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DECEMBER 2022

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contents

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10


26


36


42

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About the Cover

As well as becoming one of Australia's leading suppliers of wire ropes, slings and speciality lifting equipment and accessories, over the past 60 years LB WIRE ROPES also spawned two other extremely successful businesses, including leading road, bridge and car park safety specialists LB AUSTRALIA Pty Ltd, and specialist computational modelling and analysis company if3 Pty Ltd.

▶ Turn to **Page 12** for the full story.

Driver Education

Teach them Young & Teach them Well

Dear Readers,

It seems that not a day goes by when we aren't confronted with the seemingly never-ending carnage on the nation's roads. Every day people are having their lives cut short, or dramatically and permanently changed by a serious road accident.

Together with the 'big four' accident causes (speed, alcohol, drugs and fatigue), other factors such as distracted driving, aggression, 'hoon' driving behaviour, and a lack of driving experience will all play a significant role in numerous serious accidents each week - particularly across the younger driver population.

Not surprisingly, the over-representation of young drivers in road trauma statistics generates a significant level of often heated debate about what can be done to improve the attitude of young drivers on the road. And even though these discussions inevitably result in a myriad of ideas and laws, including increasing the legal driving age and limiting the number of passengers, it's interesting to note that the general consensus appears to be that improving driver education for young drivers will play a key role in reducing road trauma.

Regrettably, this 'consensus' of opinion has yet to translate into any significant changes in mandatory professional driver training and license testing procedures throughout Australia.

Unfortunately, it is still possible to obtain a Driver's License in some Australian States with little more than a basic understanding of the road rules, a minimal level of professional driver training (which tends to place a heavy emphasis on learning how to reverse parallel park) and absolutely no mandatory high-speed highway, freeway and/or rural road driving experience whatsoever. And while some jurisdictions utilise Learner's Logbooks with required hours of driving prior to taking the practical test, this is not a uniform national requirement.

Perhaps most alarmingly, despite numerous proposals – some of which date back decades – there is still no nationally mandated requirement for professional driver training.

For many young male drivers, and an ever-increasing number of young female drivers, the issues associated with this lack of professional driver training are further compounded by the fact that when they obtain their driver's license, in some states there are still very few (if any) limitations on the type of vehicle they may drive.

Needless to say, the combination of a lack of driver knowledge and experience, excessive horsepower and youthful 'bravado' is a deadly cocktail - one that all-too-often reaps horrendous results.

While we may be limited in our capacity to control youthful bravado, we do have the capacity to address the issues of lack of driver knowledge and excessive horsepower. If we are truly serious in our approach to road safety and in reducing the number of deaths and serious injuries on our roads, we must all work together to improve both driver education and licensing standards throughout Australia.

Rather than considering delaying our children's involvement with driving, I believe that we should be looking to incorporate formal driver education programs, including advanced driver training and 'emergency response' training, as part of the high school curriculum. In short, starting driver training as early as possible.

Importantly, for maximum effectiveness, I believe these education programs also need to be backed up with strict, nationally 'standardised' legislation governing the types of vehicles that can be driven by young and/or inexperienced drivers.

While we may never achieve the 'utopian' goal of a zero road toll, helping to eliminate the 'culture' of bad driving through education, legislation and enforcement will no doubt help the young drivers of today increase their chances of surviving to become the older, more experienced drivers of tomorrow.

Anthony T Schmidt
Managing Editor

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Low Deflection Roadside Safety Barrier

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Philip Blake receives Max Lay Lifetime Achievement Award

The ITS industry is congratulating Philip Blake after it was announced he received ITS Australia's highest honour, the *Max Lay Lifetime Achievement Award.*

Mr Blake has been an ever-present in the industry for more than 30 years and was a key contributor to the introduction and management of the first driverless vehicle demonstration in Australia and the southern hemisphere.

"I am truly humbled by this recognition by my peers nominating me for the Max Lay Lifetime Achievement Award. I encourage a career in ITS, as it is a chance to work in a very interesting field that offers so much potential for safer, greener and more productive transport," said Mr Blake.

The Max Lay Lifetime Achievement Award is presented annually to an ITS leader in the ITS and transport industry and is recognised globally.

Mr Blake has led a distinguished career, gaining numerous achievements and awards, reflected in a remarkable curriculum vitae.

He qualified with a Bachelor of Engineering in Civil Engineering from Swinburne Institute of Technology (Victoria), later adding a Post Graduate Diploma in Management.

Working with numerous teams and partners, Mr Blake has contributed to a wide range of projects, initiatives, management groups and committees. In addition, he has shared this knowledge by presenting at various ITS World Congresses, summits, and workshops.

His input to the introduction of new legislation in South Australia to create a framework for on-road autonomous vehicle trials, testing and development, cannot be understated. The Motor Vehicles (Trials of Automotive Technologies) Amendment Bill 2016 saw South Australia become the first jurisdiction anywhere to legislate trials for driverless vehicles, with it paving the way for similar pilots around Australia and the world.

Today, every State and Territory in Australia has a driverless vehicle trial, and globally there are more than 100 driverless vehicle trials that have either been concluded or are being conducted.

The SA initiative won both the industry's Government Award and the Automotive Vehicle Award in 2016, with Mr Blake accepting the award on behalf of the Department of Planning, Transport and Infrastructure (DPTI).

In addition to his role with DPTI, Mr Blake was Chair of the South Australian branch of the Transport Australia Society, and was the Engineers Australia Chair, Transport Branch. He is the current Secretary of the South Australia Chapter of the Australasian College of Road Safety and was Director of ITS Australia from 2008 to 2012.

His input to the introduction of new legislation in South Australia to create a framework for on-road autonomous vehicle trials, testing and development, has been invaluable.

ITS Australia President Dean Zabrieszach said Mr Blake was a worthy recipient of the Max Lay Lifetime Achievement Award.

"Put simply, through his leadership and determination, Philip has helped enable South Australia and Australia to become global leaders in driverless vehicle technology, research and information.

"Philip has dedicated much of his working life to furthering road safety, ITS, connected and automated vehicles and mobility as a service.

"He has enjoyed a long and distinguished career in the ITS industry, is well liked and respected by his peers in South Australia, Australia and internationally. He continues to play an active role in our industry and by championing the adoption of standards and harmonisation has already carved out a significant legacy.

"Philip is an inspiration to those currently in the industry and for any young person starting out or considering a career in ITS, learning from Philip would be well advised.

"On behalf of the ITS Australia board and industry, we congratulate Philip on his award," said Mr Zabrieszach.

The Max Lay Lifetime Achievement Award is named in the honour of Dr Maxwell Lay, AM. Mr Lay was a pioneer, leader and ITS industry figurehead, who passionately advocated for the advancement of ITS in Australia, Asia Pacific and around the world.

Philip Blake will be presented with the Max Lay Lifetime Achievement Award at the ITS Australia Awards in Sydney next year.

Philip Blake, ITS Australia Max Lay Lifetime Achievement Award winner

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Rail First awarded Australia's first Green Loan for freight industry

Rail First Asset Management has been awarded Australia's first freight *Green Loan* accreditation for a A$125 million tranche, recognising the energy efficiency of rail transport. The Green Loan is aligned with the Loan Market Association's (LMA) Green Loan Principles and issued under the *'Clean Transportation'* category.

Rail First is Australia's leading provider of full-service integrated rolling stock leasing and maintenance solutions and owns the nation's third-largest intermodal fleet, which includes more than 1,200 wagons. It is Australia's only local manufacturer of intermodal wagons and is not used to transport fossil fuels.

The Green Loan will fund Rail First's ESG commitments, including the acquisition, upgrade and maintenance of intermodal wagons that have zero direct tailpipe carbon emissions. These initiatives further support the decarbonisation of Australia's transport sector, which currently accounts for approximately 20% of the nation's greenhouse gas emissions.

Rail freight is one of the most energy-efficient forms of transport, producing 16 times less carbon pollution for every tonne-km travelled compared to road freight and significantly reducing crash costs. The Green Loan is intended to meet the United Nations' *Sustainable Development Goals* 9 and 13.

As part of its Green Loan requirements, Rail First will report annually on relevant impact metrics, including the estimated CO_2 emissions avoided or reduced through the operation of its intermodal wagon fleet.

Commenting on the Green Loan, Rail First Chief Executive, Mark Kirkpatrick said, "This industry-first accreditation reflects the ongoing sustainability improvements to our assets and operations, further supporting our customers as they work to reduce their carbon emissions. We are incredibly proud of our Australian manufacturing capability, using sustainably sourced materials and local labour to offer the highest quality intermodal wagons, maintenance, and solutions to the Australian rail industry."

The accreditation follows Rail First's acquisition by experienced infrastructure investors Amber Infrastructure and DIF Capital Partners in September.

Amber Infrastructure's Head of Asia-Pacific, Vaughan Wallace, said: "Rail First's strong ESG credentials were a key reason for our attraction to the business, aligning with Amber's responsible investment philosophy. Rail is well-placed to benefit from government decarbonisation initiatives with significant environmental and cost advantages over road transportation. Rail First's domestic wagon manufacturing capability facilitates job creation, sustainable sourcing of raw materials, and end-of-life waste reduction. It also reduces unnecessary emissions from the transport of built wagons to Australia."

DIF Capital Partners' Head of CIF, Willem Jansonius, said, "Green Loan accreditation endorses the business' ESG framework, and holds it accountable against relevant sustainability metrics. This information will be increasingly important to Rail First's customers and end-users as Australia transitions to a low carbon economy."

ING Bank is the sole sustainability coordinator of Rail First's Green Loan facility. ING APAC's Head of Sustainable Finance, Martijn Hoogerwerf said, "Sustainability is core to our business strategy, and we are proud to support Rail First as they lead the freight industry to a more sustainable future. This new partnership marks an important step for ING as our sustainable finance business matures, and we look forward to supporting more freight businesses as they look to reduce their environmental footprints."

Mandated Lead Arrangers, Underwriters and Bookrunners are ING Bank (Australia) Limited, Nord/LB, Singapore Branch and Siemens Bank GmbH.

ABOUT RAIL FIRST

Rail First is Australia's leading provider of full-service vertically integrated rolling stock leasing and maintenance solutions to the rail industry. The company operates over 1,300 locomotives and wagons with two strategically located workshops in Islington (SA) and Goulburn (NSW) which service a blue-chip customer base that is primarily focused on the intermodal market.

For more information on Rail First, please visit: www.railfirst.com.au

Hyundai Motor Group Robots Get Rolling with Pilot Programs to Advance Last-mile Delivery

Hyundai Motor Group has started two pilot delivery service programs using autonomous robots based on its *Plug & Drive* (PnD) modular platform at a hotel and a residential-commercial complex located in the outskirts of Seoul.

The delivery robot consists of a storage unit integrated on top of a PnD driving unit. Alongside the loading box used to deliver items, a connected screen displays information for customers.

First shown at CES 2022, the Group's PnD modular platform is an all-in-one single-wheel unit that combines intelligent steering, braking, in-wheel electric drive and suspension hardware, including a steering actuator for 360-degree, holonomic rotation. It moves autonomously with the aid of LiDAR and camera sensors.

An integrated storage unit allows the robot to transport products to customers.

By adding the autonomous driving capability, the PnD-based robot can find the optimal route within the area to deliver packages to recipients. It can recognize and avoid fixed and moving objects and drive smoothly, providing a fast delivery time.

"PnD-based delivery robots allow quicker delivery times with improved safety through the use of autonomous driving technology, including fast obstacle avoidance capabilities," said Dong Jin Hyun, Head of Robotics LAB of Hyundai Motor Group.

"We plan to keep upgrading mobility services, convenience, safety and affordability for customers through our pilot programs."

Hyundai Motor Group also unveiled a video of the delivery robot put into service at Rolling Hills Hotel on its official YouTube channel. View it at:

https://youtu.be/VDsmoGpnqP8

More information about the Group, visit:

www.hyundaimotorgroup.com

Hyundai Motor Group Robots Get Rolling with Pilot Programs to Advance Last-mile Delivery.

Recycled material in road infrastructure can drive a circular economy

The Australian Council of Recycling (ACOR) has welcomed the release of Infrastructure Australia's *Replacement Materials* report, which highlights the significant opportunity to increase the uptake of recycled materials in road infrastructure.

As the peak body for resource recovery, recycling and remanufacturing in Australia, ACOR identifies scaled-up procurement of recycled materials as a core priority in order to properly kickstart supply chain integration of recycled materials and establish robust and resilient end markets.

Infrastructure Australia has found that reclaimed asphalt pavement, glass fines and crushed concrete could replace over a quarter of conventional raw materials in road construction, with the potential to more than double this amount in the future, with further advances in technologies and standards.

"With unprecedented levels of public infrastructure investment and an emphasis by all of Australia's government on stimulating demand for recycled materials, a focus on recycled materials in road infrastructure is critical and timely," said ACOR CEO, Suzanne Toumbourou.

"Infrastructure Australia's release of the 2022 Replacement Materials report is promising recognition of the fact that as Australia's largest infrastructure client and major procurer of goods, government has a key role to play in leading market demand for recycled content," said Ms Toumbourou.

With demand for materials for use in road construction projects expected to grow to a peak of $7.6 billion next year, there are substantial economic, social and sustainability benefits in utilising more recycled materials in delivering the infrastructure pipeline.

"This commitment to an Australian circular economy, where resource recovery, recycling and remanufacturing are central, will generate economic and social value, all while rebuilding Australia's industrial base and improving the health of our environment," said Ms Toumbourou.

"We're heartened that Infrastructure Australia and the Australian Government understand exactly what our sector needs in order to deliver great recycling outcomes," said Ms Toumbourou.

"Road building is such significant and visible infrastructure for Australia, and our sector knows that Australians are keen to see recycled materials more widely used," Ms Toumbourou added.

ABOUT ACOR

The Australian Council of Recycling (ACOR) is the preeminent industry forum for resource recovery, recycling and remanufacturing, leading the transition to a circular economy in Australia.

ACOR represents businesses who are part of a successful $15 billion industry that employs over 50,000 Australians, generates exceptional environmental benefits for our society, and is committed to supporting proactive product stewardship initiatives, to inform better recycling and circular economy outcomes.

For more, visit: www.acor.org.au

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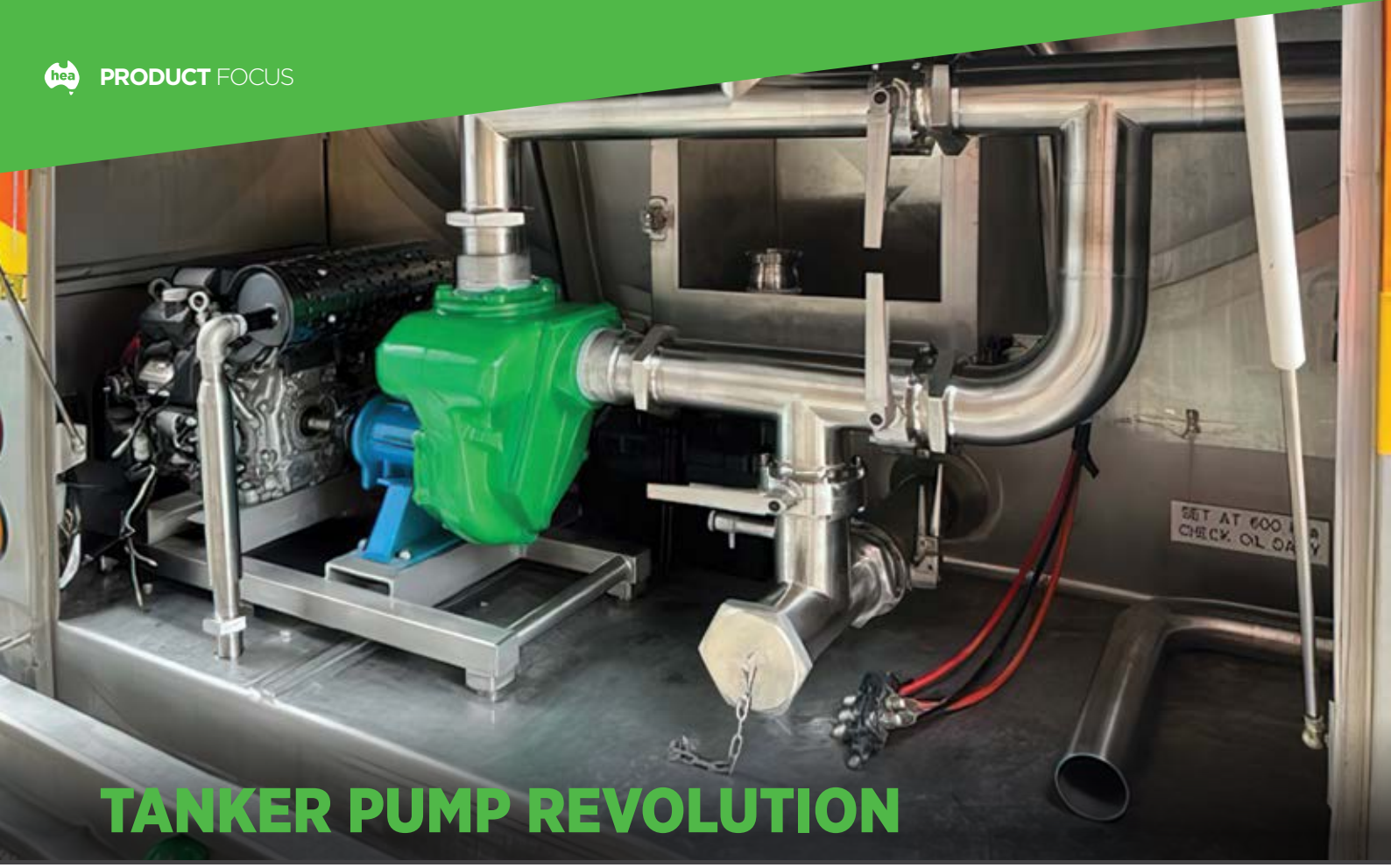


TANKER PUMP REVOLUTION

Water carts are an important part of the transport industry. Although the generic name of water carts seems pretty simple, the reality is much different.

The range of water carts can vary from a small single-axle truck with a converted fuel tank on the back to a sophisticated 30,000 or50,000-litree tanker in stainless steel delivering drinking water where required.

On the outskirts of Sydney and Brisbane, there are still plenty of homeowners who still depend on water delivery in a drought when the rainfall lets them down.

Originally water carts had dribble bars and were designed specifically for roadwork applications. In a drought, those same tankers are very useful for helping farmers and homeowners, sometimes whole villages or country towns. One only has to look to Stanthorpe in Queensland during the drought as an example! In 2020, water tankers were used to bring water from the Connolly Dam near Warwick to Stanthorpe's Storm King Dam - a 130-kilometre round trip - when the town's water supply ran dry.

Fifty years ago, those dribble bar tankers had small engine driven low-pressure pumps built into the tanker structure for loading the tanker from rivers, creeks or dams. Today, Australian Pump is the number one supplier of self-priming centrifugal pumps for tankers in the country. Their range includes a line-up of 2", 3" and 4" pumps with a choice of petrol or diesel engine driven, or hydraulically driven configurations.

Hydraulics are widely regarded as being the optimal pump solution due to the flexibility of installation on the truck, their dust-free configuration, and the amount of power they can deliver to the pump.

"We've seen plenty of pumps fail because the engine has been dusted," said Aussie Pumps Chief Engineer, John Hales.

"Sometimes the operator has got so frustrated with the poor performance, they've taken the air cleaner element out and thrown it away!"

"The performance goes up dramatically, but only for a very brief period before the engine dusted up," he said.

Mr Hales also points out that when it comes to service, sometimes the vehicle may get all the attention, but the poor pump on the back of the unit or undercarriage can be largely ignored.

"Those engines, up to 25 hp, need to be serviced regularly, the oil checked daily and only run with clean diesel fuel."

Hales also pointed out that with the hydraulic system, the pump can be mounted in a number of different locations to suit the operation. The flexibility of those hydraulic lines enables engineering freedom.

"Hydraulic drive is directly off the main truck engine, providing virtually unlimited power to the pump, providing maximum performance as required," Mr Hales said.

Australian Pump works with Australia's leading tanker manufacturers to deliver high-performance tanker pump solutions for all manner of applications. They are pleased with the way the market is reacting to the push towards hydraulics, however there are still a lot of tankers out there using both petrol and diesel-driven pumps.

"We use Honda single-cylinder and sometimes twin-cylinder engines where required. The photo shows a 4" heavy-duty 316 stainless steel GMP pump, capable of 2,600 lpm (B4XR/A), driven by a Honda GX690 27 hp engine. It's a beautiful installation in a stainless steel tanker, destined for a life delivering fresh sparkling water to customers around capital cities", said Hales.

Unsung Heroes

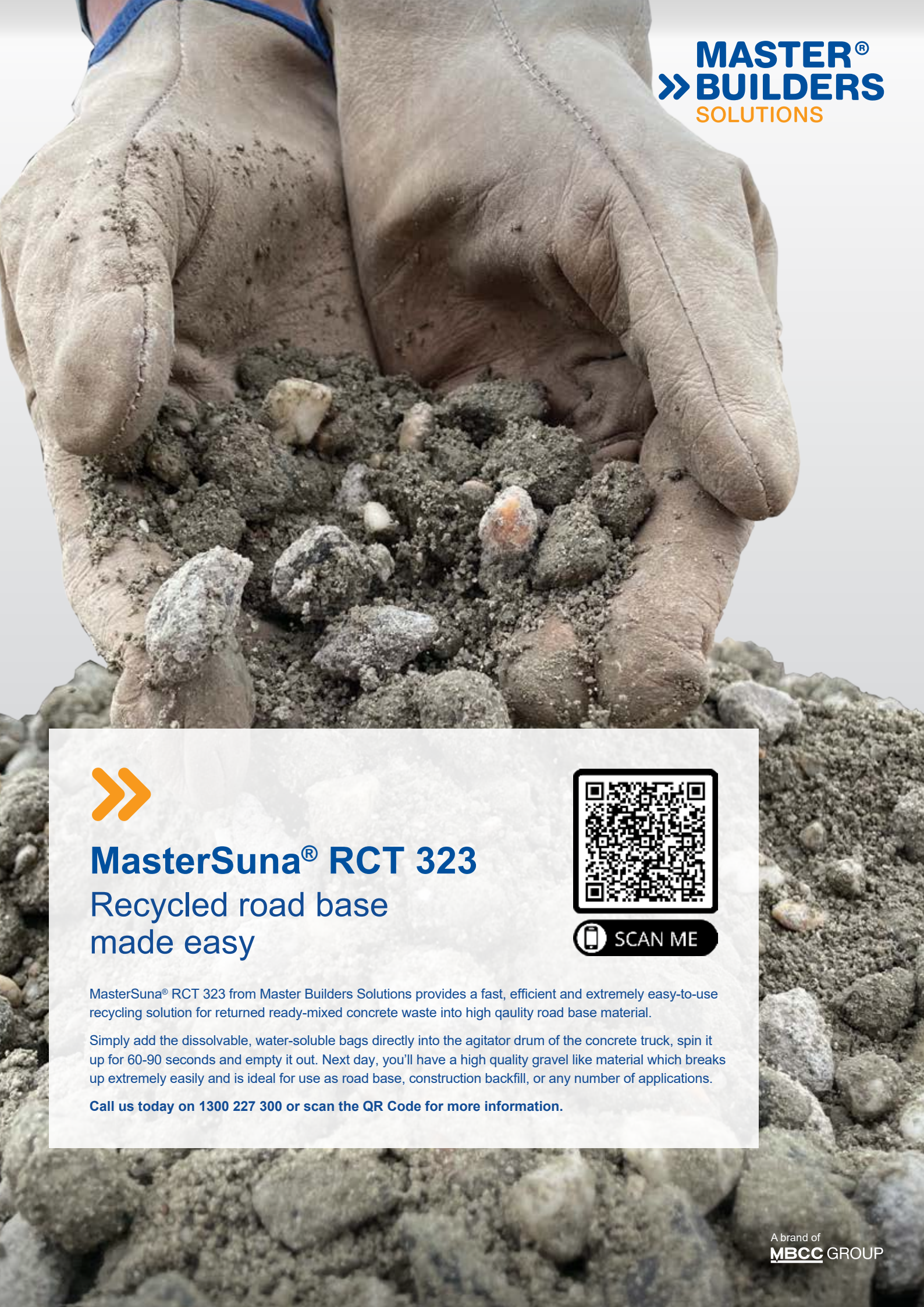
Tanker pumps don't get a lot of credit. Everybody loves big trucks, big horsepower and flash rigs, and they tend to get all the adoration – but tanker pumps are often the unsung heroes... especially in regional and remote Australia.

Aussie's range of humble tanker pumps do great jobs and often are covered by warranty for up to five years.

"In our experience, a lot of the cheaper imported tanker pumps can be difficult to prime," John Hales said. "And unfortunately, with many of the 'no-name' cheaply made hydraulic motors, they rarely give the performance promised before fading off the scene."

"Thankfully, it seems that and ever-increasing number of Australians are discovering that getting a great product at a fair price is better than getting a fair product at a great price. After all, who wants to be out of action due to a failed pump?" John Hales added.

For more information on the full range of Aussie tanker pumps, contact Australian Pump Industries or visit: **www.aussiepumps.com.au**



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From Left: Marc Hansen, Paul Hansen and Dane Hansen celebrating the 60-year anniversary of LB Wire Ropes and the 30-year anniversary of LB Australia at a recent event in Sydney.

60 CELEBRATING YEARS

60 YEARS ON AND GOING STRONG

60 years in business is a major milestone for any company – especially when you consider how much the world has changed in the past 60 years!

In 1962, the world was a very different place from what it is today. Internationally the world was witnessing the Cuban Missile Crisis, the beginnings of the 'Space Race' and the global rise to mega-stardom of the Beatles, while in Australia (with its population of 10.74 million people) Robert Menzies was Prime Minister, 1962 British Empire and Commonwealth Games were held in Perth and the final section of Sydney's Cahill Expressway was opened.

1962 was also the year that returned WWII servicemen Frank Hansen and Jack Smith got together to establish LB Wire Ropes in suburban Sydney... and it's fair to say that at the time, they couldn't have begun to imagine what the future would hold for the company.

By 1962, Frank and Jack had worked for AE Goodwin, an Australian heavy engineering firm in St Marys in Sydney's outer-west that produced railway locomotives and rolling stock, as well as roadmaking machinery, for more than a decade. Now in their early 40s, they were experienced in the best and worst that life could offer - including the Great Depression and WWII, as well as the post-war challenges and materials shortages that played a major role in shaping the 'can-do' attitude and the optimism so prevalent in Australia in the 1960s.

Not surprisingly, it was that 'Aussie can-do' attitude that gave Frank and Jack the confidence and belief that with their rigging backgrounds and experience, they could successfully strike out on their own and build a strong business offering innovative, high-quality lifting and rigging solutions. A bold move indeed, considering the headwinds of containerisation changing sea transport, higher tensile steels and higher strength webbing changing the lifting and lashing industries, and the continuing evolution of hydraulic forklifts.

Armed with experience, determination and an eye for innovation, Frank and Jack seized on the opportunity to build their own business when James Le Blanc, designer of the patented Le Blanc wire rope splice, offered to sell his rigging supply business.

From its humble beginnings in Wentworthville in Sydney's outer west, LB WIRE ROPES has not only continued to grow and prosper in its own right, it has also become a true Australian family-owned business success story.

As well as becoming one of Australia's leading suppliers of wire ropes, slings and speciality lifting equipment and accessories, LB WIRE ROPES also spawned two other extremely successful businesses, including leading road, bridge and car park safety specialists LB Australia Pty Ltd, and if3 Pty Ltd – leaders in the field of computational modelling and analysis, as well as bespoke engineering design, testing and certification for the infrastructure, construction, mining and road safety sectors.

60 years on, LB WIRE ROPES is now a 'third-generation' Hansen family business.

Paul and Vivien Hansen purchased the company in 1993 when Frank and Lois Hansen retired, while their sons Marc and Dane (who have both been with the company for over 20 years) also hold senior management positions in the Group.

In 2000, the LB Wire Ropes team (R-L) Paul Hansen, Dane Hansen, Marc Hansen, Erik Zvirbulis and Swami Nathan, conducted a successful series of live crash tests into the Brifen WRSF at the ASPACI 2000 conference in Penrith.

LB AUSTRALIA: SAVING LIVES BY DESIGN

The next major milestone in the company's history occurred in 1992, when Frank's son Paul Hansen, established LB AUSTRALIA PTY LTD. Building on the company's knowledge and 30+ years of experience with high-performance wire ropes, LB AUSTRALIA's first major project was introducing Australian councils and road authorities to the patented Brifen Wire Rope Safety fence from the UK.

At that time in Australia steel guardrail was common where roadside barrier was used. Concrete was primarily used to separate the traffic lanes on busy roads. Roadside barrier was rarely used for vehicle containment to prevent run-off-the-road accidents or along the median to prevent cross-overs. Certainly, short sections of untensioned wire rope "fencing" were used randomly in some areas in Australia and the US, but it was rare.

Considering that in the 1980s, high-performance tensioned wire rope safety barrier fencing was relatively unknown across Australia, Paul and the team were effectively 'starting from scratch' in terms of introducing a new engineered road safety solution to the Australian market. In fact, it's fair to say that Paul Hansen and the team at LB AUSTRALIA played a major role in introducing wire rope safety barriers not only to the Australian market but also in the Indian market.

From the first installation in 1992 along a section of Main North Road in Munno Para in Adelaide's outer northern suburbs for the then South Australian Department of Road Transport, LB AUSTRALIA went on to oversee the design and installation of more than 1,000 kilometres of Brifen WRSF across Australia alone. In the years that have followed, LB AUSTRALIA has built a proud history of providing innovative, life-saving road, bridge and car park safety products and solutions for clients across Australia and beyond.

Thirty years on – as LB WIRE ROPES celebrates its 60th anniversary – the LB AUSTRALIA business also continues to go from strength to strength. The company's engineering-based approach to road safety, as well as its focus on sourcing and providing innovative, high-quality road safety solutions for the Australian market, has earned LB AUSTRALIA an enviable reputation as innovators in the field of road safety barrier systems.

"When Frank and Jack first established LB Wire Ropes in 1962, their vision was to create a customer-focused business, built on the of supply innovative, high-quality products that improve safety and productivity," said LB AUSTRALIA, Managing Director Paul Hansen. "Needless to say, that initial vision also forms the cornerstone of the LB AUSTRALIA business."

"Together with our commitment to customer service, our focus on delivering innovative safety and asset protection solutions which are both technically responsible and fit-for-purpose, permeates every aspect of the business," he said.

With its focus on *'Saving Lives by Design'*, LB AUSTRALIA continues to deliver innovative, reliable road and bridge safety products and solutions founded on sound engineering principles and proven repeatable results.

"Our mission is to assist Governments, Authorities and other stakeholders in working towards the ultimate goal of ZERO ROAD DEATHS and ZERO SERIOUS INJURIES," Paul Hansen added.

"From the largest road infrastructure projects, through to small regional construction and upgrade projects, our team of specialist engineers and technicians work with our clients to deliver bespoke solutions that focus on saving lives and reducing both the severity and cost of road trauma," he concluded.

Building on its success with Brifen WRSF, LB AUSTRALIA also became a leading innovator in the field of motorcycle barrier protection systems, introducing both the MotoTub motorcyclist safety barrier and, later, the BASYC motorcycle barrier to the Australian market.

Find out more at: **https://lbaustralia.com.au**

DOLRE LOW STRESS PARAPET SYSTEM

Not surprisingly, LB AUSTRALIA's latest offering, the world-leading DOLRE Low Stress Parapet System - a high-performance safety barrier system for bridges - is continuing the company's tradition for introducing innovative engineered road safety solutions. Indeed, with the first DOLRE installations completed in Tasmania, and more already planned across Australia, DOLRE is already helping to set a new benchmark in bridge safety upgrades across Australia.

The DOLRE Low Stress Parapet System's revolutionary design combines maximum safety and protection with pleasing aesthetics, while at the same time helping to minimise damage to the bridge deck and structure during a vehicular impact. DOLRE's unique design and post fuse system, reduce transmission of impact stresses to the bridge deck by up to 80% for regular performance when compared to other conventional safety barriers.

ASBAP (Austroads Safety Barrier Assessment Panel) Approved for use throughout Australia, the DOLRE Low Stress Parapet System delivers a range of benefits, including:

- Fully compliant with AS 5100 and AS 3845
- Successfully crash tested to European Standards and simulated to US MASH TL4 requirements
- Unique design imparting low stress to the bridge deck
- Protects waterproofing membranes and coatings on the deck
- Easy to install
- Easy to dismantle in times of flood
- Cost-effective bridge rehabilitation solution
- Ideal for bridge refurbishment projects

LB AUSTRALIA can assist with bespoke design, engineering and installation services across Australia, providing the ideal DOLRE parapet to meet the specific installation requirements for each bridge and location. The team from LB AUSTRALIA can also provide on-site installation and maintenance training for in-house teams or preferred contractors.

Find out more at: **https://dolre.com.au**

A HISTORY OF INNOVATION

Working to the edict of 'Saving Lives by Design', LB Australia Pty Ltd has been responsible for the introduction of an array of innovative, life-saving road and bridge safety products and solutions across Australia, New Zealand and beyond.

From the initial introduction of high performance Wire Rope Safety Fence barrier systems, and frangible lighting poles & traffic signal poles, through to a range of fully-engineered motorcycle protection products, the world's first speed-dependent crash attenuator and the latest DOLRE Low Stress Parapet System for bridges, LB Australia has gained an enviable reputation as a leader and innovator in the field of fully-engineered road and bridge safety solutions.

Proudly, products supplied by LB Australia have been directly credited by road authorities, law enforcement agencies and emergency services across Australia and New Zealand with saving numerous lives and reducing the severity of injuries suffered during vehicular and motorcycle impacts.

2007

2000

1999

1997

1991

2008

2011

2012

2013

if3

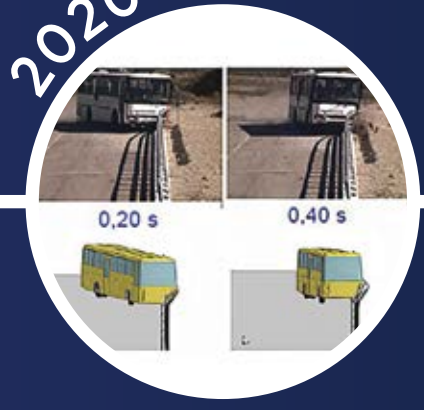
GDTECH engineering

2015

2016

2018

2020



2022 & BEYOND

1991 LB Australia introduces Brifen Wire Rope Safety Fence to Australia.
1997 LB Australia installs the first of its range of high performance car park safety barrier systems.
1999 LB Australia launches a suite of motorcycle protection products, including Moto Tub, BASYC, Barriacel and Impact Protect.
2000 LB Australia suburban speed crash tests into Brifen wire rope fence.
2007 LB Australia introduces the first of its range of 'passive protection' roadside infrastructure products to the Australian market, including Jerol Frangible Lighting Posts and Jerol Frangible Traffic Signal Posts.
2008 First installation of BASYC Motorcycle Barrier on Gorge Road, outside Adelaide, South Australia.
2011 LB Australia introduces the SMART CUSHION – the world's first Speed Dependent Crash Attenuator' – to the Australian market.
2013 LB Australia expands its work with world-leading Finite Element Analysis company GD Tech, with the creation of specialist Australian company if3.
2018 LB Australia introduces the DOLRE Low Stress Parapet System for bridges to the Australian market.
2012 LB Australia commences laboratory testing on Impact Protect product.
2015 LB Australia crash tests into SMART CUSHION.
2016 LB Australia expands its Research & Development work on 'passive protection' roadside infrastructure products, working with the University of Newcastle (NSW) on the development of a new frangible fence post for Wire Rope Safety Barriers.
2020 LB Australia expands its work with world-leading Finite Element Analysis company GD Tech, with the creation of specialist Australian company if3.
2022 & BEYOND LB Australia's commitment to 'SAVING LIVES BY DESIGN' continues, with a range of R&D projects and product innovations with product partners around the globe.

EXPANDING INTO THE HIGH-TECH REALM: if3

Considering the state of computer processing technology in 1962, it's fair to say that no one could have predicted that any company - let alone a company specialising in wire ropes - would also go on to spawn one of Australia's leading computational modelling and analysis businesses.

While at first glance, the path from wire rope company to computational modelling specialist may seem a slightly odd development, on closer inspection, it makes perfect sense. In fact, it was the success of the company's expansion into high-performance road safety solutions that spawned the creation of if3 Pty Ltd.

Established in 2011, if3 has gone on to become a leader in the fields of computational modelling and analysis. As the Australian partners of internationally renowned specialists GDTech and DI Global, if3 is supported by a global team of experts and world-leading data processing capabilities. if3 has the knowledge, know-how and capability to develop and deliver innovative solutions for even the most complex design and engineering challenges.

Importantly, despite the 'high-tech' nature of the if3 business, the focus on quality, innovative products and solutions, and traditional values that have served LB WIRE ROPES so well for the past 60 years and LB AUSTRALIA for 30 years, are also the cornerstone on which the if3 business is built.

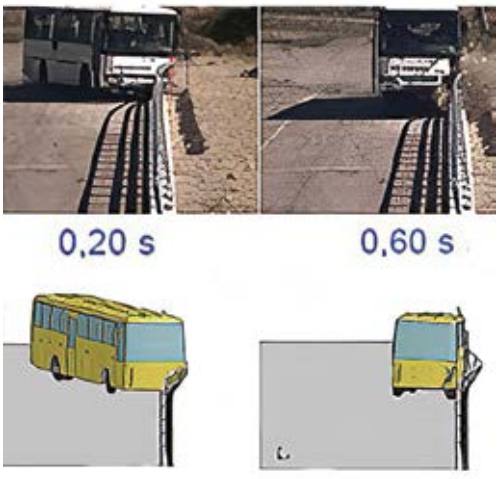
From Finite Element (FE) analysis and comparative crash test modelling, through to Computational Fluid Dynamics (CFD) modelling, engineering testing and certification, if3 offers an array of bespoke engineering and computational solutions for companies and statutory authorities across Australia.

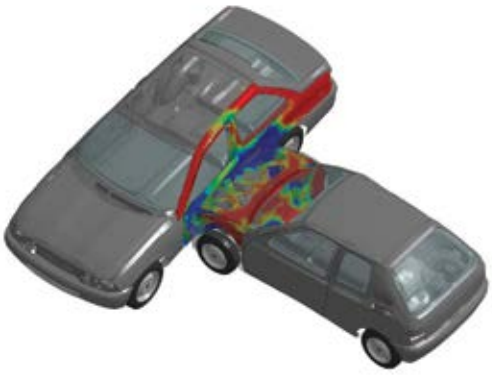
From a road safety perspective, Validated FE modelling provides engineers and designers with the ultimate 'what if?' tool when it comes to selecting an appropriate road safety barrier for a specific site. By combining validated data from actual crash tests with an array of calibrated software tools and data, GDTech's team of specialist Simulations Engineers are able to generate numerous 'what if?' scenarios – using an array of vehicle types, including motorcycles, cars, SUV's and heavy vehicles (from small rigid units to B-Doubles), impact speeds and approach angles – for specific installation locations.

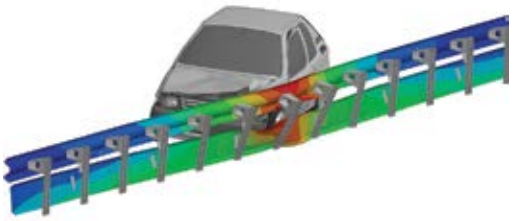
In addition to high-tech computational services, if3 also offers a range of specialist engineering, testing, certification and consulting services to governments and private sector companies within the infrastructure, construction, mining and road safety sectors, including:

- Engineering testing and certification
- On-site inspections and assessment
- Engineering design and consultation
- Product testing and development
- Bespoke engineering solutions

Find out more at: **https://if3.com.au**







DYNAMIC INFRASTRUCTURE: WHERE AI MEETS ASSET MANAGEMENT

Highlighting its focus on delivering the latest in innovative solutions, if3, through its partnership with DI Global, is also offering the state-of-the-art DYNAMIC INFRASTRUCTURE system throughout Australia.

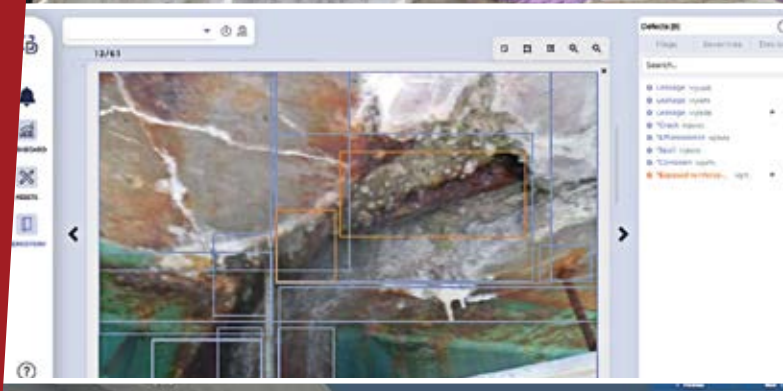
DYNAMIC INFRASTRUCTURE utilises all existing asset condition data and reports, regardless of the format or age – including paper-based engineering drawings and plans, photos, paper-based inspection and condition reports, together with digitised data and images – to build a detailed 'health record' for each bridge asset. It then also uses the power of AI (Artificial Intelligence) to analyse inspection reports and photos, comparing them against a comprehensive global database to identify future maintenance risks and evolving defects, while also monitoring repairs.

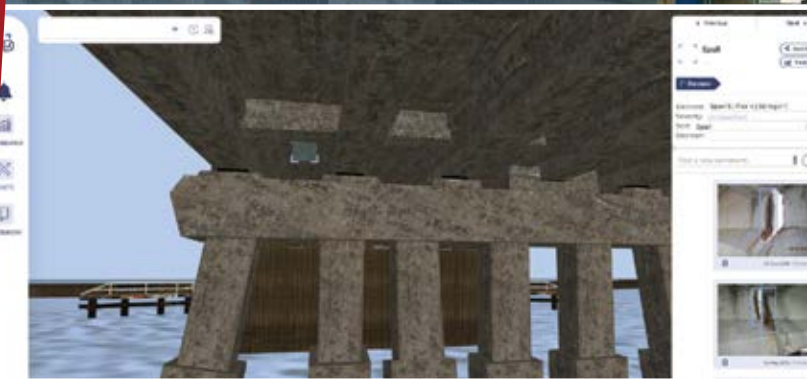
Once the 'health record' has been created, the system's unique, state-of-the-art AI-enabled algorithms get to work analysing the data and images to identify any faults or damage. Any issues that are identified are then categorised (type of damage, severity, etc) and logged with their exact location on the structure, with this data appended to the bridge's health record.

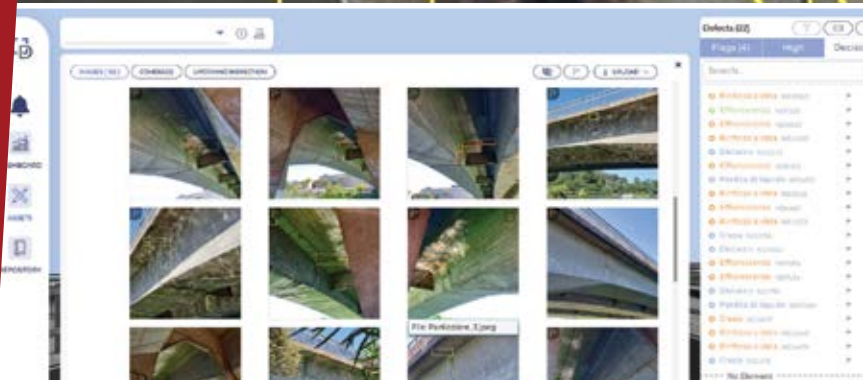
By providing asset owners and managers with a comprehensive 'health record' containing all of the information about the asset – from historic to current, and with the option to view it on a timeline in chronological order – the DYNAMIC INFRASTRUCTURE system allows asset owners to prioritise maintenance requirements and optimise infrastructure asset management activities. The system also has the option to establish fully navigable 3D 'digital twins' for each of the assets.

Most importantly, due to the fact that the system can utilise all manner of inspection data – including photos taken by field staff – THERE IS NO NEED TO CHANGE asset inspection methods or service providers!

Find out more at: **https://dynamicinfrastructure.com.au**







INFRASTRUCTURE MARKET CAPACITY REPORT FINDS RISKS TO PROJECT DELIVERY INCREASE AS INVESTMENT CLIMBS

Improving risk management and proactively sequencing the major infrastructure pipeline will be key to managing the impacts of an overheated construction market, escalating input costs, labour shortages and productivity challenges, Infrastructure Australia's *2022 Infrastructure Market Capacity* report has found.

Infrastructure Australia's Infrastructure Market Capacity Program is unique in the world as it provides a national view of Australia's infrastructure pipeline and the market's ability to deliver on it.

The 2022 edition shows that risks to on-time and on-budget project delivery have increased in the last 12 months, with demand for major public infrastructure projects climbing by $15 billion in a year.

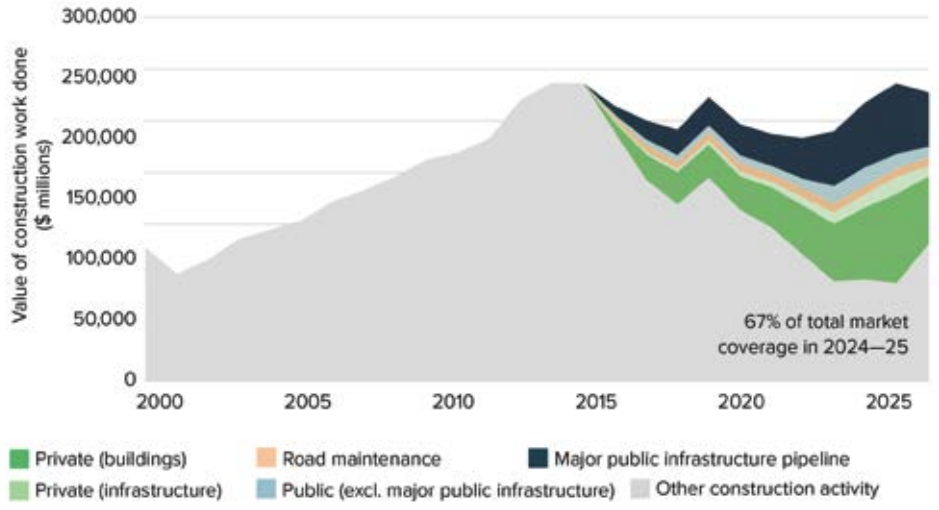
Amid an increase in public and private sector infrastructure investment, Infrastructure Australia's Acting Chief Executive Adam Copp said the industry was also contending with a surge in supply-side risks in 2021-22 caused by continuing uncertainty in the global economy.

"Australia's infrastructure sector is facing significant disruption to supply chains caused by the COVID-19 pandemic, volatile demand and, more recently, the war in Ukraine. This is causing delays and cost escalations for imported items, while delivery risks are being compounded by severe labour shortages that the industry reports as having the greatest impact on capacity.

"Industry also reports that fast-rising costs and contracts that are increasingly allocating risk responsibilities to parties not best-placed to manage them, combined with sharp declines in tier 1 contractor's profitability observed in our 2021 edition, has contributed to a sharp rise in construction sector insolvencies in 2022. This leaves fewer companies to deliver the pipeline of work, with many already operating at 90% capacity and above.

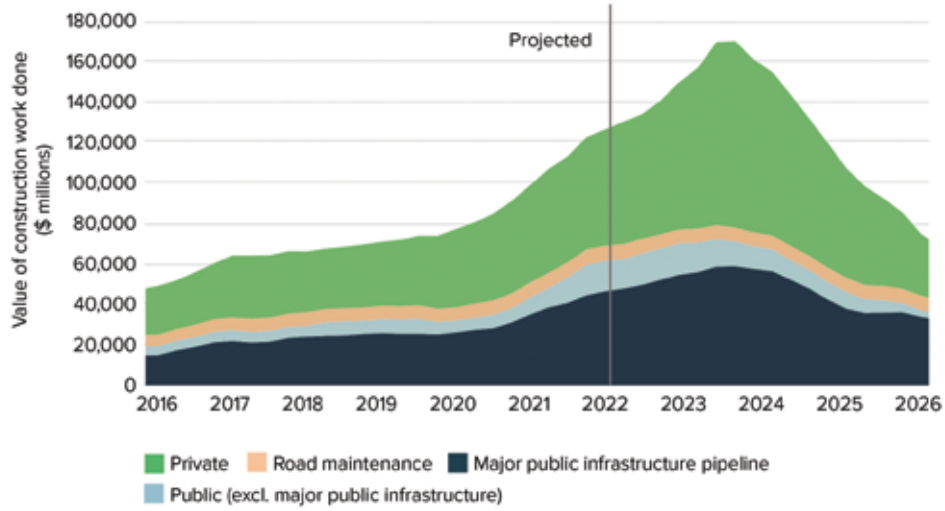
"Our latest research on market capacity points to an increasingly urgent need to better manage these risks and proactively sequence the major infrastructure pipeline. A focus on productivity improvements in planning and delivery, and more ambitious reform to sustainably expand the market's capacity through the supply of labour and materials is increasingly critical for successful, timely and cost-effective delivery," Mr Copp said.

Figure 1: The infrastructure pipeline for 2022 *Infrastructure Market Capacity*, in the context of full construction activity



Source: Turner & Townsend and BIS Oxford Economics commissioned by Infrastructure Australia (2022)

Figure 2: Infrastructure pipeline – split by component



Source: Turner & Townsend and BIS Oxford Economics commissioned by Infrastructure Australia (2022)

"The 2022 edition shows that risks to on-time and on-budget project delivery have increased in the last 12 months, with demand for major public infrastructure projects climbing by $15 billion in a year."

About the Infrastructure Market Capacity Program

The 2022 Infrastructure Market Capacity report is the second report in this series published by Infrastructure Australia in response to a request made by the Prime Minister and First Ministers at the Council of Australian Government in March 2020. In meeting this request, Infrastructure Australia has worked collaboratively with state and territory governments, and industry across Australia and internationally.

The Market Capacity Program is underpinned by a data-driven capability designed to comprehensively understand the capacity of the market to deliver the pipeline of major public infrastructure projects.

A National Infrastructure Project Database aggregates and organises project data and a Market Capacity Intelligence System applies a comprehensive suite of analytical and system-based tools to interrogate and visualise capacity across sectors, by project type and resource inputs.

KEY FINDINGS:

- The five-year pipeline of major public infrastructure projects is valued at $237 billion - an increase of $15 billion in the last 12 months and equivalent to 6.7% growth.
- Transport accounts for 63% of spend. Investment is concentrated in New South Wales, Victoria and Queensland (84% of spend).
- The demand for materials for use in road construction projects is expected to grow to a peak of $7.6 billion in 2023–24.
- Industry reports delays of up to 45 weeks in the delivery of large-diameter concrete pipe.
- Labour scarcity is the single biggest issue faced by construction companies.
- The cost of construction materials has risen by an average 24% in the last 12 months.
- As of October 2022, public infrastructure projects, including small capital projects, face a shortage of 214,000 skilled workers.
- In 2023, labour demand is projected to increase 42,000 to a peak of 442,000. This is more than double the projected available supply.

A copy of Infrastructure Australia's *2022 Infrastructure Market Capacity* report can be downloaded from: **https://www.infrastructureaustralia.gov.au/publications/2022-market-capacity-report**

MICHELLE PAYNE OAM TO HEADLINE INTERNATIONAL WOMEN'S DAY SERIES

Registrations are now open for a special 10th anniversary series of *International Women's Day* (IWD) events to be held in Sydney, Melbourne, Perth and Brisbane from 7–9 March 2023.

Sydney, Melbourne and Brisbane events will be hosted by Engineers Australia CEO Romilly Madew AO, with a keynote address from Melbourne Cup-winning jockey Michelle Payne OAM. The Perth event is a breakfast format featuring a live stream of Payne's Melbourne address.

The first and only female to win the event, Payne's triumph catapulted her into stardom where she is now a highly successful trainer, jockey and author.

Engineers Australia CEO Romilly Madew said the ground-breaking jockey was the perfect choice to headline the series.

"Michelle's story of defying gender expectations to become a national icon and one of Australia's most sought-after media and racing personalities is truly inspirational," she said.

"International Women's Day is both a celebration and reminder that there is still much work to be done in the name of gender equality. Since 2013 these events have enabled groups and individuals to come together to foster inspiration, celebrate IWD and network with like-minded professionals."

Engineers Australia IWD celebrations attract thousands of professionals every year, and with the last series in 2021 a sell-out, people are advised to register early to avoid disappointment.

The theme for IWD2023 is **#EmbraceEquity** .For event information and registrations visit the Engineers Australia International Women's Day website: **https://eaiwd.com.au/**

ENGINEERS AUSTRALIA CEO CALLS FOR REFORMS

Engineers Australia CEO Romilly Madew AO has called for reform in response to the recently released *Infrastructure Australia Market Capacity Report.*

"Infrastructure Australia's market capacity report highlights the need for change within a sector that is at breaking-point," Ms Madew said.

"Implementing reforms that overcome flaws in project planning, procurement, and capability is long overdue. This requires commitment and collaboration from federal, state and territory governments through application of risk management practices, a mature approach to project governance and procurement, and funding for infrastructure investments."

"The Clough Group collapse is a sad example of the challenges the sector is facing. Unfair allocation of risk is leading to a lose-lose scenario. Frameworks are needed to manage risk across the value chain and to ensure appropriate allocation and reporting. As the [Market Capacity] report states, time pressures are reducing the risk discovery stage, which is leading to contractors assuming an increased, and often unsustainable, level of risk.

"Understanding the skills needed to realise Australia's pipeline of projects is critical in allowing evidence-based policy initiatives to alleviate the challenges.

"There are over 433,000 qualified engineers in Australia's labour force, and still, engineers, scientists and architects are considered 'acutely' scarce. Increasing the pool of engineers is critical if these projects are to be completed.

"Job vacancies in engineering alone have risen by 176 per cent in the past two years and notwithstanding the fact the majority of Australia's engineering labour force is born overseas, our research shows that almost half of migrants already in the country that are actively seeking work as an engineer are currently under or unemployed.

"Only 14% of women are working in engineering occupations in Australia. We must harness the engineering skills of 100% of our population - and not just the male half - if we are to make any inroad toward meeting Australia's urgent need for more qualified engineers.

"Australia's recently legislated emissions reduction targets will require Australia's governments and regulators to give due consideration and prioritisation to carbon emissions abatement within the infrastructure sector.

"Pleasingly, the Market Capacity Report reinforces the recommendation to build support for the circular economy. With the report identifying 27 per cent of conventional materials used for road projects could be replaced with recycled materials, this presents an opportunity to not only expand local supply but also help the sector achieve critical reductions in emissions," Ms Madew concluded.

ENGINEERS AUSTRALIA WELCOMES THE INTRODUCTION OF ACT ENGINEER REGISTRATION SCHEME

Engineers Australia has welcomed the ACT Government's decision to establish a mandatory registration scheme for professional engineers.

The *Professional Engineers Bill 2022,* which was introduced in the ACT Legislative Assembly earlier this month, will bring the ACT into line with other Australian states and territories that have introduced/are introducing similar engineer registration schemes.

Initially, the scheme will only apply to five areas of engineering but may later be expanded. The areas proposed in the current scheme are civil, structural, mechanical, electrical and fire safety engineering.

Engineers Australia CEO Romilly Madew AO said the new laws will be a significant step forward for the territory.

"Governments around Australia are attempting to reduce the risks of buildings being evacuated or left uninhabitable and infrastructure like bridges and roads being unsafe. Registering engineers is a critical part of tackling this problem." Ms Madew said.

One of the main benefits of registering engineers in the building sector in the ACT is to reduce the risk to public health, safety, and welfare. There are also economic benefits, particularly with today's supply and skills constraints, in more efficient use of materials and less rectification work.

"Engineers are trusted every day by the community, often without realising how much is created by them. The buildings we live in and the infrastructure we use daily relies on engineering skills to make them a reality," she said.

"Most engineers provide their services competently and ethically; however, use of the title 'engineer' is unrestricted and therefore, it has become a generic term. Without registration, anyone can claim to be an engineer and provide engineering services without the appropriate qualifications and competencies."

"We thank Minister for Sustainable Building and Construction Rebecca Vassarotti and the ACT Government for their commitment to improving building standards and look forward to working with them to develop the regulations."

THE CHOICE IS YOURS!

RANGE OF MODELS
IN STOCK
NOW
SET UP & READY TO GO

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

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

THE EQUIPMENT YOU NEED – THE SERVICE YOU EXPECT

A1 Roadlines Pty Ltd | 89 Rushdale Street, Knoxfield, Victoria 3180 | **www.a1roadlines.com.au**
P: 1300 217 623 (A1ROAD) | **F:** (03) 9765 9499 | **E:** sales@a1roadlines.com.au

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.

A1 ROADLINES

www.a1roadlines.com.au

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

THE EQUIPMENT YOU NEED – THE SERVICE YOU EXPECT

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P: 1300 217 623 (A1ROAD) | **E:** sales@a1roadlines.com.au

A1 ROADLINES

ACRS SUSTAINABLE STEEL CERTIFICATION SCHEME RECOGNISED BY GBCA UNDER ITS RESPONSIBLE PRODUCTS FRAMEWORK

ACRS (the Australasian Certification Authority for Reinforcing and Structural Steels), the leading independent, third-party steel certification authority of construction steels to Australian and New Zealand Standards, and **CARES,** the leading international constructional steel certification authority, have announced that their Sustainable Constructional Steels Certification Scheme (SCS) has been recognised by the Green Building Council of Australia (GBCA) under its Responsible Products Framework.

The Framework is used by the GBCA to recognise initiatives that a product or manufacturer can comply with for the purposes of contributing to a Green Star certification.

As part of the Framework, the SCS Scheme has been recognised as Best Practice across all four of the Framework's credits. These cover building Structure; Envelope; Systems and Finishes.

With the SCS Scheme, steel producers and processors will be able to achieve Best Practice credits towards Green Star Building compliance. They will also be able to achieve compliance by using other Schemes in combination with the SCS Scheme to achieve either 'Good practice' or 'Best practice' product criteria.

Commenting on the GBCA recognition of the SCS Scheme, Andrew Wheeler, Executive Director of ACRS, said: "We are delighted the SCS Scheme has received this recognition from the GBCA and to now be contributing towards the Green Star rating system. The SCS Scheme is an internationally recognised, best-in-class sustainability scheme with thirteen years of experience in the steel industry.

"Working closely with our partners at GBCA and our certificate holders we look forward to helping the Australian construction industry verify the steel being used as being produced using the most sustainable practices as the industry is capable of achieving and to always look for ways to improve this as we head towards net zero by 2050."

The sentiments were echoed by Lee Brankley, CEO of CARES, who added: "Steel is a safety critical component in all major structures and responsible clients rightly seek the assurance that comes with confirmation the products they specify meet the highest standards in the sector. Knowing their products also meet stretching sustainability criteria set out by highly regarded bodies such as the GBCA, is a further positive endorsement of the choices these clients are making. CARES welcomes this as an additional sign of confidence in the standards set out in the SCS Scheme."

The SCS Scheme verifies construction steels entering Australia from anywhere in the world meet the highest global environmental, social and ethical standards, using independent certification of ESG criteria and performance indicators.

Australians will now be able to determine with confidence the sustainability performance of the steel procured.

Australian and international steel producers are working hard to reduce their emissions – around 7% of global CO_2 emissions[1] are generated by the industry. The SCS Scheme will help steel producers and processors measure, monitor, and improve the sustainability performance of their products and will strengthen industry efforts already underway to combat greenhouse gas emissions.

Provides a clear public benefit

The Scheme aligns to the UN-convened Sustainable Development Goals - *'The Global Goals'* - and measures and monitors a comprehensive range of criteria through the global supply chain. Raw material and transport data, combined with independently verified production and life cycle emissions data, supports the development of products' Carbon Footprint and Environmental Product Declarations. This enables accurate data, for example, the Global Warming Potential per tonne of product, to be easily accessed by designers and specifiers. On-product bar marking and digital product labelling also allows 100% traceability on all verified products from manufacture to site.

Supporting international trade and commerce

The Scheme already certifies 42 producers and suppliers in 12 countries. Products certified under the Scheme are approved inputs for a range of additional international building and infrastructure rating systems, including the UK's *Building Research Establishment Environmental Assessment Method* (BREEAM); the US *Leadership in Energy and Environmental Design* (LEED) building rating system; the Hong Kong Construction Industry Council (CIC)'s *Green Product Certification* (GPC) scheme and the Singapore *Green Building Council's Green Building Product Certification* (SGBP) Certification Scheme.

Benefits for firms seeking SCS certification

With the introduction of SCS certification, product conformity, traceability, and sustainability certification will all now be available through ACRS. Firms seeking both independent premium product and sustainability certification can now do so through one certification body. The independence and rigour that ACRS is renowned for in Australia and New Zealand will help achieve the desired quality, environmental and socially responsible outcomes across the construction industry.

About the SCS certification scheme

The Scheme covers the production of feedstock for further processing (e.g. billets, blooms slabs, wire rod), finished steel products (e.g. carbon steel bar/coil, stainless steel bar/coil and structural steels), and fabricated materials (mesh, processed bar and welded fabrication).

The Scheme is compatible with ACRS' traceability provisions in ACRS "Stage 1" (Manufactured Product) and "Stage 2" (Fabricated Product) certification plus the Traceability scheme for traders and distributors.

ACRS is the sole certification body in Australasia for delivery of the SCS Scheme, the internationally recognised scheme that is compatible with ACRS' existing certification schemes and meets local market needs.

Reference

1. IEA (2020), The challenge of reaching zero emissions in heavy industry, IEA, Paris

ABOUT ACRS

Founded in 2001, the Australasian Certification Authority for Reinforcing Steels (ACRS) is Australasia's leading, not-for-profit, independent steel certification authority.

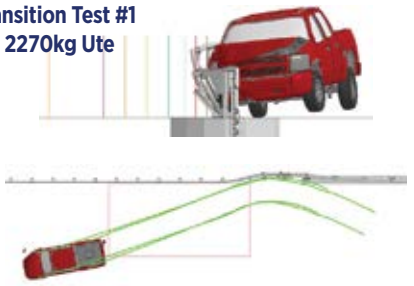
ACRS provides the most technically-rigorous, internationally-aligned, independent steel certification scheme to Australian and New Zealand Standards. It conducts audits and certificates over 100 suppliers from more than 24 countries for construction materials supplied to AS, NZS, EN and BS Standards, as well as a range of Government specifications.

ACRS certifies customer quality management systems and construction steel products to international quality standard ISO 9001: 2016 (or the identical ISO 9001:2015, or local equivalent); and Steelwork Fabrication and Erection Standard, AS/NZS 5131.

ABOUT CARES

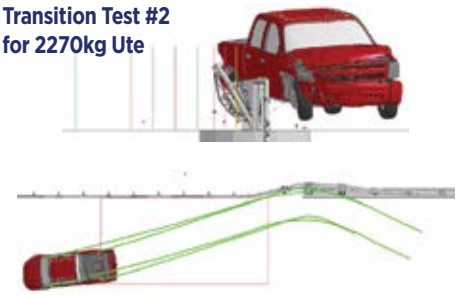
Founded in 1983, CARES is the world's leading independent provider of assured certification for the construction steels industry. CARES operates in over 50 countries, providing confidence in product performance and provenance to discerning public and private sector clients. The CARES digital ecosystem offers speed and transparency in ever-more complex international supply chains where safety, sustainability and product data quality are mission-critical.

Transition Test #1
for 2270kg Ute



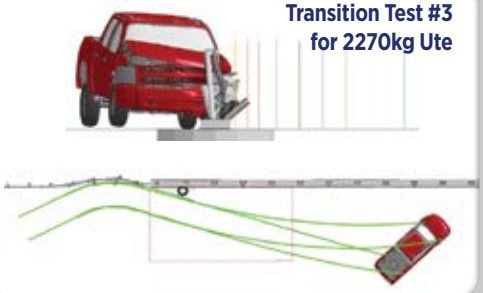
The DOLRE bridge traffic barrier development demonstrates how the incorporation of FEA into the design process can optimise a solution that is vastly different from the solutions that traditional Engineering methodologies would produce.

Transition Test #2
for 2270kg Ute



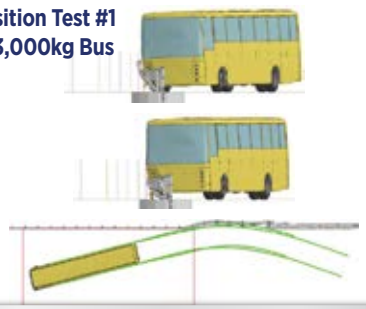
A problem was identified and through the iterative use of FEM combined with Eurocodes for structural analysis a solution was found and optimised that was vastly different to the direction that traditional engineering was leading.

Transition Test #3
for 2270kg Ute

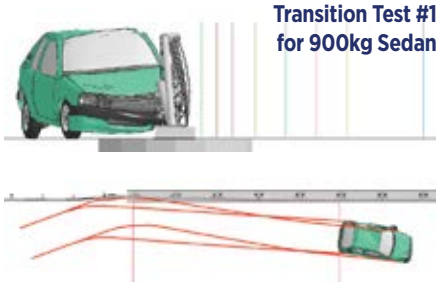


Once the bridge barrier design was optimised, the same process was used to assess **transition designs** to various European roadside barriers in accordance with EN1317 and TR16303-2011 requirements.

Transition Test #1
for 13,000kg Bus



Transition Test #1
for 900kg Sedan



Australian authorities required product assessment to Australian bridge standards. Future finite element modelling in accordance with MASH standards and NCHRP179 validation requirements satisfied ASBAP's analysis for both traffic barrier and transition designs.

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LATHAMS ROAD BRIDGE PROJECT: AUSTRALIAN TEAM LEVERAGES DIGITAL SOLUTIONS TO STREAMLINE PROCESSES

The design of a new roadway bridge under tight site conditions and a compressed schedule might seem challenging enough on its own. Combine that with concurrently implementing new design software and a digital project delivery system, and the mission might seem daunting.

However, for Hatch Ltd, the firm designing the Lathams Road bridge in suburban Melbourne, the approach was a triumph, as new software tools helped the team deal with various project challenges and prepare for future projects.

Overcoming project challenges with digital solutions

The AUD $150-million Lathams Road project widened an existing road from two to four lanes and added a new bridge over an existing freeway. When the project's lead designer discovered the existing bridge abutment location differed from as-built records by approximately 300 millimetres, the Hatch team had to adjust road and bridge alignments accordingly after the design was already in progress.

Using Bentley Systems' *OpenRoads Designer* and *OpenBridge Modeler* to develop 3D models, the team was able to amend the road and bridge geometry and make the necessary adjustments in a week, a fraction of the time if using traditional 2D methods. The ability to seamlessly exchange information between bridge and road models greatly simplified the process.

"If we did not have the 3D modelling approach, this wouldn't have been possible," said Tanmay Vegad, Senior Bridge Engineer for Hatch. He estimates the changes would have taken four to five weeks using traditional methods.

Designing innovative bridges for future resilience

The 3D approach also helped the team design modifications to the existing bridge.

The bridge design team developed custom objects in OpenBridge to accurately model bridge components. While OpenBridge includes a library of templates for common bridge components, such as abutments, piers, and barriers, the Lathams Road bridge called for unique shapes not included in the library. Working with Bentley staff, the Hatch team expanded the library with custom objects reflecting the project design.

"3D visualisations promote a greater level of understanding amongst the project team, which has helped to foster a highly collaborative working model between project partners and delivered a fully resolved design. Changes are inevitable, and when they did occur, time and cost impacts were substantially reduced," said Steve White, Design Manager for contractor Winslow Infrastructure.

Digital Project Delivery

Along with the numerous project challenges, the team was learning OpenBridge Modeler and had to ramp up quickly, obtaining training from Bentley and integrating OpenBridge with the company's digital project delivery (DPD) initiative. The company is implementing DPD to increase information value and drive quality and efficiency, extending the life of information into operations, according to Michael Gilham, Hatch's Global Solution Lead for civil work. The firm is committed to following ISO 19650, an international standard for building information modelling (BIM), on every project.

Hatch's two-pronged approach to meet company objectives and a tight project schedule presented a unique combination of challenges, however was well worth the effort, said Gilham.

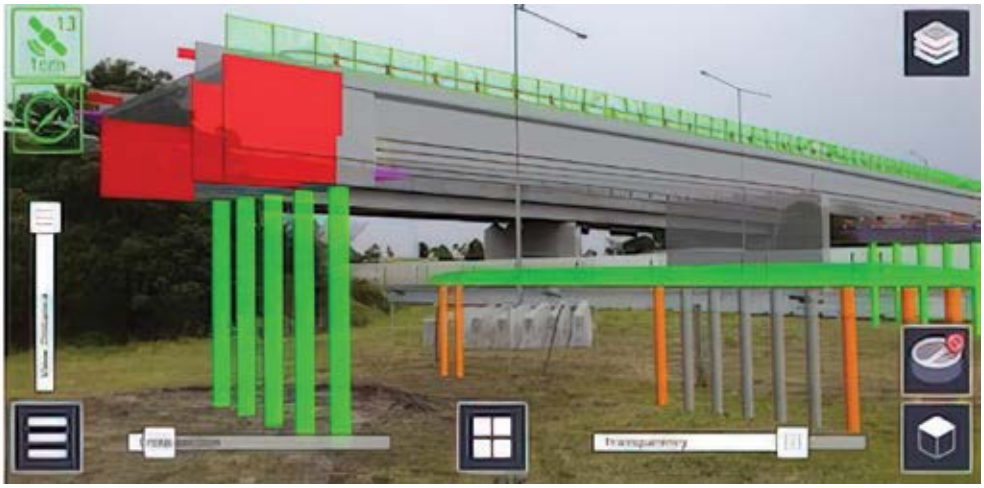
"This project helped us move the DPD project forward at the same time. The team did an amazing job to finish on time and on budget. Final deliverables were actually delivered four weeks ahead of schedule," said Gilham.

Digitalisation Sets a Benchmark for AEC Industry

The use of 3D modelling and digital project delivery through Bentley established dramatic benefits for designers and other stakeholders on the Lathams Road upgrade, a key infrastructure improvement in the Melbourne suburb of Carrum Downs.

With the Lathams Road project under its belt, Hatch is actively applying its expanded 3D experience on other projects. The company recently completed the design of the Hall Road upgrade, another project for Major Road Projects Victoria. On that project, Hatch used a similar suite of software to model the project, which featured 24 culverts of various sizes and shapes.

As technological experience grows in the architecture, engineering, and construction industry, similar approaches are likely to be adopted by other firms and agencies worldwide.



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AUSTRALIAN-MADE ALL-ELECTRIC TRUCKS STAR IN 2022

Australian truck OEM SEA Electric is primed to take advantage of the accelerating push to switch to sustainable commercial eMobility products, with growth and accolades throughout 2022 setting the scene for a bright future.

Produced in Melbourne, SEA Electric's comprehensive range of all-electric trucks is now available from a nationwide dealer network, with solutions flexible for a wide variety of final applications. First deployed in 2017, the company's SEA-Drive® power-system can be found in the light and medium-duty SEA 300 EV and SEA 500 EV models, and is adaptable to practically any installation type.

Highlights of the 2022 year have included the doubling of size of the company's manufacturing base at Dandenong in Victoria to 8,000m2, paving the way for the in-house production of up to 2,080 units per annum. The SEA Electric range also continued its award-winning run when it claimed the Sustainable Environment Award at the Australian Freight Industry Awards.

Internationally, SEA Electric won the Green Car Journal's 2022 *Green Car Product of Excellence™ Award,* which was added to the Heavy Vehicle Industry Australia's Product Innovation Award for 2021.

"This year will go down in the books as the year Australia finally started to take the change to EV solutions seriously, and SEA Electric has been at the forefront of the conversation with both Governments and industry about how to best facilitate the switch," said Bill Gillespie, SEA Electric President, Asia Pacific Region.

"Even within the EV space, Glen Walker, our Vice President of the Asia Pacific Region, was voted onto the board of the Electric Vehicle Council, giving the zero-emissions logistics sector further voice.

"We are fortunate that our products have had a decade of research and development undertaken right here in Australia, and they are proven in the field with over 2 million kilometres of use to date.

"Our products are ready to deploy right now, and we are set to take the next leap in our journey in 2023."

Other significant announcements from this year have included the expansion of the company's ecosystem of collaborators, who are assisting fleets in transitioning to a sustainable future.

Amongst this is a strategic partnership with EnergyAustralia, plus an extension of the association with National Transport Insurance, who not only provide 24/7 roadside assistance for SEA Electric owners, but also around-the-clock telephone support, with further partner announcements expected imminently.

Leading the many notable new vehicle deliveries this year for the company was the country's first all-electric aviation refueller, which has been deployed by Air bp to Brisbane Airport.

For further details on the entire SEA Electric range of Australian-made vehicles, plus the brand's nationwide dealer network, visit: **www.sea-electric.com/en_au**

ABOUT SEA

SEA Electric is an Australian company with a global reach specialising in the assembly and 100% electrification of commercial vehicles worldwide. Dealing directly with vehicle users and working alongside automotive OEM's, SEA Electric supplies and licences patented technology.

SEA Electric was founded in 2012. After four years of product development and testing, SEA Electric launched its commercial operations in early 2017, triggered by the reduction in battery kWh pricing, allowing for commercial feasibility in offering electric drivetrains to the global market.

MARRIOTT INTERNATIONAL EXPANDS ELECTRIC VEHICLE NETWORK ACROSS ASIA PACIFIC

In line with Marriott International's net zero ambitions and global commitment to source a minimum of 30% of its overall electricity from renewable energy by 2025, the company today announced that it plans to expand its electric vehicle (EV) network across Asia Pacific.

By the end of 2023, the company expects to sign EV MoU agreements to construct and operate EV charging infrastructures in nine markets, including India, Thailand, Indonesia, Malaysia, Japan, South Korea, Singapore, Australia and Vietnam, providing guests with ways to travel more sustainably. The MoU agreements stipulate the planned installation of more than 400 EV chargers across the nine markets by end of 2025.

"As climate impacts intensify across the globe, there is a growing urgency for us to increase use of renewable energy," said Neeraj Govil, Senior Vice President, Operations, Asia Pacific (excluding Greater China).

"The planned expansion of our EV network across the region is a significant investment that brings us closer towards our carbon emissions reduction target. This is just the first step in our shift towards using more renewable energy."

"We remain optimistic and laser-focused on our sustainability commitments and will continue to review opportunities that will lead us to a net zero future by no later than 2050," Govil said.

Marriott's sustainability strategy is driven by a wide range of initiatives to reduce environmental impacts through the construction and operation of sustainable hotels and responsible sourcing while protecting and restoring ecosystems in the communities where it operates.

In support of the United Nations *Sustainable Development Goals* (SDGs), this announcement aligns with the company's sustainability and social impact platform, *Serve 360: Doing Good in Every Direction*, which guides Marriott's commitment to help take on the world's most pressing social, environmental, and economic issues, delivering value for associates, customers, owners, the environment, and communities around the world.

More details about Marriott International's ESG efforts and Serve 360 can be found at **www.Marriott.com/Serve360**.

GOOD VIBRATIONS TURBO CHARGE GREEN HYDROGEN PRODUCTION

PhD researcher Yemima Ehrnst holding the acoustic device the research team used to boost hydrogen production, through electrolysis to split water. *Photo courtesy: RMIT University ©2022*

Engineers in Melbourne have used sound waves to boost production of green hydrogen by 14 times, through electrolysis to split water.

They say their invention offers a promising way to tap into a plentiful supply of cheap hydrogen fuel for transportation and other sectors, which could radically reduce carbon emissions and help fight climate change.

By using high-frequency vibrations to "divide and conquer" individual water molecules during electrolysis, the team managed to split the water molecules to release 14 times more hydrogen compared with standard electrolysis techniques. Electrolysis involves electricity running through water with two electrodes to split water molecules into oxygen and hydrogen gases, which appear as bubbles. This process produces green hydrogen, which represents just a small fraction of hydrogen production globally due to the high energy required.

Most hydrogen is produced from splitting natural gas, known as blue hydrogen, which emits greenhouse gases into the atmosphere.

Associate Professor Amgad Rezk from RMIT University, who led the work, said the team's innovation tackles big challenges for green hydrogen production.

"One of the main challenges of electrolysis is the high cost of electrode materials used, such as platinum or iridium," said Rezk from RMIT's School of Engineering.

"With sound waves making it much easier to extract hydrogen from water, it eliminates the need to use corrosive electrolytes and expensive electrodes such as platinum or iridium."

"As water is not a corrosive electrolyte, we can use much cheaper electrode materials such as silver,."

The ability to use low-cost electrode materials and avoiding the use of highly corrosive electrolytes were gamechangers for lowering the costs of producing green hydrogen, Rezk said.

The research is published in *Advanced Energy Materials.* An Australian provisional patent application has been filed to protect the new technology.

First author Yemima Ehrnst said the sound waves also prevented the build-up of hydrogen and oxygen bubbles on the electrodes, which greatly improved its conductivity and stability.

"Electrode materials used in electrolysis suffer from hydrogen and oxygen gas build-up, forming a gas layer that minimises the electrodes' activity and significantly reduces its performance," said Ehrnst, a PhD researcher at RMIT's School of Engineering.

As part of their experiments, the team measured the amount of hydrogen produced through electrolysis with and without sound waves from the electrical output.

"The electrical output of the electrolysis with sound waves was about 14 times greater than electrolysis without them, for a given input voltage. This was equivalent to the amount of hydrogen produced," Ehrnst said.

The potential applications of the team's work

Distinguished Professor Leslie Yeo, one of the lead senior researchers, said the team's breakthrough opened the door to using this new acoustic platform for other applications, especially where bubble build-up on the electrodes was a challenge.

"Our ability to suppress bubble build-up on the electrodes and rapidly remove them through high-frequency vibrations represents a major advance for electrode conductivity and stability," said Yeo from RMIT's School of Engineering.

"With our method, we can potentially improve the conversion efficiency leading to a net-positive energy saving of 27%."

While the innovation is promising, the team needs to overcome challenges with integrating the sound-wave innovation with existing electrolysers to scale up the work.

"We are keen to collaborate with industry partners to boost and complement their existing electrolyser technology and integrate into existing processes and systems," Yeo said.

Acoustically-Induced Water Frustration for Enhanced Hydrogen Evolution Reaction in Neutral Electrolytes is published in *Advanced Energy Materials* (DOI: 10.1002/aenm.202203164).

The co-authors are Yemima Ehrnst, Amgad Rezk and Leslie Yeo from RMIT and Peter Sherrell from the University of Melbourne.

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NOVEL ROAD SURFACES COULD BE KEY TO LIVING WITH CLIMATE CHANGE

University of Birmingham experts are working with the Ethiopian Roads Administration (ERA) to develop ways of future-proofing the country's road network against the effects of climate change – helping maintain and improve quality of life in Ethiopia and other Low-income Countries (LICs). The partners are trialling three innovative long-life road pavement surfacings - *Epoxy Modified Chip Seals* (EMCS), *Epoxy Modified Asphalt Surfaces* (EMAS) and *Fibre Mastic Asphalt* (FMA), resurfacing sections within existing major roads on the Ethiopian road network.

Researchers working with ERA are assessing, through modelling and insitu trials, whether these approaches provide both more durable roads, in the face of a changing climate, and value for money. The modelling is being done as part of the *Climate Resilient Sustainable Road Pavement Surfacings* (CRISPS) project funded through the UK Government's High Volume Transport Research Programme.

Project partners include the University of Auckland, Universiti Putra Malaysia and the International Road Federation.

The partnership supports the *UN's Sustainable Development Goals* (SDGs) - a collection of 17 interlinked global goals designed to be a 'shared blueprint for peace and prosperity for people and the planet, now and into the future - intended to be achieved by 2030.

Each goal typically has eight to 12 targets and in particular, the international team is interested in whether the road surfaces:

- Provide resilient roads which are economically viable -addressing SDG targets 9.1, 9.4, 12.1, 12.4 and 12.7).
- Withstand the impacts of climate change, and in particular extremes of temperature and climate.
- Enable roads to recover their level of service rapidly and with little intervention after an extreme weather event - addressing SDG targets 9.1 and 9.4; and
- Improve the sustainability of road construction and maintenance through increased durability of the materials used in their construction (EMCS and EMAS), or through the use of marginal materials (FMA) - addressing SDG targets 9.1, 9.4, 12.1, 12.4 and 12.7

Modelling carried out as part of the project suggests that the EMCS and EMAS surfaces can last between 4 -6 times as long as their conventional counterparts and are much better at withstanding climate extremes. Further, the initial economic modelling carried out estimates that road user costs could be reduced by approximately 25% and that over a life cycle of 50 years, the economic benefits, measured in terms of net present value, are likely to be around 50% greater for long-life road surfaces compared to conventional counterparts.

Dr Michael Burrow, from the University of Birmingham, commented: "Roads make a crucial contribution to economic development and growth and bring important social benefits - they are critical in helping a nation grow and develop. They also provide access to employment, social, health and education services - making a road network essential in fighting against poverty."

"Adequately maintaining road infrastructure preserves and enhances those benefits," he said.

"Insufficient maintenance can mean that roads require major repairs or need to be reconstructed much sooner than anticipated. This results in roads which ultimately require more expensive maintenance and in increased road user costs due to poorer road condition, thereby greatly increasing total transport costs which can have a major economic impact on the economy and citizens," Dr Burrow added.

Long lasting road pavements require less maintenance and provide a smoother running surface over the life cycle of the road compared to conventional road surfaces, resulting in the reduction of road use costs i.e. reductions in fuel consumption, emissions, vehicle maintenance, passenger travel time and accident costs.

Dr. William Avis, from the University of Birmingham, commented: "Decision-makers must recognise the importance of long term planning. Our research indicates that roads surfaced using these novel materials, although more expensive to construct than traditional road surfacings, will last up to six times longer, require less maintenance and ensure reduced road user costs.

"As CRISPS demonstrates, planning, design and construction of road networks, can be transformed through the use of improved climatic and design modelling, more resilient materials, appropriate technical specifications and improved construction techniques. The CRISPS project and the partnership between ERA and the University of Birmingham support each of these elements."

Eng. Yitagesu Desalegn, head ERA's research centre, commented: "The partnership between the University of Birmingham and the Ethiopian Roads Administration represents a concrete example of how cooperation across national boundaries and between stakeholder groups can provide the means through which cutting edge academic research can have a meaningful impact in the real world."

A cornerstone of the partnership is the provision of Doctoral Research support to key staff in ERA fully funded by the ERA. To date a total of three ERA staff are in the process of being awarded their PhDs with a further three in the final stages of submission. The provision of the support dates back eight years and reflects the importance that ERA places on research to support their mission.

The University of Birmingham is ranked amongst the world's top 100 institutions, its work brings people from across the world to Birmingham, including researchers and teachers and more than 8,000 international students from over 150 countries.

COMFORT CABIN FOR WIRTGEN F-SERIES COMPACT MILLING MACHINES

LEFT: The new Wirtgen compact milling machines can now be fitted with a fully enclosed comfort cabin. This makes them the world's first cold milling machines in this machine class to be offered with a cabin.

At the beginning of this year, Wirtgen celebrated the market launch of its completely redesigned generation of compact milling machines. And now, the company presents another innovation. Alongside efficiency and environmental compatibility, the focus is now set on ergonomics again. For the first time, compact-class machines can be fitted with a comfort cabin.

Comfort and safety for the machine operator

The operator's cabin for the W 100 Fi – W 130 Fi models sets new standards when it comes to ergonomics. It offers the operator a comfortable, low-fatigue workplace and provides effective protection against noise emissions. At the same time, the cabin protects the operator when working in all weather conditions – no matter whether it's windy, raining, cold or sunny and hot.

The cabin air is cleaned by a filter system and the temperature is controlled by an automatic air conditioning and heating system. The cabin is also constructed as a positive-pressure system to prevent the ingress of dirt, dust, and hazardous materials into the operator's workplace.

Regardless of the weather conditions, the operator's workplace always stays dry and clean, also when transporting the machine.

Low-fatigue working environment promotes better concentration

The increased comfort and lower impact of environmental influences inside the cabin effectively reduce stress and fatigue. The cabin offers the operator an attractive working environment with state-of-the-art control elements and assistance systems that are unique in this class. This assures that important factors that contribute to safety and productivity, such as concentration and physical or mental capabilities, are not impaired in any way.

The consequences of this are motivated operators, job satisfaction and maximum occupational health and safety. All in all, the best prerequisites for making every day a productive working day.

Problem-free communication

The comfort cabin for compact milling machines also shows another of its unique strengths when it comes to communication. The ambient noise level is so low that the operator can make hands-free phone calls from the cabin. For communication on the construction site, the operator can either use a radio headset or open the easily accessible side window to talk with the crew on the ground.

Enclosed cabin helps to protect against vandalism

When closed and locked, the operator's cabin and all control elements are securely protected against vandalism. There is no longer any need to remove and stow protection covers or open up fold-away control panels at the start of work or vice versa at the end of the working day.

AUSTRALIA'S ROADS SET TO BECOME SAFER AND MORE SKILFULLY CONSTRUCTED

For the first time, the skills of Australian roadworkers will be formally recognised thanks to a new qualification developed by the *Australian Flexible Pavement Association* and approved by the *National Skills Commission.*

The new 11-part qualification industry skills card will support better career development for workers and attract more people into a sector that is facing a skills shortage at a time of unprecedented demand from infrastructure projects and repairs to roads damaged by recent weather events.

Under the new skills card Australia's roads are set to become safer and more skilfully built than ever through a set of specially designed part qualifications introduced under the nationally qualification *RII30920 Certificate III in Civil Construction – Bituminous Surfacing,* designed to improve the nation's workforce and road-building skills.

AfPA sought to introduce the qualifications on the rationale that the bituminous surfacing industry is a specialist trades skill set that ensures the safety of the travelling public and protects government most asset – its roads.

AfPA has developed the foundation of the industry skills card which is transferrable, recognises prior experience and the academies of each organisation. In partnership with industry stakeholders, this scheme will identify, train, and provide each worker a qualification on a skill set basis.

The following skills sets within the industry card have been developed to date:

- Safely handle bituminous materials
- Asphalt Surfacing
- Spray Sealing
- Profile planer Operations
- Insitu Stabilisation Operations

AfPA's Executive Director of Knowledge and Partnerships, Tanja Conners, said: "Simply put, those who deliver the nation's highest order roads should possess qualifications specific to this industry to ensure quality, safety, long term durability, performance, and workforce sustainability."

"We are extremely pleased to be able to deliver this industry-first set of qualifications and want to thank the National Skills Commission for their assistance as we look to provide confidence to procurers and promotes attraction and retention of talent to the industry," Ms Conners added.

All units of competency will be delivered by AfPA-endorsed RTOs under a Training Delivery Agreement, with industry-developed and validated resources.

For more information, visit:
https://www.afpa.asn.au/

ITA TUNNELLING AWARDS 2022 WINNERS

The 8th edition of the ITA Tunnelling and Underground Space Awards took place during December, with the winners in the eight categories announced during the online event. Since 2015, this international competition seeks and rewards remarkable achievements in tunnelling and the underground industry.

Organized by the International Tunnelling and Underground Space Association, the event both showcases the most ambitious underground projects all over the world as well as the latest innovations, techniques, and methods in tunnelling.

Arnold Dix, President of the ITA, praised the quality of the award-winning projects, underlining that "...the Tunnelling Awards is a celebration of the great milestones and the great innovations achieved."

"It also highlights the contributions made to our planet and people," Mr Dix added. "This year, 70 nominations from almost 20 countries have been considered by a panel of independently selected judges. The ceremony today rewards the best in our industry, from the largest projects on earth right through to the latest innovations and productions. These amazing achievements can be enjoyed today."

Below are the winners in each category of the 8th edition of ITA Tunnelling Awards.

MAJOR PROJECT OF THE YEAR (OVER €500M)

Purple Line Extension, Section 1

The Skanska-Traylor-Shea Joint Venture (STS) is constructing the $1.9 billion design-build of the Purple Line Extension, Section 1, in Los Angeles. This is the first of three projects to extend the Purple Line from Wilshire / Western Station to Santa Monica, a tunnel project that has been in the works for over 60 years!

This portion of the project will add 3.92 miles to the Purple Line, beginning at the Wilshire/Western Station. The twin tunnel alignment travels beneath Wilshire Boulevard, and underground stations are under construction at Wilshire/La Brea, Wilshire/Fairfax, and Wilshire/La Cienega. The tunnels, mined by two Herrenknecht TBMs, are 35,750 linear feet long with an inner diameter of 18.8 feet.

The project also includes train control and signals, communications, traction power supply and distribution, and fare collection systems.

PROJECT OF THE YEAR (BETWEEN €50M AND €500M)

World's first spiral excavation using H&V Shield Tunnelling Method

The Tachiaigawa River's Rainwater Discharge Pipe Project aims to reduce damage from flooding in the vicinity while at the same time improving the quality of the water that flows directly into the

Katsushima Canal through the existing sewerage by constructing two 775 m long, 5 m inner diameter sewage pipelines underneath the Tachiaigawa river in Shinagawa Ward, Tokyo.

It is inevitable to face various restrictions and difficulties when planning large-scale infrastructure projects in Tokyo, one of the most densely populated cities in the world. This project was strictly restricted in its tunnel alignment along the route both horizontally and vertically due to the narrow width of the river coupled with the existence of the underground structures of the sewerage facilities.

Thus, to cope with these restrictions, the H&V Shield Tunneling Method (Horizontal to Vertical) was adopted, which is capable of simultaneously constructing two adjacent tunnels in a spiralling manner by two inter-connected TBMs.

The H&V Shield Tunnelling Method has three types of spiral excavation modes, Type-A, Type-B, and Type-C. This project adopted Type-B, in which two tunnels shift their relative positions from horizontally parallel to vertically parallel while one tunnel serves as the rotational axis for the adjacent tunnel to rotate spirally. After the spiral, two interconnected TMBs were stacked vertically and continued the excavation underneath the river until the arrival shaft.

PROJECT OF THE YEAR INCLUDING RENOVATION (UP TO €50M)

Guanyinyan Tunnel: an urban tunnel project of the unequal span four-arch tunnel with two-way and ten-lanes

Located in the north of Changsha City, China, the Guanyinyan Tunnel Project is an important passage to connect an expressway with urban roads. It is a single feasible route for tunnelling to avoid soil disturbance caused by tunnel construction on Xixin Buddhist Temple and surrounding complex buildings.

Restricted by narrow space, the application of conventional roadbeds, double-arch tunnels and split tunnels either fails to meet transport demand or environmental protection. In this project, an innovative proposal featuring an unequalled-span, four-arch tunnel with two-way ten-lane traffic was proposed. Of the ten lanes, 6 lanes in the middle lead to the expressway, while 4 lanes serve as urban roads on both sides.

TECHNICAL INNOVATION OF THE YEAR

Unprecedented In-Tunnel Diameter Conversion of the Largest Hard Rock TBM in the U.S.A.

The largest hard rock TBM ever to bore in the USA, an 11.6 m diameter Main Beam TBM, recently underwent a planned in-tunnel diameter change to a more compact 9.9 meters. The first-of-its-kind conversion process for the Main Beam TBM was undertaken 2.8 km into the bore and was not done inside a shaft or pre-excavated portal.

The City of Dallas (Project Owner) originally designed 3 km of the downstream end of the Mill Creek Tunnel (8.2 km total tunnel length) to be a horseshoe shape (11.6 m x 9.9 m excavation), for the purpose of providing a larger capacity in this stretch, and to utilize only one size TBM for the entire tunnel excavation.

The design called for a 9.9 m circular cross-section excavation, then utilizing a roadheader or conventional heavy civil equipment to bench the 3 km reach.

In partnering with Robbins and Aldea Services (Aldea), Southland Contracting (Southland) was able to work with the Owner and Owner's consultants to use a TBM that could excavate a larger diameter for the downstream end and be converted to the original 9.9 m diameter for the remaining 5.2 km.

Each entity played a key role in the successful completion of this TBM conversion. Robbins took on the challenge of designing a TBM at the larger diameter of 11.6 m, designed with skins and spacer segments that would work for both diameters, and could accommodate the constraints of the conversion process to the original diameter of 9.9 m.

BEYOND ENGINEERING

Multi-pipe jacking method for the construction of city-core metro station in soft soil stratum

Serving as a three-line interchange hub with Line 2 and Line 7, Jing'an Temple Station is a key node on Shanghai Metro Line 14. It is located at the heart of the business and cultural district around the thousand-year-old Jing'an Temple, with an estimated passenger flow of up to 400,000 people per day.

Extended along Huashan Road and crossing Yan'an Road, the station is a three-storey underground structure with a dimension of 230m (length) × 21m (width) × 26m (depth).

PRODUCT/EQUIPMENT INNOVATION OF THE YEAR

Integration of Robotics into the construction works of the Chuquicamata underground mining site

Since November 2021, Acciona has been testing the SPOT quadruped robot (Boston Dynamics´Spot) in the Chuquicamata mining site in Chile, with the main goal of reducing risks for human personnel while increasing process control and productivity.

The objective of the field trials was to automate the following five tasks:

- High precision scanning before applying shotcrete
- High precision scanning after applying shotcrete to perform quality control & estimate shotcrete thickness
- Thermal monitoring of the shotcrete to estimate setting level and mechanical resistance
- Image acquisition of the tunnel face, that allows generating a geologic report.
- Image acquisition of the tunnel after the blasting process, to identify misfired explosives.

INNOVATIVE UNDERGROUND SPACE USE

V-column Space of Shenzhen Huangmugang Transportation Hub

The Shenzhen Huangmugang Transportation Hub is a development project of an underground space, which functions as the interchange for three metro lines, the overground and underground slow traffic, and the commercial leisure and entertainment space.

On the basis of taking down the original flyover, the Project adopted an innovative and integrated design of the "Tunnel-Station-Bridge". In the design, the skylight, atrium and greenery have been introduced on a large scale. The design thoroughly has improved the problems of function fragmentisation, lack of slow traffic system and poor landscape in urban areas. It has formed an integrated underground space more naturally and comfortably, improved the convenience of community life and led to the rapid development of the areas.

The underground space of the Hub features a unique structural style of V-shaped giant columns. Lots of skylights are set on the roof. Vehicular tunnels are suspended inside the space. And staggered atriums are deployed on each floor. The space/form innovation from the top to the bottom has created a bright valley in the underground space, where a variety of trees are planted.

YOUNG TUNNELLER OF THE YEAR

Erica Frederickson

Just two weeks after graduating from university in 2011, I started my career in the tunnelling industry. I got my first taste of tunnels as a Field Engineer with Traylor Bros., Inc. on the NYC MTACC LIRR East Side Access Queens Bored Tunnels and Structures project. Looking back, I had no real idea of what to expect, other than I thought underground construction seemed “cool”. I did not expect to continue working for the same company and industry for 11 years, but there is something special about the tunnelling industry that hooked me.

Since that first job, I have worked on three more tunnel projects in three different cities across North America: the DC Water Blue Plains Tunnel in Washington, DC; the LACMTA Westside Purple Line Extension Section 1 in Los Angeles, CA; and the Second Narrows Water Supply Tunnel in Vancouver, BC. Each project has had its share of challenges, triumphs, stressed-out moments, and opportunities for growth. But most of all, I remember each project for the friendships formed with my incredible colleagues who call tunnelling their career, and for the reward of providing essential infrastructure that will improve the lives of millions for many years to come.

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PRECAST FAST-TRACKING **RAIL PROGRAMME**

Project: Merinda Park Station (Cranbourne Line Upgrade)

Location: Merinda Park, Victoria

Master Precaster: Hollow Core Concrete

Builder: South Eastern Program Alliance, Laing O'Rourke (Principle Contractor)

Consulting Engineers/Architects: Jacobs

Precast concrete was used extensively in Victoria's new Merinda Park Station to eliminate unwanted delays to the public rail network, and it resulted in the project being completed a year ahead of schedule.

The new station – part of the Cranbourne Line Upgrade in Victoria's Level Crossing Removal project - was constructed by the SE Program Alliance and has delivered eight new kilometres of new track and 50 new weekly train services.

Precast walls, floors, beams, coping stones, lift pit boxes, and stairs were manufactured and installed by National Precast Master Precaster Hollow Core Concrete.

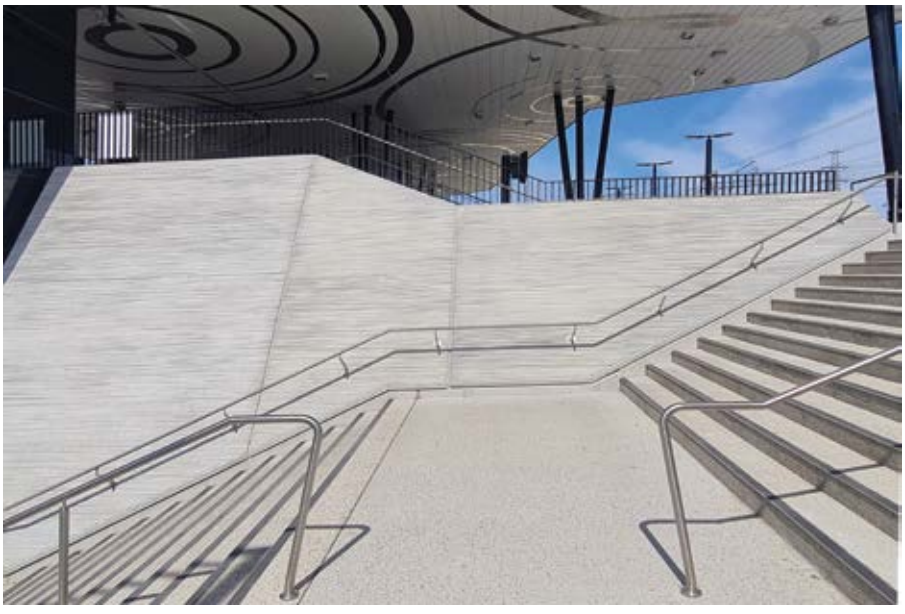
Constructed over just a three-day weekend period, the bridging component that spanned over the underpass used heavily reinforced precast deck slabs that were designed to take train traffic loads. Using precast meant that site access wasn't cut off for weeks and enabled the Cranbourne line to reopen on the Monday Morning in time for the rush hour.

Precast was used extensively above ground as well, with 80 ramp wall panels and 42 rail platform cast using an almond pigment and featuring a horizontal bamboo pattern. Ramp panels tapered in different directions and mitred seamlessly into adjacent elements at varying angles, creating a magnificent geometry.

While aligning the geometry was a challenge, the most architecturally spectacular part of the project was the station's 'Pyramid'. Appearing simple at face value, the two main panels of the 'Pyramid' comprised 27 and 13 faces. To ensure a seamless process, the Alliance proposed that Hollow Core guide the structure's design using their expertise in 3D modelling and precast construction.

According to National Precast's CEO Sarah Bachmann, the impressive outcome and in particular, the exquisite quality that was achieved for Merinda Park Station was only made possible by the Master Precaster's design expertise and technical manufacturing capability.

"A precaster of this calibre who manufactures in an under-cover, controlled factory environment with extensive quality and safety management procedures in place, naturally delivers an outstanding result for the client and end-user alike," says Ms Bachmann.



COBURG STATION PART OF **AWARD-WINNING PRECINCT**

A stunning precast concrete façade that adds depth to the landscaped site and exemplifies the changing daylight conditions, has contributed to the project winning a highly sought-after Victorian Government award.

Coburg Station – with its precast façade manufactured by National Precast Master Precaster Advanced Precast – is a part of the Bell to Moreland project in Melbourne's north. The project is a part of the Victorian Government's Level Crossing Removal Project and was recently awarded a key prize at the *Victorian Premier's Sustainability Award 2022.*

The recently completed project has been awarded the *Industry Leader Award* in the Premier's Sustainability Awards – Sustainable places and destinations category.

As a part of the Project, four level crossings were removed, two kilometres of rail between Bell Street (Coburg) and Moreland Road (Brunswick) were elevated and two new stations were built at Coburg and Moreland. In addition, 2.5 kilometres of open space were created to encourage active transport, innovative landscaping to encourage biodiversity, and co-design for better place-making.

The new Coburg Station features a stunning diamond-stamped façade manufactured with a white oxide mix. Advanced Precast has implemented the use of custom form-liners to achieve the complex embossed façade panels for the building.

Designed by Project architect Wood Marsh, the textured façade changes the building's appearance as it highlights the differing light conditions throughout the day as the sun angle changes. The panels breathe new light into the space, offering a bright and welcoming appearance to commuters.

The Bell to Moreland project incorporates a variety of sustainable features such as energy and water monitoring systems, solar panels at Coburg Station, water-sen sitive urban design, and Woody Meadows planted with Australian natives.

KEEPING PRECAST CLEAN **JUST GOT EASIER**

A new range of revolutionary coatings that mimic how Mother Nature self-cleans surfaces, are now available from National Precast Supplier member ECOTONE.

Longstanding National Precast member ECOTONE – previously known in Australia as Nawkaw – has been supplying staining products to the precast industry and has extended its product range to include protective coatings with multiple environmental benefits.

National Precast CEO Sarah Bachmann says that the company's new product line ECOCLEAN offers functional benefits to precast both internally and externally. Internally, the products clean surfaces to reduce Sick Building Syndrome and purify the air we breathe.

Externally, they have self-cleaning properties to reduce cleaning, maintenance and replacement costs. By protecting against carbonation, they also preserve the as-new look of the precast. Precast concrete with these coatings also helps to reduce airborne pollutants.

"These clever coatings add huge value to precast making it even more of a sustainable solution for our built environment," Ms Bachmann says.

The self-cleaning coatings add to the myriad of precast's sustainability benefits including:

- Use of local and recycled materials;
- Lead to better quality systems in the factory;
- Improved site safety due to less clutter;
- Minimal waste due to factory waste being
- recycled;
- Faster construction delivering economic benefits;
- Locally supplied to support Australian communities;
- Improved durability of structures because of better quality manufacturing procedures; and
- Minimal maintenance required with thermal efficiency.

These revolutionary coatings are being used in a wide range of precast project applications, from the ANZAC Memorial to the Parramatta Leagues Club Carpark, to schools, universities, clubs and houses. More information can be obtained from National Precast's website: **www.nationalprecast.com.au**

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BUILDING BETTER ROADS TO PREVENT ANOTHER $3.8 BILLION BLOWOUT

With the cost of repairing Australia's flood and rain-damaged roads expected to top $3.8 billion, the Australian Local Government Association (ALGA) has joined with the Australian Road Research Board (ARRB) to call for an urgent rethink of road construction, maintenance and funding.

Speaking of behalf of Australia's 537 councils, ALGA President Linda Scott said rebuilding these roads to current standards would only cost Australian communities more in the long term.

"In recent months, thousands of kilometres of local roads across NSW, Victoria, South Australia and Queensland have been severely damaged by flooding, and in some cases have been washed away," Cr Scott said.

"ALGA has estimated the total cost of fixing and replacing these roads is in the vicinity of $3.8 billion, which is roughly the equivalent of Australia's annual foreign aid budget.

"Considering the ongoing impacts of climate change, we can't simply rebuild our local infrastructure – including roads, footpaths and cycleways – to current standards, we need a fundamental shift in the way we fund, deliver and maintain these assets."

ARRB Chief Executive Officer Michael Caltabiano said the extensive damage to large parts of the road system across several states was a major wake-up call and an opportunity to evolve the way Australia's roads are constructed and managed to deliver more resilient outcomes.

"Moisture is kryptonite for roads, and inevitably leads to potholes. This year's floods and torrential rains have caused large scale catastrophic damage to the road systems that connect communities and deliver freight. Now is the time to reassess what innovations are possible to prevent a repeat of this infrastructure emergency," Mr Caltabiano said.

Mr Caltabiano said standards and materials used for constructing Australia's road systems needed to change to improve water resistance and recovery after significant rainfall events.

"Australia houses some of the smartest road technology in the world, and the latest ARRB research shows many recyclables – including tyre rubber – are not only eco-friendly but also create more durable and resilient road surfaces," Mr Caltabiano said.

"ARRB also has a range of state-of-the-art vehicles fitted with lasers and high-tech equipment to measure road conditions at traffic speed. Pinpointing the issues on a road can ensure valuable maintenance dollars are spent in the right place, at the right time."

Cr Scott said while councils appreciate the significant federal government support they receive, they need an increase in Federal Roads to Recovery funding from $500 million to $800 million per year to help invest in new technologies and build more resilient roads.

"ALGA has advocated for betterment funding to be more effectively incorporated into Disaster Recovery Funding Arrangements, and we are pleased the government has indicated they are keen to progress these changes.

"While many councils are facing unprecedented flooding, others in the Northern Territory and northern Western Australia see their roads washed away every wet season, and these councils need more support to break this cycle."

Cr Scott said the Government's new *Disaster Ready Fund* would play a key role in reducing damage caused by natural disasters.

"No amount of innovation can save a road that's underwater, so it's vital we continue to invest in flood mitigation.

"Allocating $200 million per year is a great first step, but we need to continue to grow this investment if we want to effectively safeguard our local towns and communities."

ARRB TRANSITIONS TO NATIONAL TRANSPORT RESEARCH ORGANISATION

The Australian Road Research Board (ARRB) is officially extending its research and expertise across all modes of transport with the launch of the *National Transport Research Organisation* (NTRO) for Australia and New Zealand.

NTRO was launched on December 1 in Melbourne, with more than 250 people from across the industry attending.

The NTRO will create new knowledge that will be used to provide world's best practice across all modes of transport – road, rail, ports and airports – for Australia and New Zealand.

ARRB has more than 60 years' of experience in the road space which will underpin the new NTRO entity, and will continue to lead the way in road research.

But ARRB has been transformed over the past five years to have a genuine focus across all modes of transport, at the same time that Australia and New Zealand's road agencies have transformed themselves into transport agencies with a holistic view of movement.

The Australasian Centre for Rail Innovation (ACRI) formally became part of ARRB in mid-2022 and will lead the NTRO's rail focus.

NTRO Ports and NTRO Airports have also been established for those disciplines.

"NTRO will truly be the one source of truth for Australia and New Zealand Governments and the private sector, delivering solutions to the transport challenges of tomorrow and genuinely shaping our transport future," ARRB and NTRO Chief Executive Officer Michael Caltabiano told the launch at the National Transport Research Centre in Fishermans Bend – home of the NTRO and ARRB head office.

"NTRO's vision is to enable transport agencies to give effect to that change, by providing that central portal for innovation in Australia and New Zealand. It's a big vision and a pretty lofty goal – but we're up for it."

As well as its Melbourne headquarters, the NTRO also has offices in Brisbane, Sydney, Canberra, Adelaide, and Perth. This makes the organisation truly national and reflective of a mode-agnostic road, rail, ports and airports organisation.

Leaders from around the transport industry attended the function, including Victorian Department of Transport secretary Paul Younis and Australian Local Government Association (ALGA) chief executive Matt Pinnegar, who were among the guest speakers at the launch function.

ARRB's transition to the NTRO signals an evolution from a roads-focused entity to one encompassing Australia's entire transport network.

As well as the many innovative projects ACRI is involved with, ARRB's Infrastructure Measurement team is already working in the airports space. It is involved in surveying airport runways around Australia, including many in Western Australia.

Find out more about the NTRO at **www.ntro.org.au**

ACT GOVERNMENT MOVES TO NEW STRATEGIC ROAD MAINTENANCE PROGRAM

The ACT Government will significantly increase road maintenance funding to $153 million over the next four years in a new strategic maintenance program to repair and preserve Canberra's roads for a generation.

The program has been developed based on research undertaken by the Australian Road Research Board (ARRB) to support a new, strategic approach to maintenance, improving safety, supporting freight movements and improving the city's liveability. This research-led approach aims to extend the life of Canberra's existing high-quality roads through proactive resealing, while undertaking more rehabilitation work, including using an up to 150% increase in asphalting.

"Our new road maintenance program represents a 52% increase in expenditure on road maintenance to deliver the good road conditions that Canberra drivers expect," said Minister for Transport and City Services Chris Steel.

"This maintenance program is evidence-based and will have a greater focus on road rehabilitation and use of asphalt, as well as ensuring that we continue our focus on preventative resealing.

"With the annual road resurfacing program now underway, this new maintenance program will extend the life of Canberra's roads by 20 years through additional resealing measures adopted across our rolling roads program. And investing now will reduce road maintenance costs in the long term."

Increased investment in the ACT's annual road maintenance program will now see resurfacing of the network grow by 268,000 square metres a year to cover an area of over 1.26 million square metres resurfaced per year going forward, concentrating on arterial and collector roads. Minister Steel said the changing climate, heavier vehicles, and greater than anticipated ACT population growth had accelerated road degradation and the likelihood of defects such as potholes.

"It's no secret that roads across south-eastern Australia have taken an absolute battering over the past few years with constant La Nina weather cycles," said Minister Steel.

"Since 2020, Canberra has continued to experience heavy and frequent rain events. In October, we experienced Canberra's wettest month since records began, with more than 2,800 pothole repairs undertaken across the Territory in that month alone.

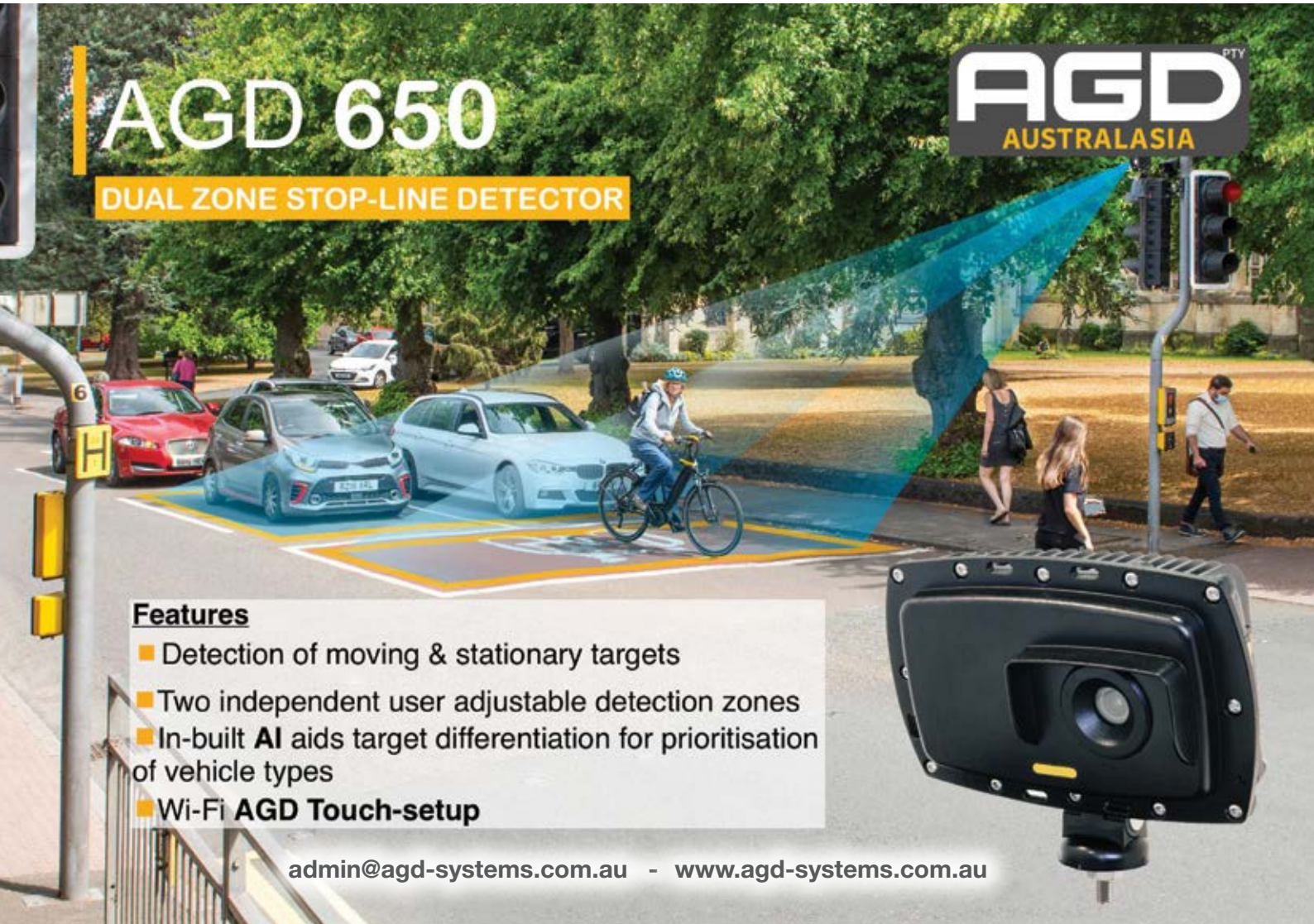
"This long-term program will see smoother, more resilient roads, that result in safer travel and better driveability, meaning Canberra drivers will save on fuel and vehicle maintenance," said Minister Steel.

The new funding includes funding under the Australian Government's *Local Roads and Community Infrastructure Program.*

"Our research looked at the condition of the ACT's roads, and the investment and treatments required to ensure that they are well-maintained over the coming decades," ARRB chief executive officer Michael Caltabiano said.

"Based on our research, the ACT Government has chosen the highest cost and highest quality option which will deliver good road conditions in Canberra over the years ahead."

For more information on the current road resurfacing program, including the daily program and which roads are being resurfaced, visit: **www.act.gov.au/roadresurfacing**



ARRB RENEWS PARTNERSHIP WITH TMR TILL 2028

The Australian Road Research Board (ARRB) is proud to announce its renewed partnership with the Queensland Department of Transport and Main Roads (TMR), extending the *National Asset Centre of Excellence* (NACOE) research program through to 2028.

NACOE is an initiative between TMR and ARRB that aims to unlock innovation and maximise knowledge transfer through different projects to improve and maintain Queensland's Road network.

The research program had its inception in 2013, and since that time has been involved with various successful projects, including the introduction of High Modulus Asphalt (EME2) and the increased use of recycled materials in pavements.

Neil Scales OBE, Director General, Department of Transport and Main Roads, said he is pleased to see the research program extend until 2028.

"Through TMR's agreement with ARRB we have access to some of the nation's leading industry experts, as well as formalising our applied research program, the National Asset Centre of Excellence (NACOE)," Mr Scales said.

"I look forward to continuing this successful partnership as we explore new innovations in the years ahead," he added.

ARRB National Director for Strategy & Innovation, Matthew Bereni, said that the renewed partnership would continue to deliver important work that would benefit all Queenslanders through safer, accessible, more resilient, and more sustainable transport infrastructure in Queensland.

"The NACOE partnership gives ARRB's leading experts an opportunity to develop and implement cutting-edge technology in Queensland."

"TMR's visionary leadership in the areas of road safety and sustainable transport infrastructure technology should be commended," Mr Bereni said.

ARRB looks forward to continuing its collaboration with local and state governments to improve Australia's road and transport network in all states and territories.

Find out more about NACOE by visiting the website: **https://www.nacoe.com.au/**

Seated (L-R): Neil Scales OBE, Director General, Department Transport and Main Roads; and Matthew Bereni, ARRB National Director for Strategy & Innovation; with Standing (L-R): TMR Chief Engineer, Dennis Walsh, and ARRB Principal Research Engineer, Joe Grobler.

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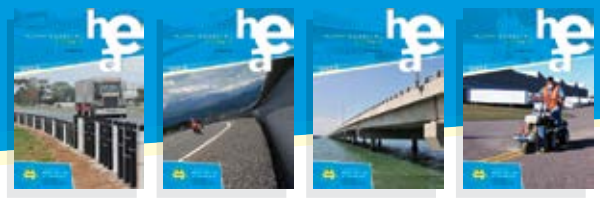

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