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AUG/SEP 2023
Volume 9 Number 2



Published by:

Editorial and Publishing

Consultants Pty Ltd

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Publication No. 100001889

ISSN 2204-7247



- 2** Editorial
- 4** Industry News
- 10** Cover Feature: What you need to know about Digital Traceability
- 14** Product Focus - Moddex Tuffrail®
- 18** Stormwater & Drainage
- 20** Case Study: Fielders FreeForm™
- 24** ETIA Blog: Technical Basics
- 26** Equipment Focus - Aussie Pumps
- 28** Op Ed - Mandatory Climate Reporting
- 30** Sustainable Construction
- 34** Digital Tehnology
- 36** Special Report - Institutional Memory
- 38** National Precast News
- 42** Underground Constriction



4



10



20



30



About the Cover

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► **Turn to Page 10 for the full story.**

RETHINKING CBD BUILDING USE AND ZONING REGULATIONS

Dear Readers,

Despite the fact that almost two years have passed since most COVID restrictions were finally lifted, the subsequent economic challenges (especially in terms of inflation and cost of living pressures) continue to take their toll on many of our cities and regions.

Even though some cities are now thriving, others remain a 'shadow of their former glorious existence', with an extremely high percentage of commercial vacancies and, in many instances, shockingly low levels of passing foot traffic for the businesses that remain.

While there may be an understandable level of reluctance on the part of some to return to office-based employment in the CBD, or to fully re-engage with city life as they did in pre-COVID times, for cities like Melbourne, there is a fear that it may take many years for the city to fully recover.

Indeed, over the past month alone, I have had numerous discussions with friends and colleagues from around the country who have recently visited Melbourne – many for the first time in a number of years – and their reactions to Melbourne's current condition (both in terms of its general appearance, the lack of people and/or activity in the CBD and many other areas) – generally ranges from shocked to horrified.

It seems that following the COVID-19 mandate of *'those who can work from home, MUST work from home'*, a significant percentage of the population has now decided that they don't really want to attend a centralised workplace every day to keep working. And it's no longer about a 'fear of

COVID' – it's now predominantly a matter of cost, convenience, and that all-important (and often difficult to achieve) work-life balance.

In short, there is now a significant proportion of the CBD workforce who appear to have no desire or intention whatsoever of ever returning to a life of daily (often lengthy) commuting to a centralised workplace five days a week. What's more, there also seems to be an ever-increasing number of employers who are quite happy to accommodate a 'hybrid' work model.

Importantly, whether the employers are fully willing participants in this new working model or are simply agreeing to it for fear of losing their workforce is essentially moot point. The fact is that a large percentage of commercial office space is now massively underutilised – which, considering our current rental crisis and housing shortage – is far from ideal.

Now, before I continue, I do not wish to suggest that eliminating office space altogether is desirable, or for that matter, even an option. However, I do believe now is the ideal time to have a serious rethink about planning, zoning and building use. Not only in terms of greenfield developments in outer suburbs and rural and regional centres, but also in terms of how we utilise our existing inner-city buildings and infrastructure.

Although it is clear that we cannot simply abandon our current CBD planning and zoning strategies, it is also clear that applying the current building use and planning model may not only result in it taking many years for many of our CBDs to return to anything even resembling their former glory (if ever), they may also be, quietly simply, no longer appropriate to our current and future needs.

Please don't misunderstand, I'm not suggesting a 'free-for-all' policy for inner-city building use. I am, however, suggesting that rather than having strict prescriptive controls for commercial office space vs. residential space vs. light-tech, etc., it might be time to consider a new type of 'mixed-use' zoning that allows the establishment of residential and business facilities within what is currently considered 'commercial office space'. Much in the same way as we've seen significant growth in home-office / home-small business enterprise 'mixed-use' housing across the suburbs and regions.

Being able to live and work in the same building – even if that building is in the CBD of a major capital – can deliver a raft of benefits... both in terms of quality of life, and sustainability.

Reduced commuting, (which reduces pollution, carbon emissions and stress), less reliance on individual vehicle ownership, improved work-life balance, expanded economic opportunities, and the revitalisation of our CBD's... the list goes on.

While it is clear that there are many more things to be considered when it comes to rethinking inner-city planning and zoning than a simple one-page editorial will allow, I believe that now is the ideal time to have the discussion.



Anthony T Schmidt
Managing Editor

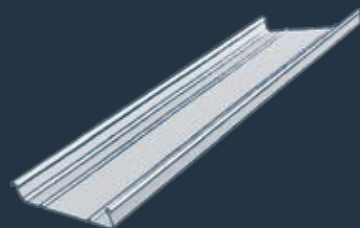


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First look at new Queen Victoria Market 'People's Park'

Melburnians are encouraged to have their say on the City of Melbourne's vision for Market Square, which is set to become a magnet for locals and visitors to the Queen Victoria Market precinct.

The 1.8 hectare 'people's park' will be one of the largest in the CBD – with welcoming, green spaces for people to savour the market experience, relax with family and friends, and enjoy events and activations that will complement the historic market.

Ahead of detailed concept design, Council is seeking feedback from the community on 11 design principles for the Square – which respond to the Market Square Charter and extensive community engagement.

The principles propose a range of features for the Square, including:

- Expansive lawns for recreation, relaxation and reflection
- Native plants to improve biodiversity in the city
- Large trees to provide shade, helping to meet Council's 40 per cent target for canopy cover
- A plaza to host events
- A play space
- A garden of acknowledgement, to be developed in partnership with Wurundjeri Woi Wurrung Cultural Heritage Aboriginal

Corporation and Aboriginal Melbourne

- Paving, planting and ways of moving through the park to respectfully acknowledge the original cemetery.

Community members can also provide feedback on a set of design principles for the Queen's Corner Building – which will deliver important amenities for traders and the community, and support the precinct through activations and creative experiences. Engagement will run to Sunday 8 October.

Council will host a range of activities, including pop-up sessions and stakeholder workshops. For more information, visit the Participate Melbourne website at: <https://participate.melbourne.vic.gov.au/market-square>. It will build on the first phase of engagement, which began on 12 July. Feedback from both phases of engagement will be presented to Council for consideration later this year.

There will be no loss of parking in the precinct – with 220 spaces for market customers, and 300 on weekends, to be delivered in Gurrowa Place, in addition to the 500 spaces already available in the Munro development on the corner of Queen and Therry streets.

Speaking about the projects, Melbourne Lord

Mayor, Sally Capp, commented: "A new Market Square will transform our city's north – creating a wide range of community spaces to boost visitation and improve the way Melburnians experience the iconic Queen Victoria Market precinct."

"Our design principles build on existing community feedback and propose a range of uses for the Square – from expansive lawns and shady trees, to spaces for relaxation, play and events."

"We have an exciting vision for our 'people's park', and we want to ensure our ideas resonate with the community, who'll be making the most of this spectacular new city space," the Lord Mayor said.

City of Melbourne Environment portfolio lead, Councillor Rohan Leppert, added: "A new Market Square will deliver much-needed public open space in one of the city's fastest-growing neighbourhoods – creating welcoming spaces for visitors and the local community to enjoy."

"This is a once-in-a-generation opportunity to convert a major grey space in the CBD into a vibrant, green open space that benefits our community – and we're encouraging all Melburnians to have their say," Councillor Leppert concluded.

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UN Plan Focuses on Emission Cuts in the Construction Sector

Rapid urbanisation worldwide means every five days, the world adds buildings equivalent to the size of Paris, with the built environment sector already responsible for 37 per cent of global emissions. A report published by the *UN Environment Programme* (UNEP) and the *Yale Center for Ecosystems + Architecture* (Yale CEA), under the Global Alliance for Buildings and Construction (GlobalABC), offers solutions to decarbonize the buildings and construction sector and reduce the waste it generates.

The report, *Building materials and the climate: Constructing a new future*, offers policy makers, manufacturers, architects, developers, engineers, builders and recyclers a three-pronged solution to reduce “embodied carbon” emissions and the negative impacts on natural ecosystems from the production and deployment of building materials such as cement, steel, aluminium, timber, and biomass:

- Avoid waste through a circular approach: building less by repurposing existing buildings is the most valuable option, generating 50-75 per cent fewer emissions than new construction; promote construction with less materials and with materials that have a lower carbon footprint and facilitate reuse or recycle.
- Shift to ethically and sustainably sourced renewable bio-based building materials, including



timber, bamboo, and biomass. The shift towards properly managed bio-based materials could lead to compounded emissions savings in many regions of up to 40 per cent in the sector by 2050. However, more policy and financial support is needed to ensure the widespread adoption of renewable bio-based building materials.

- Improve decarbonisation of conventional materials that cannot be replaced. This mainly concerns the processing of concrete, steel, and aluminium – three sectors responsible for 23 per cent of overall global emissions today – as well as glass and bricks. Priorities should be placed on electrifying production with renewable energy sources, increasing the use of reused and recycled materials, and scaling innovative technologies. Transformation of regional markets and building cultures is critical through building codes, certification, labelling, and the education of architects, engineers, and builders on circular practices.

The three-pronged Avoid-Shift-Improve solution needs to be adopted throughout the building process to ensure emissions are slashed and human health and biodiverse ecosystems are protected. The solution also requires, in its

implementation, sensitivity to local cultures and climates, including the common perception of concrete and steel as modern materials of choice.

“Until recently, most buildings were constructed using locally sourced earth, stone, timber, and bamboo. Yet modern materials such as concrete and steel often give only the illusion of durability, usually ending up in landfills and contributing to the growing climate crisis,” said Sheila Aggarwal-Khan, Director of UNEP’s Industry and Economy Division.

“Net zero in the building and construction sector is achievable by 2050, as long as governments put in place the right policy, incentives and regulation to bring a shift the industry action,” she added.

To date, most climate action in the building sector has been dedicated to effectively reducing “operational carbon” emissions, which encompass heating, cooling, and lighting. Thanks to the growing worldwide decarbonisation of the electrical grid and the use renewable energies, these are set to decrease from 75 per cent to 50 per cent of the sector in coming decades.”

“Since the built environment sector is so complex, with interdependencies across actors, all hands on deck are required to decarbonise, and we can’t leave anyone behind. Policies must support the development of new cooperative economic models across the building, forestry and agricultural industries, in order to galvanise a just transition towards circular, bio-based material economies that can also work synergistically with the conventional material sectors,” according to lead author Anna Dyson, Founding Director of the Yale Center for Ecosystems and Architecture (Yale CEA).

100,000+ fly the flag across Australia: a hi-vis strategy for workers’ mental health

Flags flew over work sites across the country on September 13 and 14 to celebrate the role of more than 300,000 Australian workers in preventing suicide.

As part of National Suicide Prevention Week, MATES’ annual Fly the Flag days recognised the work of MATES volunteers trained to recognise the signs of change in their colleagues and initiate conversations that could save a life.

MATES National CEO Chris Lockwood said the World Health Organisation-recognised MATES program, which supports the construction, mining and energy sectors, was now integrated into a large part of the Australian blue-collar workforce.

“Fly the Flag is a hi-vis strategy to bring an often hidden topic to the surface so we can help as

many as possible,” Mr Lockwood said.

“At a general awareness level, MATES have trained more than 300,000 people across the construction, mining and energy sectors. From this, we’ve been able to build a volunteer workforce of over 30,000 people who know how to have the difficult conversations that can save a life.”

Latest research into the potential drivers of suicidal thoughts in construction industry workers shows a strong relationship between job security, demands of work, and suicidal thoughts.

“The research has also found, unfortunately, that many people still struggle with the idea of needing to access mental health support,” Mr Lockwood said.



“That is why it’s so important for workmates to be aware of the signs that someone might be struggling, know how to have the delicate but important conversations, and then connect that person with help.”

Mr Lockwood said every second day, a construction worker dies by suicide. Between 2001 to 2019, there were 4143 suicides among both male and female construction workers across the country.

“Over 100,000 workers across more than 900 job sites took the time to Fly The Flag in support of their MATES,” Mr Lockwood said.



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13. Industrial Buildings Design Workshop	9 November 2023	ZOOM
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15. Residential Slabs & Footings Design Workshop	15 + 16 November 2023	F2F SYD
16. FRP Structural Design Workshop (Strengthening Concrete using Carbon Fibre Strips)	21 November 2023	ZOOM
17. Structural Steel Design Workshop	22 + 23 November 2023	F2F SYD
18. Composite Steel & Concrete Structures Workshop	28 November 2023	ZOOM
19. Pile Foundations Design Geotechnical Workshop	29 + 30 November 2023	F2F SYD
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HIA believes broader reforms are needed with the Housing Australia Future Fund

"HIA welcomes the announcement that the Housing Australia Future Fund is progressing towards fruition," stated Jocelyn Martin, HIA Managing Director.

"The fact that the Albanese government and the Greens have finally reached an agreement means we are a step closer to getting on with the job of supplying Australians with the housing they need," added Ms Martin.

"The arrangements mean there is a commitment for a \$10 billion investment towards the construction of at least 30,000 social and affordable housing over a five-year period. The announcement that an additional \$1 billion will be invested in the National Housing Infrastructure

Facility to support new homes also signals the Government's recognition of the need to deliver homes to those who need them."

"The need for greater housing supply in Australia has become more acutely apparent in recent years," Ms Martin said.

"The rebound in immigration, acute rental shortages and tight labour markets are fuelling demand for housing across Australia, driving rents and dwelling prices ever upwards."

"It is a relief to see this important enabling legislation has passed through parliament and that the need for greater housing supply across the housing continuum is being taken seriously," she added.

1.2 million homes: Actual, Forecast and Target, MAT



The Australian government recently announced that it wants to see 1.2 million homes built over the five years starting July 2024, as part of its National Housing Accord.

"It is important to recognise that the commitment to supply 30,000 social and affordable homes via the Housing Australia Future Fund represents only 2.5 per cent of this aspirational target," Ms Martin said.

"The private sector will still have to do most of the heavy lifting in terms of meeting Australia's housing needs, and it is being constrained by policy that inflates the costs of home construction and finance."

The HIA believes that broader reforms are required to reduce these costs and aid the private sector in enabling the delivery of these targets, including:

- Planning systems need to facilitate more higher-density residential development in existing suburbs near jobs and transport.
- The release of greenfield land and provision of infrastructure needs to be expedited.
- Punitive taxes on both investors and owner-occupiers need to be abolished and replaced with fairer and broader sources of revenue.
- Financial regulations need to make it easier for banks to lend and potential home buyers to borrow.

"Without these broader reforms, the pressure on social and affordable housing will only increase, and the government's latest announcement will prove inadequate," concluded Ms Martin.

Nostra Property Group delivers first ex-Porter Davis townhomes ahead of schedule

In a huge win for families across Melbourne, Nostra Property Group has completed its first cohort of ex-Porter Davis townhomes, following the acquisition of the group's medium-density division earlier this year.

Nostra Property Group put its hand up to complete 126 townhouses that were left in limbo across multiple projects, with the first 19 townhomes handed over to purchasers located in the Orana Estate in Clyde North and the Kingsfield Estate in Sunbury. The remaining homes are due to be completed within the next six months, with many ahead of their original build schedules.

Nostra's Managing Director and Founder Anthony Caruana said one of the biggest challenges when acquiring the Porter Davis medium-density division was completing homes that were already half constructed.

"Building these townhomes was made possible

by the assistance of the talented ex-staff members employed by Porter Davis, who ensured what is delivered on-site is what is on the plans."

"It's been incredibly fulfilling to see families move into their finished homes - what was an uncertain and tumultuous time for them is now in the past and they can start the next chapter and move forward," he said.

Nostra Property Group is also in the process of acquiring an additional 169 townhouses that have been pre-sold by Porter Davis, but are yet to start construction.

Nostra Property Group is an experienced and well-regarded medium-density builder who has worked alongside many developer partners across the past 15 years. Since 2006, Nostra Property Group has built over 3,100 homes and given this experience, Anthony said the acquisition of Porter Davis' medium-density division was a natural fit.



"The acquisition of the Porter Davis medium-density business was a natural addition to the Nostra business from a capability, competency and financial viewpoint. It also enabled the contracted purchases to realise the delivery of their townhouses.

"Homeowners can feel confident that we will deliver on our promises; our business direction is not driven by volume, but rather each new project we take on is assessed on its commercial merits and its fit within the company's brand and value," he said.

The Victoria Managed Insurance Authority "VMIA" recently assessed Nostra and determined the Risk Category applicable to be Risk Category A - the lowest risk category applicable.

Melbourne Master Builder triumphs in historic CBD project

Melbourne Master Builder, L. U. Simon Builders, constructed the 16-storey Le Meridien 5-star Marriott hotel in the heart of Melbourne's CBD on busy Bourke Street, surrounded by narrow laneways, 60 metres from Parliament House.

In recognition of this feat, unparalleled in projects of this complexity, the builder was named Master Builder of the Year for its meticulous work reimagining the former site of the historic Palace Theatre – this is the third time the firm has been crowned Master Builder of the Year.

To continue the winning streak, in September 2023, this project won the Australian Institute of Building's National Building Professional of the Year award and was similarly honoured, by the Victorian chapter – also for the third time.

A project of this magnitude, located in a heritage precinct, flagged significant challenges, so much so that some of the largest builders in the industry turned their backs on the project.

However, this is a challenge L. U. Simon relished. As pioneers in the industry, the firm wanted to be part of the continual transformation of the city of Melbourne.

Senior Project Manager, Dennis L. Moschoyiannis says, "Significantly, we developed a build methodology that satisfied the Melbourne City Council sufficiently to let us demolish the former Palace Theatre."

"It helped that we had 60 years of local knowledge to convince stakeholders that the job could be built and that it would be built with minimal disruption to the adjacent Princes Theatre and public transport network."

"To dig 12 metres underground required specific rigs, equipment and even a mining conveyor-belt to remove over 5,000 trucks worth of material through the CBD," Mr Moschoyiannis added.

"This was trammelled by a landlocked building, a heritage façade, public protection orders, neighbouring outdoor dining, one-way traffic and busy tram network, not to mention over 120 protests at nearby Parliament House as well as impromptu city closures during construction."

The firm commenced construction in November 2020, between Melbourne's second and third COVID-19 lockdown and completed the build in October 2022, a year after the city's sixth lockdown – handing over the project three weeks before its scheduled delivery.

Opened in March this year, the venue is already touted as one of the city's most popular hotel destinations.

Speaking about the project, Geoff Purcell, President, General Contracting Sector Committee, Master Builders Association, Victoria, said: "The Victorian building and construction sector continues to push ahead on a path of success."

"The scope of work is tremendous. The outcomes for consumers continue to be spectacular," Mr Purcell added.

Established in 1955 by Professor Leo Simon, L.U. Simon Builders is responsible for more than \$12 billion in major projects across the commercial, industrial, institutional and residential sectors.



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What you need to know about Digital Traceability

Demand for digital product traceability is heating up - and construction is next



Globalisation has brought many benefits, including in quality and pricing, a larger marketplace, and diversified supply. But it also has its challenges, not least a lack of understanding of local legislative requirements (e.g. understanding code requirements), and an increased carbon footprint for longer logistics journeys.

Additionally, complex procurement means risks and uncertainty over products' origins, quality, compliance, and related assurances.

The problems caused by the lack of visibility and assurance of fact through the supply chain are driving global demand for digital product traceability to international standards. End-consumers and responsible businesses want certainty when it comes to safety and quality, as well as ESG performance.

In construction, with the push to optimise process efficiencies and ensure compliance with local regulations, digital traceability from source to end product is being seen as a game-changer.

TRIED AND TESTED

Many industries have successfully introduced forms of digital product traceability. In textiles, the end consumer previously had no visibility over the early stages of the supply chain. But as customer expectations rose – primarily around fair trade, and more recently for assurance around other ESG factors – the industry introduced better traceability so the end user can now determine the origin of garments.

In the grocery store, to improve efficiency we moved from counter service to self-service, and then added barcodes for better customer access. These barcodes, which use global standards, also provide the traceability to ensure our foods are safe, responsibly sourced, and of the desired quality.

In the automotive industry, where safety is also a primary concern – followed closely by cost – traceability is used to drive efficiencies across a complex manufacturing process and to assure end-user safety.

In the production of a car, parts are sourced from across the globe, with unique markings at component level to ensure traceability throughout manufacture. This tracking enables specific recalls in the case of faults, thus giving the user confidence in the end product.

PROTECTING CONSUMER CONFIDENCE

We can see from industries that have already adopted the process, that digital traceability has numerous benefits including:

1. Validating safety and quality of products – good for end-users and any liable parties
2. Optimising processes – good for manufacturers
3. Improving ESG performance – good for everyone
4. Increasing consumer confidence.

On the last point – consumer confidence – transparency and trust are the key issues. We've seen several examples in recent years where transparency and trust were missing or broken, and consumer confidence quickly followed.

At the beginning of 2018, a major steel manufacturer from Japan admitted to supplying products with falsified test reports for decades. Supply chains all over the world were affected, and the company lost years of customer trust.

Similarly, major automotive companies were caught deceiving customers regarding emissions testing. In both these situations, not only was the principal company affected but also companies that used them as suppliers.

SAFE AS HOUSES

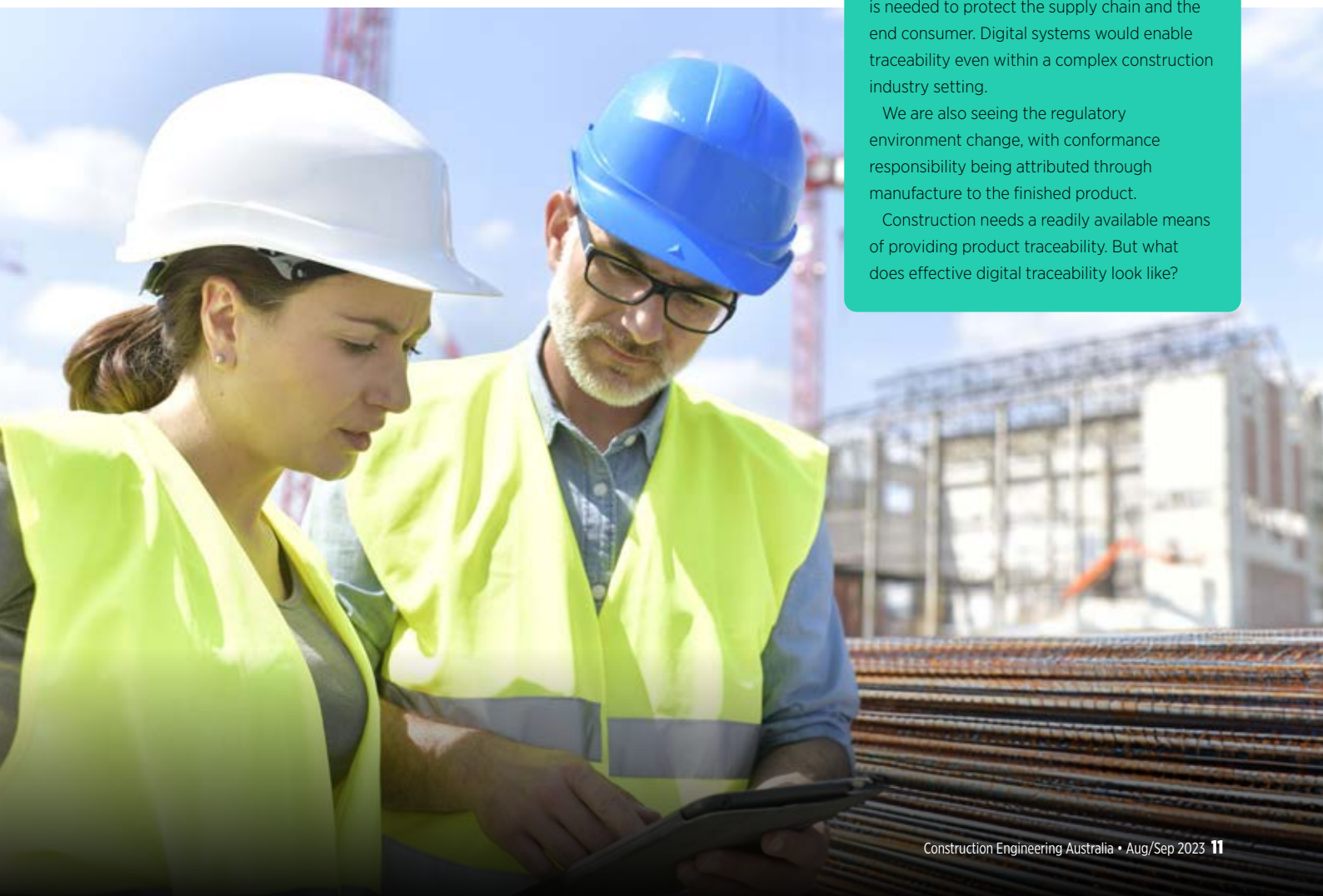
Construction is certainly not immune to such issues. Like the automotive industry, construction has long complex, global supply chains that source parts and components from multiple suppliers. Safety is paramount: compliance of products and materials is of major concern, and demonstration of safety is a legal requirement.

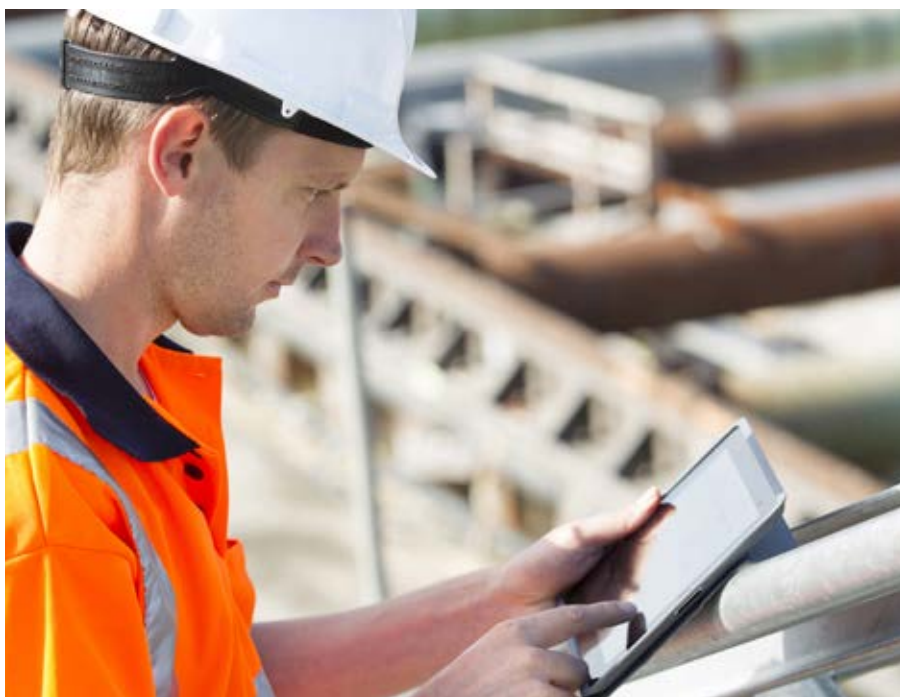
However, construction provides more complexity in supply chains and service providers than other industries, and yet, to date, we have not seen widespread adoption of digital product traceability. The current systems, being primarily paper-based, remain open to fraudulent behaviour – which in turn reduces confidence in the conformity of materials and products. As a result, the industry has seen unfortunate recent and historic examples of these shortcomings.

Inquiries have been held regarding a number of concerns, including Grenfell Tower in the United Kingdom; Lacrosse Tower; Opal and Mascot Towers in Australia, and E-Class mesh in New Zealand. Findings suggest that knowledge and understanding of material and products, and demonstration of conformance, are paramount. They suggest that traceability is needed to protect the supply chain and the end consumer. Digital systems would enable traceability even within a complex construction industry setting.

We are also seeing the regulatory environment change, with conformance responsibility being attributed through manufacture to the finished product.

Construction needs a readily available means of providing product traceability. But what does effective digital traceability look like?





GLOBAL TRUST ANCHORS

Digital traceability systems have been around for some time, but in a complex environment such as construction, linear systems don't easily provide access to the information sought. Work is currently being conducted on the global stage that considers "trust anchors" and "verifiable credentials".

A trust anchor is a point along the supply chain providing assurance, from a verified and trusted source, that the product is compliant with a particular aspect. Typically, the trust anchor would not hold all information about a product, but instead act as a pointer to enable traceability and access to the information required.

An example of a familiar tool that acts as a trust anchor would be the apps used for two-step authentication. Without the input of any personal information, the app provides verification for the user to proceed.

STEELY CONVICTION

Steel is one of the most important materials in construction. Despite that, we regularly see:

- a huge variance in quality (performance characteristics) and consistency;
- consignments delivered with mixed supply (is it all compliant?); and
- steel delivered that doesn't conform to local standards.

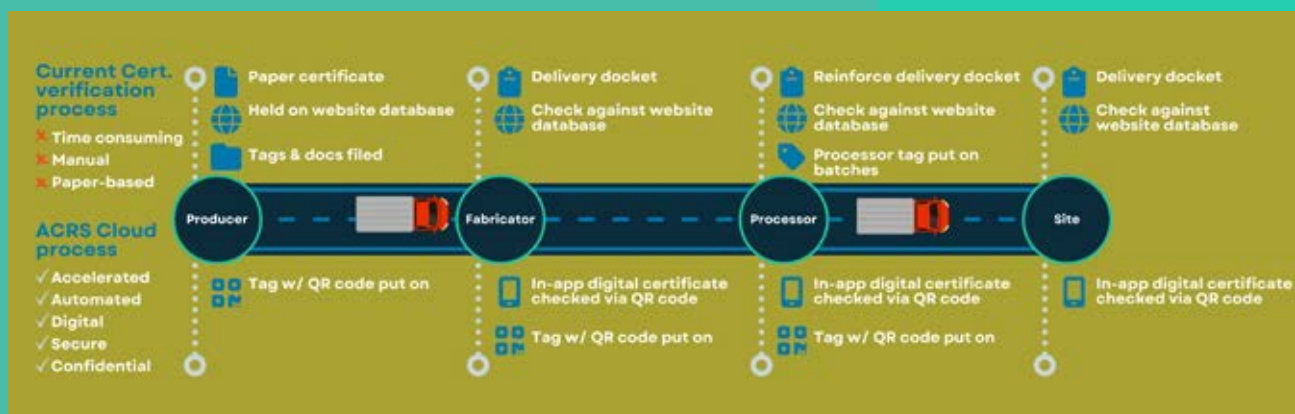
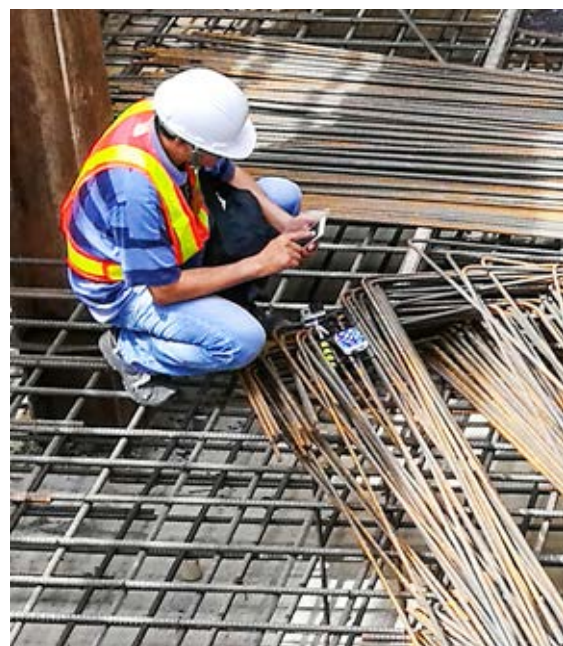
Fake or misleading paper test certificates are common, showing results for a different product, or supplier, or are falsified. We have found fraudulent certificates on steel consignments on-site on major infrastructure and construction projects, as well as steel with inappropriate product markings and inadequate traceability.

The answer to overcoming these challenges is rigorous independent certification from

mill to site, the kind provided by ACRS – Australasia's leading steel certifier.

The ACRS scheme provides effective product certification, ensuring quality and compliance along with the legislated traceability through the supply chain. To achieve this traceability, ACRS certifies steel both at manufacture and at processing. ACRS has been providing this traceability for more than 20 years, including the use of web-based verification methods.

Recognising the industry move to digital systems and to ensure this confidence in the ACRS scheme is maintained, ACRS has launched ACRS Cloud - a digital verifiable conformance scheme. By combining certification and digital product traceability, ACRS will be a trust anchor, providing confidence and traceability to the market.



ACRS CLOUD

ACRS Cloud is the first digital certification system of its kind for steel in the Australian and New Zealand construction industries. ACRS Cloud gives steel buyers and users instant assurance over product certificates at the touch of a button, in a secure environment, to provide confidence in products' conformance to AS/NZS Standards.

Users through the supply chain can get product peace of mind by checking the nature and authenticity of ACRS steel certificates in the new ACRS Cloud app – available free on Apple and Android.

The app further protects the market from product compliance issues: The ACRS Cloud system will see batch-specific tags with QR codes put onto steel at steel producers, fabricators, and processors. At each point, these QR codes (and/or those on ACRS certificates) can be scanned onsite to instantly identify the

source of a product and its certification details against a 'single source of truth', including batch number; bar and tag markings; and verification of product conformance to provide full traceability through the supply chain.

Just like via the ACRS online database, you will be able to search for certificate holders by mill name or country, and report any concerns, all in the app. Simply:

1. Download the ACRS Cloud App
2. Scan the QR code on delivery papers or electronic certificate
3. In the app, select the ACRS ID of the certificate
4. View the certificate in full, including scope, origin, and key dates.

For certainty over the steel you use, make sure you are specifying ACRS-certified steel, and checking conformance easily in the new ACRS Cloud app. Find out more at:

<https://steelcertification.com/cloud>



ASSURANCE IN YOUR HANDS: WHEREVER, WHENEVER

In order to make product traceability more secure and accessible, ACRS certificates will carry QR codes which – when scanned – will open validation and vital product information in ACRS Cloud.

The app will put assurance in users' hands wherever and whenever they need it, including bar and tag markings; where the product has come from; and its validity and its assurance credentials in the form of ACRS' sector-leading independent certification. Just like online, you will be able to search for certificate holders by mill name or country, and report any concerns, all in the app. Available on Apple and Android, the app is completely free to download and use.



1: DOWNLOAD THE APP



2: SCAN QR CODE

on delivery paper / electronic certificates



3: SELECT ACRS ID

of certificate in app



1: VIEW CERTIFICATE

inc. scope, origin, key dates



The app further protects the market from product compliance issues: not just in poor product identification or deliberate misrepresentation, but by making it easier for users to check steel's provenance at every stage. It also supports best practices for those seeking sustainable steel.

TOUGH OUT THE HARSHTEST CONDITIONS WITH THE MODDEX TUFFRAIL® PRE-ENGINEERED GUARDRAIL SYSTEM

Few guardrail solutions manage to shine as brightly as Moddex Tuffrail — even if you're having it powder-coated rather than selecting the shiny aluminium, HDG steel or 316 marine-grade stainless steel options.

The Tuffrail system has proven its mettle in some of the world's toughest and most corrosive environments. From the icy expanse of Antarctica - with a -20°C installation at Scott Base - to safety railings on ocean-front bridges, jetties and pathways or water treatment plants, Tuffrail's ability to withstand extreme conditions while ensuring safety and compliance has set a new standard in industrial barrier solutions.

Tuffrail is a handrail system designed to go up in half the time, or less, from conveniently delivered, pre-configured kits.

Fit-for-purpose compliant, it was developed to meet industrial applications that need to comply with AS/NZS 1657.

Designed for outstanding performance in the harshest environments — from offshore oil rigs, to acidic wastewater treatment plants - it will significantly reduce the cost of providing welded stainless steel handrails. It's quicker and safer than welding on site and it's easier to install than pre-fabricated stainless-steel systems that have to be dropped into place with expensive cranes, often causing work delays.

ANTARCTICA: A HARSH, ICY CHALLENGE.

Antarctica, a frozen frontier of unparalleled beauty - and terrible danger - presents an environment that is as challenging as it is stunning.

With its brutal cold, high winds, and relentless exposure to the elements, any equipment deployed in this region must be capable of enduring extreme conditions. Moddex Tuffrail has risen to this challenge, showcasing its durability and resilience in the face of the Antarctic climate. When the Scott Base had their 38-year-old water tanks replaced, they made the project safe with a pre-configured, aluminium Tuffrail system for safety railings and interconnecting walkways.

OCEAN FRONTS: BATTLING THE SALT AND SPRAY.

Coastal regions and ocean fronts subject equipment to the corrosive forces of saltwater and constant moisture. Moddex Tuffrail's robust design and material selection make it a prime choice for such environments.

Being a relatively new offer in market, Tuffrail 316 Marine-grade Stainless Steel has made its debut with projects like the Orai Loop retaining wall, on the coastal KiwiRail line south of Kaikoura, in New Zealand. Not only is it attractive and hardwearing, it's backed by Moddex with a 50-year warranty. Along with the rugged Antarctic, Tuffrail aluminium has endured extreme conditions too, from waterfront Sydney to Western Australia, on the Coogee Jetty Marina.

WATER TREATMENT PLANTS: CORROSION AND CHEMICAL RESISTANCE.

Water treatment plants, though vital for public health, expose equipment to a mix of corrosive chemicals and water. Moddex Tuffrail's corrosion-resistant properties come into play here as well. Its ability to withstand chemical exposure, while providing a reliable safety barrier that's quick, safe and simple to install, makes it an ideal solution for Water Treatment Plants like Waikato 50 — built on critical timelines in response to Auckland's water crisis.

TUFFRAIL MAKES THE CHOICE LESS... TOUGH.

The Moddex Tuffrail's success in environments as challenging as Antarctica, ocean fronts, and Water Treatment Plants is a testament to its exceptional design and construction. By incorporating high-quality materials, configurability, longevity and easy installation, Moddex has developed a safety solution that not only meets the rigorous demands of extreme environments but also ensures efficiency, minimal time on site and less disruption to project timelines.

To find out more, scan the QR CODE or visit: <https://lead.me/moddex>



COOGEE JETTY,
WESTERN AUSTRALIA

TUFFRAIL® AS TUFF AS YOU NEED IT TO BE.



A durable, easily installed product was required for the Coogee Jetty Marina expansion. The Moddex aluminium Tuffrail® system replaced steel handrails that hadn't lasted in an extreme beachfront location. They also come in HDG and marine-grade stainless with a 50-year warranty. Find out more at moddex.com



moddex®



« INNOVATIVE 'LOW STRESS' DESIGN

With its innovative design and patented 'post/fuse' system, DOLRE 'Regular' barrier delivers MASH TL4-rated protection while limiting the maximum transverse force transmitted to the bridge deck to less than 44 kN/post (22 kN/metre), which equates to only 14% of the ultimate outward transverse design load as per AS5100.2-2017.

What's more, at around 120 kg/m installed, DOLRE bridge traffic barriers are significantly lighter than many AS5100 'Regular' / MASH TL4-rated barrier alternatives.

SEAMLESS PROTECTION WITH DOLRE TL4 TRANSITIONS »

DOLRE transitions have been designed and tested to provide full longitudinal load transfer between the bridge traffic barrier and connecting roadside barriers.

The DOLRE 'Regular' barrier, together with the DOLRE transitions and Thrie-Beam barriers create an engineered continuum of MASH TL4 protection – delivering maximum safety for road users onto and across the bridge structure.



« WHERE PERFORMANCE AND AESTHETICS MEET

DOLRE's clean, uncluttered lines and aesthetically pleasing design make it an ideal match for a wide variety of bridge designs and locations. The design allows for rapid installation, as well as rapid repair and reinstatement of the barrier following an impact. DOLRE is also easy to dismantle and remove in times of flood, thereby helping to significantly reduce the risk of damage to valuable bridge assets caused by flood-borne debris.

DOLRE is also available with an extensive range of standard or custom fascia designs and integrated lighting options.

CHOICE OF PERFORMANCE LEVELS »

Available in a range of AS5100-2017 performance levels, including DOLRE Low (MASH TL2 | EN1317 N2), DOLRE Regular (MASH TL4 | EN1317 H2) and DOLRE Medium (MASH TL5+ | EN1317 H4b), there is a DOLRE barrier to suit virtually any bridge, culvert or road embankment application.

All DOLRE systems feature three rails - two rails for the initial vehicle impact and one rail to resist rollover – and one post design per system type, suitable for both sides of the bridge.



LB AUSTRALIA

www.lbaustralia.com.au

Ph 1300 522 878



THE REVOLUTION IN BRIDGE SAFETY UPGRADES

Ideal for bridge refurbishment and safety upgrade projects, DOLRE's ground-breaking 'low stress' design restricts the outward transverse force transmitted to the bridge deck during a vehicular impact to a fraction of the bridge deck's capacity, thereby minimising the risk of damage to the bridge deck and structure during a vehicular impact.

DOLRE bridge traffic barriers can play a significant role in extending the serviceable life of many existing bridges - delivering AS5100 and AS3845 compliant protection without the need for expensive deck strengthening works or additional reinforcement.

INNOVATION
TOWARDS ZERO 

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MORE**



SCAN ME



ENSURING COMPLIANCE WITH AUSTRALIAN STANDARDS FOR STORMWATER COVERS AND GRATES

Stormwater covers and grates play a vital role in civil construction projects nationwide. These essential components are extensively utilized in various infrastructure endeavours, carrying significant significance that should not be underestimated.

While some might downplay the significance of grates and covers used for stormwater drainage on roads, it is crucial to recognize their multifaceted importance. Beyond their role in water drainage, these elements bear a critical responsibility in enhancing road and pavement safety. They must withstand substantial and repeated loads from both vehicles and pedestrians.

The meticulous selection of stormwater and drainage products for Australian roads holds immense importance. Neglecting the quality and compliance of these products with Australian Standards can result in failures, potentially leading to injuries or even fatalities.

Most State Road and Municipal Councils across Australia exercise vigilance in specifying and ensuring compliance of their drainage products. Regrettably, this level of diligence

is not uniformly observed across the civil construction sector.

It's worth noting that the civil construction industry currently lacks formal regulations regarding the compliance of grate and cover products. Consequently, the responsibility falls on road authorities, councils, and asset owners to ascertain the suitability and adherence of the chosen products to Australian Standards (AS3996-2019 – Access Covers & Grates).

AS3996 outlines clear product Classes, detailing design loads and wheel loads for each category. However, instances of poor-quality, non-compliant, and even falsely compliant products are regrettably common in the civil construction industry. These discrepancies can have significant repercussions, such as products claiming to be of a certain Class but failing to meet the associated load requirements.

Some manufacturers opt for shortcuts to offer cheaper alternatives in the market, leading to a proliferation of non-compliant offerings. To safeguard against subpar and counterfeit products, it is imperative to exercise caution when procuring stormwater grate products as

there could be serious repercussions should the product fail or an accident occur, resulting in the risk of liability claims.

When selecting civil stormwater and drainage products, adherence to Australian Standard AS3996-2019 is essential and can be verified through physical markings on the product itself. Reputable manufacturers typically imprint their company name and load class on their products as part of standard practice. The absence of these markings indicates non-compliance with Australian Standards and raises the risk of potential failure with dire consequences.

For added assurance, products that have achieved Global-Mark Certification, like Civilcast ductile and steel grates, validate compliance with AS3996-2019. Certification, provided by a recognized authority such as Global-Mark, independently verifies the adherence of products to relevant standards, providing peace of mind to consumers.

For further details, contact Civilcast at: 1300 012 278 or visit their website at: <https://civilcast.com.au>

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FIELDERS FREEFORM™ HELPS MONARTO SAFARI PARK VISITOR CENTRE ACHIEVE DESIGN AWARDS

More often than not, the awards that are most coveted by recipients are those that are judged by their peers – it's an acknowledgement and an appreciation of a project from people in the know.

Architectural work on Monarto Safari Park Visitor Centre near Murray Bridge, South Australia, recently achieved such an accolade, in fact two, with the project winning the *SA Architectural Medal* and the *Keith Neighbour Award for Commercial Architecture – 2023*, from the Australian Institute of Architects (AIA), SA.

However, you don't have to be an architectural or design pundit to appreciate what has been achieved on this \$16.8M project for client Zoos SA.

The Monarto Safari Park Visitor Centre aims to connect people to the environment through education and history. At the heart of the new Centre is a gathering point or 'heart' that acts as communal space, allowing people to gather before embarking on their Zoo adventure – the celebration of arrival builds anticipation for the imminent experience.

A key design element of the project is the use of curves, particularly a ribbon-like roofline that gracefully bends, representing the intertwining of indigenous and African cultures, embodying

the inherent connection with the land, plants and animals.

Designing roof structures that feature a radius can be extremely challenging to build, with suitable construction materials that can reliably and economically form these dramatic shapes being few and far between. One construction product that has proven effective over several years though is Fielders FreeForm™.

FreeForm™ offers a virtually unmatched ability in curved applications enabling the cladding to be convex or concave and applied both vertically and horizontally. It also allows an impressive natural curve limit of 2m radii.

Fielders BDM – Architectural Design Solutions – SA, Marina Aburas, said FreeForm™ was an excellent fit for the design goals at Monarto Safari Park Visitor Centre.

"Fielders FreeForm™ has been previously used on a selection of high-profile projects in South Australia and in other states, so there's a growing awareness of the benefits of this product among design professionals," Marina said.

"We were approached to assist with developing design solutions for the roof, particularly for the tapering that was needed. We were also able to offer advice on a complementary translucent sheet product that

would work with the FreeForm™ and help meet the design objectives.

"An attractive feature of the FreeForm™ is that due to being applied as continuous sheets, there was no need for an end lap. The material also allowed for a 150mm overhang without the need for stiffening. It's practical, versatile and beautiful."

Marina said the Fielders team including James Harrison (Fielders Project Execution Manager – SA), and Luke Bassham (Fielders Account Manager – SA), continued to work closely and be available to the architects, as well as builders and roofers, throughout the course of the project.

"We stayed in close contact with the architects ensuring they had all the information and support they needed for the project, it's part of the overall service – Fielders is not just a materials supplier, we are a solutions provider for our partners."

Approximately 1700m² of FreeForm™ in COLORBOND® steel colour Shale Grey™ were used at Monarto Safari Park Visitor Centre along with other Fielders materials including S-Rib™ corrugated cladding.

For more on Fielders FreeForm™, visit www.fielders.com.au or call 1800 182 255 for technical enquiries.

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



With the ASBAP (Austroads Safety Barrier Assessment Panel) guidelines now requiring all new TMAs sold for use in Australia to be tested and approved to MASH Standards, one of the most critical questions for equipment purchasers to ask is: **“Is it MASH Approved?”**.

When it comes to **Scorpion® TMAs**, the answer is a resounding **YES** – for BOTH TL-2 and TL-3 attenuator.

In fact, the Scorpion II® Metro MASH TL-2 TMA is not only **THE FIRST TL-2 TMA** to be fully tested and approved to the latest MASH Standards, it is currently **THE ONLY TL-2** Truck Mounted Attenuator to be successfully **TESTED, PASSED & ELIGIBLE** to the current MASH Standards.

So, whether it's TL-2 or TL-3, 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, the only name you need to remember is Scorpion® from A1 Roadlines.



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 is 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 TMA's 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
Impact Angle: 10.3 Degrees
Roll-Ahead Distance: 5.1m

Impacting Vehicle Weight: 2266kg
Impact Speed: 103.8km/h

Scorpion® II METRO® TL-2 TMA

Crash Test: MASH Test 2-53
Impact Angle: 9.9 Degrees
Roll-Ahead Distance: 12.4m

Impacting Vehicle Weight: 2295kg
Impact Speed: 81.6km/h



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KNOW YOUR TECHNICAL BASICS (AND WHO TO GO TO)

by Paul Uno, Director, ETIA

In the Engineering and Building industry, it is imperative that you know what products are available in the marketplace. You should also know the technical aspects of those products and who to go to for technical guidance. In this blog, I will outline some innovative products in the marketplace that may assist you in your work and also some of the technical staff that can assist you.

FIBRES IN CONCRETE

Fibres first made their mark in the Australian building industry in the early 1990's. When I worked at the Cement and Concrete Association of Australia (CCAA) from 1990 to 1998, our Association provided a service whereby I and two other engineers would answer technical enquiries over the phone from people in industry and the public. At the time I was receiving numerous enquiries on the use of fibres (both plastic and steel) in concrete, especially for use in swimming pools. We then decided to conduct a seminar on the topic of fibres for engineers. I was astounded to have over 300 engineers register for the course (which I organised and oversaw at Nth Ryde in the early 1990's).

The main points to come out of the seminar were:

1. Micro-synthetic fibres should only be used to address plastic shrinkage cracking issues and not be used in lieu of steel mesh for industrial floors (due to major issues which developed in floors where engineers had been convinced to replace steel mesh with micro-synthetic fibres by very enthusiastic fibre sales reps); and
2. Not to use steel fibres in swimming pools in lieu of steel bars and mesh (due to a number of pool failures where only steel fibres had been used).

The industry has come a long way since then, especially with the advent of macro-synthetic olefin fibres (i.e. heavy-duty plastic fibres) and twisted steel fibres. Macro-synthetic fibres (referenced in BS EN 14889-2, 2006) are now used in sprayed tunnel walls, embankments, rail sleeper bases and industrial floors. A good paper by Alani and Beckett (UK) in 2013 outlines the robustness of macro-synthetic fibres for industrial floors. Similarly, a very good structural design booklet by Barchip, provides detailed engineering calculations showing the steps on how to quantify these fibres for industrial floors. A PDF of this publication can be obtained directly from the Barchip website (www.barchip.com) or by hard copy through ETIA (admin@etia.net.au). The technical engineer from Barchip to contact on this publication is Todd Clarke.

With regards to steel fibres, a twisted steel fibre called Steel X, is available in the marketplace which improves the pullout

resistance of the fibre in concrete.

More information on this product can be obtained from Rueben Ramsey at McClay Industries website (www.mcclay.au).

ELASTOMERIC BEARINGS

When it comes to issues of vibration in buildings or bridges, one needs to understand the basics of dynamics. The most common way of arresting vibrations caused by machinery on floors, or vibration in bridges, is to mount the vibrating element on elastomeric bearings. These products increase the damping ratio which then reduces the amplitude and acceleration of the vibrating element especially where the forcing frequency matches the natural frequency of the structural element, resulting in resonance (see *Figure 1 below*).

Further information on elastomeric bearings can be obtained from Peter Fourtzis and his engineers at Granor (www.granor.com.au).

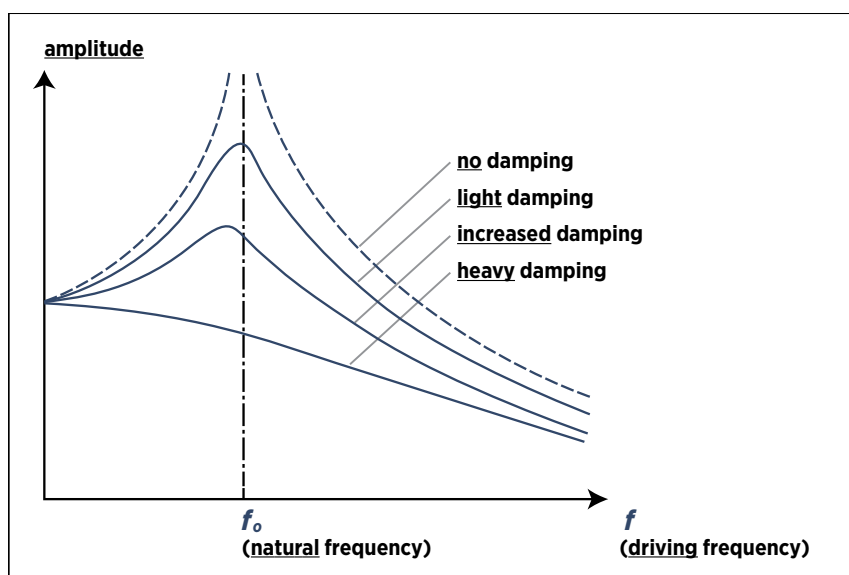


Figure 1

DOWELS IN INDUSTRIAL FLOORS

There are a whole range of dowels that are used to transfer loads from adjacent pavements and industrial floors. These include round, square, tapered and diamond-shaped dowels, but what is the technical difference and the cost difference?

Simply put, round dowels are the most basic (when addressing load transfer) and the cheapest. The square and tapered dowels are the next in efficiency, with the tapered ones sometimes referred to commercially as PD3 plate dowel cradles.

Diamond dowels are the most efficient in transferring load from one pavement to the next and are usually the most expensive. A detailed technical report on this load transfer mechanism was produced in 2000 when Danley Construction Products engaged QUT to carry out detailed testing on diamond dowels using 32 MPa concrete.

More information on these tests and the general efficiency of load transfer in dowels can be obtained from these engineers: Andrew McFarland (QLD), Peter Kinsley (NSW), Drilon Musai (VIC) (www.danley.com.au).

STEEL CONNECTIONS

Tolerances in connections is a very important aspect of construction. A connection invented in Australia called Orbi-Plate was designed to allow for larger tolerances on site (e.g. 20 mm). This mainly occurs when a steel element (e.g. Angle) is connected to concrete or other steel members.

When the elements do not align, onsite welding or cutting is usually required, which is obviously undesired. This Orbi-Plate connection is simply a steel member with an oversized hole (70 mm) with a high tensile circular serrated metal disc and washer which inserts into the hole. The 'out of line' issue is readily solved merely by rotating the disc in the oversized hole and then tightening the serrated connection thus limiting any further movement.

For further information go to the Ramset website (www.ramset.com.au).

Engineers in the past may have remembered this item being promoted by Reid. Reid and Ramset are sister companies and thus both promote a whole range of connections including anchors, epoxies, bond breakers, precast connections and much more. The contact engineer at Ramset is Kate Storer.

ETIA COURSES AND SPONSORS

At ETIA we have many sponsors who have highly qualified engineers on staff who can help you with technical questions. One of our sponsors can even provide you with drafting services at much more competitive prices than you would ordinarily be able to obtain.

For further information on that drafting service, contact Ray Perry at PAEC (www.paec.com.au), who is a qualified engineer and draftsman.

At ETIA we conduct many courses that address all of the points made above and more.

For further information on our upcoming courses please visit www.etia.net.au

This blog is the latest in a series produced for Construction Engineering Australia by globally respected engineering educator and reinforced concrete specialist, **PAUL UNO** BE MBdgSc MIE(Aust) CPEng NER RPEQ APEC Engineer IntPE(Aus), Director, ETIA (Engineering Training Institute Australia).



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MOVING THE EARTH

Earthmovers know there is nothing dirtier than moving earth. After shifting tonnes of spoil from A to B, there still seems to be even more mud to be washed off the machinery!

Caked on clay can prevent an operator from noticing serious issues, like leaking hydraulics or blown seals. Not only is cleaning critical for plant maintenance, but operators feel pride in a well-kept machine.

AUSSIE UNDERSTANDS EARTHMOVING

Earthmovers know that after a long day on the job, the last thing they want is to waste hours in a wash bay.

"There are pressure cleaners available that are simply not up to the task of cleaning earthmoving equipment," said Aussie Pumps Chief Engineer John Hales.

"A pressure cleaner purchased from a tool shop, hardware barn or even a mower shop, may be adequate for DIY projects at home. For efficient earthmoving washdown, professional pressure cleaners are essential," said Hales.

DESIGNED FOR EARTHMOVERS

Aussie's Scud series of cold water pressure cleaners was developed following in-field experience with earthmovers. Their aim is to reduce the time operators spend washing their equipment.

When Aussie introduced the Scud five years ago, it took the market by storm. Elegant in design, functional, easy to push around and

extremely powerful, the Scuds are ideal for big plant washdowns. They boast a fully-welded stainless steel frame (no bolt-togethers for Aussie), and the world's best high-pressure piston pump, a "Big Bert" Bertolini. These machines are made tough, and ready to work.

Aussie Scud Models come in a choice of three configurations targeting large equipment washdown.

All powered by Honda 13hp engines, available in either recoil or electric start, the Scuds are gearbox driven. That means no belts and pulleys to wear, stretch or fray, and of course, the machines are slow speed. The engine runs at 3,200 rpm but, by the time it's got through the reduction box to the pump, the pump is only running at 1,450 rpm. Those big pumps, with huge, finned crankcases run cooler and provide long, trouble-free life, for decades.

SAFE AND FAST

All machines come with Aussie's 'Safety Protection Kit' which includes a safety valve that will blow off in the event of a pressure spike. A thermal dump valve is also fitted as standard equipment. This is to protect the pump from overheating if left on excessive bypass.

High pressure guns, long lances, and even stainless steel reels with 30 metres of high pressure hose are all part of the package of accessories available to operators.

The additional 30m hose gives the operator a whopping 60m reach, so there's no need to keep moving the cleaner as you work.

"That saves even more time," said Hales.

3 SCUD OPTIONS

The Aussie Scud range offers three options for pressure/flow combinations.

For extremely dirty applications, Aussie reckon their Scud 351 is the go. With a flow of 21 litres per minute, matched to 2,600 psi pressure performance, the machine will make light work of grime and clay. The Scud comes standard with detergent injection as part of the kit. A 5,000 psi rated gun with a stainless steel double lance enables high-pressure/low-pressure modulation, and the activation of the detergent system. Using Aussie's heavy duty Turbo Master turbo lance means the blaster has an effective working pressure (EWP) of 4,000 psi.

Second in the line-up is the Scud 350. This machine produces 3,000 psi at 15lpm, with the same great engine, and same gearbox driven heavy duty "Big Bert" pump brand. Matched with a Turbo-Master, it has an effective working pressure (EWP) of 4,785 psi.



Aussie's Scud HR Industrial Pressure Cleaner with new reel plate in front, allowing for a lift bar on top.

The third option is Aussie's Scud 400. It's found in every Kennard's Hire branch around the country. The diesel version is standard in Coates rental fleet as well.

It's a tried and true winner. With 4,000 psi and 15lpm the unit has the extra grunt, and flow to clean big plant fast. Add a turbo lance and the Scud 400 delivers an amazing EWP of 6,485 psi. All machines are available with detergent injection as standard equipment, and all the safety gear you would ever want.

CLASS A MACHINES

Australian Pump is Australia's leading manufacturer of high-pressure water blasting and cleaning equipment. The Aussie Scud range are all Class A machines under the Australian High-Pressure Jetting Safety Standard, so no operator certification is required.

FREE ONLINE SAFE OPERATOR TRAINING COURSE

Aussie Pumps absolutely recommends all operators of pressure cleaners, whether using Class A or B machines, should undergo some form of safety training.

To that end, the company has produced its own online safety program, called "Aussie Safe Operator."

The 'Aussie Safe Operator' course aims to inform users on the safe operation of Class A and Class B high-pressure water blasters to 500 Bar maximum pressure. The course covers a range of key topics, including Australia Safety Standards for Operators, triplex pump technology, identifying and minimising hazards associated with high-pressure water blasting, and basic machine maintenance.

Managers are encouraged to have their operators trained through the program.

Access this free training is available online by visiting <https://aussiepumps.com.au> or scanning the QR CODE.



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Did you know you can access the latest issue of *Construction Engineering Australia* via Informit?

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MANDATORY CLIMATE REPORTING:

EXPLORING THE THREE C'S FOR OPTIMAL PREPAREDNESS by Rob Fowler

The approaching era of mandatory non-financial climate reporting carries profound implications for investors, banks, corporations, and trusts.

As the deadline draws near, organisations must assess their readiness for these imminent changes. Understanding critical tasks and establishing a solid roadmap is now essential.

The Australian Treasury's recent release of the Climate-related financial disclosure consultation paper in June signified a significant step towards implementing a new reporting framework.

This shift focuses on non-financial information, encompassing sustainability issues and climate-related metrics.

The government's approach aims to integrate non-financial data with existing financial and corporate disclosure structures, leveraging established auditing and assurance frameworks. This substantial change, coupled with an ambitious timeline, emphasises the urgency for affected organisations to take action promptly.

Global entities are rapidly introducing frameworks and standards, with Australia committed to aligning with this global trend. The clock is ticking, with the first reporting period for listed companies in Australia and New Zealand just ten months away. Now is the time to assess organisational preparedness to confront the challenges of mandatory non-financial reporting.

Success lies in proactive engagement by all stakeholders, embracing this transformative shift with foresight and groundwork. By adapting to evolving requirements, businesses can fulfill compliance obligations, mitigate risks, and unlock avenues for sustainable growth and global alignment.

EXPLORING THE 'THREE C'S' CAN SET ORGANISATIONS ON THE RIGHT PATH:

Capability: As organisations embark on mandated non-financial reporting, assessing the team's expertise, skills, and technology to effectively gather and disclose non-financial data is paramount. Identifying capability gaps early allows proactive mitigation for a seamless transition.

Capacity: Evaluating resource availability within prescribed timelines is crucial. Adequate human resources, financial support, and technological infrastructure are necessary for efficient reporting. Thoughtful planning and resource allocation circumvent last-minute obstacles.

Credibility: Trustworthiness is pivotal. Disclosed information must be reliable and accurate. Robust processes and governance uphold data integrity. Third-party audits aligned with global reporting frameworks enhance credibility and stakeholder trust.

In Australia, greenwash risk management and mitigation have also become a considerable focus. The best defence is through transparency and disclosure. The best offence is to have rich stories backed up by solid data. However, both these strategies are unattainable unless the right internal infrastructure and processes can support and validate those narratives. This is where external support can accelerate your progress.

The good news is that the integration of non-financials also opens up exciting possibilities and potential. Partners in Performance has consistently observed that emphasising non-financial information and key performance indicators (KPIs) within a business can unlock

tremendous value for clients. When we look at the physical aspects of business operations from a value perspective, and work with our clients on looking through this lens, businesses can unleash potential in production volumes, energy conservation, labour productivity and asset uptime.

ABOUT ROB FOWLER

Rob Fowler is a senior adviser with over 25 years of global experience and deep expertise in Sustainable Finance, Green Bonds, Carbon Offsets and the implications of the energy transition for companies, markets and investors.

Since 2002, Rob has been at the frontier of mobilizing capital and finance to transition our industries, economies and communities to a sustainable existence. His journey in green bonds, carbon markets, carbon offsets and sustainable development has included many "world firsts" which have set the stage for proving and scaling up innovative solutions to mobilizing capital.

In early 2022, Rob joined Partners in Performance as a Partner in their Energy Transition Practice. Rob is helping clients reduce emissions, establish a pathway to a low-carbon future, and achieve positive economic outcomes. Partners in Performance is a global consulting firm focused on enabling lasting change through commercial impact and inspiring people to transform their behaviours.



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STEPPING UP TO THE NCC 7-STAR RATING: AUSTRALIA'S CONSTRUCTION INDUSTRY REDEFINES ENERGY-EFFICIENT HOMES

Bradford Insulation Championing the Shift Towards Energy-Efficient Building Standards

Australia's construction industry is rapidly evolving towards sustainable energy-efficient homes, with notable changes in the National Construction Code (NCC) 2022 energy efficiency provisions for new homes to take effect (with various State transition periods) from October 1, 2023. The introduction of the NCC 7-Star rating will rely heavily upon the insulation sector, yet achieving this rating need not completely change the way we build.

Insulation for the roof, walls and floor, is a cornerstone of energy-efficient building design. Proper insulation not only reduces energy consumption for heating and cooling, but it also ensures a more comfortable and healthy living environment. It can also significantly contribute to noise reduction, leading to more peaceful and quiet interiors.

Given Australia's diverse climatic zones, insulation has to work both ways - keeping homes cool in the scorching summer months and warm during the chilly winters. A well-insulated home reduces reliance on air conditioning and heating systems, cutting energy consumption and greenhouse gas emissions.

The new NCC 7-Star rating is a significant step forward in promoting more energy-efficient and durable systems, with a longer-term GOAL OF net zero design and construction practices in Australia. This standard primarily affects the residential sector, pushing the building trade to adopt new approaches and techniques to achieve higher energy efficiency levels.

In addressing the forthcoming introduction of the NCC 7-Star rating, Kathy Hocker, General Manager of Marketing & Customer Operations from Bradford Insulation; said, "We are at a pivotal point in the industry."

"The advent of this new rating is set to bring about a significant change in insulation installation and usage across Australian residences."

"We foresee a boost in demand for sophisticated insulation materials, to meet the increased energy efficiency standards," Ms Hocker added. "However, before we go through this transformation, there are a number of factors that builders, specifiers and architects should understand and which homeowners of new builds should also be across."

Under the previous regulations, the minimum required rating was 6-Stars. With the new NCC 7-Star rating, buildings will need to have even higher insulation, glazing, sealing, design or layout and passive solar design to meet the

higher standards. This update represents an 18-25% improvement for homeowners on the base energy efficiency requirements as compared to the older NCC 6-Star rating.

Builders and architects will need to adapt and incorporate different designs, layouts and material selections that help to comply with these standards. The following practical tips and strategies are designed to help industry professionals effectively explain these changes to their clients, thereby enabling them to make well-informed decisions about their insulation choices.

- 1. Don't ignore R-values:** An R-value is a measure of thermal resistance; a higher R-value is likely the most cost-effective choice for achieving energy efficiency in any design. Regardless of the climate zone, building orientation, or construction type, prioritising a higher R-value insulation should be a fundamental part of a building plan and recommendation to homeowners



- 2. Look for quality products:** Quality is key in insulation products for their effectiveness and longevity. Bradford Gold™ and Bradford Gold™ High-Performance Insulation is designed for Australia's unique climate and has been independently tested for performance under various conditions. It's also certified to Australian standards, meeting or exceeding compliance guidelines for thermal performance. Bradford products are also accredited for fire safety, environmental sustainability, and health considerations.
- 3. Don't overlook acoustic insulation:** Alongside thermal insulation, consider the benefits of acoustic insulation to help reduce noise transmission between rooms and from external sources. Some insulation materials, such as Bradford SoundScreen provide both thermal and acoustic benefits.
- 4. Install properly:** Even the best insulation won't perform well if not installed correctly. It's essential that insulation fits snugly between studs, joists, and beams, without gaps or compression so it retains its design thickness. Installation in accordance with the NCC and Australian Standards is always recommended.

- 5. Seal it up:** A well-insulated home isn't just about the insulation itself; it's also about preventing air leaks and minimising hot and cold draughts blowing through the home. Builders should ensure gaps around windows, doors, and other areas prone to air leaks are properly sealed.
- 6. Don't forget condensation control:** While sealing a home for energy efficiency is important, so too is ensuring sufficient moisture control and ventilation to reduce the risk of condensation, mould growth, and poor air quality. Vapour permeable wall wrap and ventilation solutions should be considered as part of the overall design.
- 7. Understand the full cost:** The cost of insulation isn't just about the price of the product. It also includes installation costs and the ongoing savings in energy costs that the insulation will provide over its lifetime. Optimising insulation is more cost-effective compared to enhancing other more expensive building components, as it provides an overall Star rating gain for less than the cost of other building elements.



As Australia continues to move towards a more sustainable future, it's likely that energy efficiency standards will continue to rise. The new NCC 7-Star rating not only demonstrates a commitment to energy efficiency stewardship but also presents a wealth of opportunities for better practices in building design and construction. The insulation industry in Australia is stepping forward to a 7-Star rating and, with it, the future of sustainable living.

For more information about Bradford Insulation products, visit: <https://www.bradfordinsulation.com.au>

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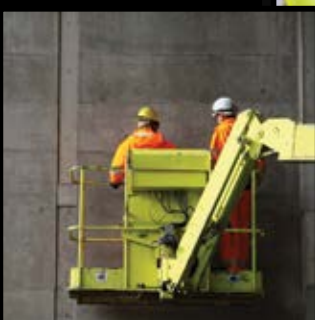
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ESSENTIAL DOCUMENTATION FOR REGULATORY COMPLIANCE

YOUR PRE-CONSTRUCTION CHECKLIST

Construction regulatory compliance is of utmost importance due to its significant impact on safety, quality, and project success. Regulatory compliance ensures that construction projects adhere to established standards and guidelines, mitigating potential risks and liabilities. By complying with regulations, construction companies demonstrate their commitment to responsible and sustainable construction practices, fostering trust and credibility within the industry and among clients.

Construction site compliance in Australia is a vital aspect of the construction industry, aiming to ensure the safety, quality, and sustainability of construction projects across the country. Australia follows a comprehensive construction compliance framework that encompasses both national and state-specific regulations. Compliance with these regulations is not only legally mandated but also essential for maintaining high industry standards and safeguarding the well-being of workers, the public, and the environment.

PREPARING FOR CONSTRUCTION PROJECT COMPLIANCE

Documentation plays a critical role in construction regulatory compliance. To ensure successful compliance with construction regulations, it is crucial to adequately prepare and understand the requirements involved. Pre-construction preparation is a vital step in the compliance process, as it sets the foundation for a smooth and compliant construction project.

By proactively addressing compliance requirements from the outset, construction professionals can minimize risks, avoid potential delays, and maintain the integrity of their projects.

Essential documentation for regulatory compliance on the construction site:

- 1. Building permits and approvals:** These documents provide authorization to commence construction activities and ensure that the project meets the required safety and structural standards.
- 2. Construction contracts and agreements:** Construction contracts and agreements define the scope of work, project timelines, payment terms, and any special provisions for the owner, contractor, subcontractors, and suppliers. Construction contracts ensure clarity, protect the rights of all parties, and provide a framework for dispute resolution if necessary.
- 3. Environmental impact assessments and approvals:** These assessments include factors such as air quality, water resources, noise levels, and ecological impacts - in order to minimize the project's potential for negative effects on the environment.

4. Health and safety plans and procedures:

Health and safety plans and procedures are essential documents that outline the measures and protocols in place to protect the health and safety of workers, visitors, and the general public. These may include hazard identification, risk assessment, emergency response plans, and safety procedures for various construction activities.

5. Insurance and liability coverage:

Insurance and liability coverage documentation is necessary to protect construction parties against potential risks and liabilities associated with the project, including certificates of insurance and liability policies. Insurance coverage safeguards against property damage, bodily injury, or third-party claims.

6. Licensing and certification documentation:

Licensing and certification documentation establishes that individuals or entities involved in the construction project possess the necessary qualifications, licenses, and certifications required by regulatory bodies. This includes expertise and competency certifications for specific construction methods or materials.

7. Employment and workforce

documentation: This includes all records related to the workforce involved in the construction project. This includes employment contracts, worker identification, payroll records, tax documents, and proof of worker eligibility.



BEST PRACTICES FOR MANAGING AND ORGANIZING COMPLIANCE DOCUMENTATION

Effectively managing compliance documentation is vital for construction professionals to ensure regulatory compliance and streamline operations. Utilising document management systems with features like categorisation, search functionalities, and version control simplifies tracking and management. It is also crucial to maintain version control and regularly update the documentation. Adhering to these practices guarantees quick and orderly access to necessary documentation for audits, inspections, or post-project inquiries.

CONCLUSION: COMPLIANCE, CONNECTIVITY, AND QUALITY

Following a pre-construction checklist is key for construction businesses to ensure regulatory compliance and minimize risks throughout their projects. By diligently adhering to compliance requirements from the early stages, construction professionals can proactively address potential compliance issues, streamline documentation processes, and mitigate risks.



ABOUT PLANRADAR

PlanRadar is a cloud-based Software-as-a-Service (SaaS) management platform for documentation and communication in construction and real estate projects. It can be used for fault and task management, maintenance, building inspections, construction documentation, handovers, and more. Using a web application or apps for all smartphones and tablets (iOS, Android, and Windows), teams can share digital floor plans or BIM models, communicate, and track any kind of information.

By digitising workflows, PlanRadar reduces the frequency of errors, saves time for all parties involved, and enables enormous increases in efficiency: customers report saving up to seven working hours a week.

Headquartered in Vienna, Austria, the company now enables more than 120,000 users from 65+ countries to track, connect, and solve on Construction, Mining, and Real Estate projects worldwide.

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INSTITUTIONAL MEMORY: THE LIFEBLOOD OF CAPITAL PROJECT SUCCESS

ROB BRYANT, EVP, ASIA PACIFIC & JAPAN, INEIGHT

From the time the first cave paintings were made some 64,000 years ago humans have recognised the importance of knowledge transfer. While the concept of knowledge sharing isn't new – the methods that can now be used are, as you'd expect, far more advanced. If we take this in the context of today's construction industry, the technology that can codify and share project, company and human knowledge presents a significant opportunity to improve productivity and reduce risk. With this goldmine of connected data at our fingertips that allows for the proliferation of institutional memory, what is the true value for the industry, and how can organisations ensure they take full advantage of it?

CAPITAL PROJECT INSTITUTIONAL MEMORY EXPLAINED

Apart from tangible knowledge held within documents such as legal guidelines, project roadmaps, reports and technical drawings that employees often have to pore over to glean useful information, an abundance of intangible knowledge also exists in the hands of the most experienced personnel. While this knowledge may be transferred to other employees by veterans or obtained first-hand when actively on the job – there's a big chance that information like this is never formally retained, and often, even leached to competitors when employees change jobs.

Tangible or intangible, this information forms an organisation's institutional memory. When captured and digitalised in a structured way to scale up over time so that employees can benefit from knowledge transfer between projects and systems, as well as from employee to employee – teams can be better informed for future projects. In capital projects, budget, schedule and risk are under intense scrutiny, so the benefits this brings when executed effectively are pivotal to a company's growth, competitive edge, and capacity for innovation and stakeholder partnership. Those that do not address the generation, process and project transition in the next few years, will face significant challenges in delivering capital projects in a smarter way than their peers with robust institutional memory. Here's why:

IT REPRESENTS A COMPANY'S COMPETITIVE EDGE

Institutional memory is an invaluable asset. It is a company's intellectual property and corporate DNA, combining accumulated knowledge, risk learnings, or specialised techniques and the outcomes of applying those techniques. The goal of capturing, organising and digitising institutional memory is to reduce the knowledge gap between experienced and new employees, along with old and new projects of a similar nature, providing teams with a means to upload and download information essential



to the success of their work. Having a dynamic and scalable reference bank will also ensure that employees can access real-time insights needed to minimise risks, improve operational efficiency, control project costs and make more informed decisions.

IT RAMPS UP EFFICIENCY

Few capital projects are the same with timelines, location, regulations, supply chain disruptions and materials just some of the many variable examples. This makes it essential to build a dynamic bank of reference for organisations to determine the best estimates, schedule and delivery method. Having a bank of project performance data also facilitates benchmarking for the future.

With this data, AI can be applied to streamline processes, automate scheduling, allocate resources, and inform procurement, to help avoid delays and cost overruns, enabling project teams to determine the most effective approach to delivery.

IT FACILITATES GENERATIONAL TRANSITIONS

Skilled labour shortage, an aging workforce and a strong pipeline of projects can create a concerning intersection of needing fresh talent to execute complex projects – and fast, with innovation and increased productivity. Teams also vary from project to project, and the retention of talent is a constant challenge for the construction industry.

Institutional memory provides a legacy of insight, critically important to implement a structure for retaining knowledge from past and current project delivery, to enable better decision-making. Encouraging a diverse and skilled Gen Z cohort into the sector will also provide assurance for the future, and a digitalised and accessible institutional memory enables organisations to demonstrate that they offer an attractive vision and culture of successful project delivery.

IT CREATES THE CAPACITY TO INNOVATE

With today's advanced technologies, evolving construction standards and the increased emphasis on sustainability, continuous innovation is crucial, and we see this accelerating with processes such as advanced manufacturing, digital engineering and automated data capture on job sites becoming more commonplace. However, companies cannot innovate and compete with the best without having the right technologies, systems and processes in place to unlock new efficiencies.

Often, veterans in the industry with 20-40 years of experience may seem to grapple with innovation, but the reality is that they are a fundamental pillar in driving innovation. With institutional memory systems in place, their knowledge can be captured and processed, and this, integrated with new project data, AI and advanced digital tools, will drive up the pace of innovation.

IT MITIGATES RISK

Without a doubt, estimates and schedule accuracy are among two of the most crucial success factors for both capital project owners and contractors. If lessons from past project delivery can be captured and assessed, it can reduce the risk of making errors or being blindsided by simply taking strategies from the past that yielded good results but are not necessarily suited to the project at hand. The accuracy derived from knowledge management systems and processes can also reduce risk throughout the lifetime of an asset, and empower companies with agility, especially if circumstances change and quick decisions on pivot strategies are required.

IT BUILDS COMPANY REPUTATION AS A MORE VALUABLE PARTNER.

In the landscape today, multi-stakeholder scenarios are increasingly common. Any organisation that can bring its decades of experience into a venture – all retained in its project control solutions which determine accurate estimates, schedules and effective processes, customised to suit each project



- instantly becomes an incredibly valuable partner in project stakeholder groups. The most effective alliances in project delivery today involve organisations that know their strengths and play to them. Retained and applied institutional memory allows firms to consolidate and leverage all the expertise they have acquired through thousands of people and projects, potentially over decades.

MOVING AHEAD

To take full advantage of the benefits discussed, organisations have to start now to put the systems and tools in place, so that both good and bad decisions can be captured, to create their institutional memory.

Structure is key here... and while AI can help trawl through datasets to determine patterns and insights, there needs to be structure and consistency of data. For starters, project estimates and capturing data from projects with a common CBS (cost breakdown structure) allows for useful comparison. Recording progress and outcomes is also essential as standardised data structures are a challenge for the industry and utilising solutions that can help address this is equally vital.



NEW BRACING AND PROPPING GUIDE FOR ENGINEERS, BUILDERS AND OTHERS INVOLVED WITH PRECAST CONSTRUCTION

With precast concrete construction classified as a high-risk construction activity, the correct bracing and propping of precast while in its temporary state – that is, until it is permanently

supported by, and incorporated into, the adjoining completed structure – is critical.

To promote safe and best practice, a new guide has been published by National Precast.

Temporary Bracing and Propping of Precast Concrete Elements provides guidance to engineers, builders and others involved with precast design and construction.

The guide details the requirements, specifications and use of bracing and propping and details the responsibilities for Erection Designers, In-service Designers, installers and head contractors.

National Precast's CEO Sarah Bachmann says the guide has been developed by four engineers who are all members of National Precast and come with extensive precast experience.

"We are incredibly grateful to John Woodside OAM, Simon Hughes, Geoff Fletcher and Andreas Boomkamp, for their many, many hours of work on this guide. These four

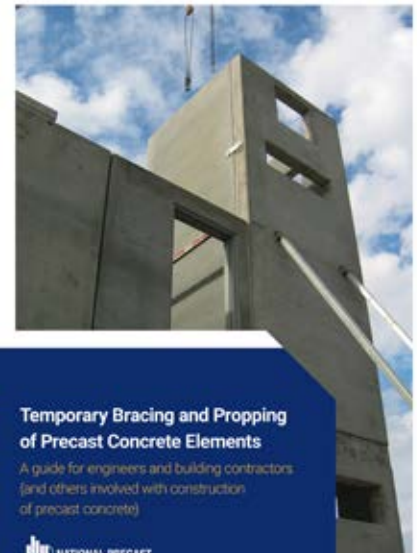
individuals are highly respected in the industry and come extremely well-placed to contribute to this important topic" she comments.

The new guide discusses issues such as:

- bracing and propping design;
- typical notes for drawings and erection documentation;
- types of braces and props;
- total precast structures;
- erecting precast on steel beams;
- erecting vertical precast elements on post-tensioned floors;
- durability of inserts and bracing components;
- critical safety considerations;
- connections for braces and props;
- the importance of grouting;
- inspection of torque-controlled expansion anchors;
- brace and prop removal.

It also provides a comprehensive list of references and further guidance.

The guide is available as a PDF or hard copy and can be purchased from National Precast's website, https://nationalprecast.com.au/portfolio_page/temporary-bracing-and-propping-of-precast-concrete-elements.



Temporary Bracing and Propping of Precast Concrete Elements

A guide for engineers and building contractors (and others involved with construction of precast concrete)

NATIONAL PRECAST
CONCRETE ASSOCIATION AUSTRALIA

BRACING AND PROPPING EXPLAINED

Bracing is an engineering term for the structural components that resist and transfer lateral (horizontal) loads imposed on a structure. Typically, bracing applies to the securing of vertical elements, usually down to the footing system. Usual sources for these loads are wind, gravity induced/out-of-plumb forces, seismic effects and construction loads. Resistance of such loads is required in the temporary and permanent stages, and in the temporary stage, this is typically achieved using inclined braces.

Propping – in contracts – is an engineering term for the structural components that resist and transfer vertical loads (usually self-weight and construction loads), typically for horizontal elements. The term is usually applied in the case of temporary supports only. Any lateral loads that exist with horizontal elements would usually be resisted by bracing.

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TWO DAYS OF PRECAST BUSINESS & FUN

Anyone involved in precast specification, design, manufacture or construction is welcome to participate in the National Conference that is being run by the precast industry's peak body, National Precast, later this year.

The Conference runs over three days and is being held at the Crown Plaza in the beautiful Sydney beachside location of Coogee from Monday, 30th October to Wednesday, 1st November 2023.

National Precast's CEO Sarah Bachmann says that this conference will be bigger and better.

"With support from our Conference Partner Leviat, we will be bringing together leaders in the precast industry from around the country, providing a wonderful opportunity to catch up with friends old and new," Bachmann comments.

The October Conference sees the introduction of the Welcome Reception and Exhibition, showcasing new products from over 15 suppliers.

"The Welcome Reception and Exhibition will be Hawaiian-themed. There'll be plenty of time to see what's new, chat and enjoy the special entertainment we have planned."

The line-up of speakers for the full-day Conference is impressive, with some of the presentation topics including tough contracting (with success), meeting supply challenges in big projects, creating healthy working environments

and overcoming the new multi-employer bargaining provisions of the Fair Work Act.

The Conference Day will be followed by an underwater-themed Networking Dinner overlooking the water at Coogee's Ocean Room, with entertainment and prizes! And on the final day, for members, there'll be a visit to the Metro West tunnel segment factory.

"We're taking steps to ultimately create an event that is widely talked about and that draws anyone who manufactures, supplies, specifies or uses precast," says Bachmann.

"We want to make doing business, fun. Come along and see what our exhibitors have to offer, share information and learn."

Register at www.nationalprecast.com.au/events, or contact Shiva on 0451 475 724.

Tickets are limited, so make sure you get in FAST!



National Conference Sydney

Monday 30th October 2023

Board Meeting (Board Members only)

Board & Industry Partners Lunch (Board & Industry Partners only)

Welcome Reception & Exhibition (Sponsored by Reid Construction Systems)

Tuesday 31st October 2023

Conference

Networking Dinner (Sponsored by PSA & Progress Group)

Wednesday 1st November 2023

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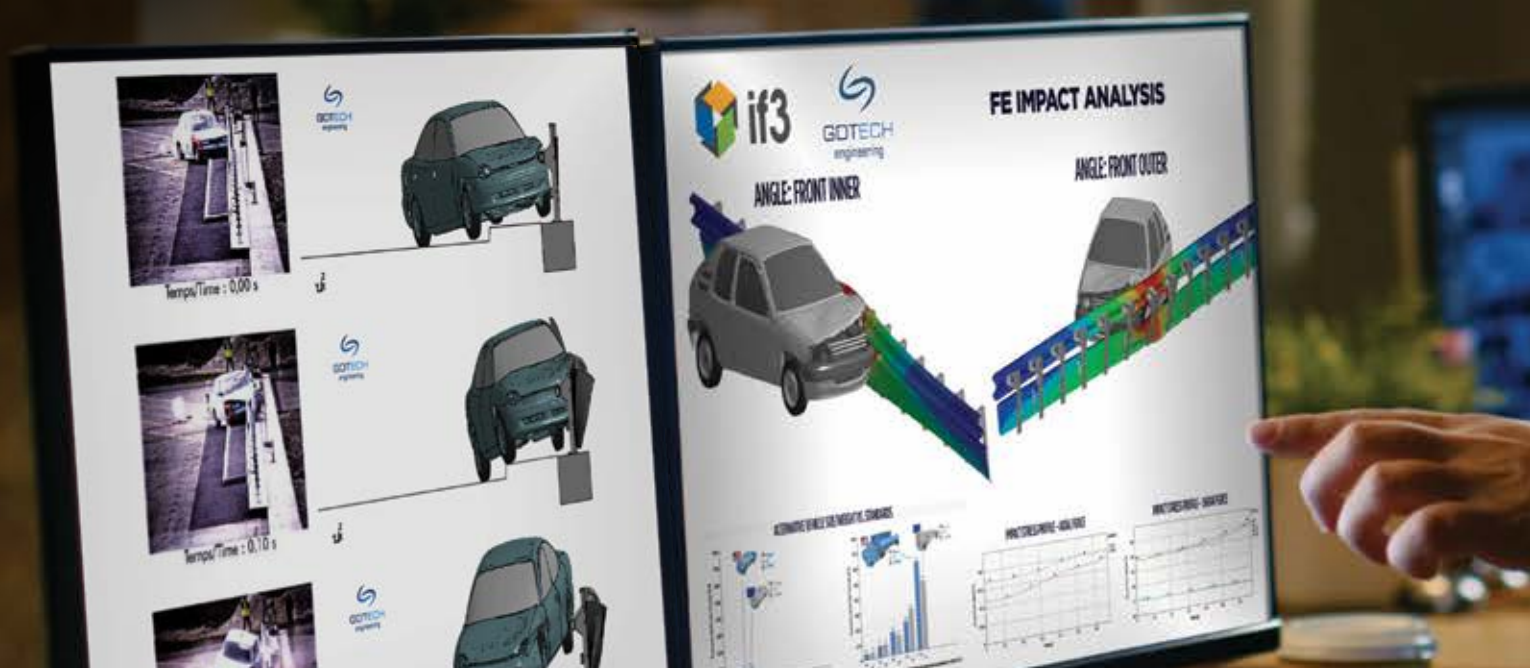
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IS A NEW APPROACH TO UNDERGROUND CONSTRUCTION ABOUT TO TRANSFORM THE ENGINEERING LANDSCAPE?

PATRICK LANE-NOTT, DIRECTOR OF ENGINEERING, HYPERTUNNEL

As countries and regions face their own unique developmental challenges, the need for innovative construction methods is intensifying. The infrastructure in and around cities, for example, including transportation links to better connect rural communities, is key to driving socioeconomic progress that does not drive an inequality wedge between groups of people.

Inevitably, this demands a conveyor belt of construction comprising all manner of structures and buildings, from residential accommodation and healthcare facilities to

the roads and railway lines required to expand multimodal and far-reaching transportation networks. However, many developed cities and urban conurbations are struggling to find the space needed to accommodate these additional building requirements. While taller and taller buildings have become a common feature of skylines, there is only a finite amount of land that can be developed.

One means of addressing this challenge is to look downwards and build underground.

In addition to solving inner-city building challenges, key industrial sectors, especially

the likes of underground mining and utilities, already rely heavily on sophisticated networks of tunnels, arches and subterranean structures to operate.

It is big business. For instance, as a subsegment of the underground construction industry, tunnelling alone is set to expand markedly over the course of the current decade. In 2021, the sector was worth \$105 billion worldwide – by 2027, it will have expanded by more than 50% to almost \$261 billion. (Source: ITA - International Tunnelling Association - 2019 Tunnel Market Survey)

HYPERTUNNEL: A FRESH APPROACH

Crucially, there are some major advances in technology on the horizon that promise to make underground construction and maintenance significantly faster, cheaper, safer, less disruptive and more environmentally friendly.

Approaches to processes such as tunnelling have broadly remained the same for well over a century, meaning projects continue to be characterised by high levels of risk, complexity and cost, as well as a heavy carbon footprint.

However, hyperTunnel presents a new method of underground construction that is gaining traction – one that leverages the power of swarm robotics and in-situ construction to transform the traditional tunnel boring process.

HOW DOES IT WORK?

The first step is to drill and line pilot bores and send robots inside to inspect the geology, taking core samples and scanning using ground penetrating radar. The result? A near-perfect understanding of the entire tunnel length's geology. Using this data, we develop a virtual model of the tunnel structure – the digital twin. Leveraging AI and machine learning, the next step is to design the optimum solution to create a sound structure.

Once the structure profile is defined, a swarm of robots is sent into the lined bores to visit planned locations to drill and deploy chemistry according to the AI-generated design. Thousands of robots could be used, all controlled using swarm technology to 3D print the structure, much like how bees build a hive or

Swarms of hyperBots are sent into each construction bore to build the structural shell, deploying an additive manufacturing process, similar to 3D printing

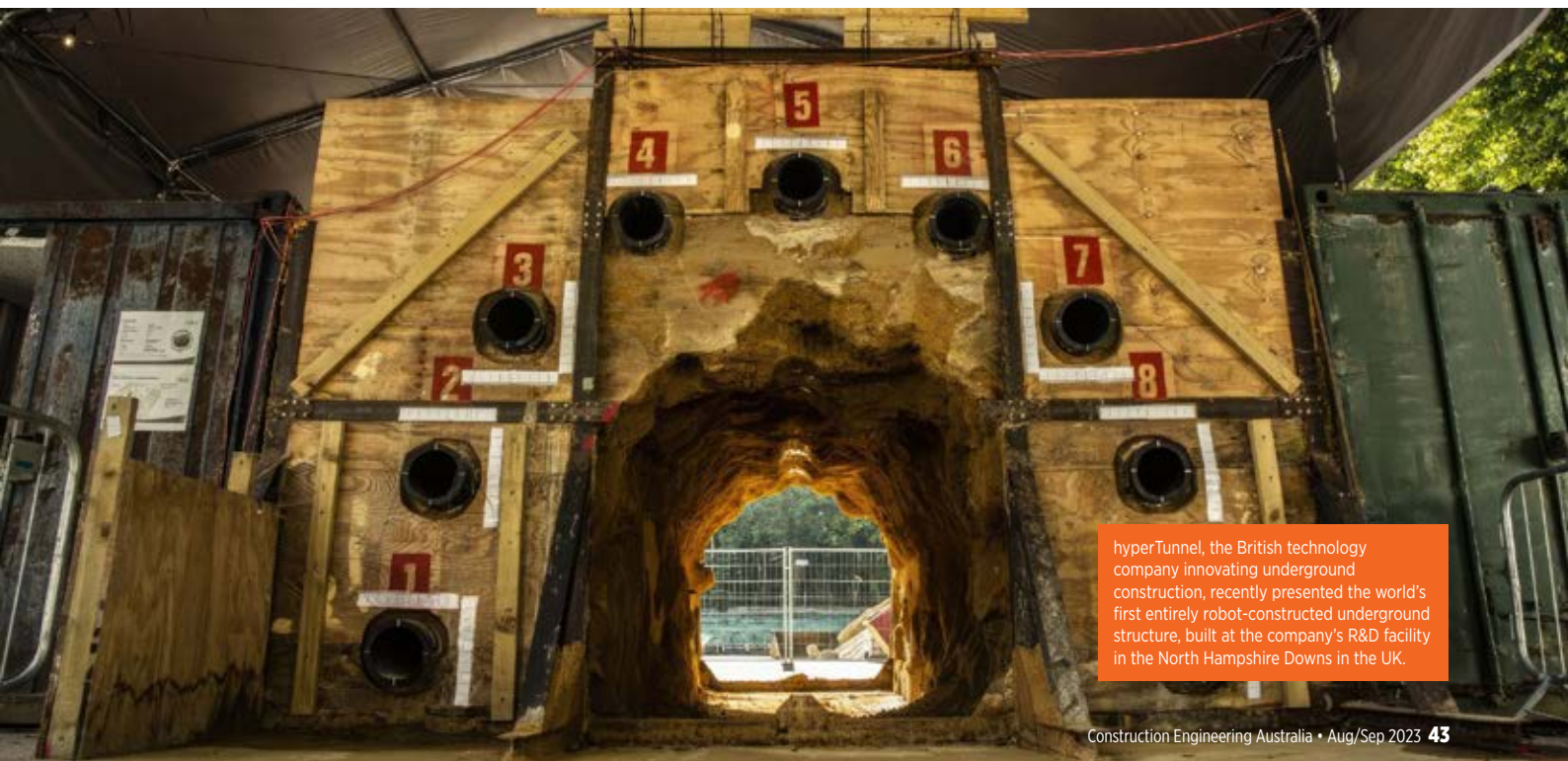


termites build a mound. After precise chambers are carved into the geology, these are filled with suitable construction material, creating in-situ blocks that interlock to form a permanent structure.

The survey bots are deployed again to ensure the construction material is located correctly and matches the digital twin. Finally, the tunnel walls are prepared for their end use, leaving a smart structure that can be monitored and

maintained throughout its life.

As well as creating structures from scratch, the hyperTunnel method can be used for the monitoring, repair and maintenance of underground structures. In the area of water management, for example, it has the potential to deal with issues of water ingress in tunnels, bridges, culverts and other structures by managing the water flow coming into the tunnel.



hyperTunnel, the British technology company innovating underground construction, recently presented the world's first entirely robot-constructed underground structure, built at the company's R&D facility in the North Hampshire Downs in the UK.

TESTING IN THE REAL WORLD

So, how close are we to seeing hyperTunnel robots in the ground?

The truth is we already are. Last year, the world's first entirely robot-constructed underground structure was unveiled at hyperTunnel's R&D facility in the UK. This is part of a project with Network Rail, the body responsible for maintaining UK rail infrastructure. The organisation is eager to adopt technologies that enable low-disruption tunnel maintenance and, a contract has been secured to manage the waterflow in a leaking tunnel.

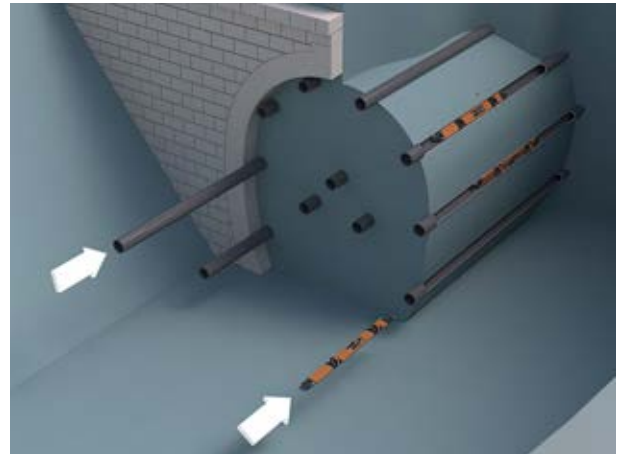
In addition, hyperTunnel has also submitted a feasibility study into the potential to build an underpass at the Global Centre of Rail Excellence (GCRC) in Wales, UK.

The testing landscape for this novel application involves swarm simulation, robot development, fleet planning and building, regulatory compliance and process engineering to meet various development milestones.

Constant testing is taking place at hyperTunnel's own indoor test centre. There, robots are run on a 24/7 basis through 12-metre pipe sections, which replicate the section size and operating space of the actual underground construction environment.

hyperTunnel is using AI to verify and validate its robots and end-to-end production system, with AI algorithms learning the best course of action for any failures. An example of this learning would be where the system automatically classifies and characterises the geology and then selects the correct treatments.

hyperTunnel has built a swarm simulation that can calculate contract timings and fleet performance by using AI to select the optimum fleet and robot parameters. The beauty of swarm robotics is that it has built-in resiliency, the AI being able to shrink or grow the fleet automatically to ensure that the contract is delivered on time.



Rather than digging through the ground with a cylindrical boring machine or using a traditional drill-and-blast technique, the hyperTunnel method uses a simple horizontal directional drilling (HDD) rig to install a network of HDPE pipes to provide access to the whole tunnel length so that a swarm of multi-function robots can 3D print the tunnel.

CUSTOMER FOCUS

It's been important to the test strategy to enlist a diverse set of team members who reflect the typical technical competency of construction industry asset managers who will manage a hyperTunnel system over the life of the underground structure.

If hyperTunnel is to successfully disrupt the status quo in underground construction, in addition to being more efficient, sustainable and cost-friendly, it must also be as user-friendly as possible.

For more information, visit: <https://www.hypertunnel.co.uk>

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