electric motors. The only emission from the exhaust is water.

The development comes after JCB made manufacturing history last year by going into full production with the construction industry's first fully electric mini excavator, the 19C-1E. JCB has also extended electric technology to its innovative Teletruk telescopic forklift range with the launch of an electric model, the JCB 30-19E.

Through constant innovation and design improvements, JCB has also been leading the way on clean diesel technology to meet Stage V EU emissions regulations and has almost eradicated the most harmful emissions from its latest range of diesel engines. Nitrous Oxide (NOx) is down 97%, soot particulates down by 98% and Carbon Dioxide (CO₂) emissions down by almost half.

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