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AUGUST 2020

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TRANSPORT  
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SINCE 1968

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**SMART CUSHION**  
Speed Dependent Crash Attenuators

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



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

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

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

So, whether it's TL-2 or TL-3, when it comes to selecting a fully MASH tested, passed and eligible TMA that has also been **ASSESSED, APPROVED & RECOMMENDED FOR ACCEPTANCE** throughout Australia by ASBAP, the only name you need to remember is Scorpion® from A1 Roadlines.



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# contents

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- 2 Editor's Column
- 4 Industry News
- 8 Cover Feature: SMART CUSHION  
Speed Dependent Crash Attenuators
- 14 Recycled Roads
- 16 ACRS Feature - Exploding the Myths
- 22 National Precast Feature
- 26 TMAA News
- 28 Equipment Feature
- 34 ITS Feature
- 36 Case Study: Concrete Fibres for  
Rail Sleepers
- 42 Focus on Bridges



14



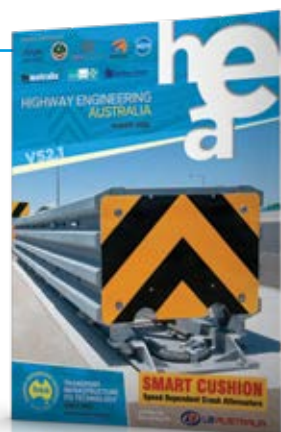
22



30



42



## About the Cover

Lauded by road safety experts, engineers, road authorities and emergency services alike, SMART CUSHION has been directly credited with saving lives and reducing serious injuries in numerous major impacts. SMART CUSHION has also been credited with delivering a massive reduction in both maintenance and repair costs following impacts.

► Turn to **Page 8** for the full story.



# Losing the Commute...

## Is it time to rethink our daily travel habits?

Dear Readers,

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

For example, prior to the COVID-19 pandemic, the majority of people in Australia's capital cities (and an alarming number of major regional centres) were faced with an ever-increasing daily commute to their place of employment. Indeed, for commuters in our five major capitals, a daily commute time of 30 minutes would be considered 'a dream run' with 2019 research showing daily average commute times of 60 minutes or more. That's a minimum of 5 hours per week (or 200+ hours per year for an average work year) just to get to and from work.

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

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

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

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

Now, before I continue, I do want to point out that for many, having to work from home was both onerous and challenging on many levels, and as such, I do not wish to suggest that eliminating office space altogether is desirable, or for that matter, even an option. There is also the matter of existing buildings and infrastructure. One cannot simply 'abandon the cities!' As well as being completely wasteful and pointless, it would also result in an economic crisis for the building, construction, and real estate sectors.

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

While the concept of *'The 15-minute City'* (where cities are designed so the majority of residents can live within 15 minutes of their workplace, essential shopping and recreation facilities) is not new, the glimpse of a less polluted and less congested world offered by the COVID-19 shutdowns has once again brought the concept back to the fore, with many arguing that it delivers a significant

amount of benefits for residents and the planet alike.

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

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

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



**Anthony T Schmidt**  
Managing Editor





## QuadGuard® M10

### Crash Cushion

**MASH COMPLIANT**

#### Reusable Non-Gating Redirective Crash Cushion

The QuadGuard® M10 is a redirective, non-gating crash cushion that consists of an engineered steel nose and crushable, energy absorbing cartridges surrounded by a framework of steel Quad-Beam™ panels. The system is tested to the Manual for Assessing Safety Hardware (MASH) Test Level 3. It can be used to shield fixed objects of 610 mm wide.

The QuadGuard® M10 system utilises two types of cartridges in a configuration designed and tested to address vehicles as defined by MASH for both lighter cars and heavier, high centre-of-gravity vehicles.

#### Advantages

- Self-supporting steel nose.
- Tension strut backup with Monorail guide stabilisers.
- Anchorage in concrete or asphalt (does not use anchoring chains or tension cables).
- High strength Quad-Beam™ panels.
- Damaged cartridges are replaceable



## ET-SS

**MASH COMPLIANT**

**Front Anchored Technology**

### MASH End Terminal

#### W-Beam End Treatment for End-on Impacts

The MASH compliant ET-SS is the next generation of guardrail end terminal and is compliant to Test Level 3. The ET-SS system uses a proprietary head with front anchored technology to anchor the WBeam from the loads exerted on the rail during an end-on or side vehicle impacts on the terminal. This front anchor also minimises the deflection of the downstream guardrail system to help contain and redirect an errant vehicle.

#### Assembly Advantages

- Splices at mid-span of the posts allow for easy assembly.
- Vertically compressed rail is flattened and maintains connection to unit for quicker repair and clean up.
- Slim design of the impact head, improving shy-line offset.
- Compatible with various proprietary and public domain guardrail systems.
- Protective cover available for vulnerable road users, ideal for shared use paths.



Optional System Offset up to 610mm over 15.2m

Head Width: 178mm

Available in TL3 and TL2 configurations

Length of Need: Starts at Post #3

Optional protective cover available for vulnerable road users





## TORSUS offers new bus configuration to maintain social distancing for passengers

TORSUS is now offering passengers of the PRAETORIAN, a heavy-duty, off-road bus, protection from COVID-19 (Coronavirus) with a new adaptive seating option that meets international social distancing guidelines.

Discussions with TORSUS distributors around the world indicated that when much of the global community had to pause, multiple industries such as mining, remained operational but needed to ensure the safety of its staff to and from work sites.

To support these industries TORSUS is proud to introduce the 'Anti-COVID-19' social

distancing pack for the TORSUS PRAETORIAN. By taking advantage of the vehicle's modular interior configuration TORSUS engineers have been able to ensure that passengers can be transported safely while social distancing is adhered to.

In the 37-seat capacity bus, the double row seats on each side can be easily removed leaving only a single coach seat on each side. Each seat is then encased in its own protective pod crafted from 3.5mm thick clear plastic, specifically moulded to slot into the now vacant seat rails without causing any

damage. When social distancing is no longer required, the bus can be simply reverted to its full capacity interior with no unsightly holes or damage.

The TORSUS PRAETORIAN was designed to transport personnel and equipment safely across the world's harshest environments. The bus is based on an upgraded heavy-duty MAN chassis and is powered by MAN engines and drivetrain. From the Michelin off-road tyres, to the military grade coating on body parts, PRAETORIAN is engineered to take on any terrain, in any conditions, anywhere in the world.

For further information, please visit the website: <https://www.torsus.eu>

### ABOUT TORSUS

TORSUS is breaking new ground by designing, developing and manufacturing the world's toughest off-road buses, including the iconic PRAETORIAN and TERRASTORM heavy-duty 4x4 models. The TORSUS brand was released in 2016, developing and manufacturing heavy-duty off-road 4x4 buses in a purpose-built factory in Slovakia.

TORSUS operates and sells in global markets to customers in heavy industry, utility and government service sectors, with warranty and service backup provided in all markets. TORSUS works in partnership with MAN and VW on key chassis and powertrain technology.

## Charlotte is bridging the gender gap in engineering construction

Steel cap boots and a hard hat is a far cry from her marketing background, but Gerringong local Charlotte Boreham couldn't be happier working on the \$342 million Nowra Bridge Project.

Charlotte made a career switch to engineering construction after completing a *Diploma of Construction Project Management* at TAFE NSW St George. That was only the start of changes for Charlotte, who then secured a place in Fulton Hogan Construction's Graduate Program and re-located from Sydney for the opportunity to work on the major project.

Charlotte is fulfilling a growing need for more female Engineers, who made up only 13% of the workforce in 2016. With engineering construction activity rising by 6.7 per cent in the year to March 2019 following an increase of 24.9 per cent in the previous year, there are many opportunities for more women to enter a non-traditional industry.

Charlotte's advice for other women thinking about making a career switch is, "Give it a go, make the change, study and gain more knowledge. My Diploma of Construction Project Management taught me practical

skills I could use across all industries, not just engineering."

"I love my new career, every day is different and I am constantly learning. I feel lucky to work for a company that values diversity and supports graduates in gaining valuable experience," Charlotte added.

Fulton Hogan's Graduate Leadership Program offers successful applicants the opportunity to join business streams in Construction, Infrastructure Services, Utilities and Finance.



TAFE NSW Building & Construction Project Management Head Teacher Stanley Ivanov described Charlotte as an extremely dedicated and talented student.

"Charlotte is a great example of what how TAFE NSW students can be whatever they want by learning the skills they need to get a head start in the project management industry."

"It was an incredibly brave decision for Charlotte to give up on a well-established career in marketing, but she is a fine example that career changes are within reach if you're willing to work hard," Mr Ivanov said.

With the Federal and State Governments supporting nearly 5,500 jobs across New South Wales through a joint \$1 billion investment in shovel-ready infrastructure projects and road safety upgrades, there is increasing demand for skilled construction workers, from brick layers to project managers.

TAFE NSW has a range of Building Construction courses. For further information, including course content, dates and enrolments, please phone 131 601 or visit: [www.tafensw.edu.au](http://www.tafensw.edu.au)



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## The TOSA e-bus: Innovative flash-charging technology for sustainable e-mobility

Developed and manufactured by ABB Switzerland, the TOSA e-bus provides a viable solution for urban mass transit, making catenaries, large and heavy batteries, range and schedule limitations as well as greenhouse gas and noise emissions a thing of the past.

ABB has developed and optimised its flash-charging technology and onboard traction equipment for high-frequency and high-capacity bus routes. By selecting the appropriate technologies and ensuring optimal energy management, the system can save as much as 1,000 tons of CO<sub>2</sub> on a bus line covering approximately 600,000 kilometres per year. In addition, the e-bus' energy costs are around 30 percent below those of a diesel bus.

### Smart energy management

The flash-charging technology allows the bus to take on energy at selected bus stops along the route, reducing battery size and weight, and freeing space to accommodate up to 143 passengers. The energy from the charging equipment is stored in compact roof-mounted batteries, along with the vehicle's braking energy, powering both the bus and its auxiliary services, such as interior lighting.

The TOSA e-bus system uses three types of feeding stations:

- Flash-charging stations at selected bus stops providing a short high-power boost at 600 kilo-watt (kW) for 15 seconds (s).
- Terminal feeding stations delivering more pro-longed charges of 4-5 minutes (min) at 400 kW.
- Depot stations applying a longer charge to provide the energy required to travel between the line and the depot location. Buses are recharged at 45 kW for about 30 min.

### Flexible drivetrain solutions

ABB's innovative drivetrain system includes a highly integrated traction and auxiliary converter for roof-mounting. The traction converter is of compact design and highly energy-efficient. The permanent magnet traction motor is especially designed for e-bus applications. The Lithium-titanate battery unit is capable of being rapidly charged and discharged.

The solution is completed by the energy transfer system (ETS), a laser-controlled moving arm that docks into the overhead receptacle of the flash-charging station in less than a second, making it the world's fastest connecting system.

High speed energy transfer system is fully automatic so that the driver is not distracted by the connection process and can focus on passengers, pedestrians and traffic. Importantly, the system is suitable for use in all ambient conditions and is resistant to dust and pollen pollution, providing for year round operation, even in areas with heavy snow, rain, hail, fog and ice.

### Efficiency vs autonomy

The TOSA concept prioritises efficiency over autonomy. This implies smaller onboard batteries and a lighter more energy-efficient bus, allowing for a higher passenger capacity.

Flash-charging stations at selected bus stops along the route recharge the buses' batteries while passengers are embarking and disembarking. The opportunity-charging principle minimizes infra-structure investments while ensuring optimal and safe operation. It also allows for greater flexibility in route layout and integration with other public transport systems including tramways.

## Hydrogen vehicle refuelling deal could be green light for Australian fuel cell electric vehicles

hydrogen vehicles are a step closer to taking over Sydney's roads after leading energy infrastructure company, Jemena, signed a new deal to supply Australia's emerging zero emission vehicle industry with renewably generated green hydrogen.

Jemena has committed, through a Memorandum of Understanding (MOU) with Hyundai Australia and Coregas, to produce and deliver hydrogen gas to Hyundai's Macquarie Park headquarters from early 2021.

Jemena's Managing Director, Frank Tudor, said the deal will make hydrogen gas, generated from solar and wind power, available to the vehicle industry.

"A lack of critical refuelling infrastructure is regularly cited as a hand-brake to hydrogen vehicle sales. Our agreement with Hyundai and Coregas releases some of that pressure and is an opportunity to demonstrate that renewably generated hydrogen gas can be made directly available to the vehicle and transport sectors," said Mr Tudor.

"The MOU also signals the wider community benefits of our Western Sydney Green Gas project and demonstrates the value of renewable gas to Australia's transport industry."

*Fuel Cell Electric Vehicles (FCEVs)* combine hydrogen and oxygen to produce electricity, which runs the motor. With a range of approximately 650 kilometres, hydrogen powered FCEVs can travel much further than pure Electric Vehicles. As part of the deal, Coregas will provide the compressor, pipework and connectors for filling and discharging hydrogen.

Mr Tudor said hydrogen gas for transport will be generated as part of Jemena's \$15 million Western Sydney Green Gas project (which is being co-funded on a 50 per cent basis by ARENA). In addition to supporting the hydrogen vehicle industry, the project will also produce hydrogen from solar and wind power and test how hydrogen gas can be stored and used across Jemena's New South Wales gas network.

"We are demonstrating that electrolyzers not only produce safe and green hydrogen gas to blend with natural gas for home appliances, but that they also enable hydrogen to be made available for zero-emission transportation," Mr Tudor said.

For more information visit: [www.jemena.com.au](http://www.jemena.com.au)







## Over 13 million vehicles recalled globally in first half of 2020

Data acquired by *finbold.com* indicates that approximately 13,362,759 million vehicle units have been recalled globally by different manufacturers between January 1st and July 13, 2020. The recalls are mainly due to safety concerns.

This year, Toyota has the highest number of recalls at about 3.95 million followed by Ford at 2.9 million. Volvo comes third with 2.8 million recalls while Fiat Chrysler Automobiles lies in the fourth slot with 1.74 million recalls.

Honda Motors is fifth with about 1.4 million recalls.

KIA's 244,000 recalls places it in the sixth spot followed by Hyundai at 207,000. Nissan had 49,225 recalls followed by another Japanese manufacture Mazda that has 24,000 recalls.

Germany's Volkswagen has recalled 16,098 vehicles followed by America's electric vehicle manufacturer Tesla at 15,000. Bentley has recalled 6,000 vehicles. BMW and McLaren had one of the least recalls at 3,800 and 2,763 respectively.

The research acknowledges the impact of the current crisis on the vehicle recalls. According to the research report:

"The over 13 million vehicle recalls

were done mostly during the coronavirus pandemic, a period when social distancing was being advocated to contain the health crisis. At the same time, some manufacturers had scaled down their operations due to the economic impact of the pandemic. This factor might affect the time-frame when these vehicles are returned to owners."

The *finbold.com* research also reviewed the leading auto and truck manufacturers worldwide in sales revenue. Toyota motor occupies the top spot at \$280.5 billion followed by Volkswagen Group at \$275.2 billion. Daimler had net revenue of \$189.2 billion followed by Ford Motor at \$149.9 billion. Honda Motor recorded the fifth highest sales revenue at \$142.4 billion.

In the sixth spot, General Motors recorded a revenue of \$137.2 billion followed by China-based SAIC Motor at \$121.1 billion.

United Kingdom-based Fiat Chrysler Automobiles registered a revenue of \$121.1 billion while BMW Group had returns of \$116.6 billion. From the list of over-viewed vehicle manufacturers, Nissan Motor had the least revenue at \$96.3 billion.



# GS6 Tempest™

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- Choice of Cab Chassis
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# SMART CUSHION

Speed Dependent Crash Attenuators

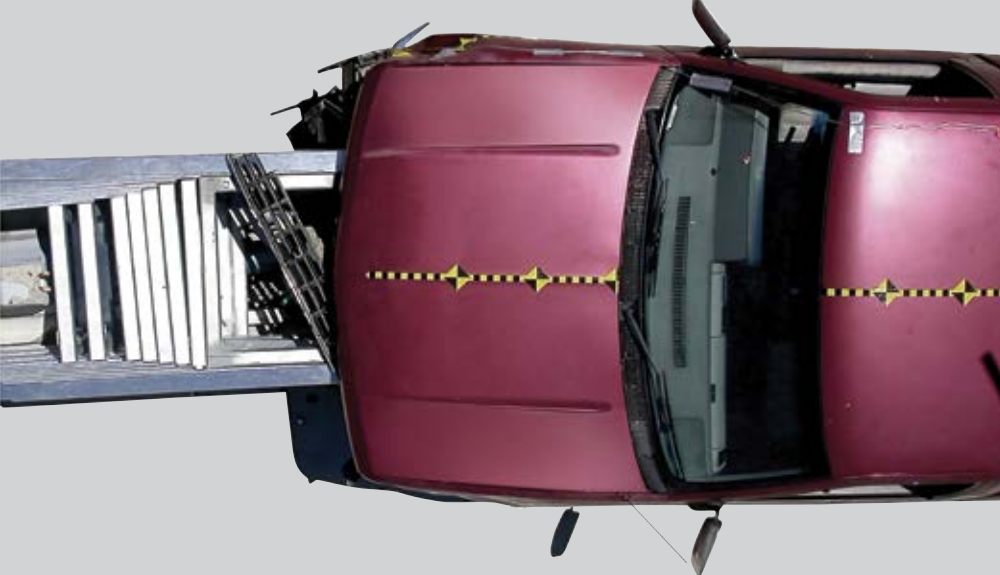
# SAVING

 **LIVES ✓  
MONEY ✓  
TIME ✓**

In the five years that have passed since the first **SMART CUSHION** Speed Dependent Crash Attenuator was installed in Australia, these remarkable road safety devices continue to go from strength to strength, with over 100 units now installed at key locations across Australia.

Lauded by road safety experts, engineers, road authorities and emergency services alike, **SMART CUSHION** has been directly credited with saving lives and reducing serious injuries in numerous major impacts. **SMART CUSHION** has also been credited with delivering a massive reduction in both maintenance and repair costs, as well as the time taken to repair and reinstate these critical safety barriers back to full operation following an impact.





speed. The SMART CUSHION is an interactive variable force attenuator based on the vehicle speed, ensuring low *g* forces for the occupants.

The hydraulic porting in the cylinder ensures that in the event of an impact into the attenuator that is equal to or less than the equivalent force of a MASH TL3 or TL2 impact (depending on the model), the vehicle will stop before it reaches the end of the cushion's usable length.

When the SMART CUSHION attenuator is impacted on the front end, the energy of the impacting vehicle is dissipated in a responsive manner throughout the entire machine to give the vehicle occupants the safest ride-down experience.

## A CRASH CUSHION WITHOUT ANY 'CUSHIONS'

As the world's only speed-dependent crash attenuator, SMART CUSHION's design is unlike any other crash attenuator on the market. It is the only barrier design that absorbs all the impact energy without deforming elastomeric materials, damaging the attenuator or rebounding the vehicle. SMART CUSHION dissipates energy both by mechanical and by hydraulic means, with three interacting processes working simultaneously to safely reduce the impacting vehicle's momentum.

Paul Hansen, Managing Director of road safety systems and engineering specialists – and SMART CUSHION's exclusive Australian distributor – LB Australia Pty Ltd, explained:

"The SMART CUSHION Speed Dependent Crash Attenuator has several advantages over all other crash cushions."

"Whereas other cushions rely on 'cushions' – be they plastic 'boxes' or barrels of composite layers of plastics – the SMART CUSHION is a crash cushion without any 'cushions'," he said.

"The SMART CUSHION attenuator is a really a machine by any other name – rather than a cushion. It absorbs impacting energy through a combination of mechanical and hydraulic devices: devices that are simply and safely reset to be ready for the next impact," he added.

There are two SMART CUSHION models to suit different road speed classifications and traffic mix. Both the SMART CUSHION SC100 and SMART CUSHION SC70 have been successfully tested to MASH-2016 Standards, with both models have been ASSESSED, APPROVED & RECOMMENDED FOR ACCEPTANCE throughout Australia by ASBAP (Austroads Safety Barrier Assessment Panel).

The most common model is the SC100 which has been successfully tested to MASH TL3 requirements (vehicle of up to 2,270kg travelling at 100km/h). The other model, the SMART CUSHION SC170, has been successfully tested to the requirements of MASH TL2 (vehicle of up to 2,000kg travelling at 70km/h). The SC170 is commonly

used in urban areas and on lower speed roads.

Unlike the old-style attenuators, the SMART CUSHION attenuator rarely reaches maximum stopping resistance unless a vehicle is traveling at the maximum design

## WHERE DOES THE IMPACT ENERGY GO?

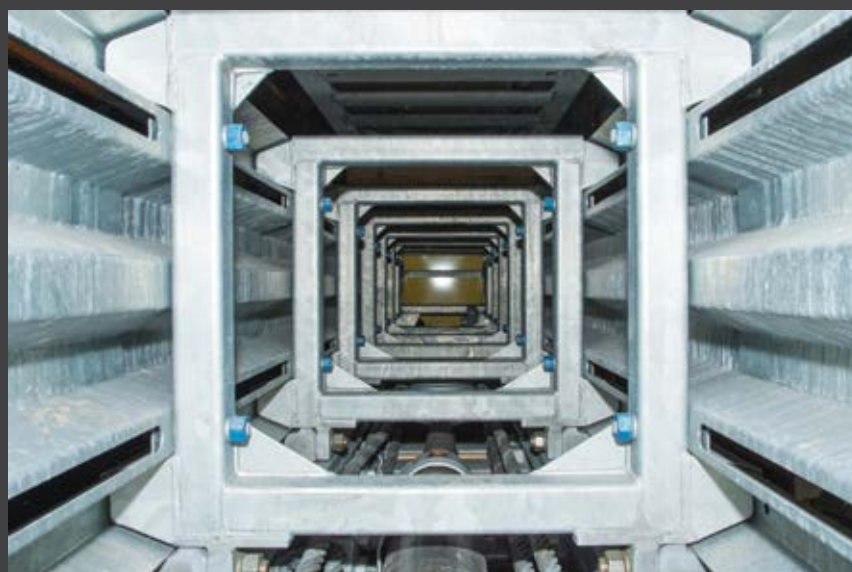
The internal parts of a SMART CUSHION are few. To look down the middle of the frame there are no plastics that deform and there is no steel that fractures. Energy is not absorbed in violent destruction or deformation.

When you look down the compacting frame of the SMART CUSHION you see nothing but a void from start to finish – a void outlined by the regular square shape of the steel frames and the steel plates adjoining those frames.

With SMART CUSHION, impact energy is simply and safely absorbed, not stored. The steel frames slide and do work absorbing part of the energy however, the primary function of the sled is to energise the mechanisms in the base of the SMART CUSHION to absorb energy. The base of the unit is protected from the impacting vehicle that causes the frames to move.

The base houses a large wire rope drawn around immovable sheaves and then attached to a hydraulic cylinder with no return spring. The impact energy is dissipated in the cylinder, where the energy causes oil in a ported internal cylinder to be displaced under pressure to the lower pressure of the outer cylinder. There the displaced oil stays safely stored until the piston is retracted and the SMART CUSHION system is reset.

It is a simple system and the photo tells the story.







### STACKING UP THE SAVINGS

While in these days of tight budgetary constraints and ever-increasing demands to 'do more with less' it may be tempting to opt for a product or solution with a lower initial cost, when it comes to road safety barriers, 'whole-of-life' cost benefit analysis is a critical consideration.

*Put simply, low initial cost does not always equate to getting a good return on the investment.*

This is particularly true for impact protection systems, which, by their very nature, are installed in locations where they are likely to get damaged and are therefore extremely likely to require repairs and/or replacement parts following a vehicular impact.

With that in mind, what may appear at the outset to be a 'better value' solution can, in fact, end up being an extremely expensive selection, with repair costs quickly adding up to multiples of the initial purchase price.

Put simply if every impact results in a majority or even total replacement of the unit, the perceived initial savings of a lower purchase price can soon disappear – and the costs will continue to escalate... year after year!

SMART CUSHION has set a new benchmark in what road safety experts regard as 'good value' in crash cushion selection. Indeed, when it comes to spare parts and reinstatement costs following impacts, SMART CUSHION has truly proven itself to be in a league of its own – both in Australia and internationally.

## PROTECTION FROM ALL DIRECTIONS

With side angle impacts representing such a high proportion of total impacts into safety barriers and crash cushions, performance during side impacts is critical – not only in terms of protecting vehicle occupants, but also in terms of the amount of damage sustained by the crash cushion.

**SMART CUSHION's unique design allows it to withstand a MASH TL3 rated impact from all directions – front, side-on and even reverse angle during contra-flow – with no structural damage.**

The use of the steel frame base pinned with 48 anchor bolts (for SCI100 unit) and the square rib design of the side panels – which are fabricated from 10-gauge (3.4mm), 60ksi (414MPa) minimum yield steel with a G90 galvanized coating for maximum service life even under the harshest operating conditions – means that it is extremely rare for the side panels to suffer any damage. Indeed, the greater majority of side-angle impacts into SMART CUSHION units result in no damage and do not require a maintenance crew to attend.

**Pictured right: Reverse angle / side impact test using a 2000kg vehicle impacting at 100km/h at a 20° impact angle resulted in NO STRUCTURAL DAMAGE**







***After 59 impacts in Australia, the average cost for each reset was \$169. In addition, the average reset time for a SMART CUSHION following an impact is less than 60 minutes, generally with a one-person crew.***

As an example, in 90% of all impacts in Australia, the only spare structural parts needed for repairs are 2 shear pins (COST <\$5). After 59 impacts in Australia, the average cost for each reset was \$169. In addition, the average reset time for a SMART CUSHION following an impact is less than 60 minutes, generally with a one-person crew.

Together with the significant reduction in labour and traffic management costs offered by SMART CUSHION following an impact, the speed and ease with which the units can be reset also ensures that they are able to be reinstated into active service in the shortest possible timeframe, thereby delivering maximum protection for all road users and minimising exposure for repair crews.

Not surprisingly, with post-impact repair costs such as these, an ever-increasing number of road engineers and safety experts are now looking at 'Whole-of-Life' cost rather than just the purchase price when assessing the true 'value' of impact attenuating barriers.

## FEATURES & BENEFITS

Approved for use in both Permanent and Temporary (work-zone) locations  
SMART CUSHION Speed Dependent Crash

Attenuators deliver a range of benefits, including:

- **Lowest repair cost** of any roadside crash attenuator in existence
  - Only **variable force attenuator in existence** gives the safest ride-down based on speed
  - **Least amount of spare parts needed** of any attenuator in existence
  - **Fastest reset** of any attenuator
  - **No parts needed for stock requirements** (other than \$1 shear pins)
  - Designed for **High Frequency impact zones**
  - Designed **low maintenance**
  - Designed for **rapid repair**
  - Designed for **rapid reset**
  - Designed to require **minimum spare parts**
  - Designed for **safety for vehicle occupants**
  - Designed for **safety for the work crew** in the work zone
  - Frontal impact energy absorbed **without vehicle rebound**
  - All **impact energy safely dissipated within the system** to protect repair crew
  - All steel system **easy system to inspect** for maintenance records
- NOTE:** No elastomeric components to be inspected and recorded for service condition

- **Solid and secure base** prevents system from twisting (saving replacement cost)
- **Rigid sled frame** which provides for straight-back collapse with no racking of system.
- Likely 20-year working life (provided impacts are within MASH standard test conditions)
- Tapered design to allow stress-free collapse of the system and **easy reset**
- Designed to provide **value for all stakeholders**

Importantly, with over 100 units deployed in Australia over the past 5 years, and thousands of units deployed internationally over the past 15+ years, SMART CUSHION's proven performance in the field is unrivalled – especially in locations where the SMART CUSHION has been impacted multiple times. This includes one location in Australia where a SMART CUSHION has been impacted over a dozen times, and one high-speed location in Reno, Nevada, USA where one SMART CUSHION has been impacted 48 time in 48 months! In each impact, the SMART CUSHION units performed as expected and only required minimal spare parts to return to full service.



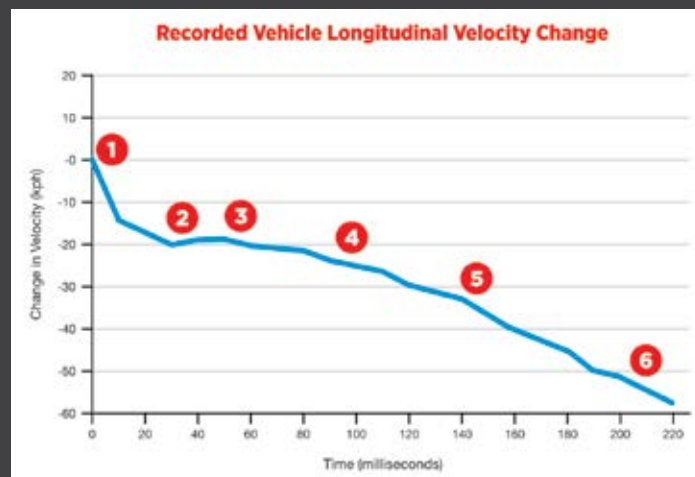


## PROTECTION FOR OCCUPANTS

SMART CUSHION's unique variable force capability has been specifically designed to provide the safest ride-down based on speed – thereby maximising protection for the occupants of the impacting vehicle. This demonstration impact at the 2015 ASPACI Conference in Sydney provided a clear demonstration of these capabilities.

The demonstration, which involved a 2012 Holden Barina Spark weighing 967kg impacting the SCI70 TL2 SMART CUSHION at 67km/h head-on (impact angle 0°) resulted in no significant damage to the vehicle's passenger cabin. The SMART CUSHION successfully absorbed and dissipated the impact energy, reducing the ride-down deceleration forces and bringing the impacting vehicle to a safe stop.

The SMART CUSHION suffered no structural damage whatsoever. The only damaged parts were the two ¼" shear bolts which are designed to give way during an impact. The SMART CUSHION was able to be reset and reinstated to full operational capability in under 30 minutes with a total replacement parts cost of less than \$5.



**DISCLAIMER:** The ASPACI impact was not intended as an academic exercise. It was only designed and conducted to provide a live demonstration of the SCI70 SMART CUSHION functioning during a MASH TL2 impact. Whilst the data collected and shown in the graph is accurate, the positioning of images along the impact timeline is approximate due to the frame speed limitations of the camera being used.

## PERFORMANCE BEYOND SPECIFICATION

Whilst the SMART CUSHION SCI100 has been successfully tested and certified to MASH16 TL3 standards (impact by a vehicle of up to 2,270kg travelling at 100km/h), there are an ever-increasing number of incidents around the world where SMART CUSHION units have provided life-saving performance way beyond their design specifications.

In this instance along a high-speed section of highway in the US state of Nevada, a fully laden semi-trailer weighing over 23,500kg impacted an SCI100 SMART CUSHION head-on with an estimated impact speed of 90-100km/h.

Despite the fact that the force of this impact was between 9 and 11 times the required performance required under MASH TL3 standards, the truck driver was able to walk away from the impact with only minor injuries!



For further information on the SMART CUSHION crash attenuator, please visit the website: [www.smartcushion.com.au](http://www.smartcushion.com.au) or contact LB Australia Pty Ltd, Ph: (02) 9631 8833 or Email: [roadsafety@lbaustralia.com.au](mailto:roadsafety@lbaustralia.com.au)





# PAVEMENT RECYCLERS

SUBSIDIARY OF STABILISED PAVEMENTS OF AUSTRALIA PTY LTD

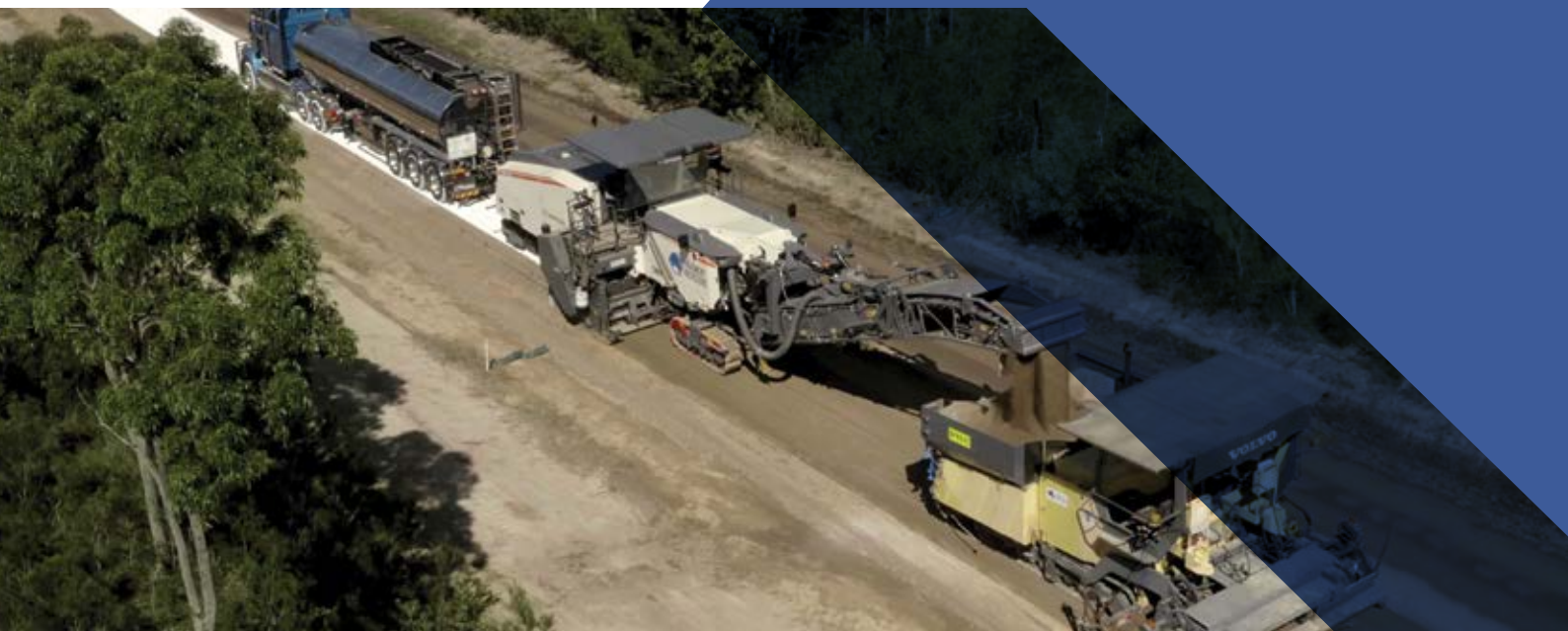


## Foamed Asphalt

- Insitu Recycling
- Paver Laid
- Forward Moving Train
- Single Pass
- Controlled Levels
- Accelerated Construction Process

Foamed Asphalt combines insitu foamed bitumen technology with the single pass, paver laid method, similar to conventional asphalt, in a forward moving train. Alongside many improved features on current conventions, the single pass, paver laid aspect is a unique key advancement in the insitu recycling process in Australia. **Up to 100% of the existing road can be recycled** and turned into a superior and higher quality product without importing new material or disposing waste to landfill.

- Superior Performance
- Innovative Construction
- Cost Effective Solution
- Environmentally Sustainable







# BACK TO BASICS WITH INNOVATIVE PAVER LAID INSITU RECYCLING

Whilst there have been creative concepts to increase the use of recycled materials in our roads, Pavement Recyclers are set on raising the bar through innovative advancements on fundamental recycling practices.

**Pavement Recyclers** are a new subsidiary division of Australian-owned company, Stabilised Pavements of Australia. Since its inception in 1984, Stabilised Pavements of Australia has been leading the road rehabilitation industry in all facets of innovation, from plant to geotechnical engineering solutions.

The company is no stranger to the introduction of new processes and technologies, and encountering the inevitable barriers that test new concepts, before they are accepted and embraced as common-practice.

One such instance is how the business played a key part in the reintroduction of insitu foamed bitumen stabilisation to the Australian market. Now Pavement Recyclers are excited to introduce to Australia the next instalment of pavement recycling – Foamed Asphalt.

Foamed Asphalt is a completely new method of recycling existing road pavement materials. The process combines the insitu pavement rejuvenation treatment with foamed bitumen incorporated using a single pass, paver laid operation, similar to conventional asphalt. All operations occur in just one pass of the construction train.

This process is the ultimate in recycling, as up to 100% of the existing road can be recycled and turned into a superior and higher quality product without the many downsides of importing new materials to site and disposing existing materials to landfill.

The Foamed Asphalt process is only possible using machinery specially designed to undertake insitu pavement rejuvenation in conjunction with discharging the recycled material into a paver for placement. As such, Pavement Recyclers have imported a purpose-built Wirtgen 380CR. The company

acquired this specialised machine and associated plant, which included carrying out modifications to perfect the process.

Alongside many improved features on current conventions, the paver placement aspect is a key advancement unique to any insitu recycling process in Australia. It enables many construction and quality advantages including improved layer thickness control, assists material uniformity through secondary mixing, and ensures precise and controlled surface levels thereby eliminating the need for a grader.

The purpose-built Pavement Recycler offers interchangeable working widths spanning 3.2m, 3.5m and 3.8m. These significant working widths surpass any working widths of conventional stabilisers or profilers. However the screed of the paver is capable of achieving greater widths, easily up to 5m. The extensive and variable working





and placement widths offer construction versatility, road widening and high production rates unlike any other process.

Pavement Recyclers are setting themselves apart from the rest in the recycling movement through a back-to-basics approach centred on maximising the recycling potential of the most obvious yet overlooked materials available in all road pavements – the existing road pavement materials.

General Manager of Pavement Recyclers, David Berg, says “It’s a single pass process with a paver finish that recycles all of the pavement material. As recycling is the global direction, this process will become commonplace.”

“Asset owners have the opportunity to revolutionise the way pavements are rehabilitated and maintained. Through this technology Pavement Recyclers can deliver a pavement with structural integrity and environmental sustainability with economic savings.”

Beyond the benefits of the process, the foamed bitumen technology used in Foamed Asphalt pavements is a proven and reliable recycling treatment that is not only widely recognised and used throughout Australia, but has been found to be superior to comparable alternatives.

For instance, a foamed bitumen trial on the Kwinana Freeway (in Perth, Western

Australia), featured in Austroads Research project TT1825, showed average rut depth after 5 years in operation was around 2 millimetres. The report also acknowledged there was less rutting and slower rate of deformation than conventional asphalt pavements and outstanding resilience to high pavement temperatures of up to 60 degrees in comparison to asphalt.

Pavement Recyclers is well underway with Foamed Asphalt operations with projects undertaken for local government in New South Wales, Victoria and Queensland so far.

The first project was completed at Chain Valley Bay Road for Central Coast Council.

Central Council Director Roads Transport Drainage and Waste, Boris Bolgoff said the exciting new road construction technique will be revolutionary in Australia.

“At Central Coast Council we embrace new technology to deliver for our community and we jumped at the opportunity to work with our industry partner to use this exceptional road construction system for the first time in Australia,” Mr Bolgoff said.

“We could not have been happier with the outcome – the process was quicker than conventional methods, cost effective, significantly reduced truck movements, and my favourite –100 percent recycling of the existing pavement.”

For further information, please visit:

**[www.pavementrecyclers.com.au](http://www.pavementrecyclers.com.au)**





ACRS CERTIFICATION OF WELDED STEEL SECTIONS TO AS/NZS 5131

# EXPLODING THE MYTHS




PHILIP SANDERS, CEO, ACRS



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

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





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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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



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

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

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

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

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

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

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







## ACRS 2020 CERTIFICATES AMENDED FOR ADDITIONAL CLARITY AND AVOIDANCE OF MISUSE

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

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

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

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

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



## HOW DO I SPECIFY ACRS CERTIFIED STEELS?

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

### FOR STRUCTURAL STEELS

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

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

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

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



### FOR STEEL REINFORCING MATERIALS

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

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

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

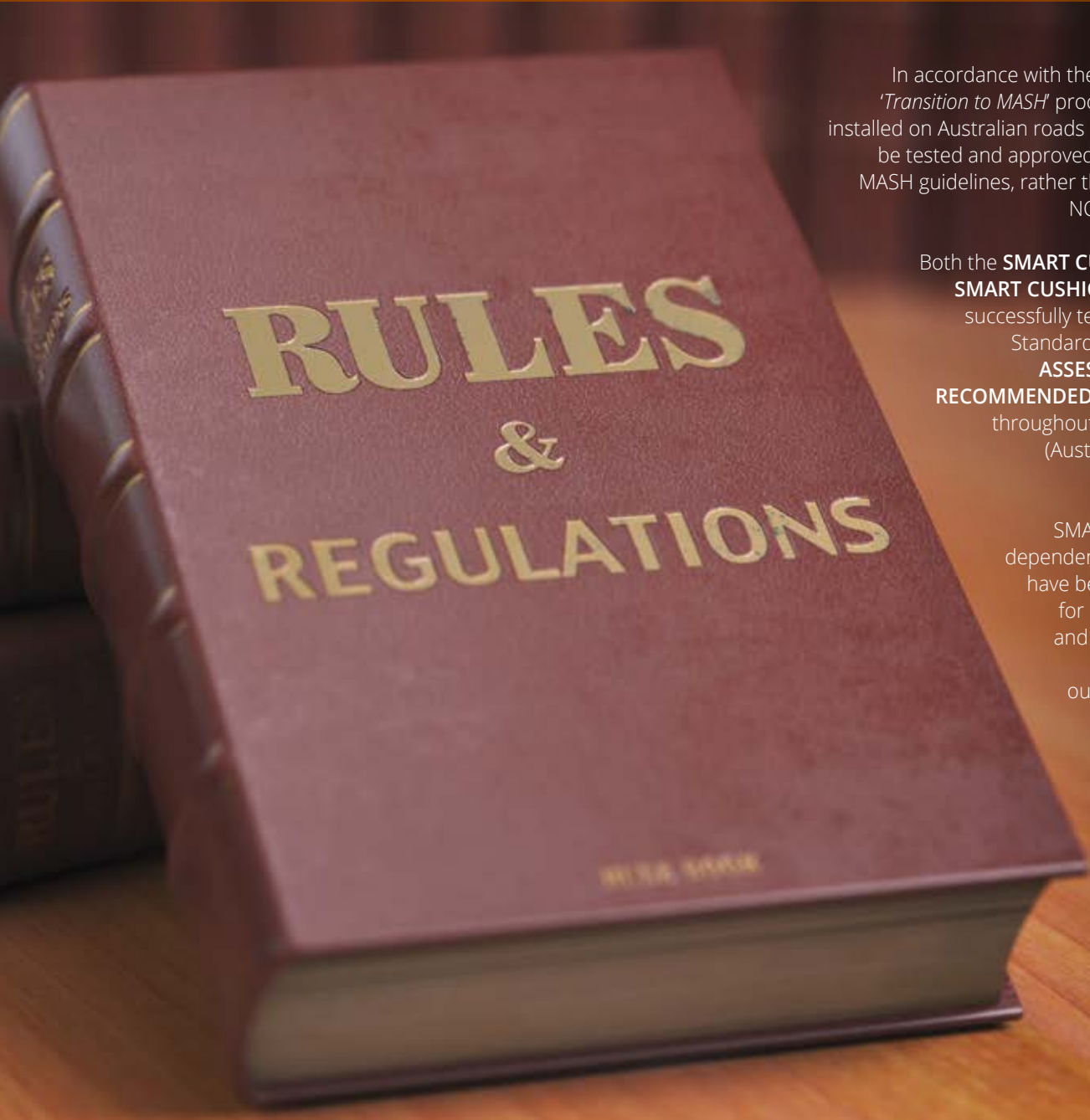
Acceptable manufacturers and processors of steel prestressing and steel reinforcing materials, including both manufacture and application of reinforcing couplers, must hold a valid certificate of approval issued by the Australasian Certification Authority for Reinforcing and Structural Steels Ltd (ACRS),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

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

# CRASHWORTHINESS RULES HAVE CHANGED...

## DO YOUR CRASH CUSHIONS COMPLY?

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



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

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

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

# SMART CUSHION

**Speed Dependent Crash Attenuators**



# SMART CUSHION

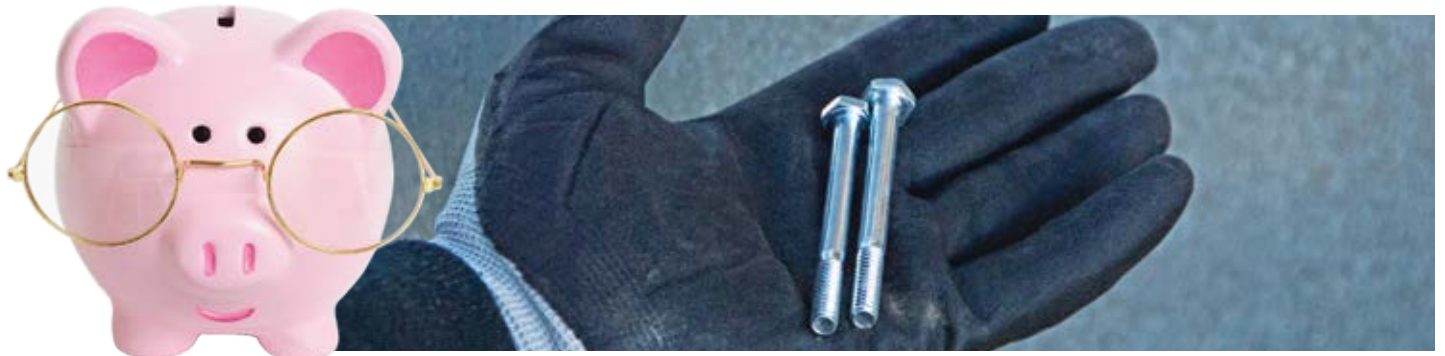
## Speed Dependent Crash Attenuators

### MASH TESTED & APPROVED



**SAVE TIME...**

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



**SAVE MONEY...**

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



**SAVE LIVES...**

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



Ph 02 9631 8833

[www.lbaustralia.com.au](http://www.lbaustralia.com.au)

# ANCON STEPS UP TO PARTNER

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

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

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

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

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

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



**Ancon**  
A CRH COMPANY



## MITIGATING FLOODING IN NEW RETIREMENT VILLAGE

**PROJECT:** Highton Retirement Village  
**LOCATION:** Highton, Geelong, VIC  
**CLIENT:** Ryman Healthcare  
**MASTER PRECASTER:** Rocla

National Precast Master Precaster Rocla has provided precast concrete elements for a 700kl *RainGrid* modular stormwater system for the Highton Retirement Village in Highton, Geelong. The Village is one of Ryman Healthcare's latest additions to its retirement living portfolio.

Currently under construction, the Village is perfectly positioned to the nearby Highton Shopping Centre Precinct, with a community bus service available to residents. With multiple amenities including a café, open gardens and bowling greens set out in the first stage of construction, residents will feel comfortable and at home in their new spaces. Lush greenery surrounds the site, giving privacy to residents, as well as tranquil views.

The on-site detention (OSD) system was required as a buffer storage to attenuate flow from peak rainfall events to mitigate any potential flooding of downstream properties. The system ensures that discharge of stormwater leaving the site does not exceed those of pre-development levels.

Rocla worked with the client from design stage right through to manufacture and delivery to a very tight timeline.

With the additional hurdles of bad weather, COVID-19 and coming from Wodonga, logistics required careful planning and co-ordination. Then there was an additional challenge of only one truck being able to get onto the site at a time.

Multiple Rocla departments combined to deliver the modules over four consecutive days working together to carefully plan and execute the deliveries to ensure that each component was delivered in the correct order and on time.

Feedback from the customer has been extremely positive, to the extent that Ryman Healthcare has already approached Rocla about the next similar project.





# 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](http://www.a1roadlines.com.au)

**P:** 1300 217 623 (A1ROAD) | **F:** (03) 9765 9499 | **E:** [sales@a1roadlines.com.au](mailto: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.





# THE ULTIMATE TEST OF ATTENUATOR PERFORMANCE

## HOW IT'S DONE

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



## WHAT ABOUT ROLL-AHEAD DISTANCES?

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

### **Scorpion® II TL-3 TMA**

Crash Test: MASH Test 2-53  
Impact Angle: 10.3 Degrees  
Roll-Ahead Distance: 5.1m

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

### **Scorpion® II METRO® TL-2 TMA**

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

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



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# YOUR SPEED IS OUR SAFETY DURING COVID 19 AND BEYOND

There are a lot of people working on our roads during COVID 19 and this will increase as restrictions lift and the plethora of promised works in each state and territory commence.

The *Traffic Management Association of Australia* (TMAA) urges drivers on roads, constructions sites, and near emergency services, to slow down to save lives.

TMAA Executive Officer, Louise Van Ristell, said, "Almost 1200 people have been killed on Australian roads in the past 12 months. Deaths were recorded in every state and territory during 2019 with the number of lives lost totalling 1182."

"We ask that now, more than ever, people value lives and part of this is keeping yourself and everyone else safe."

"*Our Your Speed is Our Safety Campaign* is a three-part series that I urge you to share with your teams, colleagues and wider community, to spread the message that speeding can kill," she said.

Ms Van Ristell said the campaign, which is airing on television around the country during May, September and November, brings together three 'Your Speed is Our Safety' advertisements which tell the story of a little girl and her father, something we can all relate to, especially at this time.

"TMAA is proud to lead the development

**YOUR SPEED IS  
OUR SAFETY**  
SLOW DOWN FOR ROAD WORKERS.



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of the series," Ms Van Ristell said. "It highlights the high-risk nature of all roadwork activity, driving home the message to the motoring public to slow down."

"As government pushes for further infrastructure projects to drive Australia's economy, it is important to promote the safety message."

"So, if you 'See the Cones. Obey the Zones.' and slow down at roadworks because 'Your Speed is our Safety'," she added.

Links to all three advertisements are

below. Please share on your social media and with your colleagues so everyone gets home safely.

For more information contact TMAA on 1300 798 772 or visit the website:

**[www.tmaa.asn.au](http://www.tmaa.asn.au)**

**Part One** - <https://youtu.be/QLwXOtrMsCg>

**Part Two** - <https://youtu.be/OWGSBA4LOW4>

**Part Three** - <https://youtu.be/4yzkIYJp4M>





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# THE BEST OF BOTH WORLDS

While there will always be a discussion about what is the most effective and versatile method of pavement sweeping – especially in challenging conditions - one company has taken a different approach to the challenge. Rather than focusing on one particular sweeping methodology, leading German equipment manufacturer FAUN has combined the benefits of air circulation technology with high-performance vacuum sweeping to produce a sweeper that delivers the ‘best of both worlds’.

Distributed exclusively throughout Australia by Superior Pak, the state-of-the-art FAUN VIAJET 6 incorporates a patented air circulation system which combines the benefits of regenerative air sweeping with traditional vacuum sweeping. This unique design not only delivers outstanding sweeping performance across a wide range of surfaces, it also results in a significant reduction in fine dust emissions from the sweeper – another critical factor in sweeper design. Glen Fuller, Sales Manager – Sweepers with Superior Pak, explained:

“When it comes to sweepers, ensuring the dust emissions are kept to an absolute minimum is as important as the machine’s sweeping capabilities.”

“After all, there’s no point in picking up the dirt and debris from the pavement surface, just to have it blown back out of the sweeper into the atmosphere.”

The FAUN air circulation system continuously transports the extracted air from the debris container to the blowing nozzle behind the suction nozzle. When loaded with new debris, the already moistened and heated air is once again sucked into the suction nozzle and recirculated. The quantity of recirculating air can be variably adjusted between 30 and 70 % depending on the application.

Only the relatively small proportion of air which is not recirculated flows out smoothly under the machine. Fine dust emissions from the FAUN road sweeper with the air circulation system are therefore approximately 50 % lower than for pure suction road sweepers.

Importantly, this unique design means that the VIAJET 6 does not blow dust around. Clean exhaust air is expelled behind the sweeper units on the portion of the road which is already clean. Adding water to the blast air also enables the road to be cleaned in the working area of the suction nozzle.

## DEVELOPED TO SUIT AUSTRALIAN CONDITIONS

When it comes to sweeping equipment, versatility and performance are paramount. Even sweeping routes that cover a relatively small geographic area tend to present a range of different sweeping conditions. What’s more, these conditions can, and often do change from week-to-week, due to things including weather events, traffic loadings, seasonal conditions, or any other number of factors.



The state-of-the-art FAUN VIAJET 6 incorporates a patented air circulation system which combines the benefits of regenerative air sweeping with traditional vacuum sweeping.





Specifically developed to meet the demands of harsh Australian operating conditions, the FAUN VIAJET 6 delivers the ideal combination of features, capacity and manoeuvrability to suit a wide range of applications. From suburban streets and roads, through to major arterials, rural roads and transport hardstand areas, the VIAJET 6's size, features and capacity make it an ideal choice for councils, contractors and road authorities alike.

"Needless to say, when it comes to choosing a sweeper to meet your needs, you need to be sure that it has the capacity to cope with an array of variables, including different pavement types and terrains, a range of debris types and loadings, wet and dry conditions, etc.," Glen Fuller said.

"Over the past six months, our demo unit has been subjected to pretty much every type of sweeping condition imaginable, from major CBD areas and inner-city streets, through to metropolitan arterials, suburban streets and rural roads – many of which had extremely high leaf and debris loadings. It really has been put through its paces," he said.

"In every instance – no matter what we put it through - the FAUN VIAJET 6 delivered the goods, collecting the debris and fines, and leaving a clean, debris-free pavement," Glen added.

For further information or to enquire about a demo of the new FAUN VIAJET 6, contact Superior Pak on: 1800 013 232 or visit: [www.superiorpak.com.au](http://www.superiorpak.com.au)

BELOW: The FAUN air circulation system recirculates air to the blowing nozzle behind the suction nozzle. When loaded with new debris, the already moistened and heated air is once again sucked into the suction nozzle and recirculated.



## AUSSIE GMP NEW WATER CART PUMP



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# WATER CART PUMPS FOR DUST SUPPRESSION

Even before the stringent EPA rules about dust suppression on construction sites, tankers were part of every major construction plant fleet. We've all driven around country roads when there has been road construction going on in the past decades and seen water carts with "dribble bars" as part of the road construction plant.

Today, those old tankers with dribble bars are a thing of the past! The new EPA rules not only make dust suppression mandatory on every site and there are hefty fines for transgressors. That means water carts, the unsung heroes of the construction industry, are even more important than they ever were before.

Australian Pump Industry saw councils buying their Honda powered transfer pumps, not only because of their reliability and performance but because Aussie Pumps offers electric start as a standard option. OH&S is a big issue, not only to councils, but contractors as well.

"When we launched the Aussie QP402, a 4" self-priming pump, it was a revolution," said Aussie Pumps' Chief Engineer, John Hales.

"People hadn't seen a big 4" pump that could be driven by an 8hp Honda petrol engine and produce a whopping 1,800 lpm flow. Waiting time filling tankers became a thing of the past," he said.

The big 4" pump, with huge 'shoulders' surprised the market with an ability to draft water through a vertical lift of 8.4 metres.

"The shoulders in the pump, revolutionary in design at the time, meant fast self-priming, first time, every time", Hales added. "The shoulders hold a water tank which allows the pump to prime like no other."

## Along came diesels

Aussie Pumps started making the same 3" and 4" pumps in diesel drive, after a deal was struck with Yanmar and then later with Kubota. Both engines, from Japanese companies of absolute integrity and engine expertise, perform beautifully, even in the toughest conditions.



Being air cooled engines, they are compact, lightweight and in the range of 4.8hp, through to 10hp, provide reliable power. Coates Hire for example, has operated a number of these 4" Aussies with Kubota engines over the years in their fleet with excellent results!

Engine drive pumps, both petrol and diesel drive, come into their own with requirements moving from just fast filling the water cart to run a dribble bar, to the need for spray bars, spray heads and the ability to spread water over a wide distance.

One issue can be dry-running of the pump. Sometimes the tanker operator, unknowingly continues to run the pump mounted on the back of the unit, even though the tank is empty. The result is cavitation which can make the impeller not only vibrate but, become pock marked.

"Cavitation is a pump killer and tanker operators need to be warned about allowing a pump to run without adequate water supply," said Hales.

### So what's the latest with tanker pumps?

"Putting a big 25 hp diesel engine on the back of a tanker is space inefficient," said Hales.

"We then looked at hydraulic drive and ... bingo! We struck the exact right combination," he said.

Now, having started out with low pressure 4" cast iron pumps, the company gravitated to a 3" Aussie GMP, model B3XR-A/ST that is a trash pump, a medium to high pressure pump and a high flow pump all in one.

"Not only that, but by running it off a 22cc motor, we don't make huge demands for oil or the motor supply load to get the job done," said Hales.

Other breakthrough products in the range include, a big 4" hydraulic drive pump, also used by the army, available in cast iron or 316 stainless steel. The big pumps will deliver a whopping 2,300 lpm, emptying a 20,000 litre tanker in ten minutes.

The best news is that those same pumps are capable of heads as high as 35 metres, close to 50 psi, so they can also double as spray pumps.

Hydraulic drive pumps mean no drivelines and no shafts - just hydraulic hoses as flexible as the imagination of the installer or engineer. The pump can be located virtually anywhere that it suits the manufacturer.

Aussie Pumps' new G3TMK-A hydraulic drive is a 3" high pressure, high flow, self-priming pump with front opening port and an open impeller that will pass small solids in suspension. Yes, it self-primers!

Although it's a 22cc motor, it's built like a tank. The pump internals come with a stainless steel wear plate and a silicone carbide mechanical seal for a long, trouble free life.

"Of course, they don't like running dry," said Hales. "That's one weakness they we haven't got over yet. But otherwise, these pumps are designed for the toughest applications on the planet - including mines, construction sites or quarries," he said.

### So why Aussie?

Australian Pump has an affinity to the industry. They believe in the country, and the capability of the construction industry, and work hand in glove with customers as diverse as hire companies to quarries and earthmovers, from Bobcat owners to the biggest in the industry.

"We know they'd want what we'd want," said Hales. "Products that work, that do what they claim to do and, the people who support it."

"We want to know if there's a problem, and never run from it."

"In fact, some of the best advances we've made in engineering have been based on problems found in the field. Our customers tell us about issues and site conditions that we could never imagine," he said.

For further information, including technical data and information about the full Aussie Pumps range, or to get a copy of the new *Basic Guide to Aussie Tanker Pumps*, please contact Australian Pump Industries on 02 8865 3500 or visit the website: [www.aussiepumps.com.au](http://www.aussiepumps.com.au)

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# A SWEEPER TO MEET EVERY NEED

**G**arwood International's expansion into the sweeper market started in 2017, when it partnered with Boschung to become the company's exclusive Australian and New Zealand distributor.

Keen to build on its well-earned reputation for the design, manufacture and supply of high-quality waste collection and compaction equipment and vehicles, the move to incorporate sweepers into its product offering was really a natural progression for the growing company. Garwood International's Managing Director, Daniel McHugh, explained:

"While expanding into the sweeper market had been a long-term goal for the company, we wanted to make sure that when we did it, we would be able to offer our customers a full suite of high-quality, reliable sweeping solutions."

"From compact footpath sweepers and mid-range units for urban environments, through to full-size highway sweepers

and specialist units for road works and pavement construction applications, we wanted to make sure that we had a comprehensive product offering to meet the needs of any sweeping challenge," he said.

"With that in mind, I travelled the world looking at what products were available and whether they'd be a good fit for us – especially in terms of quality, reliability and, perhaps most importantly, the equipment's ability to stand up to the harsh Australian operating environment," Daniel added.

"Needless to say, with both Boschung and Schwarze, we found their sweepers well and truly 'ticked all the boxes.'"

"Once we had established our partnership with Boschung, we started our discussions with Schwarze," Daniel said. "Schwarze had built a strong reputation throughout Australia for quality sweepers in both the local government and contractor market, and we felt their products were a perfect fit."



Garwood International was appointed as Schwarze Industries' exclusive Australian and New Zealand distributor in 2017, taking over sales, service and after-sales for both the Schwarze and Bonne branded sweepers.



Schwarze GS6 Tempest™ 6 Cubic Metre Regenerative Air Sweeper.



BELOW: Schwarze A4 Storm™ 3.6 Cubic Metre Regenerative Air Sweeper.

RIGHT: Available in a choice of models, Bonne heavy-duty Tractor and Trailer Brooms by Schwarze offer the ideal sweeping solution for road maintenance and construction sites.



Since that time, Garwood International has continued to build both the Schwarze and Bonne brands, with its sweeper business going from strength-to-strength.

"We're extremely proud to be the exclusive distributor for Schwarze throughout Australia and New Zealand," Daniel said.

"Together with the fact that both brands are held in extremely high regard in terms

of their quality, reliable and performance in the field, for us, signing the agreement with Schwarze also represented 'the last piece in the puzzle' in terms of us being able to provide our customers with a sweeper to meet every need," Daniel concluded.

For further information, please visit: [www.garwoodinternational.com.au](http://www.garwoodinternational.com.au)

# SITE SWEEPING DONE RIGHT!

Specifically designed for road maintenance and construction, Bonne Tractor and Trailer Brooms from Garwood International deliver the quality, performance and reliability you need.

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Cohda Wireless's world-leading V2X technology to enable fire trucks and rescue service teams to get to accidents and emergencies faster, potentially saving lives long into the future

Image courtesy: City of Ludwigsburg

# COHDA WIRELESS V2X TECH GIVES GERMAN FIREFIGHTERS THE GREEN LIGHT

The German city of Ludwigsburg just north Stuttgart has been equipped with Cohda Wireless's world-leading V2X technology to enable fire trucks and rescue service teams to get to accidents and emergencies faster, potentially saving lives long into the future.

In an initiative led by leading traffic technology group SWARCO, all traffic lights and intersections in Ludwigsburg (pop. 85,000) have been fitted with Cohda MK5 Road-Side Units which correspond with the equivalent MK5 On-Board Units in fire trucks and rescue vehicles to grant them green-light passage en route to emergencies, when every second counts.

Following a successful pilot project in early 2019, SWARCO has equipped 114 traffic lights in Ludwigsburg with Cohda's technology which allows them to exchange information directly with approaching vehicles using DSRC (standardised radio). The ACTROS control units of the traffic lights were equipped with the necessary program, which automatically prioritises the fire engines as they pass through.

The system works by sending messages relaying position and speed, several times per second, from emergency vehicles to a traffic light controller. There, the signals are processed and compared with the scenarios stored in the programming. If the system detects an approaching emergency vehicle, the programmed signal sequence is started and the traffic light controller switches to the prioritisation program. Once the firefighters have passed the intersection, the traffic light controller switches back to normal as quickly as possible to minimize impact on road traffic and traffic disturbance.

Dr. Paul Gray, Cohda Wireless's CEO said that this is a prime example of a cooperative,

intelligent transport system that is geared to saving lives.

"V2X technology improves safety on our roads and is usually applied to help reduce injury and death. This initiative demonstrates the versatility of the technology," explained Dr. Gray.

"In this instance, it is being applied to support emergency services in responding to incidents and accidents that have already happened, thereby also saving lives."

"Ludwigsburg is setting an example that cities around the world can follow," added Dr Gray.

Ludwigsburg's mayor Dr. Matthias Knecht said the fire department prioritisation in his city is a first full practical application of V2X in Germany and makes Ludwigsburg a showcase city that is already relying on innovative C-ITS technologies and intelligent traffic lights, thus preparing for its future as a smart city.

"A primary goal of our mobility concept is to optimize the traffic flow. To achieve this, we also rely on intelligent traffic light systems," said Dr. Knecht.

"SWARCO's technology for prioritising emergency vehicles of the fire brigade is an excellent example for this - because in an emergency every second counts, of course. Together with the city of Ludwigsburg, SWARCO has developed this innovative technology and brought it to the streets," added Dr. Knecht.

Cohda Wireless's technology has been applied in other similar ways to make roads safer. In Estonia and Finland, Cohda's V2X hardware and software features in a smart pedestrian crosswalk solution which alerts pedestrians and other road-users to danger.

In Norway, Cohda's vehicle positioning system contributed to a successful trial carried out in the Bjørnegård tunnel in the municipality

of Bærum. The purpose of the trial was to demonstrate the efficacy of Cohda Wireless's world-leading vehicle positioning solution, V2X- Locate, in the newly-built 2.2km tunnel in an effort to improve vehicle safety in this tunnel and others like it around the world.

Cohda's software products are applied in more than 60 percent of all V2X field trials in the world today in compliance with US Federal Communications Commission, European Telecommunications Standards Institute (ETSI) and Chinese standards.

## ABOUT COHDA WIRELESS

Cohda Wireless is a global leader in the development of Connected Vehicles and Connected Autonomous Vehicle software with proven applications for Smart City, Mining and other environments. Cohda's technology connects vehicles with infrastructure and pedestrians to make our streets, cities and working environments safer, smarter and greener.

Cohda is headquartered in Australia and has offices in Europe, China and the USA.

Cohda Wireless's innovative software solutions enable autonomous vehicles to connect with other vehicles and with Smart City infrastructure. These connections span Vehicle-to-Vehicle, Vehicle-to-Infrastructure, and Vehicle-to-Pedestrian (collectively called V2X), and allow CAVs to 'talk' to each other, Smart Cities, and vulnerable road users in order to avoid accidents, reduce congestion and be more efficient.

Cohda partners with Tier 1 Automotive Suppliers, ITS Equipment Vendors, and Mining Equipment Technology and Services (METS) vendors to provide complete hardware/software solutions to Car Makers, Smart Cities, and Mine Operators, respectively. Cohda's products are used widely in locations including the USA, Europe, Australia, Japan, Africa, Middle East, China, Singapore and Korea.



# VELODYNE LIDAR POWERING INTELLIGENT TRAFFIC MANAGEMENT IN NEVADA

Velodyne Lidar, Inc. recently announced a partnership with University of Nevada, Reno to advance research in transportation infrastructure. The university's Nevada Center for Applied Research purchased and, in conjunction with the Nevada DOT and Nevada Governor's Office of Economic Development, is using Velodyne's lidar sensors in its Intelligent Mobility initiative to collect data aimed at making transportation more efficient, sustainable and safe.

The program has integrated Velodyne *Ultra Puck* lidar sensors with traffic signals to detect, count and track pedestrians, cyclists and traffic to help improve traffic analytics, congestion management and pedestrian safety. These lidar sensors have been placed at crossing signs and intersections in the city of Reno, Nevada, and because lidar used today does not allow for facial recognition, these smart city applications can preserve trust and anonymity among the public.

"Lidar-enhanced" roads can also communicate data to connected vehicles to support eco-drive and collision avoidance applications. To address roadway congestion monitoring, university researchers have developed speed measurement, and delay and queue length measurements using lidar data.

The program also has an electric bus operated by the Regional Transportation Commission of Washoe County. The bus is equipped with an *Ultra Puck* and other sensors to collect data to assess mass-transit routes and feasibility of mass-transit automation in city segments with a connected infrastructure.

"Velodyne's lidar sensors have been instrumental in our transportation research, providing the accurate, reliable 3D data we need in our Intelligent Mobility program," said Carlos Cardillo, Director, Nevada Center for Applied Research.

"Velodyne sensors are helping us address the challenge of improving mobility and safety in transportation, and contribute to advancing smart cities."

"The Nevada Center for Applied Research is charting a path to create the smart cities of the future by enabling multimodal communication between infrastructure, vehicles and people," said Jon Barad, Vice President of Business Development, Velodyne Lidar.

"Their multidisciplinary research team is using Velodyne's lidar sensors in innovative ways to collect and analyze data needed to improve efficiency and safety."

The Velodyne *Ultra Puck* provides a full 360-degree environmental view to deliver

accurate real-time 3D data. It is a small, compact lidar sensor that delivers 200 metres range. The sensor's reliability and power efficiency make it an ideal solution for smart city applications such as pedestrian safety, vehicle traffic and parking space management, and more.

The *Ultra Puck* does not identify individuals' facial characteristics, addressing a growing concern for civic applications.

For further information, please visit:  
[www.velodynelidar.com](http://www.velodynelidar.com)

## ABOUT VELODYNE LIDAR

Velodyne provides smart, powerful lidar solutions for autonomy and driver assistance. Headquartered in San Jose, Calif., Velodyne is known worldwide for its portfolio of breakthrough lidar sensor technologies. Velodyne's founder, David Hall, invented real-time surround view lidar systems in 2005 as part of Velodyne Acoustics. Mr. Hall's invention revolutionized perception and autonomy for automotive, new mobility, mapping, robotics, and security.

Velodyne's high-performance product line includes a broad range of sensing solutions, including the cost-effective *Puck™*, the versatile *Ultra Puck™*, the autonomy-advancing *Alpha Prime™*, the ADAS-optimized *Velarray™*, and the ground-breaking software for driver assistance, *Vella™*.

The University of Nevada, Reno's Nevada Center for Applied Research has integrated Velodyne *Ultra Puck* lidar sensors with traffic signals to detect, count and track pedestrians, cyclists and traffic.  
(Photo: Velodyne Lidar, Inc.)



# Greener Concrete Reinforcement for Improved Concrete Sleeper Applications

by Associate Professor Olivia Mirza

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

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

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

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

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

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

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

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

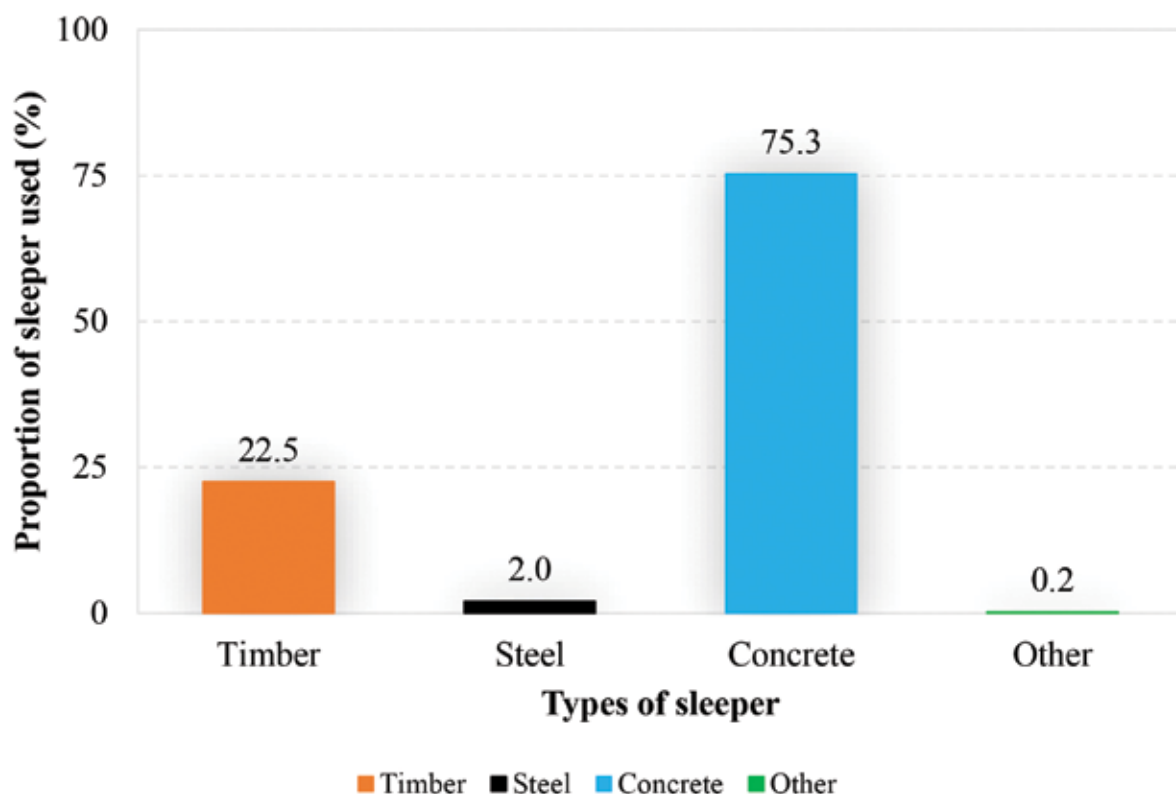


Figure 1: Use of railway sleeper material in European countries [UIC, cited in 4]



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

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

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

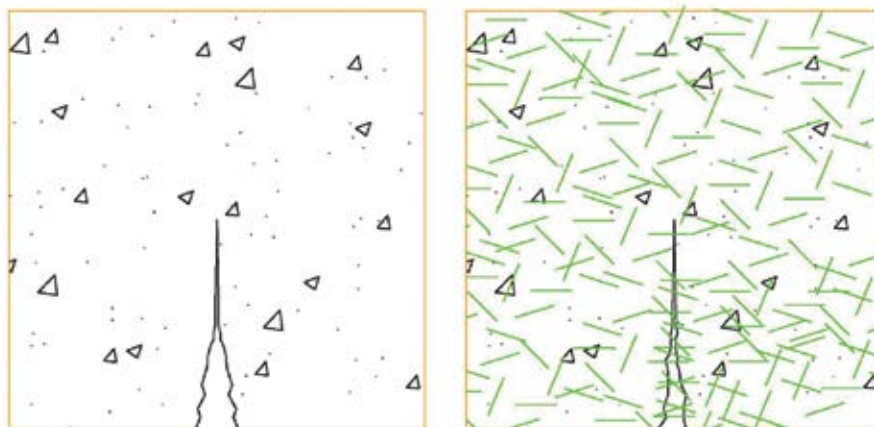


Figure 3: Illustration of cracks with and without the addition of macro-synthetic fibres

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

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

Research recently conducted highlighted the benefits of BarChip fibres, namely BarChip 48 and BarChip MQ58 tested up to a fibre dosage of 2.0% by volume (i.e. approx. 18.2 kg/m<sup>3</sup>) which were found to significantly improve the post-cracking capacity and failure mechanism of concrete elements [6, 7]. In fact, these benefits directly result from the addition of fibres which suppress and stabilise the propagation of cracks throughout the concrete matrix.

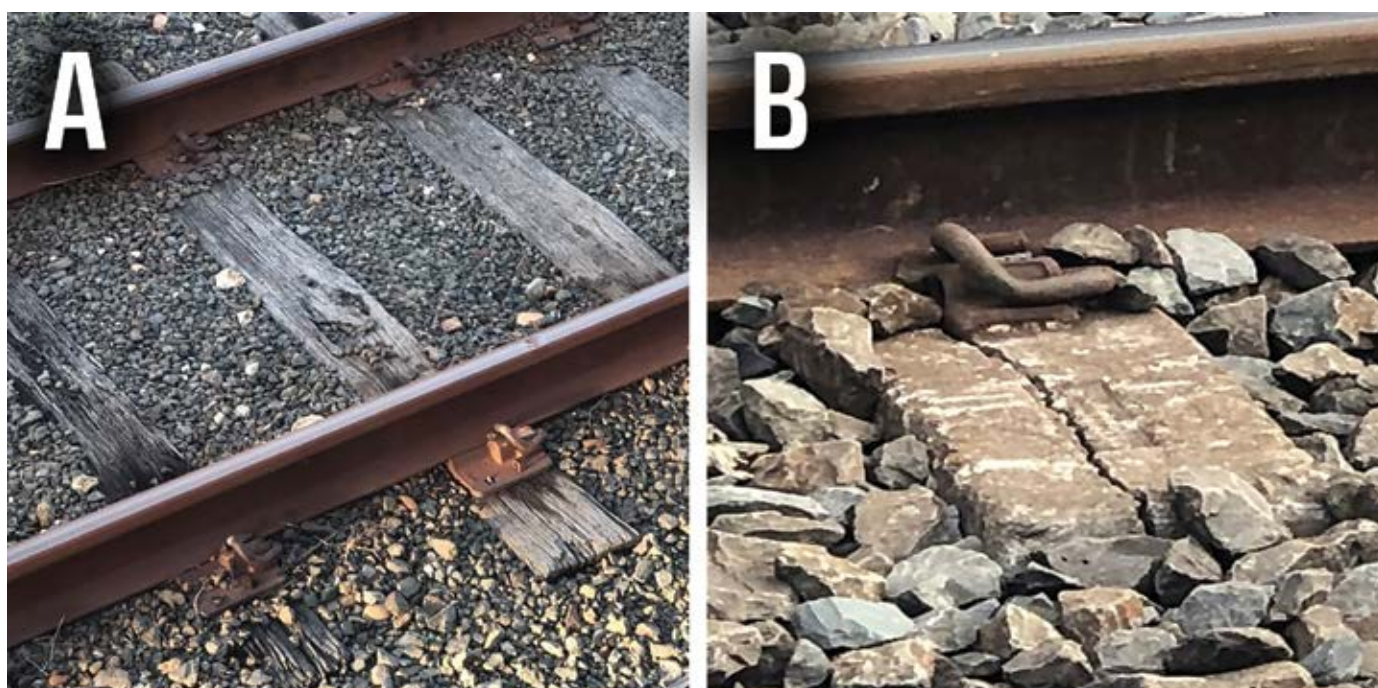


Figure 2: Typical failures of conventional sleeper – (a) timber & (b) prestressed concrete



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

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

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

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

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

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

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

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

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

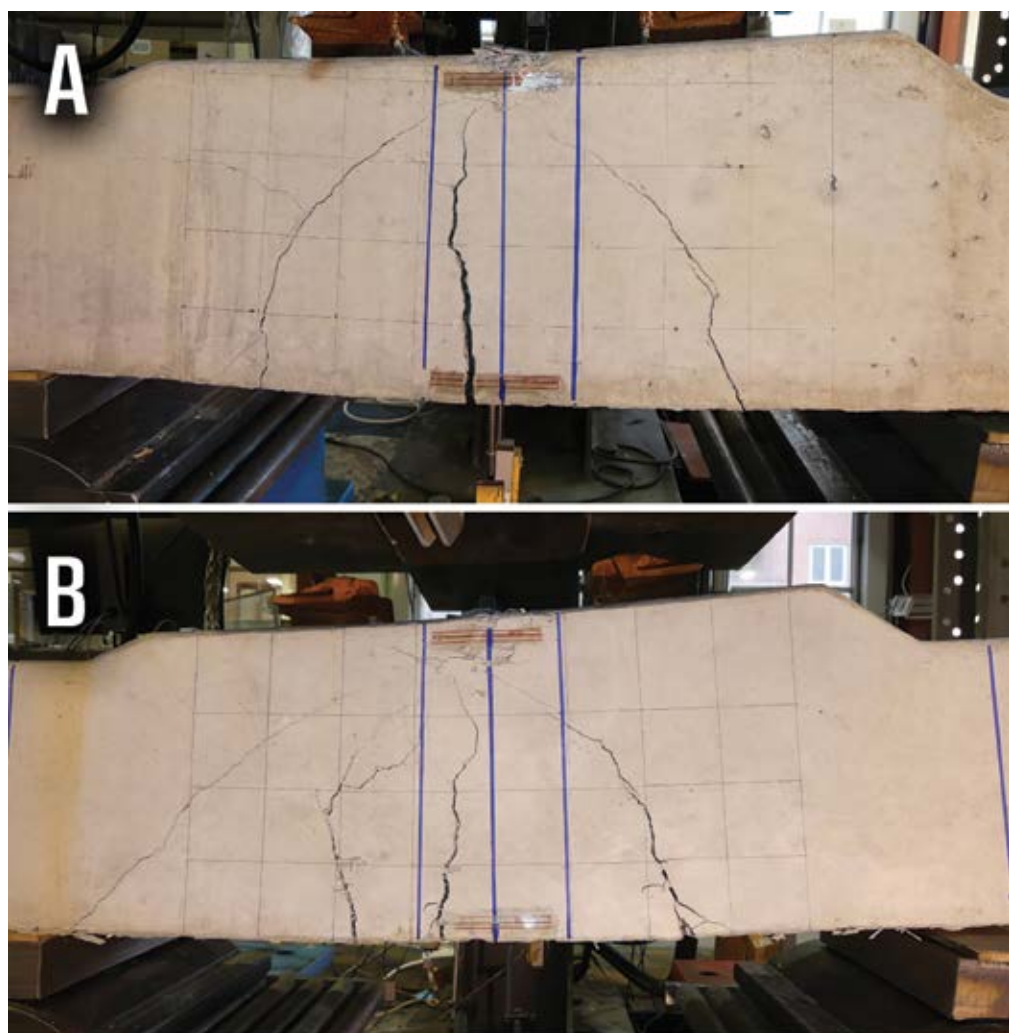


Figure 5: Rail seat positive bending moment test comparison for prestressed concrete sleeper (a) without BarChip fibres & (b) with BarChip fibres



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

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

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

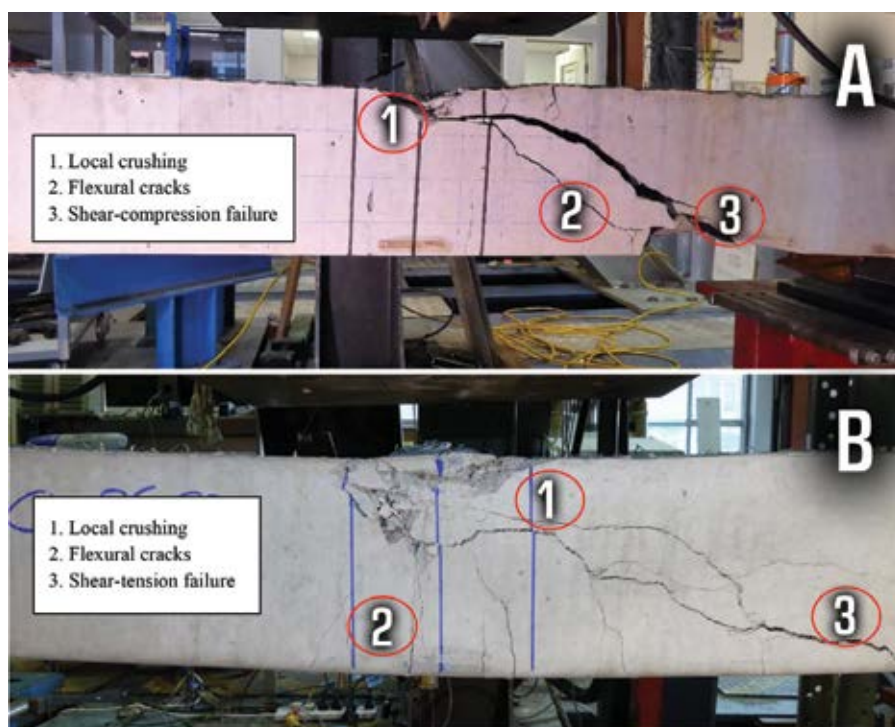


Figure 6: Centre negative bending moment test comparison for prestressed concrete sleeper (a) without BarChip fibres & (b) with BarChip fibres

## BarChip Inc.

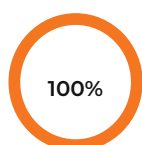
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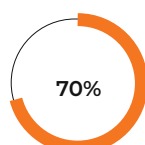
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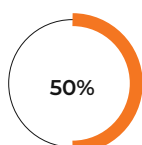
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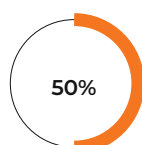
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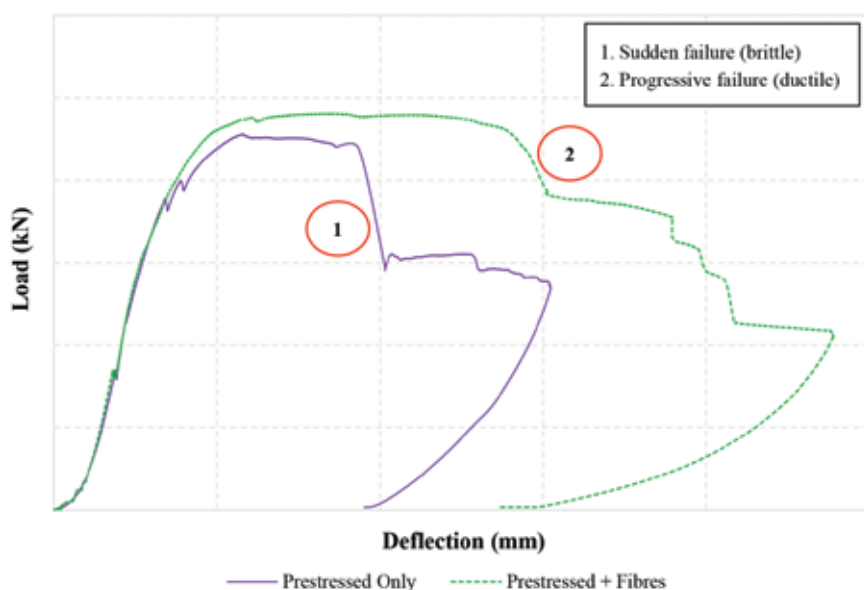


Figure 7: Rail seat positive bending moment test comparison for prestressed concrete sleeper reinforced with BarChip fibres

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

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

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

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

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

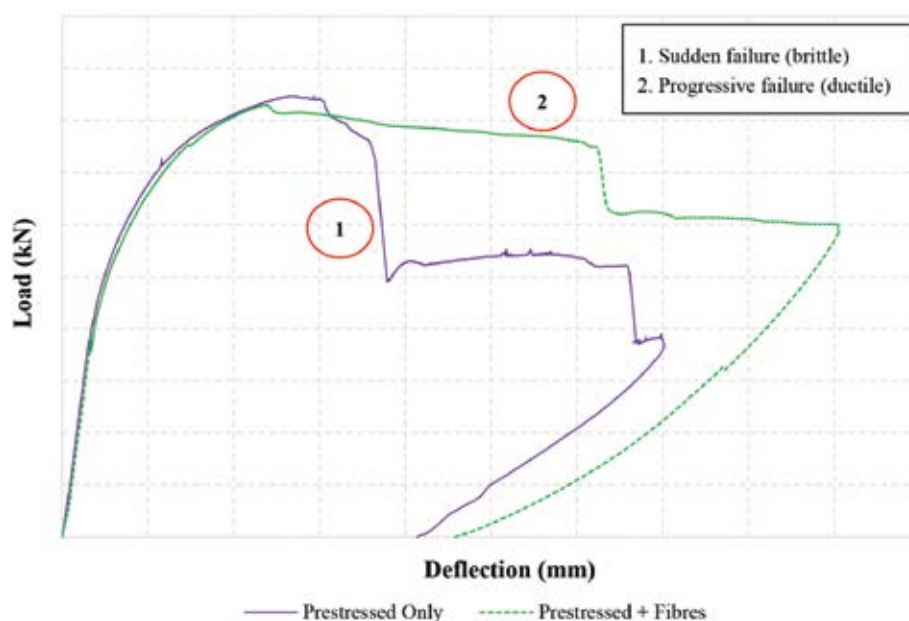


Figure 8: Centre negative bending moment test comparison for prestressed concrete sleeper reinforced with BarChip fibres

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# MENARD COMPLETES GROUND IMPROVEMENTS SUPPORTING NEW BATEMANS BAY BRIDGE

A better bridge connection across popular Batemans Bay in New South Wales, expected to bring economic and social benefits to the region, is another step closer to completion thanks to specialist ground improvement technology from Menard Oceania.

Menard has used *Controlled Modulus Columns* (CMCs) to support the new \$274 million NSW Government funded four lane bridge across the busy Clyde River. Menard first developed its CMCs technique in the 1990s to support foundation work on soils with low weight bearing capacity and high deformation. Since then it has completed 2,500 projects using the technique including the Brisbane International Cruise Terminal and Perth's Optus Stadium.

A CMC is essentially a small diameter displacement auger which is pushed into the soil matrix by a modified piling rig, in this case, a Casagrande B250.

Once the tool has completely penetrated through the compressible soils, the auger is extracted, and concrete or mortar is pumped under pressure through the hollow stem to fill the annulus left by the operation. The CMC is then replicated on a grid pattern.

The matrix of columns ultimately controls the stiffness or modulus (an elastic soil parameter and a measure of soil stiffness) of the soil, hence the name 'Controlled Modulus Column'.

CMCs will support transport for NSW's new southern approach to the Batemans Bay Bridge replacement as it continues to be built, eventually replacing an old vertical steel lift truss structure built in 1956 which rises twice daily to let vessels pass under it. CMCs will ensure a smooth transition from the uncontrolled embankments into the rigid bridge abutments founded on piles.

Menard was awarded the contract for the

treatment of soft soils around the significant 3,500 square metre project site last year by design and construct contractor John Holland. Menard started work at the site in September and has now completed the foundation element of the project.

Kevin Doyle, a civil engineer and Menard's project manager, said a five-man team drew on the company's 20 years of experience when installing CMCs to support the new bridge development.

"The first step of a ground improvement project was undertaking soil testing, and then navigating the design process to integrate our solution with the proposed structure. The design process can be lengthy, and on this occasion, we finished the last CMC one year to the day since starting."

"Once the design was completed, we started construction of the CMCs," Kevin Doyle added. "We were on site for over two



months, which sounds a lot for one bridge approach, however the biggest challenge on this project was the depth requirement combined with the complex interbedded alluvial soil deposits.”

“Since inventing this technique some 20 years ago, Menard initially installed CMCs to depths in the order of more than 20 metres. However recently Menard has achieved depths internationally of over 50 metres. For this project however we went to over 30 metres to get to good soil,” he said.

Mr Doyle said the successful and safe installation of CMCs was high on his team’s agenda throughout the project, coupled with robust investigation of potential environmental impacts.

“It’s an environmentally sensitive project within a marine park, and internationally listed wetlands with mangroves only metres from the project site. We needed to make sure no effluent from our works went into the river and carefully managed our materials on site so there were no spills. Detailed environmental considerations went into our foundation work due to the unique ecology of the area which also includes substantial

natural oyster beds. I’m pleased to say there were no environmental issues as a result.”

Mr Doyle, who has been with Menard for eight years since arriving in Australia from his native Ireland, has worked on many significant projects over this time but says the Batemans Bay Bridge replacement project has easily been one of the best yet.

“Our team worked very closely with, and for, John Holland. The company had an excellent team to work with and we worked well together from the design and execution phase to delivering our works on budget and ahead of time. It’s great to see the job has

been done well and know that the client is equally as happy as we are,” he said.

John Holland Construction Manager Ed McPhillips says Menard’s scope of work, and location for this activity was extremely challenging.

“The key for us was to engage a professional organisation who understood and would manage the constraints with working in close proximity to a pristine environment and live highway traffic.”

“We needed an organisation that could guarantee the safety of their people, the community and other nearby subcontractor personnel, and could come on the journey with us to provide solutions for a highly complex design and construct process,” Mr McPhillips said.

“Menard achieved all of this, and more. John Holland could not be more pleased with the result,” he added.

Once the new four-lane bridge is complete, the local community will benefit from less congestion in and around Batemans Bay. A height clearance of 12 metres will also allow vessels to travel along the Clyde River unimpeded while a three-metre shared path will make it accessible to pedestrians and cyclists.

## ABOUT MENARD OCEANIA

Menard Oceania maintains an exceptional 45-year history in Australia offering design and construction geotechnical experience, providing cost effective ground improvement solutions for some of Australia’s mid-to-large infrastructure and construction projects.

Its recent completion of the Pacific Highway upgrade, Optus Stadium (Perth) and Melbourne’s Webb Dock Project are Menard’s largest CMC projects in Australia.

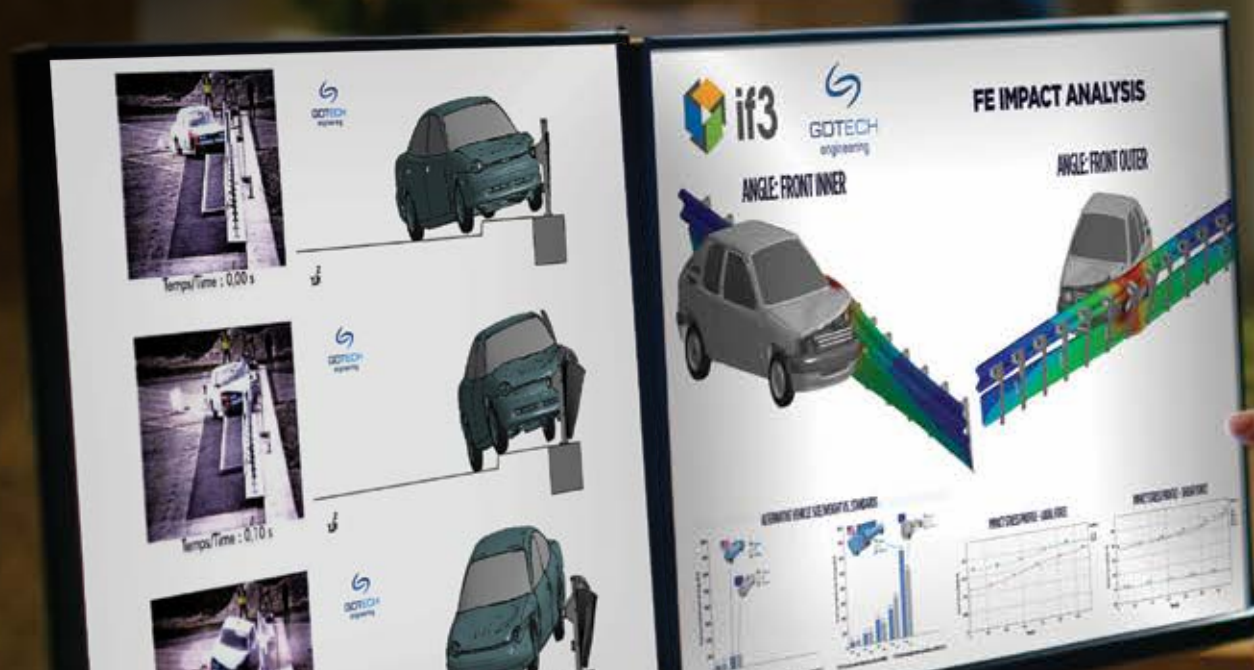
Menard Oceania is a part of Soletanche Freyssinet, a group of world leaders in geotechnical, structural, civil, nuclear and remedial engineering. This relationship further strengthens Menard’s ability to manage complex integrated problems and continue as the leader and pioneer of specialist geotechnical contracting.

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# COST-EFFECTIVE SOLUTION FOR UPGRADING SMALL BRIDGES

Government infrastructure spending boosts following the Covid pandemic may provide a welcome opportunity to upgrade many of Australia's 53,000 bridges now handling loads they were not originally expected to carry.

The opportunity for maintenance is particularly significant for Australia's local roads network, involving some 30,000 bridges, most small to medium, many built before 1950, and some before the turn of the century.

"Public authorities who manage most of these typically smaller bridges have long been aware of the problem facing our road transport infrastructure, but haven't had the funds to do the work they would like to. Now they have the opportunity to list their preferred projects with the Government so as to extend the safety and lifespan of assets," says bridge sliding bearing producer Mr David Booty.

Mr Booty has more than 40 years' experience in the assessment and life-extending renovation of bearings supporting public and private concrete and steel bridges and access ways, accommodating changing loads and demands upon them. He says the engineers responsible for bridge management would often like to do such work for safety and productivity reasons, knowing that trucks

and utility vehicles of all types today are a vital link in our rural and urban infrastructure.

"But many of the larger trucks out there today weigh far more than the 30-odd tons that was considered appropriate for short-to-medium bridges up until the mid-70s. And not only are all vehicles generally heavier – cars, utes and trucks – but also the number of individual vehicles on the roads has increased vastly since then. This adds considerably to the changing loads and vibration resulting from generally bigger vehicles and more of them."

## Addressing the impact of climate change on bridge structures

"Now, climate change also has to be factored into sliding bearing design, because the rates of heat and cooling expansion and contraction in a bridge structure have to be planned into structures decades ahead. All bridges are an expensive asset with a finite lifespan, so it is common sense and safety planning to factor in the foreseeable," says Mr Booty, who is Manager of Hercules Engineering (a division of Cut To Size Plastics).

The challenge facing builders and operators of thousands of smaller bridges and aqueducts throughout Australasia is ensuring how concrete and steel structures can flexibly,

quickly, and cost-efficiently cope with internal movement and stresses caused by changing loads, vibration, thermal expansion, and other common attritional factors.

One solution developed by Hercules Engineering comprises the range of no-maintenance, cost-efficient Herculon Type D Bearings (HLD/SG, HLD/FF & HLD/FX), which are widely proven on applications ranging from steel and concrete beam engineering structures through to materials handling and processing facilities.

Herculon Type D Bearings (HLD/SG) consist of a mild steel or 316 stainless steel top plate to which a polished stainless steel facing plate is fixed. This plate slides against a low friction hard-wearing (PTFE) Herculon-coated Hercupad, which is in turn bonded to a mild steel or grade 316 stainless steel base plate.

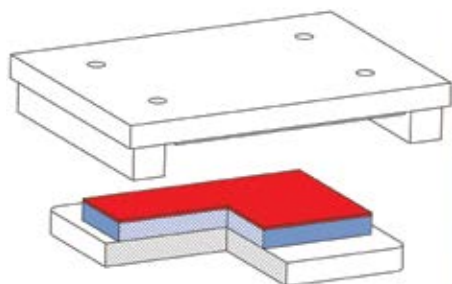
"Among the big plusses of HLD Bearings, compared with more sophisticated and expensive heavy alternatives such as pot bearings and roller bearings, are benefits such as lower initial cost, easier installation and no maintenance for periods of 30 years or more," says Mr Booty.

"Larger bridge structures demand sophisticated and typically more expensive solutions, but HLD bearings are very suitable for a wide range of bridge, materials handling, and process equipment structures up to 60 tons per bearing."

The evolving range of Herculon type D sliding bearings – incorporating polymers proven globally for outstanding durability without lubrication or maintenance – were developed to fulfil the need for low-friction bearings on corbels and columns where continuous sliding joints were not appropriate.

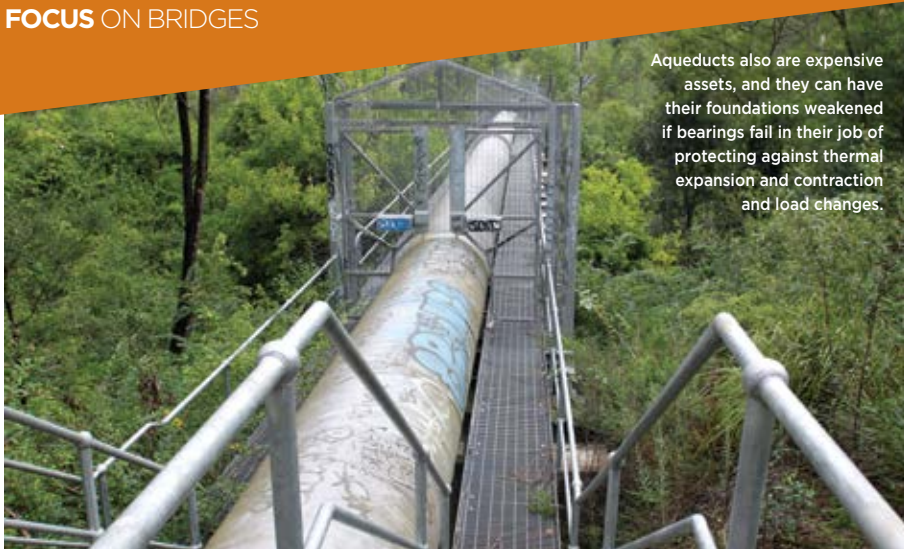
## Cost-effective, maintenance-free performance

Stock Type D Herculon Bearings (HLD/SG) are designed to accept a lateral load of 30 per cent of the vertical rated load, which



Herculon Type D bearings are engineered to minimise downtime and maintenance by accommodating the vertical and horizontal stresses imposed by the shuddering and vibration of varying loads.





Aqueducts also are expensive assets, and they can have their foundations weakened if bearings fail in their job of protecting against thermal expansion and contraction and load changes.

can be up to 600 kN per bearing in stock sizes, with higher capacity available custom-engineered for particular applications. They are removable and replaceable, to optimise no-maintenance performance in access infrastructure and high output industrial plant.

The ability to provide cost-efficient and maintenance-free solutions to such issues is especially important to road and pedestrian access projects demanding high safety.

In addition to public bridges handling road transport, such structures include private assets, such as those providing supply, exploration and service routes to mining, energy, oil and gas projects, where movement

within access structures is caused by factors such as climate, changing uses and delivery of plant including conveyors, motors, turbines and reticulation systems.

Asset life-extending maintenance solutions are also important to access facilities in urban infrastructure projects, including pedestrian walkways, small bridges and health and carpark facilities.

HLD Performance characteristics include:

- Outstanding sliding performance, to provide smooth, easy movement under load
- Friction co-efficient 0.05 – 0.08 depending on stress

- Expansion capacity up to  $\pm 40\text{mm}$  for standard bearings. (Larger movements can be accommodated upon request)
- Maximum contact stress 10-12 MPa
- Maximum rotation up to 0.02 radians
- Maximum temperature 80 deg C (with higher temperatures accommodated by thermally insulating bearings or using high temperature materials, both as recommended by Hercules).

Herculon HLD bearings are part of a comprehensive range of Hercules composite sliding joints and structural bearings incorporating engineered high performance combinations of engineered thermoplastics and stainless steel facing surfaces.

### ABOUT HERCULES ENGINEERING

Australia's Hercules Engineering – the producer of Hercules™ composite sliding joints and Herculon™ structural bearings – has provided long-lasting product for use in structures as diverse as the Sydney Opera House, the Hang Seng bank in Hong Kong, Australia's New Parliament House in Canberra and the world's largest copper mine, Kansanshi, in Zambia.

For further information, please contact David Booty, Hercules Engineering, Phone: +61 (0)2 9681 0400 or Email: davidb@cutoffsize.com.au

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