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DEC 2019/JAN 2020

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## About the Cover

City of Gold Coast has recently completed construction of an innovative coastal engineering project. The Palm Beach Shoreline Project on the southern Gold Coast was born out of a need to protect a vulnerable section of coastline while simultaneously enhancing surf amenity for the local community.

► Turn to Page 10 for the full story.

# Providing a Safe Oasis

## Safe inner-city Green Space critical for building communities

Dear Readers,

While few would argue the pivotal role of the massive boom in inner-city residential apartment facilities has played in helping to reinvigorate both the economy and appearance of many of our major capitals and larger cities, the popularity of this high-density / high-rise lifestyle also presents a number of significant challenges for councils and other statutory authorities around Australia.

While there are numerous planning issues associated with individual projects and precincts, one of the biggest challenges facing Australia's 'inner-city' councils is undoubtedly the requirement for efficient and timely development and provision of services and infrastructure to meet the needs of their rapidly expanding residential population. What's more, these services and facilities must be delivered without sacrificing the needs of the remainder of the City's residential and business community, and without alienating the many tourists and visitors that inevitably also play an important role in stimulating the economy in these inner-city areas.

Together with transport planning challenges, another major issue associated with the rapid increase of inner-city high-rise living relates to the provision of public open space areas; in particular, parklands and 'green' open space.

Even though many new inner-city residential developments incorporate a 'common' plaza area for residents to enjoy, most of these tend to be paved areas, or at best, are only designed with minimal

amount of 'grassed' areas and a limited number of trees.

That is not to suggest that these areas are all badly designed or unattractive 'concrete jungles' - quite the contrary. Many of these plaza and/or 'common' areas are both practical, inviting and aesthetically pleasing. What's more, in many instances, they provide a 'central meeting place' for the high-rise community - in much the same manner as the traditional village green did in the past.

They are, in my opinion however, no substitute for natural parkland with an abundance of grass, trees and other plants.

Not surprisingly, this lack of 'green' open space, combined with the lack of 'backyard' environment, has resulted in a significant increase in demands upon inner-city public parks and gardens in terms of providing a 'green oasis' for inner-city residents to enjoy.

This also presents a number of significant challenges for inner city councils, including the increased maintenance costs and public safety and security issues.

Parks and public reserves, by their very nature, are usually designed with a focus on providing a peaceful and tranquil area which is 'separated' from the surrounding area. Unfortunately, this 'secluded' nature and often heavily-treed design also provides ample 'cover' for any number of anti-social and/or illegal activities.

Whilst I wouldn't dare to suggest that we are now faced with an epidemic of crime in our inner-city parks and gardens, it is a sad fact that, in many locations, there has been a significant increase in the

number of crimes, including drug offences, robberies and serious assaults being committed.

Together with the impact on the actual victims, these crimes also have the effect of making many people 'too nervous' to go into the parks for fear of being attacked.

Unfortunately, this also now applies to an ever-increasing number of bike paths and multi-use trails, following a number of widely-reported serious offences across the country.

We must never underestimate the importance of 'green space' - both to the environment, and in relation to the positive impact that they have on our mental and physical wellbeing. Good quality public facilities and infrastructure are critical factors in building 'communities' rather than just groups of 'dwellings'. One only has to look at the positive impact that a 'community garden' can have - regardless of the demographic or the location.

With inner-city living continuing to grow in popularity, I believe that improving safety and amenity throughout our public parks, gardens and recreation reserves and along our multi-use recreational paths must be given a high priority by all stakeholders.

After all, these facilities - no matter how tranquil and attractive - are of little value if residents and visitors are too scared to visit or utilise them.



**Anthony T Schmidt**  
Managing Editor





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# SMITHSONIAN ARCHITECT AND ABORIGINAL ARTIST DESIGN NEW SYDNEY PLAZA

Artist's impression of the new Plaza  
Image courtesy of Adjaye Associates

Internationally renowned architect Sir David Adjaye of Adjaye Associates and award-winning Sydney-based contemporary Aboriginal artist Daniel Boyd have been chosen to design a new public square, plaza building and public artwork near Circular Quay in Sydney.

Based in Accra, London and New York, Adjaye Associates designed the \$540 million Smithsonian Institute National Museum of African American History and Culture in Washington DC.

Adjaye Associates has teamed up with Boyd to design an inclusive public building and suspended artwork that will sit 20 metres above the ground, providing a new place for workers and visitors to dwell and take respite from busy city streets.

Sydney Lord Mayor Clover Moore said the public plaza would be a stunning addition to the revitalised Circular Quay precinct and the transformation of George Street as central Sydney's main boulevard.

"By working closely with Lendlease, we have been able to secure this spectacular public artwork and meeting place for city dwellers, office workers and visitors to enjoy," the Lord Mayor said.

"The artwork reflects our commitment to recognising Australia's First Peoples proudly in the public domain. Much like

Anish Kapoor's Cloud Gate, I have no doubt that Daniel Boyd's artwork will become a treasured inner-city destination.

"The public plaza will connect to George and Pitt streets and a new network of laneways that is being built as part of the redevelopment. It will sit on top of public bike parking facilities and below our affordable innovation space in the Lendlease tower."

The plaza building is being delivered as part of Lendlease's Sydney Place development at 180 George Street. A development application for the works has been lodged by Lendlease for this latest addition to the revitalisation of George Street. When completed, it will be transferred to the City as a new public asset.

This follows the City's approval of the adjacent 263-metre high commercial office tower by Lendlease and its joint venture partners China's Ping An Real Estate and Japan's Mitsubishi Estate Asia. Global customer relationship management firm Salesforce has been announced as the anchor tenant.

Chair of the City of Sydney's Design Advisory Panel, Professor Ken Maher AO, said the work would have international significance.

"The building and plaza are a remarkable addition for the city and will be something that will be visited internationally. It gives a moment of pause along the journey of George Street. It is a more intimate moment in the life of the city," Professor Maher said.

A perforated steel artwork will filter dappled light through circular openings of varying size, animating the space with an ever-moving pattern reflecting the night sky.

"This is an incredibly powerful work because it's so unusual. It's a public square but it's also a room within the city. It has that wonderful ambiguity and the potential for an incredible presence in the evening," Graham Jahn, Director of City Planning, who has steered the transformation of private land along George Street, said.

"We believe this new community building and George Street public plaza will become a cherished destination in Sydney's city centre, a generative place for people to connect, recharge, reflect and take a pause from the rhythm of a fast-transforming city," internationally-renowned architect Sir David Adjaye of Adjaye Associates said.

The public square and building are scheduled for completion in 2022.





## NO STONE UNTURNED IN MAJOR STRATEGY ON SILICOSIS RISKS

A cross-industry strategy lead by SafeWork NSW has dramatically increased awareness of silicosis and standardised practices of exposure prevention.

SafeWork NSW has visited every stone manufacturing business in the state and in addition has had 448 interactions with businesses in the tunnelling, domestic and civil construction, foundries, and building products industries.

Executive Director Specialist Services, Andrew Gavrielatos, said SafeWork NSW is just two years into a five-year strategy and is on course to drive down future cases of silicosis.

“The strategy is comprehensive and involves four key components - awareness, interaction, research, and legislation,” Mr Gavrielatos said.

“We’re approaching silica exposure from all angles, for example, in addition to a media campaign ‘Which Mask will you Wear?’, we’ve trained 184 inspectors to deliver education and compliance initiatives, we’ve held 48 industry forums, presentations and workshops, and we’ve instigated partnerships and research into better exposure prevention techniques.

“We’re also working with icare to improve knowledge of and access to health monitoring.”

Last financial year a total of 3,563 workers exposed to silica underwent health monitoring provided by icare’s Dust Diseases Care.

During inspector visits SafeWork NSW issued a total of 617 improvement and prohibition notices to ensure businesses

comply with their work health and safety obligations around silica exposure.

Eighty per cent have been fully complied, with the majority of the remaining relating to workers having a health monitoring test where SafeWork NSW is awaiting confirmation from icare.

“As the number of notices complied with shows, silica exposure can be controlled by following simple steps,” Mr Gavrielatos explained.

“Cut silica containing products with water, use ventilation and dust capture systems, wear a mask, and clean up with water or a H or M class vacuum.

“If you work with silica containing products and haven’t already made exposure prevention a priority, I urge you to visit the SafeWork NSW website for more information, to request an inspector visit, apply for a rebate or find out how you can provide health monitoring to your workers,” Mr Gavrielatos added.



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# MELBOURNE'S LARGEST MIXED-USE URBAN PARK OPENS IN PRAHRAN



Melbourne's largest urban parkland project, Prahran Square, opened to the public during December. Welcomed as one of Australia's biggest and most innovative examples of mixed urban design - expanding community facilities while increasing parking and boosting business around the precinct - Prahran Square will provide 10,000 square metres of public space, more than Melbourne's Federation Square.

The urban renewal project is one of the most significant additions to public space in inner-city Melbourne and the biggest building project ever undertaken by the City of Stonnington. Construction has taken only 22 months at a cost of just over \$60 million.

Created from the conversion of the former Cato street ground-level carpark into a 500-bay underground facility, Prahran Square provides essential public space and will help to drive the economic renewal of the Chapel Street precinct.

An impact study predicts the square will attract 112,500 visitors a year and increase retail spending by \$32 million.

Victoria's chief architect said Prahran Square demonstrated how designers can help solve problems of parking and traffic, by creating "gathering places, breathing places".

"The design for Prahran Square is a great model for change - it puts pedestrians first by locating cars underground, returning valuable open space to people," said Jill Garner, Victorian Government Architect.

"Imagine the open space Melbournians could gain if this model was more prevalent."

The square's architect, Adrian Stanic, director of Lyons Architecture, said it transformed a car park into a series of accessible areas and addressed a "desperate need for outdoor space in Prahran".

The scope of the square was large, even by international standards, Mr Stanic said. "It's quite unique, enabling the expansion of car parking while enhancing public space."

Urban designer Kirsten Bauer, Adjunct Professor RMIT and Director from ASPECT Studios said the square was the largest of its type in Melbourne, if not Australia, and was at the forefront of a global multi-functional approach in densifying cities.

"A diversity of spaces will provide a variety of experiences for the community," Adjunct Professor Bauer said. "It's not a one size fits all square, it's responding to the diversity of Prahran."

The multi-functional urban parkland includes new lawns, terraced seating, an accessible forest walk, new commercial spaces and children's water play area, with over 130 new trees and original public art.

Council's long-term vision is for the square to become an artistic, creative and community-focused hub that engages the local community.

Mayor Stefanopoulos said Prahran Square would provide much-needed public open space as Melbourne's population continued to grow. The City of Stonnington had the second-lowest amount of public open space per capita in Victoria, and the suburbs surrounding the square are expected to grow by around 12,500 new residents by 2036.

"Through the redevelopment of this new square, Council is working to address Stonnington's urgent need for more open public space and to create accessible, welcoming areas for the community to enjoy," Mayor Stefanopoulos said.

"Prahran Square will be an iconic cultural and recreational destination for residents and visitors to Stonnington," said Mayor Stefanopoulos. "It will also provide facilities and parking to attract shoppers and benefit local businesses."



## NEW FIRE SURVIVAL GUIDE

Australian Pumps is going into emergency over-drive to distribute their new Bushfire Survival Guides. With fires rampant across the country, the guide has been produced to help property owner's deal with what is predicted to be the hottest, driest summer on record.

Where possible, homeowners and farmers need to plan ahead to protect their livestock and property. Generally, they know the basic preparation but not necessarily all the detailed steps required. This year's guide has been expanded to include information to minimise the risk to livestock.

"With a tragic start to the season, homes have been lost with fires already raging across the country. We are urging people to be prepared now," said Aussie Pumps' Product Manager Brad Farrugia. "Our Survival Guide is available free and aims to educate on fire protection and safety," he said.

The guide covers the essentials of bushfire protection, while also delving into detailed information, regarding equipment checklists. Also included are fire drills and pump maintenance. They are essential last minute checks to do in the event of an approaching fire.

The Survival Guide deals with product selection, while also stressing the need for an adequate water supply to be available for the property to be fully prepared.

A quality firefighting pump is key to setting up a protection system. It's capability that counts. Not all pumps are designed to deliver top performance. Second-rate gear can risk property, crops, livestock and even lives.

This comprehensive guide is unique in that it covers how to set up a roof reticulation system and sprinklers for property defence, as well as outlining how to protect livestock.

"Homeowners need to be prepared, planned and practiced at using the gear," said Farrugia. "The time to get organised is now!"

Free copies of the Aussie Fire Survival Guides for are available from Aussie Pump distributors Australia wide, or directly from Australian Pump from their website: [www.aussiepumps.com.au](http://www.aussiepumps.com.au)



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# Mental health, an opportunity to thrive in construction

by Jennifer Cameron, Injury Prevention Manager at icare

Mental health is a growing area of concern for workplaces across the country. As New South Wales' social insurer, icare protects more than 320,000 New South Wales businesses and their 3.2 million workers and our data shows we have experienced a 34 per cent increase in mental health claims since icare was established in 2015.

The rising issue of mental health in the workplace has been further highlighted by the Productivity Commission, which recently released a report revealing that mental health is costing Australia up to \$18 billion a year in lost productivity.

Mental health in the workplace is one of the challenges of our time. National data indicates that as many one in five<sup>1</sup> employees are likely to be experiencing a mental health condition, with the state's construction industry experiencing an increase in mental health claims over the past two years.

Despite the construction industry experiencing the lowest number of mental health claims compared to other industry

sectors. The industry has still experienced an 80 per cent increase in mental health claims over the past two years.

In 2017, there were 133 mental health claims made by employees working in the construction industry in New South Wales, with the average claimant requiring 136 days off and costing approximately \$67,000.

***National data indicates that as many one in five employees are likely to be experiencing a mental health condition.***

Mental health claims on average cost three times more than physical claims. This is partly due to the extended time off work many claimants require, with employees experiencing mental health issues taking on average, almost four times as long to return to work compared to employees with physical injuries.

Due to the nature of the work, the construction industry can be a high-risk environment, which can lead to both physical and psychological injuries. However, what is less widely acknowledged is the psychological impact of issues like job security, the transient nature of the workforce and workplace culture.

In addition to this, more broadly speaking, across Australia there is increasingly less stigma associated with mental health issues and as a result, there has been an overall increase in the diagnoses of common mental illnesses among the Australian population.

According to icare's data the most common reason for mental health claims in NSW is work-related harassment and workplace bullying, which accounts for 43 per cent of mental health claims across the workforce and is likely to be the case for the construction industry.

While a lot of work has been done by businesses within the construction industry to address bullying in the workplace, for some, it still forms part

<sup>1</sup> Australian Bureau of Statistics. (2009). National Survey of Mental Health and Wellbeing: Summary of Results, 4326.0, 2007. ABS: Canberra



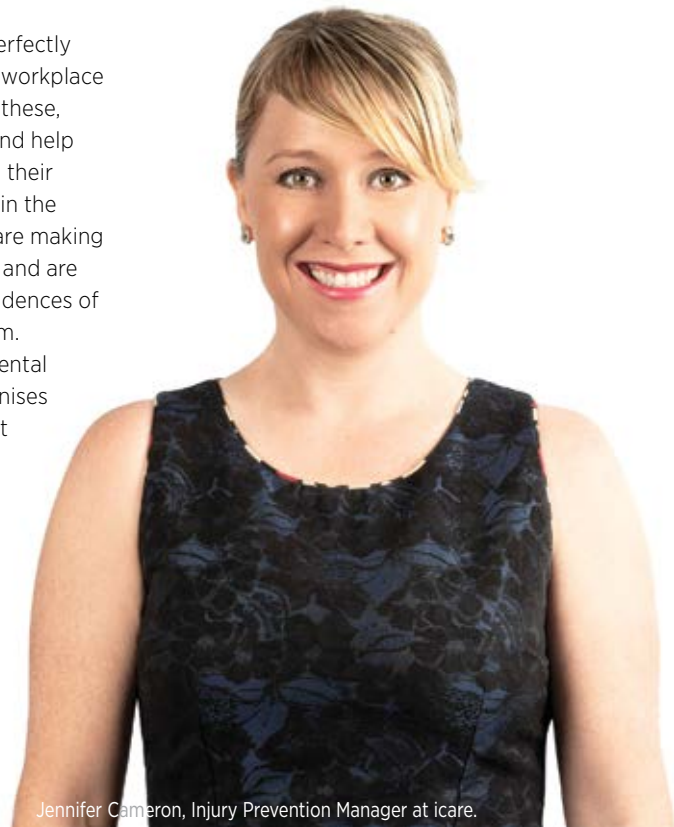
of the culture in this male dominated environment. Therefore, it is vital that workplaces turn their attention to the culture within the workplace and focus on engaging leaders and workers around behaviours that allow workers and the business to thrive.

With mental health proving to be a growing challenge in the workplace, a primary focus for icare has been putting people ahead of process to generate better outcomes and help get people back to work quickly and safely.

As a result, this positive change journey has led us to develop a range of useful mental health initiatives aimed at providing businesses with techniques to support their employees. Just last month we started a new pilot workshop with employers to help them identify workplace factors that impact on mental health in the workplace risks that could lead to cases of poor mental health. The workshop aims to support the creation of strategies to address the identified risks.

The construction industry is perfectly positioned to take advantage of workplace mental health programs such as these, which create tailored solutions and help to identify risks that may arise in their workplace. Businesses investing in the mental wellbeing of employees are making a firm commitment to their staff and are helping to prevent avoidable incidences of low productivity and absenteeism.

While the data surrounding mental health is concerning, icare recognises the need for workplaces to adapt to meet changing employee needs and is working to change the way we operate to better support both employees and employers. We know that there is still more work to be done within the construction industry but increasing awareness of the challenges of mental health and providing helpful programs is a positive step in the right direction.



Jennifer Cameron, Injury Prevention Manager at icare.

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*“Our Ocean Beaches Strategy highlights our ongoing and increasing commitment to managing and protecting Gold Coast beaches now and into the future.”*

MAYOR TOM TATE

# Making Waves on the Gold Coast

City of Gold Coast has recently completed construction of an innovative coastal engineering project. The Palm Beach Shoreline Project on the southern Gold Coast was born out of a need to protect a vulnerable section of coastline while simultaneously enhancing surf amenity for the local community.



# oast

PICTURED ABOVE: Aerial of Palm Beach showing the location of the artificial reef

The Gold Coast welcomed more than 12 million visitors in 2018\*, spending a record \$5.7 billion\* across the region. These holiday-makers are increasingly choosing to stay for the sought-after coastal lifestyle and are fuelling a population boom. The city's annual population growth rate is 3.2 per cent, 1.4 per cent higher than the national figure.

The lure of spectacular white sand beaches is what draws many tourists and newcomers, a fact not lost on Gold Coast Mayor Tom Tate.

"We recognise that our 52 kilometres of beautiful beaches are one of our most precious natural assets for residents and visitors alike as well as being a major natural economic asset" he said.

The significance of the beaches to the Gold Coast's image and regional economy was evident between 2009 and 2013 when a succession of intense storms battered south-east Queensland. Parts of the coastline were impacted by storm damage, leaving locals and visitors unable to effectively enjoy the iconic Gold Coast beach experience.

In response, the City created a prioritised framework for managing and protecting the city's beaches now and into the future. The Ocean Beaches Strategy 2013-2023 sets key objectives to be achieved through 16 specific actions over a decade.

Mayor Tate acknowledges that a significant portion of the urban fabric of the city is exposed to the high energy ocean environment.

"Our Ocean Beaches Strategy highlights our ongoing and increasing commitment to managing and protecting Gold Coast beaches now and into the future," he said.

A key objective of the strategy is protecting infrastructure from coastal hazards through active management of our ocean beaches using a variety of best practice methods.

Since the time when the Gold Coast was just a string of sleepy seaside villages, one of the most susceptible beaches to coastal erosion has been Palm Beach. Lying between Tallebudgera Creek to the north and Currumbin Creek in the south, this four kilometre stretch of beach trends more easterly than beaches further south, which are somewhat protected by the famed surf break, Snapper Rocks.

The Mayor said the City had long recognised a need to find a sustainable solution for Palm Beach.

"For decades, significant erosion events along Palm Beach have threatened beachfront infrastructure, exposing seawalls and jeopardising the lifestyles of locals through the temporary loss of useable beach" he explained.

Hydrographic and beach survey data collected since the 1960s shows Palm Beach has the lowest volume of sand compared to all Gold Coast beaches backed by beachfront infrastructure. With no long term trend of sand accretion evident, Palm Beach would remain susceptible to coastal erosion unless management strategies were implemented to increase the volume of sand on the beach.

With a considerable challenge to tackle, the Palm Beach Shoreline Project was established in 2012.



## DEVELOPING THE SOLUTION

The City's coastal engineers collaborated with a talented team of consultant scientists, coastal management experts, engineers, environmental officers, and dredging consultants to determine the best possible solution for Palm Beach. With the Gold Coast's global reputation as a centre for surfing, the local surfing community also became an important stakeholder in the project.

The City is the first local government anywhere in the world to adopt a Surf Management Plan, which formally recognises the importance of surf breaks to the local surf community.

"The plan reinforces the critical nature of maintaining surf amenity with solid science, community input and effective management strategies," explained Mayor Tate.

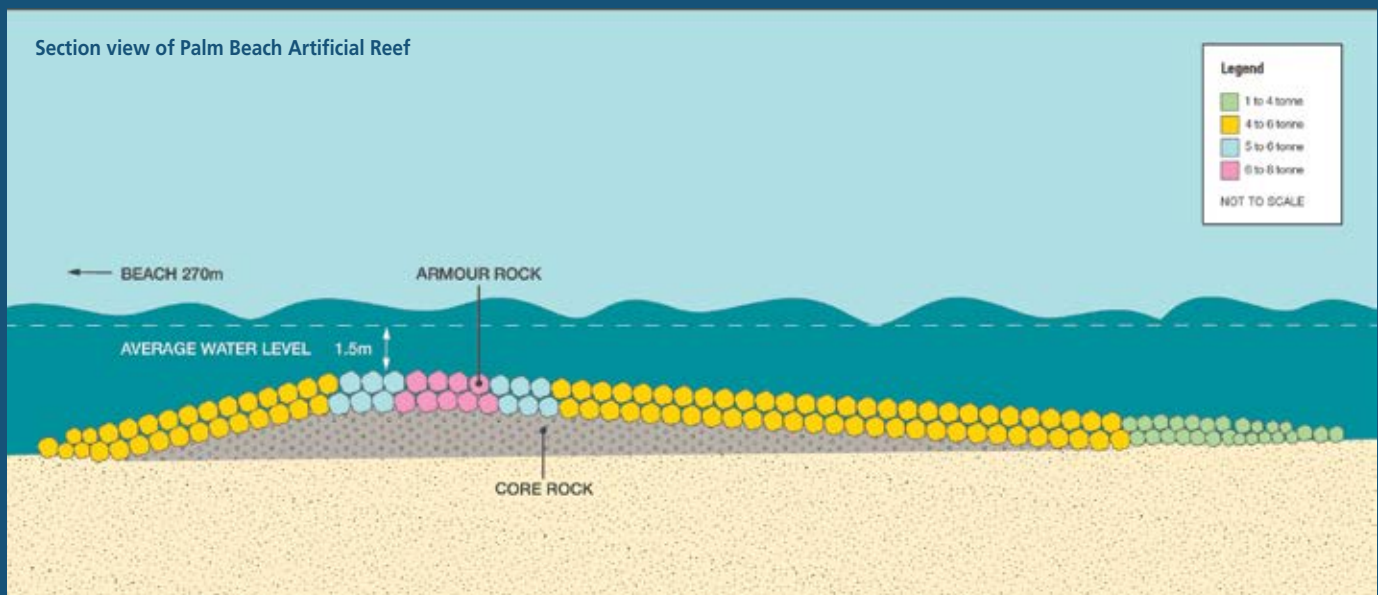
During the first phase of the project, eighteen options were identified to address erosion vulnerability along Palm Beach, and a shortlist of seven management options were then developed for further assessment and comparison.

The options included combinations of potential coastal management elements including accelerated seawall construction; increased annual dredging from Currumbin Creek entrance to

nourish Palm Beach; mass beach nourishment from offshore sand reserves; extension of the existing groyne structures; and construction of an artificial reef.

Each option was diligently assessed using multiple criteria including cost; coastal protection benefits; and impacts on ecology, coastal processes, surfing, and beach amenity.

An artificial reef, in combination with sand nourishment, was favoured largely due to its low visual impact and it providing a sustainable solution by retaining nourished sand over the long term.



*"The plan reinforces the critical nature of maintaining surf amenity with solid science, community input and effective management strategies."*

## REFINING THE DESIGN

Once an artificial reef was established as the best solution for Palm Beach, the City spent a further three years carrying out intensive investigations to achieve the most effective, cost efficient final structure, a world first in artificial reef design.

Design investigation for the artificial reef adopted a 'multiple lines of evidence' approach, involving real world data capture and several forms of sophisticated computer modelling.

A scaled model of the proposed reef was built in a wave tank to assess rock stability under different swell conditions and determine minimum rock sizes. Wave transmission, sand movement, and surf amenity around the artificial reef were also investigated, and the findings used to verify the accuracy of computer models. Each of the single methods used has benefits and limitations and the use of multiple methods allows cross-checking and validation between the various investigations. This approach

provides confidence in the design solution and its performance outcomes.

The reef works by influencing the surrounding waves and currents to promote a long term increase in sand along vulnerable sections of Palm Beach. Design investigations showed the sustained increase of sand would be in the range from 200,000 cubic metres to 450,000 cubic metres. Other predicted benefits included improved surfing amenity over and inshore of the artificial reef and reduced storm erosion inshore.



Image showing benefit area of Palm Beach Artificial Reef)

## BEACH NOURISHMENT

Fast forward to 2017 and the City began laying the groundwork for construction of the artificial reef. A beach nourishment program delivered more than three million cubic metres of sand to Gold Coast beaches. Palm Beach received its share, with 470 000 cubic metres of extra sand delivered as a buffer to protect the coastline from the impacts of storms and large swells.

Mayor Tate said the sand was directed to specific sites along Palm Beach and

the rest of the coastline by a dredging vessel either “bottom dumping” or “rainbowing”.

“Bottom dumping releases sand near the wave breaking zone through the vessel’s hull. Rainbowing projects sand from the bow of the vessel into the wave breaking zone. Thanks to extensive investigations we have ample information to know exactly where to place the sand,” he said.

A novel beach nourishment framework used multiple data sources and methods

to inform sand placement locations on a weekly basis, with the aim of balancing operational, morphological, social and environmental outcomes. This innovative methodology drove placement of individual artificial sand banks or a ‘sand pattern’, which is in contrast to the more usual ‘fill to profile’ methodology used for beach nourishment. This approach was successful in reducing beach use interruptions, safeguarding nourishment production and delivering temporarily enhanced surfing amenity.

Dredge delivering sand to nourish Gold Coast beaches







## BUILDING THE REEF

Work commenced on the construction of the Palm Beach Artificial Reef in May 2019. It is located approximately 270 metres offshore from Nineteenth Avenue between the beach and the existing natural reef. The reef footprint is 160 metres long, 80 metres wide and is 1.5 metres below the average water level at its highest point.

Basalt and greenstone rocks were used in the construction for being particularly durable, heavy and dense. 60,000 tonnes of rock was quarried in

South East Queensland and classed into four sizes, with the smaller rocks making up the core of the structure, stopping sand moving up from the seabed and undermining the reef.

Constructing anything offshore and underwater is a complex undertaking. Positioning the rocks required specialised machinery and technology. The rocks, each weighing up to eight tonnes, were loaded onto Split Hopper Barges at the Port of Brisbane before being shipped over 20 hours to the site offshore from Palm Beach. They were then deposited

on the seafloor by opening the hull of the barge.

A specialist marine construction vessel called a backhoe dredger then accurately moved the rocks into position using GPS technology. The backhoe dredger was fitted with a sophisticated machine control computer system that allowed the operator to visualise the seafloor level, the artificial reef design levels and the position of the backhoe dredger in real time. The rocks could then be accurately positioned to the design specifications.

## OTHER WAVES ON THE HORIZON

A plaque was unveiled by Mayor Tom Tate in September 2019, onshore from the artificial reef, to mark the completion of the \$18.2 million project.

Finishing ahead of schedule, to budget and achieving the stringent design requirements, construction of the artificial reef was declared a success by the Mayor.

"The early signs of coastal protection benefits are positive and we're seeing waves breaking on the reef," he said.

Since then, the City has been working with Griffith University to closely monitor sand movement, surf amenity and ecology around the reef. A build-up of sand has already started to form inshore of the reef.

The artificial reef is also proving popular with local surfers who are keenly anticipating the typically larger summer swells to see its full wave generation potential.



In another triumph for the project, the City accepted an Excellence Award in the category of 'Innovation' from the Queensland Branch of the Institute of Public Works Engineering Australasia (IPWEA) in October.

Mayor Tom Tate said the City of Gold Coast has committed to further work that will consider other sites for potential artificial reefs.

"We recognise there is a growing demand on our beaches because our community and visitors understandably love to use them for a wide range of activities. Projects that deliver coastal protection, surf amenity, and environmental outcomes are important in achieving the outcomes of our Ocean Beaches Strategy."

"Our learnings and the data collected from the Palm Beach project may help to inform the design of future offshore artificial reefs," suggested the Mayor.

For more information about the Palm Beach Shoreline Project and Coastal Management on the Gold Coast, visit: [www.cityofgoldcoast.com.au/beaches](http://www.cityofgoldcoast.com.au/beaches)

*\*Source: Destination Gold Coast: Calendar Year 2018 Summary*

# NON-COMBUSTIBLE BUILDING FACADES

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# Non-Combustible Building Facades

## Navigating the Design & Construction Process

In recent years the world has been witness to building fires either caused by or exacerbated by flammable cladding products - including fires in Sydney and Melbourne Australia. The aftermath of these events has sent shockwaves through the marketplace with ramifications for existing building owners and occupiers, governments, regulators and insurers.

Recent warnings from the Australian Institute of Building Surveyors suggest that unless the Federal government takes action, it is possible that professional indemnity insurance will collapse over the coming months.

This situation places professionals of all types involved in the property industry in a tenuous situation as despite the political landscape, Australians will continue to build, own, work and reside in buildings. In this article we highlight key considerations for designing and constructing non-flammable facades.

### DESIGNING COMPLIANT FACADES

The National Construction Code (NCC) 2016, produced and maintained by the Australian Building Codes Board (ABCB) on behalf of

Federal, State and Territory governments provides a uniform set of technical provisions for the design and construction of buildings throughout Australia.

The NCC Volume One, Performance Requirement CP2 requires that *“a building must have elements that will avoid the spread of fire between buildings and in a building, in a manner appropriate for that building”*. There are two pathways to achieve compliance with CP2:

1. **Deemed to Satisfy** - Satisfying the Deemed to Satisfy (“DTS”) requirements set out in C1.9 of the NCC Volume One
2. **Performance Solution** - demonstrating that the proposed solution is equal to or better than a ‘Deemed to Satisfy’ solution and meets the requirements of CP2.

### CLADDING SPECIFICATIONS – KEY CONSIDERATIONS

In addition to achieving NCC compliance, cladding like any other building element must be fit for its intended purpose. This requires consideration of capital and non-capital expenditure over the products life cycle which can then be compared against competing products.

Key considerations include:

- **Non-combustibility** - Is the product capable of responding to NCC CP2 and certified as not combustible to AS1530 Part 1?
- **Mechanically fixed** - Can the product be mechanically fixed? Mechanical fixing offers an insurance policy against adhesion failures
- **Maintenance & Cleaning** - Are the surfaces durable, light and colour fast and do they offer resistance to graffiti and/or have any self-cleaning properties?
- **Thermal protection** - In combination with mineral insulation and an innovative sub-structures what U-values is the cladding system able to achieve?
- **Noise Isolation** - When offered as part of an external wall system solution what sound reductions (in decibels) are possible?
- **Condensation** - When offered as part of an external wall system solution, how is internal condensation dealt with to avoid future problems with mould and mildew leading to uninhabitable spaces?
- **Installation speed** - Is the cladding system modular enabling rapid installation in both low, medium and

high rise applications using a range of conventional access methods?

- **Panel Replacements** – In the event of mechanical damage caused by impact, can a single panel be replaced with ease?
- **Warranties** – Are manufacturer's warranties offered credible and for the long term?
- **Environmental sustainability** – are cladding products manufactured in accordance with environmental standards and fully recyclable?
- **Design flexibility** – Does cladding offer designers of new and refurbished buildings adequate design flexibility in terms of colours, surface finishes and formats?

As an element with a 25 year plus design life, cladding must be designed to stand the test of time. Ceramic panel manufacturer Agrob Buchtal has been manufacturing ceramic cladding systems for over forty years delivering an enviable list of reference projects world-wide.

Made in Germany, these ceramic façade systems are highly functional offering mechanical fixing systems, thermal and acoustic insulation properties, easy install modular systems and most importantly are made from Australian-compliant non-



combustible materials, tested in accordance with AS 1530.1.

### DESIGN FLEXIBILITY AND SERVICE

Agrob Buchtal's ceramic façade systems come in an enormous range of sizes, colours, surface textures and finishes, and design styles including uniform colours in both satin matt and gloss finishes, stone,

cement, metallic and timber look finishes across three ranges: KeraTwin, KeraShape and KerAion. Products can be installed horizontally, vertically and overhead with brick-bond and other panel layout options available, due to a wide range of mechanical fixing solutions.

An in-house planning department is available to provide specialist technical advice.





## LIFE CYCLE BENEFITS, LOW MAINTENANCE COSTS AND SUSTAINABLY RESPONSIBLE

With a design life of 50 years, Agrob Buchtal's ceramic façade systems are an investment for future generations – particularly relevant for municipal capital investment spends.

Ceramic panels are manufactured with Hytect Technology providing them with self-cleaning, anti-bacterial properties when exposed to natural sunlight and on account of the panel's hydrophilic surface. Hytect also activates an air-purification process during which pollutants such as nitrogen oxides are neutralised.

Agrob Buchtal ceramic panels require little to no maintenance however in the

event of mechanical impact, an individual panel can be easily replaced.

Manufacturing processes and raw materials enable certification with international sustainability programs such as LEED, BREEAM and DGNB and the materials are completely recyclable.

### KLAY SALES

KLAY supplies Agrob Buchtal ceramic façade systems to the Australian market. KLAY's sales staff are experienced in design, supply and installation related matters pertaining to ceramic facades.

For further information including samples, contact KLAY at: [sales@klay.com.au](mailto:sales@klay.com.au) or (03) 9545 5788 or visit the website:

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

*“As an element with a 25 year plus design life, cladding must be designed to stand the test of time. Ceramic panel manufacturer Agrob Buchtal has been manufacturing ceramic cladding systems for over forty years delivering an enviable list of reference projects world-wide.”*



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# IT'S TIME

Australia is moving to MASH tested Crash Cushions on December 31st 2019 and the time to prepare, is NOW!

## DECEMBER 2019

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31 transition to MASH	1	2	3	4

### JANUARY 2020

S	M	T	W	T	F	S
		1	2	3	4	
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

### FEBRUARY 2020

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29

●: 4 ○: 12 ●: 19 ●: 26

According to the Austroads / ASBAP 'Transition to MASH' process, tenders called for new crash cushions installed on Australian roads after December 31st 2019, will require them to be tested and approved under the AASHTO MASH guidelines, rather than the superseded NCHRP350 guidelines.

With this date rapidly approaching, **NOW IS THE TIME** to start preparing for this critical transition.

**SMART CUSHION** has been **ASSESSED, APPROVED & RECOMMENDED FOR ACCEPTANCE** throughout Australia by ASBAP (Austroads Safety Barrier Assessment Panel).

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**SMART CUSHION** is the **ONLY** crash cushion to have passed both the NCHRP350 and MASH-2016 crash test standards.

# SMART CUSHION

Speed Dependent Crash Attenuators

# SMART CUSHION

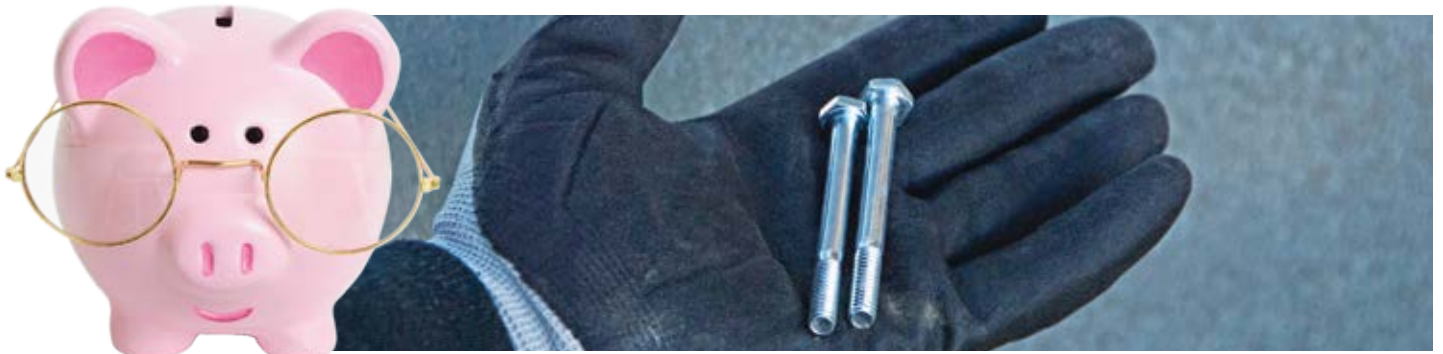
## Speed Dependent Crash Attenuators

### MASH TESTED & APPROVED ✓



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#### SAVE MONEY...

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#### SAVE LIVES...

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# The 'virtual' art of being specified

Have you ever wondered where architects and interior designers source the furnishings that populate project specifications? You probably wished your products were attracting all that attention, volume sales and frequently, higher-end price points.

Chances are, the images of those products have been conveniently downloaded from a website, usually an overseas brand.

Australian furnishing manufacturers aren't being sufficiently noticed by those architects and interior designers, who trawl furnishing websites for suitable 3D models, quality downloadable images and product specifications.

We asked Jonathan Muller, experienced architect, designer and visualiser for advice on how to be noticed online and increase turnover of locally designed and manufactured furnishings.

## ON-SPEC BENEFITS FOR DOMESTIC BUSINESS

As Jonathan explains, the advantages of having your products selected by architectural specifiers are many.

"Most importantly, manufacturers are encouraged to design and produce products that don't compete purely on price point. Prestige projects demand prestige furniture," he said.

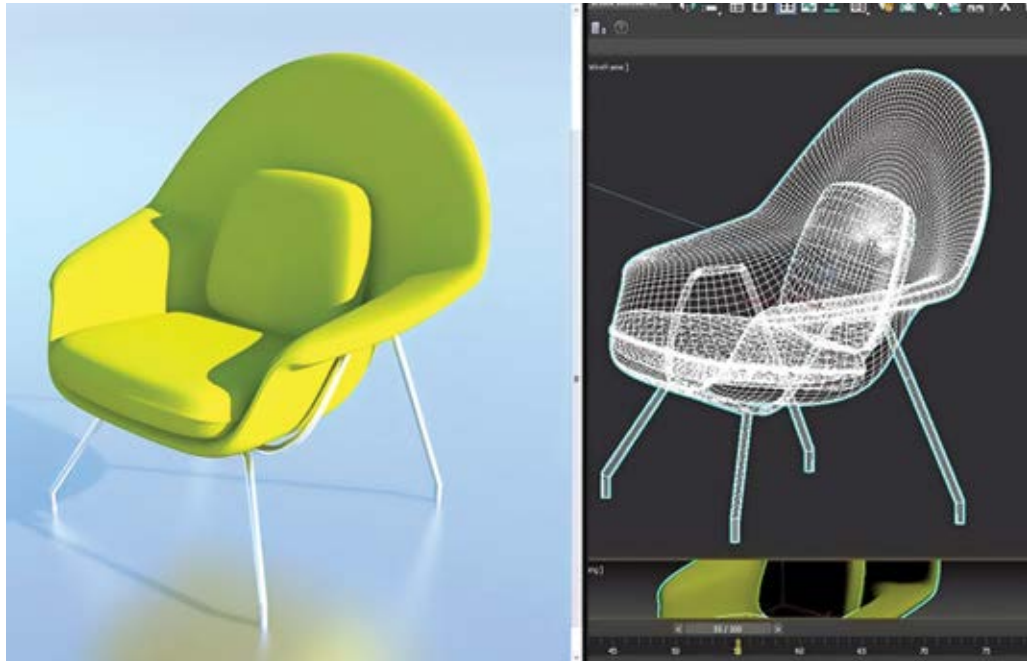
"As you are no doubt aware, there is a lot of competition at the low-end of the market, but with specifiers, the product will be judged on the value it adds to the project in total."

The good news is, Jonathan says, that local designers and manufacturers can offer specifiers huge advantages, that are just waiting to be exploited.

"Customisation of products, for example, is more difficult for imports. Traditional manufacturing may prohibit customising, but innovative design can make semi-bespoke a high value-added option," he added.

## TIME TO RE-THINK YOUR BUSINESS MODEL

The first step for local furnishing businesses, is to recognise what isn't working so



***"By building a 3D model of your products, and offering them for free download, you are creating a virtual catalogue that will increase the possibility of your products being specified on projects..."***

well for them. Perhaps it's that business model where powerful retailers call the shots via 'exclusive' supply deals on your products while lining them up against your competitor's in the showroom.

Sound familiar?

Your local domestic market of loyal but ageing customers may have served you well in the past, but the next generation will shop elsewhere for 'their' style of products, and they'll probably start their selection process online.

According to Jonathan, it helps to understand the process within an Interior design department of a typical architectural firm.

"The furniture for a new apartment project, for example, forms an important part of the 'style' of the proposed interiors" Jonathan said.

"Designers are tasked with not only seeing reps from the usual importers and distributors, but also of trawling the web for products with the right 'look'. This

work is sometimes allocated to the recent graduates in the firm, so the web becomes a powerful tool in researching suitable products and developing the brief for a client."

"Once a chair, sofa, desk or other furnishing catches their eye, that image is saved for inclusion on a 'mood board' for presentation to the client. If the client likes the look, then those products, or something similar are tentatively specified, dependant on budget constraints and availability."

"For the presentation to be as realistic and engaging as possible, the downloaded furniture models are often used in 3D rendered scenes, and sometimes in animated 'walk-throughs' of the proposed interiors," explains Jonathan.

## MAKE IT EASY FOR THE DESIGNER

Global manufacturers and big brands have had the resources to boost their online presence for some time now, whilst smaller

local manufacturers have assumed that they don't have the resources or know-how to follow suit.

"There is an investment required for building downloadable content, but it should be viewed as a marketing and promotional necessity, amortised over the whole product range of the company," Jonathan advises.

"Someone browsing for a chair will be exposed to your entire product range. They may or may not specify multiple products, but if your site is user-friendly, it will be bookmarked and revisited many times."

"By building a 3D model of your products, and offering them for free download, you are creating a virtual catalogue that will increase the possibility of your products being specified on projects - often in considerable volume," he added. "Without this digital presence you have little or no chance of your products being seen, liked or specified."

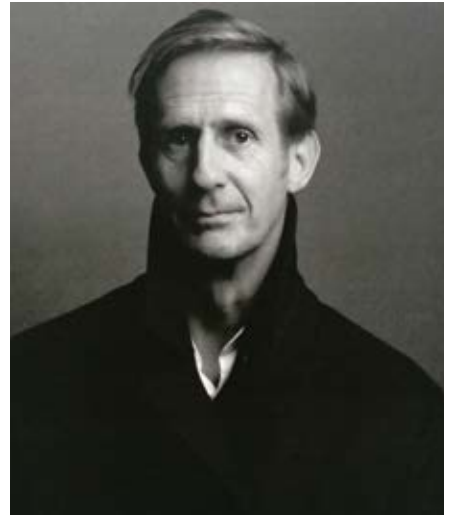
The world of virtual technologies may seem like the 'dark arts' to some, but in

reality, the steps are simple, and there are plenty of website developers, animators and 3D designers who can help furnishing manufacturers and retailers get themselves better noticed in the online world.

"If you already have CAD assets available, you are part of the way towards creating a 3D virtual version of your product. The Australasian Furnishing Association offers advice to members on where and how to develop website virtual design elements, for a better chance of being specified. If you don't embrace new technologies, your business will be left behind," Jonathon concluded.

.....  
*Jonathan Muller (BArch.) is a graduate of architecture, designer and experienced visualiser. More recently he was Associate at a health planning and architectural practice. His expertise is in architectural and Interior concept design and software rendering working in the healthcare sector on projects ranging from low rise aged care facilities to major hospitals, both*

*public and private. Jonathan has also designed furniture for a number of local manufacturers. He was an assistant to Fred Lowen at Module International and has been an Australia Council awarded designer/maker of timber furniture. Contact Jonathan Muller via the Australasian Furnishing Association at: [www.australianfurniture.org.au](http://www.australianfurniture.org.au)*



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## NEW PURPOSE-DESIGNED ENERPAC EDC DECOMMISSIONING CUTTERS BITE DEEPLY INTO HAZARD, DELAY AND COST

A new series of powerful and portable EDC Decommissioning Cutters is being introduced by Enerpac to increase the speed, safety and cost-efficiency of such tasks while also helping to curtail the delays and complexity they often involve.

The purpose-designed EDCH Series 700 bar hydraulic cutters – which feature exceptionally large blade apertures, up to 170mm – can handle material hardness of up to 41HRc (Rockwell measure), including metal tubes, cables, profiles and similar materials.

This versatility makes them an invaluable efficiency and safety asset when decommissioning plant and undertaking maintenance shutdowns involving infrastructure and machinery typically found on sites ranging from construction, mining, energy, oil and gas, through to manufacturing, transport and logistics, primary production and utility projects, including electricity, water and wastewater, says Enerpac Regional Sales Manager Darryl Lange.

“Decommissioning tasks frequently involve a multiplicity of tools and a high degree of hazard, risk and delay potential that

competitive companies and efficient utilities cannot afford,” Mr Lange said.

“These purpose-designed decommissioning tools offer minimal spark risk compared with torching, grinding and sawing methods, while also producing minimal vibration to help prevent HAVS (Hand/Arm Vibration Syndrome),” he added.

The new tools are designed to work with Enerpac electric high-flow, cool-running ZE6210X pumps, which are part of a ruggedly reliable ZE series of configurable pumps requiring 18% less current draw than comparable types. They complement Enerpac’s comprehensive range of advanced hydraulic, electric and manual cutting technologies, including EB Bar Cutters, EC Chain Cutters, EFB Flat Bar Cutters and EWC Wire and Cable Cutters, as well as WHC, WHR, WCB and STC cutterheads in capacities from 3-20 tons. All are backed throughout Australia, New Zealand and Papua New Guinea by Enerpac’s comprehensive service and technical support network, optimising their uptime and safety in service even in aggressive conditions and remote locations.



Enerpac EDC Series Decommissioning Cutters are designed to work with Enerpac high flow, cool-running ZE6210X series pumps (both cut and pump pictured)

Features include:

- Durable blades to maintain efficiency throughout rigorous use
- Double-acting steel piston and cylinder to improve robustness and control
- Three model range weighing 11.5, 16.9 and 24.2kg, with versatile blade apertures of 130, 145 and 170mm respectively
- External hydraulic pump to help keep the tool cooler and working longer

Enerpac’s new EDC Decommissioning Cutters complement the global high pressure hydraulics market leader’s comprehensive ranges of lifting cylinders, pumps, pullers, presses, control technologies and professional bolting technologies, offering a one-stop shop for high performance industrial tools and solutions throughout Australia, New Zealand and Papua New Guinea. The tools are designed to Enerpac’s global standards of safety, Standards compliance and performance precision and traceability.

For more information about Enerpac equipment please contact Enerpac on: +61 (0)2 8717 7200, E: [sales@enerpac.com.au](mailto:sales@enerpac.com.au) or visit the website: [www.enerpac.com.au](http://www.enerpac.com.au)

### ABOUT ENERPAC

Enerpac is an international market leader in high-pressure hydraulics, which has been established in Australasia as a major supplier of high-pressure (700 bar) hydraulic equipment for 50 years, having nationwide service backup and a strong distribution network.

Enerpac is wholly owned by the Enerpac Tool Group, a premier pure play industrial tools and services company serving customers from operations in more than 30 countries and is headquartered in Menomonee Falls, Wisconsin.

For further information on Enerpac Tool Group and its businesses, visit the Company’s website at: [www.enerpactoolgroup.com](http://www.enerpactoolgroup.com)



The purpose-designed EDCH Series 700 bar hydraulic cutters – which feature exceptionally large blade apertures, up to 170mm – can handle material hardness of up to 41HRc (Rockwell measure), including metal tubes, cables, profiles and similar materials.

# AUSSIE'S HYDRAULIC PUMPS



Australian Pump Industries provides a range of GMP hydraulic drive self-priming pumps for water carts and dust suppression. The company's breakthrough in using lower capacity hydraulic motors enables smaller sealed systems on these vehicles to benefit from the advantages of these installations.

One of their key pumps is the 3" self-priming pump, called the Aussie GB3XR- A/ST HYD. The pump can provide maximum flow of 1,500 litres per minute and a maximum head to 31 metres. This big 3" pump is capable of handling a wide range of applications including construction site dust suppression, batter spray and filling tankers.

Hydraulic drive pumps derive their power from the main engine of the vehicle or equipment on which they are mounted. Thus, operators can get the advantages of virtually unlimited power, delivered through a flexible drive system that doesn't depend on drive shaft or PTO adapters.

The new Italian hydraulic motor requires 22cm<sup>3</sup> per rev at 150 bar pressure, that's equivalent to 12.5kW.

The drive system and the compact design means that the pump can be mounted onto the vehicle in the best location from both a space and weight perspective. Hydraulic hoses are flexible and allow designers a lot more scope.

The elimination of a separate petrol or diesel engine to drive the pump means a major reduction in maintenance costs.

"This pump really bridges a gap in the market in terms of a high head hydraulic drive pump that will handle dirty water," said Aussie Pumps Product Manager Albie Bester.

"At a maximum head of 31m the pump will deliver 1,500 lpm flow. That's impressive for a 3" self-priming semi trash pump," he said.

The 3" pump has excellent self-priming characteristics with the ability to draw water from pits of vertical depths of 6 metres. It has been designed to pass solids up to 35mm making it suitable for handling in silty water.

The Aussie semi trash pump is fitted with a hard wearing silicon carbide mechanical seals with an alumina counter face with nitrile rubber elastomers. Tungsten Carbide seals are an option. It also features a stainless steel wear plate and stainless steel motor shaft.

The pump includes a front opening clean-out port that makes it easy to access the pumps internals. That's a huge advantage as this means the unit can be cleared of chokes in situ without having to dismantle pipework.

The big pump will soon be available in cast 316 grade stainless steel configurations making it suitable for where corrosive liquids. Viton seals are available as an option.

**Above:** Aussie 3" hydraulic drive tanker pumps now feature a smaller capacity hydraulic motor that enables the pumps to be used on a wider range of vehicles.

***"This pump really bridges a gap in the market in terms of a high head hydraulic drive pump that will handle dirty water."***

Like all Aussie Pump products the units are designed and built to ISO 9001 quality standards. Australian Pump believes that users deserve the best quality and won't offer any product that is not built to their stringent standards.

Further information, including a free catalogue, is available from Australian Pump Industrial Distributors or by calling Australian Pump Industries on: 02 8865 3500.



# ULTRA-THIN LIFTING BAGS SAFELY HOIST HEAVY LOADS IN SOFT, EMERGENCY AND REMOTE CONDITIONS



Pronal ultra-thin CLT lifting cushions combine the advantages of high durability and power with gentle, precisely controlled lifting that can spread the load over broader surfaces of the object being lifted, rather than focusing the power on point loads.

Lifting bags so powerful and durable they have been used to hoist crashed locomotives are being offered by Air Springs Supply Pty Ltd for heavy vehicle recovery, on-site repair and emergency rescue operations on soft ground or irregular surfaces.

Pronal ultra-thin CLT inflatable cushions – which are easily transported to remote areas by helicopters, light aircraft and 4wd service vehicles – can individually handle lifting loads of 65 tons on surfaces including soft ground, confined trenches, crash recovery areas and uneven earthworks that can create hazards for conventional lifting technologies such as cranes and hydraulic or pneumatic cylinders.

Multiple Pronal cushions, each as thin as 20mm uninflated, with lifting heights from 85-500mm, can be stacked one on top of another for heavier lifts. The cushions, which comply with standard NF EN 13731 'Lifting bag systems for fire and rescue service use - safety and performance requirements' for safety in operation, can also be used to immobilize blocks of stone and to release trapped people.

Seamless inflatable CLT lifting cushions are actuated by compressed air cylinders or standard portable compressors at 8 Bar, to rapidly but delicately raise loads ranging from heavy vehicles, pipelines and plant through to beams, bridge components, building components, machinery and resource development structures. The cushion remains leak-tight after disconnection, thanks to its self-sealing coupling.

CLT cushions are highly suitable for use at crash and rescue sites, urgent vehicle extraction and repair sites, mining and energy exploration sites, construction sites, remote infrastructure developments and recovery and maintenance of 4wd and heavy vehicles used by local authorities and service utility services including electrical distribution and water and waste water plants and pipelines.

Pronal lifting and separation cushions range from ultra-thin bags (just 20mm thick deflated) to powerful spreading cushions that can exert hundreds of tonnes of force to part plant and machinery components for servicing. Complementary low-pressure CPB Maxi-Lift cushions can be used on land and under water, offering greater strokes of up to 700mm (or 1400mm where a pair are employed).

"Their durability in aggressive and remote conditions, where reliability is paramount, is assured by construction with threaded layers coated with chemical resistant elastomer, hot vulcanised under pressure in one operation," says James Maslin, National Sales and Marketing Manager for Air Springs Supply, which is national distributor for Pronal products.

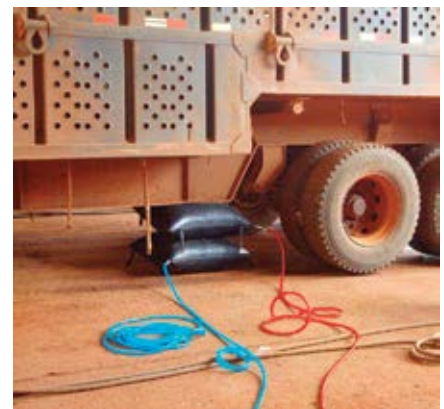
"Often there is insufficient room overhead to employ suitable cranes, even if they can be brought overland to a remote site. Sometimes also there is insufficient stability underfoot to employ lifters that produce high point loads both on the ground and on the object being lifted," he says.

They can be used in confined spaces underneath inaccessible loads which, in addition to vehicle lifts, range from engines and plant, through to foundations of bridges, buildings, machinery, pipeline structures and resource development rigs requiring lifting for inspection and repair.

Features include:

- Lifting height from 85-500mm (CLT), with longer strokes provided by combinations of cushions
- In addition to standard sizes, specific sizes and shapes can be made to order to suit particular applications
- Ease of use, with inflation either by compressor or simple air cylinders
- Inflation pressures up to 8 Bar, regardless of stroke (CLT models – CPB pressures vary from under one bar, depending on model)
- Non-slip surface providing maximum friction when stacking two cushions
- Control systems tailored to particular uses
- Can be used for straight lifting, pressing, clamping, tilting or guiding

Pronal equipment such as the PAC series of lifting cushions can be supplied with trailers, lifting bases and control systems developed to the demanding standards of Pronal's world-wide customer base, including military and civil aviation applications.



Pronal CLT lifting bags are ideal for vehicle recovery, repair and emergencies

## ABOUT PRONAL

Pronal is one of the world's most experienced and respected producers of flexible products used to lift, push, press, seal and store. Founded in 1961 and headquartered near Lille in the north of France, Pronal builds standard and customised flexible products from fabrics coated with elastomer and/or plastomer. In addition to extensive industrial expertise, Pronal also works in the defence, aerospace, civil emergency and maritime/harbour sectors.

Pronal's Australian distributor, Air Springs Supply, is Australia's leading supplier of air springs and associated pneumatic technology for the industrial and transport sectors.

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

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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!



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# GET THE FACTS!

## on TRUCK MOUNTED ATTENUATORS (TMA's)

### BEWARE OF 'FAKE NEWS'

With the move from NCHRP350 testing to MASH (Manual for Assessing Safety Hardware) as the preferred testing for Truck Mounted Attenuators (TMA's) in Australia currently progressing there has been confusion amongst some equipment owners as to what equipment is compliant and, perhaps more importantly, what the status of their equipment will be after Australia moves to MASH as the testing standard.

This situation has no doubt been inflamed by the inaccurate information and spurious claims that have surfaced over the past 12 months - including claims that some units will no longer be permitted to be used after December 31, 2020.

With that in mind, the following fact sheet has been developed to provide key FACTS as to the current status of the 'Transition to MASH Guidelines'.

**FACT!**

The move by the Austroads Safety Barrier Assessment Panel (ASBAP) towards MASH testing and certification is a complex process that will take some time to implement. The Panel is transitioning the current suite of accepted road safety barrier systems and devices within the Australasian market to MASH guidelines over an extended timeframe, with Part 2 Products (which includes TMA's) to be completed by 31 December 2020.

**FACT!**

The transition to MASH guidelines is a lengthy and ongoing process and lists of 'Austroads Approved Products' are currently a Work in Progress. If a product does not currently appear on a jurisdiction's list, or is not currently recommended for acceptance at an Austroads level by ASBAP, it **DOES NOT** mean that it has not been successfully tested and certified to MASH guidelines, or that it is not acceptable for use in that jurisdiction. It may simply have not yet been assessed by ASBAP.

**FACT!**

This **DOES NOT** by any definition mean that non-MASH tested equipment is suddenly obsolete or can no longer be used. It also **DOES NOT** render TMA's that have been previously approved as tested under NCHRP350 guidelines obsolete or unusable - **to suggest otherwise is simply NOT TRUE.**

**FACT!**

The Scorpion® II Truck Mounted Attenuator was the **first TMA to be fully certified as Tested, Passed and Eligible to MASH 16** by the U.S. Department of Transportation Federal Highway Administration. The U.S. Department of Transportation Federal Highway Administration *Safety Eligibility Letter CC-132* for the Scorpion® II TMA can be viewed online at: [https://safety.fhwa.dot.gov/roadway\\_dept/countermeasures/reduce\\_crash\\_severity/barriers/pdf/cc132.cfm](https://safety.fhwa.dot.gov/roadway_dept/countermeasures/reduce_crash_severity/barriers/pdf/cc132.cfm)

**FACT!**

While there is a formal agreement on the transition to MASH testing from NCHRP350 testing, there is **NO CUT-OFF DATE** for using equipment that has been certified under the NCHRP350 testing while it is operational - **to suggest otherwise is simply NOT TRUE.**

**FACT!**

The Scorpion® II Trailer Attenuator is also fully certified as Tested, Passed and Eligible to MASH 16 by the U.S. Department of Transportation Federal Highway Administration. The U.S. Department of Transportation Federal Highway Administration *Safety Eligibility Letter CC-138* for the Scorpion® II Trailer Attenuator can be viewed online at: [https://safety.fhwa.dot.gov/roadway\\_dept/countermeasures/reduce\\_crash\\_severity/barriers/pdf/cc138.cfm](https://safety.fhwa.dot.gov/roadway_dept/countermeasures/reduce_crash_severity/barriers/pdf/cc138.cfm)

**FACT!**

Even if a TMA is recommended for acceptance at an Austroads level by ASBAP, it must still be approved for use in individual jurisdictions by the relevant State Authority. The State Authorities are responsible for approving the use of TMA's in their individual jurisdiction.

**CHECK THE FACTS**

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# Want to increase sustainability in concrete production? Consider admixtures

From Australia to Singapore, more countries in Asia Pacific are encouraging sustainability in construction. Partly driven by regulations, partly driven by demands, there's increased awareness on the benefits of sustainable construction practices. An often-overlooked construction method that improves sustainability is the use of admixtures in cement-based products.

Cement additives and concrete admixtures are construction chemicals that reliably improve the sustainability of a broad range of cement-based systems. This improvement can be derived from enhancing durability and strength through water reduction and catalysing the cement hydration process to enable replacement of clinker with supplementary cementitious materials.

Today, different admixture technologies are often used in combination, especially in concrete systems that incorporate secondary cementitious materials (SCMs), where not only water reduction but also chemistries that catalyse the cement hydration reaction are used to allow for more inclusion of SCMs while maintaining the specified strength.

## Dispersant-based water reducers and superplasticisers

Dispersant-based water reducers are one of the most effective concrete enhancing technologies developed. These dispersing agents have the ability to deflocculate cement grains and other fine particles, thereby releasing the water that is otherwise bound in the cement flocs. This action leads to an increase in the bulk flow of the concrete system. Application of these powerful water reducing chemistries has enabled production of concrete with favourable rheological properties. Another way that water reducers can be employed to increase sustainability is by using less cement content or more SCMs in the concrete.

## Air entraining agents

Air entraining agents (AEAs) are surface active agents which function by stabilising small air bubbles in the concrete to provide pressure relief when entrained water

expands during freezing. For this reason, AEAs are required by building codes in many freeze-thaw susceptible regions in the world and have been successfully used for 75 years.

AEAs can also play a significant role in the reduction of CO<sub>2</sub> derived from mortar production, an application which accounts for 40% of the cement used in the developing world or about one third of the world cement production. Through incorporation of AEAs, mortar manufacturers can achieve comparable flow, via the lubricating effect of the air bubbles, to the more common methods of adding more cement or water to the system.

## Accelerators

Set and hardening accelerators have been known and used for well over a century. Their ability to catalyse the hydration of cement and compensate for the low early strength development with SCMs make them indispensable to the production of cement-based products. They are generally soluble calcium salts of chloride, nitrate and nitrite. Other classes of accelerators include sodium thiocyanates and amines.

Although very effective, chloride salts are frequently excluded from use by specification, due to their potential to encourage corrosion of reinforcement components. As a result, greater application of non-chloride and non-corrosive accelerators provides another promising alternative to enable development of sustainable concrete.



## Admixture adaptation to new cementitious systems

Innovative use of cementitious materials, for example limestone calcined clay and development of new clinker are important technologies for reaching the sustainability goal for cement-based materials. To achieve maximum sustainability, their use needs to be accompanied by admixtures, particularly in cases where minimization of water usage is required.

The increase in use of various raw materials in the production of concrete, whether as cementitious materials, aggregates or admixtures, can inevitably create complex interaction effects. In the most severe cases, these negative interactions may lead to production of green concrete which will not set, or weak concrete, which has a poor microstructure and short life span.

Provided that these obstacles are circumvented, sustainable concrete production (i.e., a net reduction in CO<sub>2</sub> emissions over the life-cycle of a structure) can be achieved by:

1. a reduction of cement used
2. a reduction of mixing and/or placement energy
3. an increase in longevity of the concrete structure

To make the most sustainable concrete, some of the procedures need to be tailored to the specific locations of use, and this depends on the infrastructure and the available transport capabilities to and from the job site.

In locations where bulk cement is used, for example in urban ready-mix concrete plants, chemicals are added in both the cement grinding and concrete mixing processes. It is, therefore, important to take all of the chemicals entering the final concrete into account.

Conversely, in locations where bagged cements are typically supplied, for example in manual mixing concrete sites, the use of cement additives in their maximum dosage levels is critical to the production of high-quality concrete that incorporates a significant portion of SCMs.



## 50 YEARS OF EXCELLENCE IN CONCRETE

The Concrete Institute of Australia is proud to announce the launch of its Golden Jubilee 50 Year Celebrations that will take place in 2020.

CONCRETE INSTITUTE   
of AUSTRALIA

Activities include:

- Nationwide Birthday Party 17 April 2020
- National symposium — Concrete Past, Present and Future October 2020
- Commemorative Book
- Young Professionals and Student Competitions
- Concrete in Australia Medallion

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🌐 <https://www.concreteinstitute.com.au/Golden-Jubilee-2020>





# 50 YEARS OF EXCELLENCE IN CONCRETE

## The Formative Years



**GOLDEN JUBILEE**  
2020  
50 YEARS OF EXCELLENCE IN CONCRETE

In 2020 the Concrete Institute of Australia will celebrate its Golden Jubilee. Recognising 50 years of excellence in concrete is a mighty achievement, and to commemorate the occasion there will be a nationwide birthday party held in all the capital cities, and the regional centres that the Institute has a presence in. The date, Friday 17th April 2020, is significant, as it will be 50 years to the day that the Institute was officially registered in NSW as a company limited by guarantee with an approved Memorandum and Articles of Association. However, the Institute didn't just start on that day, the prelude to that moment took nearly twenty years and a brief history of those activities can be found below.

The Concrete Institute of Australia owes its origins to the introduction of prestress concrete in Australia. Following the introduction of this "new and exciting" construction technique in Europe in the late 1930's, and its role in the reconstruction of war torn areas, a group of Australian engineers realised its potential. This led to the first prestressed concrete structure being built in Australia - the ice tower for Warragamba Dam, which is located in south western Sydney (in those days it was country NSW), completed in 1953. This was followed by many other examples of prestressed concrete design and construction such as bridges, buildings, and jetties.

At this time the first Australian symposium on prestressed concrete was organised by the Cement and Concrete Association (now known as Cement Concrete Aggregates Australia). On the back of a symposium on prestress concrete, along with other events, a group of engineers came together in NSW in 1962 and founded the Australian Prestressed Concrete Group (APCG) with the backing of the C&CA. From its foundation the APCG grew and expanded into other states

forming new branches in Queensland and South Australia, and expanding membership, which consisted mainly of engineers, across its two categories - Ordinary Members and Business Members. The APCG also held two conferences, one in Sydney (1965) and one in Melbourne (1967).

In March 1966, the APCG President, Mr E.M. Birkett, suggested that the APCG should "widen its objects to include concrete construction generally". This gained further traction and in September 1967 the C&CA indicated that it was willing to support this expansion. As a result a sub-committee, comprising of some familiar names to the Institute such as Denison Campbell-Allen, Jim Robson-Scott, and Kevin Cavanagh, was formed to investigate and report on this proposal.

Part of this investigation included an examination of two overseas models of interest - the Concrete Society in the United Kingdom, and the America Concrete Institute in the USA. Whilst taking on board many ideas from both of these organisations, in the end a draft constitution was drawn up that recognised that the strength of the Institute would lie in its State Branches, whilst being supported by the local regional office of the C&CA.

On 16th December 1968 the Council of the APCG resolved to adopt a proposal to merge into the Concrete Institute of Australia and form one organisation, where membership was open to anyone with an interest in concrete construction and technology. Then, on 6th May 1969, the Annual General Meeting of the APCG was held in the Department of Main Roads Auditorium in Sydney, attended by 100 members and guests, where it was formally resolved to establish the Concrete Institute of Australia. Mr William (Bill) Brown was elected President and Mr Kevin Cavanagh was elected Secretary, with Mr Paul Mahaffey appointed as the Institute's first Executive Officer. The inaugural meeting

of Council was then subsequently held on 14th July 1969 and later that year a formal service agreement was drawn up between the CIA and C&CA, which allowed for the C&CA to provide technical and administrative services for the Institute. The Institute continued to work on the foundation laid by the APCG including maintaining membership of the Federation Internationale de la Precontrainte (FIP), and holding the first conference under the name of the CIA in Brisbane in September 1969.

The Institute's structure was formally recognised after the registration of the organisation on 17th April 1970, and provided for a National Council along with State Branch Committees, the first of which were formed in NSW, South Australia and Victoria, quickly followed by Queensland. Council comprised of a President, Vice President, Secretary/Treasurer and eight elected Councillors, with Councillors serving two year terms. Branch Presidents were automatically members of Council together with two non-voting Councillors nominated by C&CA. This structure provided the platform for the Concrete Institute of Australia to launch its beginning of a new era.

### THE 50TH BIRTHDAY PARTY

On the 26th May 1995 a small group of people gathered to celebrate 25 years of the Concrete Institute of Australia. The article in *Concrete in Australia* (v21.3 October 1995) to mark the occasion concluded by saying "Let's look forward to the next 25 years". Well here we are, nearly 25 years later and we are about to turn 50!

To kick start the celebrations for our Golden Jubilee, the Concrete Institute of Australia invites everyone to attend our nationwide "birthday party" which will be held on Friday 17th April 2020. The date marks the occasion in which the Institute was officially registered as a company limited by guarantee and with the signing of the Memorandum of Association and

Articles of Association in 1970, and by a twist of fate, falls on a Friday next year.

The night promises to be an extravaganza of concrete around the country, not only in the capital cities, but in our regional centres as well. All the birthday party events in the major capital cities will be joined together by a live stream where we will cross to various states for interviews and catch ups with members. Each venue will also have a birthday cake that will be cut at the same time, and this will be followed by a sharing of their highlights and acknowledging those people and projects which over the previous 50 years have helped make the Institute the successful organisation it is today across Australia.

Most importantly it is a chance to reconnect with old colleagues, catch up with your current network, or meet a new bunch of people who have had a part to play in the first 50 years of the Institute, and will be involved in the next 50!

Registration is now open for the Birthday Party and you can check out all the details



on our web site. There are also plenty of sponsorship opportunities available and these can also be found on the site. This is a once in a lifetime opportunity, as you only turn 50 once, to celebrate everything

that the Concrete Institute of Australia has brought to our industry and will continue to do so for the next generation.

**Event:** Concrete Institute of Australia  
50th Birthday Party

**Date:** 17th April 2020

For Details & to Register, please visit:  
<https://www.concreteinstitute.com.au/Golden-Jubilee-2020/Party>

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# CONCRETE INSTITUTE CELEBRATES THE APPOINTMENT OF NEW LIFE AND HONORARY MEMBERS

## LIFE MEMBER – FRANK PAPWORTH

Frank Papworth, who amongst many roles is currently a Director with BCRC, has spent his 40 year career focusing on the durability of concrete structures, including identification, assessment and modelling of behaviour.

Frank took this passion to the Concrete Institute of Australia where we have been the driving force in the concrete durability community, bringing his wealth of international experience to the CIA. Frank drove the extensive update of the Z7 Durability Series of Recommended Practices to seven detailed documents, and was Chair of the Durability Committee from 2009 to 2015. He has also transferred this extensive knowledge in the durability field to the industry by being actively involved in CIA technical seminars, workshops, and conferences. In more recent years Frank has also integrated his work with the International Federation of Structural Concrete, fib, with the Institute, and as a result the CIA now has a global profile with respect to durability input.

Frank has also served on the WA Branch committee as President from 1993 to 1995, served as a Councillor from 2011 to 2015, and was instrumental in bringing the International Congress for Durability of Concrete (ICDC) to Australia as part of the Concrete 2017 conference in Adelaide.



Frank Papworth receiving his Life Membership from National President Con Komselis at Concrete 2019

## LIFE MEMBER – PAUL MAHAFFEY

Paul Mahaffey was the first Executive Officer of the Concrete Institute of Australia from 1969 to 1972.

He contributed greatly to its early and continuous growth for the first 25 years of the Institute's life. At the time the Institute came into being Paul was a senior engineer with the C&CA which in 1969 also authorised his appointment as the first Executive Officer of the Concrete Institute of Australia. Paul became heavily involved in the New South Wales branch of the Institute, firstly as the Branch secretary, then as general committee member, vice president, and president from 1972 to 1992 continuously. He was also heavily involved with the National Council of the Institute from 1985 until 1994, and was National President of the CIA from 1991 to 1992. Paul was also involved in Institute technical committees from 1972 to 1989 making a considerable contribution to Institute documents on connections, low-pressure steam curing, precast concrete, and durability of concrete.

Paul's contribution to the Concrete Institute of Australia over its first quarter of a century was enormous and the National Council voted unanimously that he be honoured with Life Membership posthumously in recognition of his immense contribution. It was wonderful to have Paul's son David Mahaffey, who himself has been a long time member and contributor to the Institute, receive the award on his behalf.



Paul Mahaffey's son, David Mahaffey, with the Life Membership which recognises Paul's huge contribution in the early years of the Institute.

## HONORARY MEMBER – IHOR HINCZAK

Ihor Hinczak's career in the in the Australian cement and concrete industry spans over 57 years, much of which has been at the forefront of creating innovative solutions to the Australian cement and concrete industry which are now common practice, and he is widely regarded as the father of slag cement development in Australia.

Ihor recognised the value of ground granulated blast furnace 'slag cement' as not just a "supplementary cementitious material" to cement but a valuable performance enhancer in a variety of applications. His Masters "The Durability and Serviceability of Slag Cements in Marine and Sulphate Environments" established the foundation for his Ph.D "Studies of Portland Cements and Binders Containing Supplementary Cementitious Materials". Combined with his commercial developmental work, each provided the foundation for the widespread application of these cements in high durability and stabilising applications. One example including the Immersed Tube Units of the Sydney Harbour Tunnel are testament to his work in this area with a 150 year durability design life.

Ihor's career has always been in the pursuit of excellence. He has always required it of himself and those around him. His enquiring mind often sought solutions from outside the norm, bringing an innovation to a conservative industry, and it was with great delight to his peers that he was made an Honorary Member of the Concrete Institute of Australia.



Warren South (CCAA and Concrete 2019 Co-Chair) accepted Ihor Hinczak's Honorary Membership on his behalf at Concrete 2019.

**HONORARY MEMBER – MALCOLM BOYD**

For all of his career, Malcolm Boyd has been involved in the development and delivery of innovative concrete products and systems, both in Australia and overseas. Most notably, he was involved in the development of the Reinforced Earth retaining wall system from its introduction in Australia in 1973, and was the leading technical proponent of this system during the years of its development and establishment as one of the most significant innovations in concrete construction of the late 20th Century. Whilst working with Reinforced Earth Malcolm also led the introduction of the TechSpan precast arch system in Australia where it is now widely used in infrastructure and mining projects.

More recently Malcolm has continued working on innovative concrete products. He has been a key figure in driving interaction with industry at the University of Sydney, and since 2007 has been closely involved with the Concrete Institute, including roles as the President

of the organising committee of Concrete 2009, NSW State Committee President, and his current roles as National Council member, Membership Committee chair, and committee member for Concrete 2019.



Malcolm Boyd has made an incredible contribution to the industry and the Institute in a career that has spanned for nearly 50 years.

**HONORARY MEMBER – VUTE SIRIVIVATNANON**

Vute Sirivivatnanon is Professor of Concrete Engineering in the School of Civil and Environmental Engineering at the University

of Technology in Sydney. He graduated in civil engineering under the Colombo Plan Scholarship from the University of Tasmania and completed a PhD in Premixed Polymer Concrete at the University of New South Wales, Australia.

Vute's early career gave him extensive academic and industrial experience before he commenced his research career with CSIRO in 1988 where he contributed significantly towards developing the understanding of concrete durability design, utilisation of Supplementary Cementitious Materials (SCM), and service life design. In 2006, he became Research Manager of Cement Concrete & Aggregates Australia where he managed key industrial research projects leading to sustainable use of cement, concrete and quarry products. He published widely for CSIRO and authored leading CCAA technical notes and reports. In more recent years he took up an industry supported position, Professor of Concrete Engineering, at UTS where he has set up a major research centre that has about 15 commercially and ARC funded PhD

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candidatures working on the broad issue of durability of concrete and alkali-silica reaction in concrete.

Over his career, Vute has made an outstanding contribution to the development and use of concrete in Australia. He has undertaken research and commercial projects at the highest level, and his research, particularly that relating to durability, has been disseminated throughout the industry.



Vute Sirivivatnanon and his Honorary Membership in recognition of his incredible contribution to the industry.

## HONORARY MEMBER – BOB MUNN

Bob Munn has over 50 years' experience in the field of concrete technology, construction techniques, research, expert witness, condition surveys, and building and construction materials. He was Chief Engineer with Boral Construction Materials for nearly 30 years and for the past 15 years has been a Managing Consultant with BCRC.

Throughout his career Bob has authored practical technical specifications, contributed to reference texts, and prepared local and international standards. He has used his extensive knowledge and high level of technical expertise to develop a framework for the behaviour and treatment of concrete as an engineering material, as well as educating other practitioners to improve and advance the industry as a whole. This has included the preparation of the CIA's Recommended Practice Z7 Durable Concrete Structures in 2001, and being an active participant on AS1379, AS1012, and AS3600 committees over three decades.

Bob has continually been involved in the research of concrete, leading the Technology Research group at the Australian Centre for Construction Innovation for 10 years, advancing industry knowledge of concrete properties. He has also authored and presented over 80 technical papers on concrete related subjects that cover a vast range of topics.



Bob Munn's service to the concrete industry has been long and distinguished, and he is a very worth recipient of Honorary Membership of the Institute.

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# NEW BOARD GIVES GREEN LIGHT TO BIG CHANGES

As of its November AGM National Precast has a new Board of Directors. Embracing National Precast as a real means to connect, promote, learn and influence, the new Board has already agreed on some big changes which will pave the way to grow and shape the Association's future.

## MICHAEL WAEGER CONTINUES AS PRESIDENT

According to National Precast CEO Sarah Bachmann, Managing Director of Waeger Constructions, Michael Waeger, has accepted to continue his role as President since taking over from Ultrafloor's Kevin Crompton.

"I'm delighted that Michael will lead the Association as President for the next two years. He has been on the Board for a number of years and his enthusiasm for the Association is already having an impact," Ms Bachmann comments.

---

**"The Board meeting was one of the most positive and progressive I have participated in during my 16 years with the Association."**



National Precast's CEO Sarah Bachmann says the big changes approved by the Board mean there is no excuse to not be a National Precast member.

## ABOUT WAEGER CONSTRUCTIONS

Based in the Hunter Valley NSW, Waeger Constructions was established in 1987. Under Michael's leadership the company undertakes predominantly civil projects, focusing on bridge design and construction, precast concrete manufacture, precast concrete installation and the construction of boutique landmark civil projects.

Having made its mark with some landmark projects such as the Newcastle ANZAC Memorial Walk, a myriad of NSW bridges and supply of precast to some of the country's leading builders, Waeger prides itself on delivering innovative, quality solutions whilst providing opportunities for people to grow and prosper.

"Our final member event for the year was held recently in Melbourne and what a fantastic event it was. The Board meeting was one of the most positive and progressive I have participated in during my 16 years with the Association."

With Ms Bachmann at the helm as CEO, National Precast has transitioned its focus from one that was predominantly technical to developing a much broader mandate and now offers a significant number of services to its members.

## NO REASON TO NOT BE A MEMBER

"Our members see a lot of value in National Precast membership. That's something that others often don't understand until they become involved. We have an impressive line-up of services already and we are going to see that improve even further with some big changes that have just been approved by the Board," says Ms Bachmann.

"We have gradually been making changes and adding services over the years but these changes will give precasters who have not yet joined, no reason not to. The new changes will be implemented 1st July 2020. Watch this space."

Precasters who are not yet a member of the Association and who are interested in joining, may contact Ms Bachmann on 08 8294 0833 or via email to: [exec@nationalprecast.com.au](mailto:exec@nationalprecast.com.au)

"You might be surprised when you call as to what's on offer. The Board has given me the green light to make the new regime available now to new members," she adds.

## NATIONAL PRECAST'S 2019-2020 BOARD OF DIRECTORS

- Michael Waeger, President and Managing Director of Waeger Precast;
- Ian Coulter, Past President and founding Director and also Managing Director of Precast Concrete Products;
- Craig Zinn, Past President and Owner/Manager of Stresscrete;
- Graham Underwood, Incoming President and National Technical & Engineering Manager at Rocla;
- Alberto Ferraro, Managing Director at PERMAcast;
- Riccardo Musella, Managing Director at The Reinforced Earth Company Aust/NZ;
- Paul Adams, National Sales & Marketing Manager at Humes;
- George Spiropoulos, Director at Euro Precast
- Daniel Coutts, General Manager of Austral Precast; and
- Daniel Nassar, General Manager of Alpha Precast.

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**Precaster:** Austral Precast

**Location:** Lavadia, NSW

**Client:** Serco & NSW Government

**Builder:** John Holland

Designed to house 1,700 inmates, the new \$798m Clarence Correctional Centre is currently under construction near the New South Wales north coast town of Grafton. The new facility is being constructed on rural land at Lavadia, approximately 12.5 kilometres southeast of Grafton.

During the early stages of the development of this project, discussions were underway regarding the most suitable building materials for such a large-scale project. The conclusion was quickly made by John Holland, the developer, that precast concrete was the best option. National Precast member Austral Precast was brought in as a part of the team to manufacture over 4,500 panels.

Since construction began in 2018, Austral Precast has delivered more than 4,500 panels (worth a combined \$18 million) to the Clarence facility, which will become the largest operational gaol in Australia when it opens to inmates next year. Precast concrete can be found in every building in the complex as well as along the perimeter fence.

## SUPERIOR SAFETY AND QUALITY THE DECIDERS

John Holland chose concrete for the bones of the correctional centre due to the material's superior safety profile.

"Timber, brick and steel can be manipulated or damaged in such a way that prisoners can either hurt themselves or hurt someone else," explains Austral Precast project manager Michael Elms. "You can't do that with concrete."

The developer was reluctant to pour so much concrete in a remote location where the quality of the work could not be assured, so it decided to use precast panels instead.

"It can be quite difficult to control the quality of site work," says Elms. "With precast, the client could place the responsibility for manufacture with us."

Once the client had delivered their specifications, Austral Precast commenced manufacture at its state-of-the-art factory.

"The way that we make precast in our factory goes through a number of milestones and quality control steps that you wouldn't necessarily get on site," says Elms. "The factory-controlled environment means better quality for clients."

## SECURITY AN ADDED BONUS

In a prison context, better-quality construction means enhanced security. Using precast concrete for the project means that there will be a high level of security, leading John Holland to feel confident throughout the multiple stages of construction. With the manufacturing of precast



Precast concrete is being used extensively throughout the facility, with precast elements used in every building, as well as along the perimeter fence.





When it opens in 2020, the Clarence Correctional Centre will be the largest operational gaol in Australia, housing 1,700 inmates.

concrete being highly reliable and repeatable, numerous copies of profile can be duplicated, as moulds can be used many times.

“In a prison environment where you are duplicating floor plans over and over for inmate housing, consistency is key,” says Elms.

“An additional benefit of precast for clients working on secure facilities is that they can flag with us the items they consider highly critical, and we can control those items every step of the way, from design through to manufacture, delivery and installation.”

### RELIABILITY DELIVERS ON PROGRAMME

Large construction projects often fail to be completed on time, however using precast for this project is helping John Holland stick to its timeline to open Clarence Correctional Centre in 2020.

“We were able to take critical path items away from the construction process so they could work on other tasks such as steelwork,” says Elms. “They weren’t waiting for things to be made and cured onsite - they could be made off-site, out of the way, and once delivered they could be immediately installed.”

Clarence Correctional Centre will provide about 600 permanent jobs once operational. By 2037, it will have pumped an estimated \$560 million into the local economy.

---

**“The factory-controlled environment means better quality for clients.”**

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# GROUTING... NOT TO BE UNDERDONE

Sydney's Opal Tower building has reinforced the criticality of robust engineering design and proper construction practices. As well, it has shed light on the role of grouting under prefabricated precast concrete elements and how inadequate grouting controls can result in significant structural consequences.

It is critical that engineers, builders, installers and grouting contractors understand the role that grouting plays in a structure's design. Some of the responsibilities and considerations where grouting is concerned are listed below.

## ENGINEER RESPONSIBILITIES

- Design the type of joint - flat or stepped (also known as ship-lapped which are



Ensure joints are completely grouted without air pockets, and that the grout has reached the specifies strength BEFORE additional loads are applied. In the case of stepped joints, only the higher horizontal section of the lower panel should be grouted.

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generally specified to prevent water ingress), loadbearing or not - and specify the type and method of grouting;

- From the technical information for the selected grout, ensure it is appropriate for the intended use and that its strength is equal to or greater than the adjoining concrete elements;
- Consider all forces at a horizontal joint such that the sloping section and lower horizontal section of a stepped joint should NOT be grouted, as it is unreinforced and prone to breakage if grouted. Only the higher horizontal surface should be grouted;
- Consider the size of the backing rod and caulking compound as it replaces some of the total volume of grout between the precast elements in the joint, thereby affecting the load-bearing area; and
- Inspect that the grouting practice is undertaken in accordance with the design, drawings, specification and erection procedures and provide written reports to the builder as required, plus approve any changes.

### BUILDER, INSTALLER AND GROUTING CONTRACTOR RESPONSIBILITIES

- Ensure grouting methods are in accordance with the design, drawings, specification and erection procedures;
- Ensure joints are completely grouted without air pockets, and that the grout has reached a strength (per the grout manufacturer's specifications) that is equivalent to the concrete element below, BEFORE additional loads are applied;
- Ensure joints are grouted for the FULL length and width of the loadbearing area of the prefabricated concrete element with an approved non-shrink grout as partial grouting can develop splitting stresses and ultimately fail;
- Ensure grout ducts are grouted immediately after joints are sealed to enclose and engage the dowel/starter bars. This should occur either as grouting is undertaken or immediately following the grouting of joints, depending on the sequence of construction and specified requirements;

- Ensure the volume of grout required is equal to the actual measured use if inspection of a joint is difficult; and
- Ensure the engineer inspects grouting practices as grouting occurs to ensure it is undertaken in accordance with the design, drawings, specification and erection procedures. The builder should also seek written reports from the engineer as required, plus ensure any changes are approved.

**NOTE:** *The use of foam ring inserts (doughnuts) is not recommended, as these can allow shear movement and stop the flowable grout from reaching the desired areas.*

National Precast is producing a comprehensive grouting guide which will be made available soon.

This list is not exhaustive and is intended for guidance only in no way replaces the services of professional consultants and suppliers of products and materials for individual projects. No legal liability can be accepted by National Precast Concrete Association Australia for its use.



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# Green Architecture: Towards Sustainable Development

By Spyridon Achinas, Faculty of Science and Engineering, University of Groningen, Netherlands

## 1. GREEN ARCHITECTURE

Green or sustainable, building is the practice of developing and applying resource and energy-efficient models of design, renovation, construction, and operation. Green architecture entails sustainable and modern cities.

While urban centers consist of green spaces, they are also the areas that are susceptible to the undesirable ramifications of urbanization and economic development. Green architecture has paved the way for planning of sustainable cities, an intrinsic factor for bolstering the environmental quality of built environment.

Urbanisation is regarded as the dominant factor for the disparage of green city areas. Overcrowding and unplanned growth have resulted in city demotion on a variety of aspects. This includes city-regional problems i.e., contamination of drinking water, health problems, non-waste abatement, and air pollution. Revitalization of green city areas may upgrade the environmental quality leading to significant change in citizens life.

Green architecture concepts currently attract new business activities in cities all over the world, therefore emboldening both

new inhabitants and visitors to rediscover a new side of the cities.

Moreover, improving the physical built environment, social fabric and urban spaces can be served as places for public congregation and activity, thus, it rises the social interaction and cohesion between citizens.

## 2. GREEN HOME

Today's homebuyers are increasingly interested in green building. Green building focuses on the way homes use energy and water in order to minimize negative effects on human health and enhance the overall environment.

The environmental reverberations of green architecture are significant to climate change, and particularly over the land-use, energy depletion, and water scarcity. Green architecture entails pollution minimization and natural resources conservation.

From an economic perspective, it is beneficial for the building owners as it helps to understand the energy and water consumption.

Socially speaking, green buildings are beautiful as well as impactful to the human



behaviours in the context of cultural and ecological elements.

## 3. POLICY

The expansion of green planning practices is essential to foster concurrently conservation and development. The environmental deadlock redounds a cross-cutting disquiet for drastic alterations.

The barrage of legal restructuring often curbs the entrepreneurial activities and relapses green development. However, political think-tanks go beyond simply production efficiency and adopt a more proactive stance on certain core principles which concatenate and underpin green architecture and sustainability.

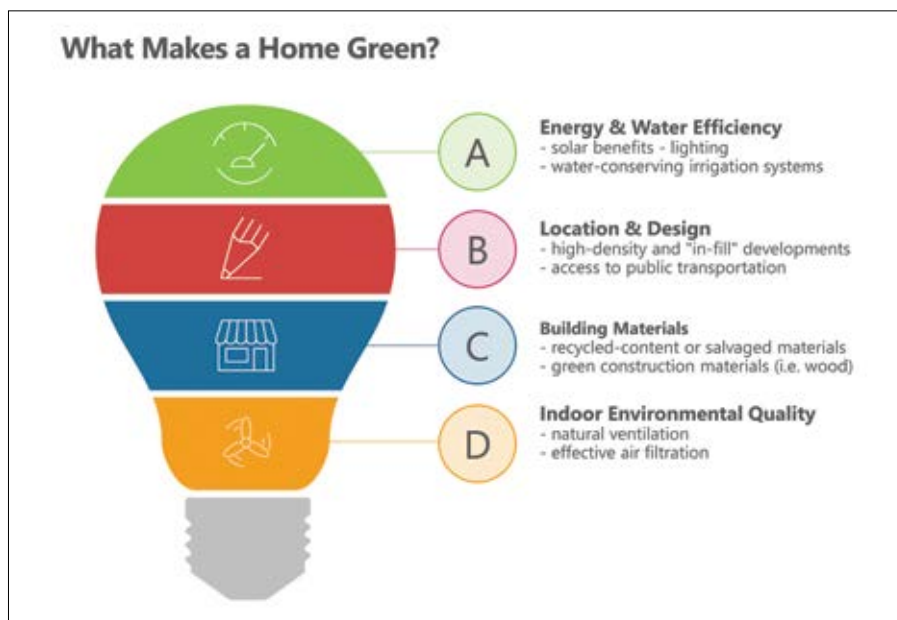
There are plenty of green home programs available, depending on the country. Several countries have developed specific green building guidelines that focus on both overall environmental objectives and local concerns. There are also several national organizations that underpin green architecture through green home certification programs.

## 4. CONCLUSION

Design of sustainable cities is a fundamental catalyst to add notable merit, eminence, and physical integrity to the cities. In addition, urban planning is regarded as a pathway towards sustainability, as urban planning often confronts many environmental problems which are ascribed to the crowded city centers and urban areas.

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# Building the future with the right skills

**Tom Karemacher, Vice President, APAC, Procore Technologies**

Like most, Australia's construction industry is undergoing a technological transformation, creating opportunities for fast-adopting companies to be pioneers of new technology and ultimately drive efficiencies, business growth, and improve safety. This transformation is seeing Australia's construction workforce handle technologies from connected power tools to autonomous heavy equipment, drones, robots, telematics, augmented virtual reality, big data and analytics, BIM and 3D printing.

The sector is expected to be dramatically altered by pre-fabricated parts, which has been identified as the most transformational technology in the construction business over the next three years.

Pre-fabricated building currently represents only three to five per cent of Australia's \$150 billion construction industry, but it's expected to skyrocket to 15 per cent by 2025.

It's a trend that has also been recognised by the Australian government. Federal minister for Industry, Science and Technology, Karen Andrews recently announced the federal government would invest up to \$2 million to fund a feasibility study. The findings from the study will be used to develop a lab to help manufacturers design new prefabricated buildings that could significantly reduce time and money across the construction sector.

While there are incredible opportunities, there is also a significant skills challenge that may affect the sector's ability to take advantage of emerging technologies.

According to a new survey commissioned by Procore and conducted by ACA Research, *How We Build Now: Tracking Technology in Construction 2019*, while 86 per cent of construction companies in Australia think increasing technology usage is an important means of improving productivity, an existing skills gap could prove to be an issue with 92 per cent of respondents stating that upskilling the workforce is equally important.

Key to ensuring construction companies can successfully adopt these new technologies is to upskill and support the workforce for considerable and ongoing digital change.



## UPSKILLING THE EXISTING WORKFORCE

The Procore report, which examines the impact technology adoption is having on construction firms, and how it's changing the Australian construction industry revealed the sector overwhelmingly understands how important it is for its workforce to have the right digital skills.

The findings show that local firms believe upskilling their workforce will improve overall productivity. This is reflected in the finding that 91 per cent of construction companies plan to support their workforce by introducing more training programs. Another 72 per cent of respondents agree their business should proactively support employees in skills development for their careers.

Lendlease is one major player in Australia's construction industry that has initiated comprehensive training programs, in anticipation of a shortage of skilled construction workers as the sector faces challenges including new technology, the ageing workforce and low apprenticeship completion rates.

The firm collaborated with TAFE NSW and the Construction and Property Skills Council to set up the *Barangaroo Skills Exchange*. This program delivered training to over 8,000 on-site construction workers during the Lendlease's \$6 billion Barangaroo South urban regeneration project.

Upskilling the workforce with digital skills is an area that has also been recognised by the federal government. The Morrison government pledged in the latest Budget that more than \$520 million will be invested under the Skills Package, *Delivering Skills for Today and Tomorrow*, to ensure Australians can access vocational educational training for initial training, upskilling and reskilling.

The commitment by government follows on from an independent review of Australia's

vocational education and training sector that identified skilled construction workers are currently in high demand and will remain so in the future.

## ADDRESSING THE SKILLS CHALLENGE

Focusing on digital skills, what exactly should these future capabilities in the construction sector look like? The changing nature of the construction industry is seeing the demand for a broader range of skillsets, according to Procore's report.

This is because businesses will increasingly value adaptable candidates who are not just capable of handling current technology but who also have the skills to master technology that is expected to arrive in the near future.

The demand for the type of skills will differ depending on the size of the business. Medium and large businesses anticipate a greater need for technical skills to enable them to take advantage of technologies like data analytics, BIM, artificial intelligence and machine learning. When this happens, 90 per cent of large businesses anticipate their revenue will increase as a result.

For smaller companies, while knowledge and experience with technology, as well as technical skills are at the top of the priority list, they believe soft skills are equally vital for the digital construction workforce. These softer skills include being able to manage multi-faceted projects, as well as communicate and negotiate with a variety of stakeholders.

Despite understanding what skills their workforce will need, the biggest concern for construction business leaders is hiring and retaining these skilled staff. Training is key to addressing these concerns – not only does it allow businesses the control and flexibility to build the workers with the skills they need, it also helps with staff retention as workers are given the opportunity to shape their careers.

Construction companies that focus on improving the quality and digital capability of their staff through training and technology can expect to become technology leaders in the field. Not only this, they will also experience fewer productivity issues and ultimately increased revenue – even during times of significant market challenges.



# AUTODESK USHERS IN NEW ERA OF CONNECTED CONSTRUCTION WITH AUTODESK CONSTRUCTION CLOUD™

**More than 50 new enhancements and powerful integrations unveiled across construction management solutions enable the construction industry to improve collaboration, reduce risk and increase profitability**

Global engineering, design and construction software specialist Autodesk, Inc. unveiled its new Autodesk Construction Cloud™ at the recent *Connect & Construct Summit*. The new cloud-based platform combines advanced technology, a unique builders network and predictive insights to connect people and data across the entire building lifecycle, from design through operations.

At the centre of Autodesk Construction Cloud are best-of-breed construction solutions *Assemble*, *BuildingConnected*, *BIM 360* and *PlanGrid*. Autodesk Construction Cloud brings these solutions together, and with Autodesk's established design authoring tools, connects headquarters, office and field teams to increase collaboration and productivity. Autodesk Construction Cloud includes more than 50 new product enhancements, as well as deeper integrations between each product to allow data to flow across all stages of

construction. It also includes powerful new artificial intelligence functionality that helps construction teams identify and mitigate design risks before problems occur - reducing delays, rework and costs.

Autodesk Construction Cloud includes three core elements:

- 1. Advanced Technology:** Best-in-class software solutions built for simplicity and power - uniting headquarters, office and field teams from design through construction and operations.
- 2. Builders Network:** The industry's largest network of owners, designers, builders and trades, enabling each to connect with the right partners and projects.
- 3. Predictive Insights:** AI-driven analysis of previously siloed project data provides builders with powerful insights to predict outcomes and reduce risk.

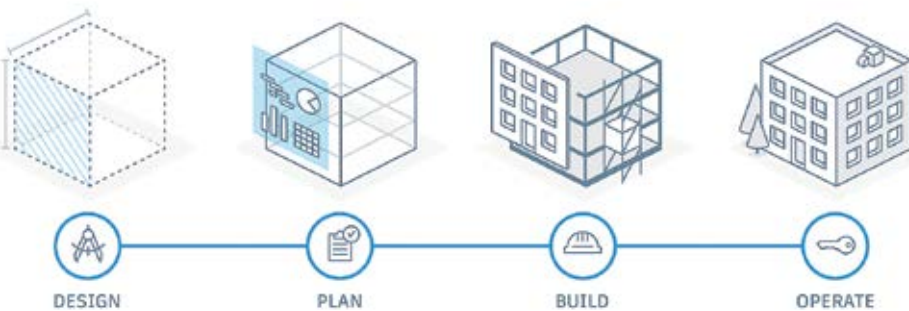
"Despite the tremendous challenges construction companies face to connect huge volumes of data and people, no one has delivered on the promise of unified construction from design to operations — until now," said Jim Lynch, vice president and general manager, Autodesk Construction Solutions.

"With Autodesk Construction Cloud, we're introducing a new era of connected construction and offering unrivalled integration between headquarters, office and field teams. We've never been more dedicated nor clearer in our mission to empower designers, contractors and owners to meet the world's rapidly expanding construction needs, while helping to make building more predictable, safe and sustainable."

"We need to be able to measure ourselves, look to the future and anticipate project risk. This insight is what's missing today, and is a key driver in moving the industry forward," said Jenny Moshea, head of technology at Sellen Construction. "Autodesk Construction Cloud brings together advanced technology which Autodesk has always been known for, with the network of the building community - which is the core of what we do as an industry - underpinned by predictive insights."

"This is the next evolution, the connected tissue that brings it all together so the construction lifecycle is no longer disjointed."

## AUTODESK CONSTRUCTION CLOUD™



### 50+ NEW ENHANCEMENTS & INTEGRATED DATA FLOW

As part of the launch of Autodesk Construction Cloud, the company is unveiling more than 50 new product enhancements that

span the entire building lifecycle from design through operations.

Highlights of the new innovations include:

- Expanding support within *Assemble* for the latest version of Autodesk design tools *AutoCAD*, *Revit* and *Navisworks*;
- Empowering subcontractors to immediately quantify 2D views in *BuildingConnected BidBoard Pro*;
- Enabling greater collaboration - field teams can now take videos directly within the *PlanGrid* app. Along with improved photo management, teams are able to provide richer commentary from the jobsite;
- Enhancing all *BIM 360* modules, along with deeper feature integrations – such as between *Construction IQ* and *BIM 360*'s design review capabilities, called *Design Risk Management*, which helps reduce the likelihood of RFIs and change orders originating from design issues.

To empower construction teams to reduce miscommunication, errors and rework, Autodesk is focused on providing the entire construction team with access to crucial data whenever it's needed. Over the past

18 months, the company has rolled out 18 different integrations, allowing data to flow between all its construction products.

These include integrations between *Revit* and *PlanGrid*, *BIM 360 Design* and *Civil 3D*, *BuildingConnected* and *PlanGrid*, and *BIM 360* and *Assemble*, to name just a few.

Built with *BIM 360*'s common data environment (CDE), Autodesk Construction Cloud ensures the whole team is collaborating on an integrated record set. Beyond the current capabilities, Autodesk is investing in supporting its customers in meeting ISO-19650.

#### INDUSTRY'S LARGEST NETWORK

Autodesk Construction Cloud encompasses the industry's largest ecosystem of owners, designers, builders and trades, including nearly one million subcontractors who use *BuildingConnected*. The Builders Network enables owners and builders to connect to the right partners to create the best teams for any project anywhere - reducing risk, decreasing rework and increasing profitability.

#### AI-POWERED ANALYTICS IDENTIFIES RISKS

Autodesk Construction Cloud encompasses powerful Artificial Intelligence that helps

construction teams identify and mitigate risks before problems occur - helping to reduce delays, rework and cost.

Technology such as *TradeTapp*, which arms general contractors with subcontractor risk analysis during the planning phase, and *Construction IQ*, which uses algorithms to prioritise the highest risk projects, subcontractors and issues that need attention during the build phase, gives teams the insight and confidence to make informed decisions and build right the first time.

For example, according to Autodesk's data science team, more than 70 percent of RFIs in construction are attributed to design issues or documentation errors, which often escalate into costly change orders and even larger litigation disputes.

*Design Risk Management* applies *Construction IQ*'s machine learning capabilities to the design review process that happens within *BIM 360*'s Document Management module, enabling GCs to easily identify and predict as early as possible the design and constructability issues that may turn into costly RFI's.

For more information, please visit: [www.autodesk.com](http://www.autodesk.com)



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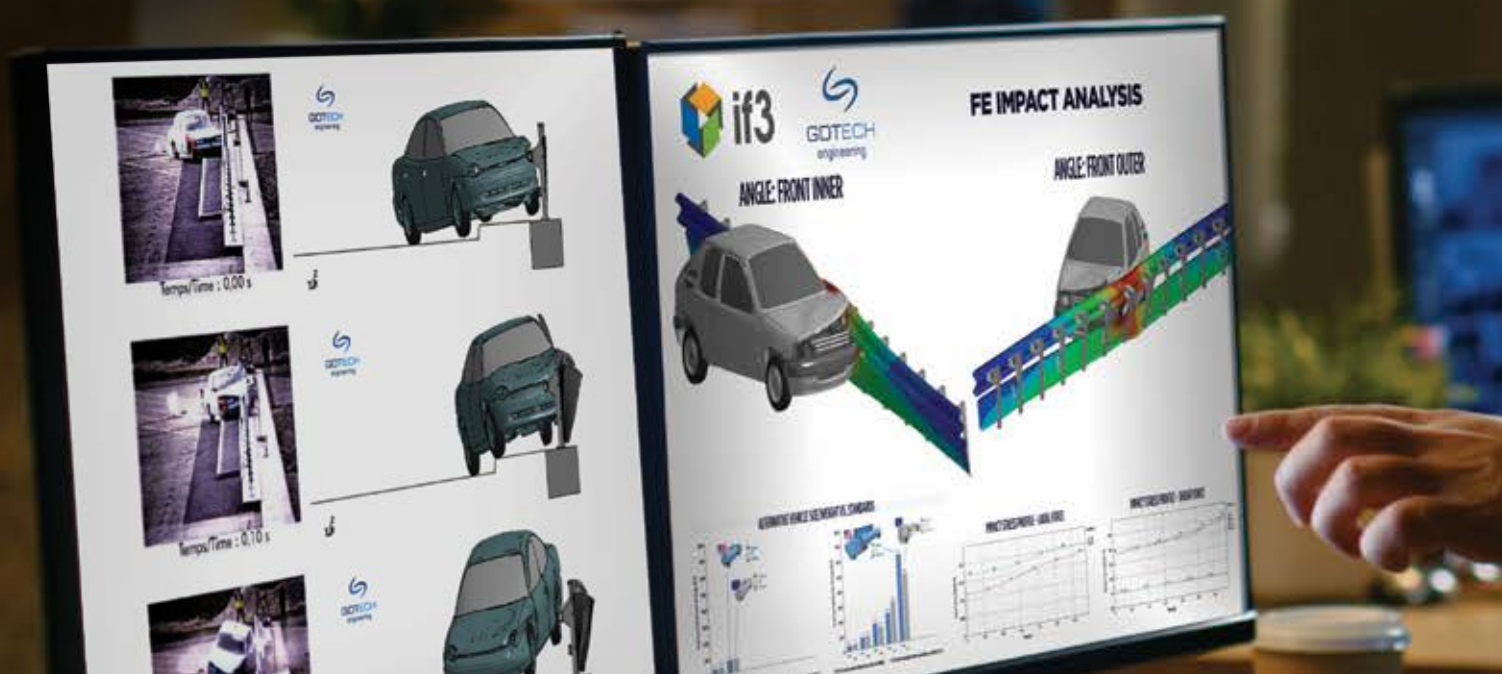
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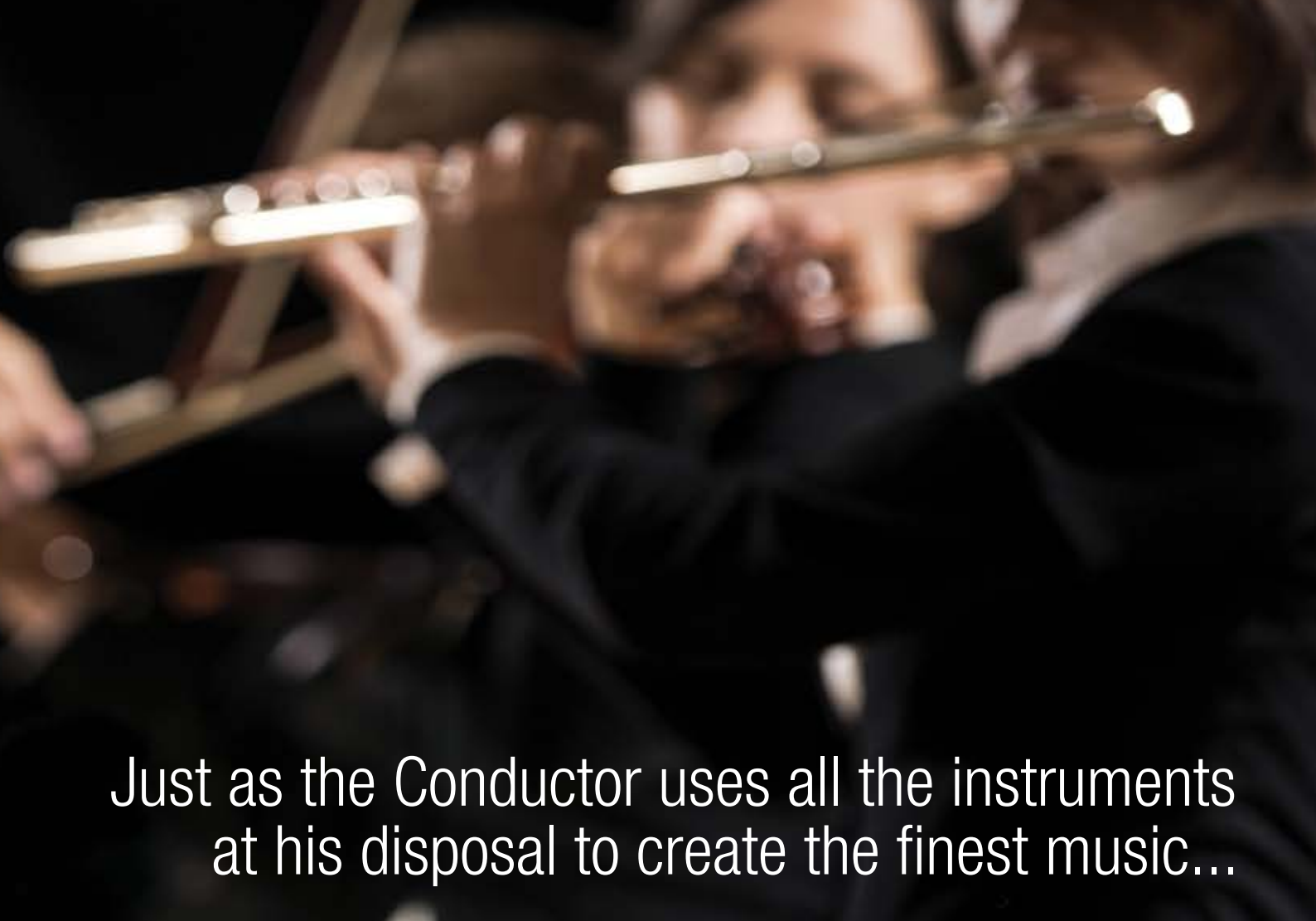
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# Beneficial re-use of site soils

Declan McDonald BSc (Urban Hort), M SustAg, CPSS, SSA Senior Soil Scientist | Horticultural Scientist, SESL Australia

Global awareness is growing of the fact that soil is a non-renewable resource. On one hand this impacts food production; on the other, it impacts urban horticulture and urban landscaping. Once upon a time, soil for urban landscaping was dug out of Farmer Joe's paddock and delivered to site: too easy! However, those days are over and quality soils for urban landscaping are getting harder to find, not to mention the expense of shipping large quantities of quality soil to site.

The focus of many large infrastructure projects such as the Level Crossing Removal Projects and the upcoming North-East Link Road project is conservation of site soil resources for re-use. Not only does this make economic sense, it also saves on greenhouse gas emissions from avoided trucking and materials handling. And it goes a long way to guaranteeing quality outcomes (figure 1).



**Figure 1. Completed section of the Caulfield to Dandenong Level Crossing Project**

So how should site soil resources be shepherded so their value is protected or enhanced during the construction phases?

## Soil survey

It sounds simple enough. Survey the site to see what's there! Soil surveys involve assessment of the soil quality, topsoil depth, subsoil quality, and the consistency of soil types or soil properties across the work site or along the alignment.

It is very important to understand that the data sought from a soil survey is very different to that sought from a geotechnical investigation. When I'm called on to assess a site I'm often told that all the soil testing has been done. What I am provided with is a collection of bore logs which are very useful in telling me about the soil profile but tell me nothing about the capacity of the soil to support plant life.

Geotechnical engineers generally want to compact a soil so that built structures do not move. This involves expelling almost all the air out of the soil and ensuring soil particles are packed closely together. In complete contrast, soil and horticultural scientists are very concerned to preserve the maximum amount of air in the soil; the enemy of productive soils is compaction while the enemy of structural soils is air.

Healthy productive soil, such as in your garden, is typically comprised of 25% air. We are therefore concerned about preserving the property referred to as structure. Soil structure is the arrangement of solids and voids that characterise a healthy soil. I often use the analogy of a lung to illustrate the fact that, like lungs, soils are made up of an infinite number of large and small spaces from millimetres to nanometres in diameter. It's in the tiny end chambers of our lungs – the alveoli – where the action of oxygen and CO<sub>2</sub> exchange happens. Similarly, in the soil, it is in the smallest spaces that nutrient exchange happens.

So, when we need to clear a site and set aside quality soil, how do we preserve these inherent qualities so that when we come to re-use that soil, it is in a suitable condition to achieve the design intent? The short answer is to minimise churning the soil and avoid compaction. That is a bit difficult to do from behind the controls of a D9!

We have distilled the results of considerable research into stockpiling methods to develop guidance for stripping and stockpile management on Australian construction sites. A guidance document is available from our website ([www.sesl.com.au](http://www.sesl.com.au)) but the essential elements of good stockpile management are set out here.

# Powering a Sustainable Future

## Best practice stripping and stockpiling

Achieving the best outcome in terms of protecting resource quality starts with the soil survey. This is best carried out by a qualified soil scientist. Soil Science Australia's accreditation scheme is the CPSS – Certified Professional Soil Scientist<sup>1</sup>. This system is to soil science what a Chartered Engineer is to engineering.

The soil survey will document soil profiles and will interpret results of physical and chemical analyses against the soil specification(s) for the job. While topsoil is the major focus of beneficial re-use, an assessment of subsoil quality is also highly beneficial. The best topsoil will fail if underlying subsoils are hostile to plant growth. Treatment of subsoils following stripping provides a rare opportunity to address hostile properties and improve access to deep moisture reserves.

A NATA-accredited laboratory should carry out the prescribed testing. The CPSS will determine if the soil is, or can be made, fit-for-purpose. If the soil is deemed not fit-for-purpose, advice should be provided for an alternative beneficial re-use, or disposal.

The CPSS' role is to also determine if a specific non-compliance will compromise the soil's fitness-for-purpose or not, and if amelioration is necessary. If non-compliance does not impact on fitness-for-purpose, the CPSS may issue a certificate of compliance.

Assessment of compliance against the specification shall be determined ahead of soil stripping and stockpiling. Early assessment will identify soils with re-use potential. Soils that cannot be re-used should not be stockpiled and should be designated as fill material or disposed of.

The CPSS will provide guidance to address issues likely to fail compliance or otherwise impact on the soil's fitness-for-purpose. Amelioration of soils shall be undertaken after stripping and stockpiling and before, or at the same time, that soils are reclaimed for use.

## Stripping and Stockpiling

Soil stripping shall be informed by the soil survey which will indicate recoverable topsoil depths and volumes. Stripping should be carried out using equipment and methods that minimise compaction. Movement and mixing of soil from excavation to placement in stockpiles should be minimised.

Of utmost importance to the stripping process is ensuring that topsoil stripping does not include subsoil. Subsoil contamination of topsoil can greatly impact on topsoil re-use and subsequent plant performance.

Stripping and stockpiling of topsoil should occur immediately before bulk earthworks and be done in such a manner as to minimise erosion and sediment loss from site. Stockpiles must be located in a convenient place away from any risk of running water and subject to suitable erosion control measures. They must be protected from contamination during the construction process and records kept of their source location and laboratory analyses.

It is critically important that stockpiles not be trafficked. Stockpiles should be constructed by pushing material up or placing material on top, not by heavy equipment driving over the piles. The compaction that results from traffic is enormously damaging to subsequent soil performance (drainage and plant growth) and must be avoided (figure 2).

<sup>1</sup> <https://www.soilscienceaustralia.org.au/>

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**Figure 2. Heavy compaction results from traffic over stockpiles**

It is important to keep appropriate records on the position and origin of each stockpile.

If an excess of topsoil is expected above which can be re-used on site, any such material must be assessed against the EPA's IWRG621 Guideline (Soil Hazard Categorisation and Management) to determine disposal requirements. It is illegal to move soil to another site without such certification.



**Figure 3. Flat top to reduce erosion and erosion control to minimise soil loss. Traffic is also excluded.**

Recovery of stockpiled topsoil should be carried out at the earliest opportunity to minimise the time spent in stockpiles.

A summary of stripping and stockpiling essentials is shown below:

Stripping	
<b>Preparation</b>	<ul style="list-style-type: none"> <li>• Clear all debris including demolition waste, timber, rubbish, wire fences, rock, bitumen, gravelled driveways etc.</li> <li>• Clear trees and shrub growth and slash if necessary.</li> <li>• Clear and / or spray stands of State Prohibited Weeds</li> <li>• Grasses / pasture mixes do not require spraying prior to stripping. Such materials may be included in stockpiles without treatment.</li> </ul>
<b>Soil stripping</b>	<ul style="list-style-type: none"> <li>• AVOID THE INCLUSION OF SUBSOIL IN TOPSOIL STRIPPING; adjust depth accordingly.</li> <li>• Strip topsoil according to recommendations contained in the soil survey</li> </ul>
Stockpiling	
<b>Stockpile management</b>	<ul style="list-style-type: none"> <li>• DO NOT DRIVE ON STOCKPILES during or after construction of the stockpile</li> <li>• Stockpiles must be no higher than 2 m but may be flat topped.</li> <li>• Label stockpiles with location origin and date.</li> <li>• If topsoil stockpiles are to be in place longer than 1 month, sow with a seasonally appropriate annual cover crop (28 days as per EPA guidelines for major construction sites).</li> <li>• If subsoil stockpiles are to be in place longer than 1 month, no sowing is required. Apply gypsum to all surfaces at a rate of 200g/m<sup>2</sup> and lightly water to prevent removal by wind</li> <li>• Locate stockpiles 5 m or more from concentrated water flows (including drainage lines, roadways).</li> <li>• Locate stockpiles away from / upslope of works areas including re-fuelling operations.</li> <li>• Use diversion drains upslope from stockpile.</li> <li>• Protect downslope sediment loss using sediment control structures (silt fencing or other approved method).</li> <li>• Locations should have less than 10% slope.</li> <li>• Locate stockpiles outside designated Tree Preservation Zones (TPZ) or more than 8m away from any retained trees.</li> <li>• Protect stockpiles from waste and rubbish dumping and encroachment of works.</li> </ul>

# Women in Corrosion



## PICTURED ABOVE:

**TOP ROW (L-R):** Tracey Grantham, Customer Relations Manager, Adelaide Galvanising Industries; Sarah Furman, Associate Director-Advanced Materials, AECOM;

**MIDDLE ROW (L-R):** Jessica Lyndon, ACA Council President; Trish Shaw, Principal Scientist and Team Leader, Coating and Polymers Team, Callaghan Innovation; Candice Blackney, Senior Engineer, Corrosion Management at City West Water.

**BOTTOM ROW (L-R):** Pam Nicoletti, Director, Education at NACE International; Carmen Andrade, Visiting Research Professor at the International Centre for Numerical Methods in Engineering (CIMNE).

Modern, developed economies use technology in a vast, diverse range of ways, from the mathematics used to develop public-private key encryption that secures internet transactions to the physics underpinning the many types of battery powering our cars, phones and computers.

A diverse workforce, well educated in science, technology, engineering and mathematics – referred to as the STEM subjects – is required by most businesses, industries and organisations.

According to the 2019 Women in STEM Decadal Plan, prepared by the Australian Academy of Science (AAS) and the Australian Academy of Technology and Engineering, every organisation in Australia is increasingly reliant on STEM skills to thrive, whether they operate in government, academia, industry, or the education sector.

*“All these stakeholders face a common challenge: the need to tackle the significant under-representation of women in the STEM workforce, because we can ill afford to under-utilise all of the nation’s available talent. To achieve this requires removing barriers to participation at every point of the STEM pipeline. We must create an environment where girls and women can readily engage in STEM education and then use those skills to progress through their careers to senior levels,”* the AAS report states.

In many ways, the corrosion industry reflects this general state of affairs, being reliant on researchers – investigating both the process of corrosion and ways to control it – and practitioners managing its application.

To support its sector in particular – and industry in general – the Australasian Corrosion Association (ACA) provides an extensive knowledge base of best practices in corrosion management, thus ensuring all impacts of corrosion are responsibly managed, the environment protected and economics improved. Through its ACA Foundation, the organisation also provides research that is used in curriculum development for schools and universities.

The AAS report suggests using an ‘attract–retain–progress’ framework gives an understanding of the issues and challenges faced by women and girls in their STEM education and working lives. Attraction relates to encouraging girls and women to pursue STEM education and careers and ensuring they see STEM as a viable and exciting career pathway.

A good education is the starting point which must provide learning and teaching environments in which girls choose and relish all STEM subjects.

Sarah Furman, Associate Director-Advanced Materials at AECOM in Melbourne was one of only three girls in Year 12 at her all-girl school studying STEM subjects.

“My teachers thought my subject choice – three science and two maths – was too hard for a girl,” she said. “While I did get a lot of pressure to make alternative choices that they said would give me access to a broader range of subjects, my decision probably impacted the finances of the school as it had to set aside a teacher for just three students.”

However, Trish Shaw, Principal Scientist and Team Leader, Coating and Polymers Team, Callaghan Innovation in New Zealand, said she did not feel any pressure to change her subjects.

“Ultimately, I went down a completely science orientated path,” she stated. “While at age 15 I thought I may do social history and French, by the time I was in 7th form I was taking two maths, chemistry, physics and biology.”

“While I was always in the minority – one of three or four girls in a class of 30 doing chemistry and physics – I did not perceive any pressure to change to other subjects,” Shaw added. “Also, we almost exclusively topped the classes.”

Tracey Grantham, Customer Relations Manager with Adelaide Galvanising Industries, studied science and maths at school but went on to study occupational safety, health and welfare as well as adult learning before starting work in the corrosion industry.

“While I could study science, at my rural high school, chemistry and agriculture were definitely considered male career options,” she said.

While Furman, Shaw and Grantham were in the minority of girls at their schools,



they expressed similar reasons for studying STEM subjects at school. Grantham stated “I liked the fact that the answer was definitive and could be proven,” while for Furman it was “the analytical nature of the subjects and the subject’s applicability to the real world.” Similarly, Shaw felt she “liked science because it was problem solving and always learning new things about how everything worked and how the world was put together.”

Various reports by the Australian Curriculum Assessment and Reporting Authority and other bodies covering the years 2015 – 2017, show the numbers of girls electing to study engineering and computing in Year 12 was 10 and 19 per cent. This trend was mirrored in university and VET enrolments for the same subjects. It was only in biology and health subjects where the gender split changed for females to outnumber males.

In 2016 only a quarter of places were taken by women, in contrast to India where more than twice as many girls were studying STEM subjects or China where the uptake was 76 per cent by girls.

Furman recalls that when she was at university ten per cent of the 300 students in the engineering subjects were girls.

***The most recent census data from the Australian Bureau of Statistics (ABS) shows that while women make up 47.5 per cent of Australia’s workforce, they only make 16 per cent of the STEM-skilled workforce.***

“However, if I remember correctly, all the girls graduated from the course,” she added wryly.

The ACA works with industry and academia to be a source for advice to support curricula design and also develop course materials to support specific subjects. Furman added that she had been on the Board of the ACA Foundation in such a role.

“We looked at curriculum design and course material development that would engage students in Years 9 and 10 and so

encourage them to stay on with the STEM subjects,” she said. “But we also looked at the other end of education showing graduates an idea of where/what they can do with the subjects they study.”

The most recent census data from the Australian Bureau of Statistics (ABS) shows that while women make up 47.5 per cent of Australia’s workforce, they only make 16 per cent of the STEM-skilled workforce. For companies within the technology and research sectors, the number of women at each more senior level steadily drops until only 28 per cent of managerial roles are filled by women. At the “C Suite” level of such organisations, representation decreases further with women occupying only eight per cent of the corner offices.

Even in disciplines where women have greater than 50 per cent representation at the undergraduate and postgraduate levels, such as in agriculture and environmental sciences, and health sciences, the proportion of women in these fields significantly decreases after the early to mid career stage. This clearly demonstrates the problem of retention, ensuring the experiences of girls and women pursuing a career in STEM are conducive to them remaining in a STEM career.

There is a need to tackle the significant under-representation of women in the STEM workforce.



There have been brief periods in history when the skills and abilities of women were appreciated and used. During the Second World War, slightly more than half of the 16,000 people working at Bletchley Park on code breaking were female and there was similar equality during the United States' space program in the 1960s with women filling the majority of the "computational" roles. Unfortunately, this has not been maintained and in the intervening decades, the percentage of women in Australia studying science and technology at secondary and tertiary levels and then using it in the workforce has steadily declined.

The AAS report also points out that all employers of STEM professionals must curtail the attrition of women from the STEM workforce by removing obstacles, barriers and biases which are disincentives for women to remain in STEM careers or return to them after career interruptions.

The hurdles faced by women arise at every stage of their schooling and working career. The most common include lack of role models, stereotyping and discrimination. Both Furman and Shaw stated they felt that more role models might have helped them somewhat at the start of their careers.

Furman added that her team at AECOM was 65 per cent female and that many of them had been asked to be guest lecturers on courses at universities in Melbourne. "In this way, girls can see other women in leadership/decision making roles as well as working at the coal face within industry and become the role models that have been missing," she said.

In a similar vein, Shaw's group in New Zealand regularly welcomes local school groups to her workplace. "If a group of female students comes through, we give them tours and get them to talk to women scientists so they can see that there are role models," she said. "We actually created an intern position for one woman just finishing a degree in engineering after she visited."

"In recent years, I've been thinking it might have been of value to have some women supporting me," Shaw added. "I came through an era where I didn't want to be treated differently, I'm just a scientist and why should my gender make an issue?"

While it is becoming easier to get girls and young women to take up studying the STEM subjects - anecdotally there are increasing numbers of females in



engineering classes across the country - keeping them within industry is the challenge. According to Furman, "Materials Engineering appears to be appealing to women because it is a combination of scientific disciplines that can be applied in the real world."

Progression is the third broad category of challenges faced by women in STEM and relates to the ability of women to move equitably to the highest levels of their chosen career.

For Shaw's team at the New Zealand government's innovation agency, the staff mix reflects the ABS figures with 20 per cent being women. Shaw admits this is not very high and that in the group she works in, only four out of 20 are women. "Out of the 20 team leaders only two are female," she added. "However, our Chief Executive at Callaghan Innovation is female."

It will not be the simple matter of developing a new curriculum and strategy for getting women excited by the STEM subjects and the corrosion industry. It will also involve changing long-entrenched workplace attitudes. Shaw stated "It's important to recognise that you have to bring men on this journey so they don't feel threatened by women in the workplace and understand that women can bring a different perspective and different approach and they don't have to be afraid of us."

Twenty years ago, workplaces were predominantly male and those are the people that have risen to the level of making decisions but those people are now starting to retire which facilitates change.

"It has been quite hard for women to have that balance and have families

and have time off and still get back into their careers, said Shaw. "In sciences and engineering I think it's getting better now and people are recognising the value of diversity so they are making it easier for women to have those career breaks."

"When I started out in the galvanising industry I felt ostracised on work sites where I heard comments such as 'Don't worry, the boys will know what they are talking about,'" Grantham added. "Fortunately for my daughter who also works in an industry with few females, things have changed and she faces 'speed humps' rather than 'hurdles.'"

"I haven't really noticed any barriers because of my gender, often because I have remained focused on achieving tasks," Furman said. "If we do our job right, it gives a good feeling to know we are a part of something that might still be here 100 years from now."

"We have had conversations about 'unconscious bias' which is also very hard to define," Shaw stated, "Whenever someone was talking about whether you were going to give a senior role to a hypothetical person they would always refer to this 'person' as 'he.'"

"I would strongly recommend that women getting into this field look for and take advantage of other women in the field, don't see it as a sign of weakness to look to them as mentors and sounding boards. It is easy to get isolated," Shaw added.

Like the work mentors, it is important to have support and encouragement at other stages of life. Parents, career counsellors and societal behaviours and values all



influence the choices made by girls and young women. However, girls engaging in and with STEM education will not on its own facilitate retention and progression through their careers. "I do not know why society appears to think the sciences are so hard but the school curriculum seems to add to the difficulties of subject choice," Furman said. "I was lucky that my father encouraged me in all my choices."

Support was available at home for Grantham as well, but "as youngest of eight you had to fight to prove your merit."

A lot of professional associations provide great networks of knowledge. People in the industry are encouraged to attend seminars, training courses and other functions like those that the ACA hosts, all of which helps develop a 'technical' support network as well.

Furman said she had great teachers at both primary and secondary school but also had continuing support from friends and family. "Such an on-going support network is very important," she added.

The corrosion industry seems to foster resilience and determination in its

practitioners. According to Wayne Burns, ACA member and consultant at Anode Engineering, this was exemplified by a particular woman back in 1989. "It seemed like we all went to hell and back in August that year," he said. "The day before the start of our major joint conference in Surfers Paradise, the airline pilots strike started."

"This young corrosion practitioner from Perth was due to be presented with an award and was not going to let the adversity and inconvenience of the strike get in her way," Burns added. "She was determined to be present to receive her award and proceeded to get across country by bus, rail and any other form of transport necessary and her efforts were roundly applauded by the members of the Association."

Such tenacity is an aspiration for young people to strive to follow.

The journeys of Grantham, Shaw and Furman to their chosen careers may have been varied, but - badly paraphrasing Monsignor Georges Lamaitre, a Belgian physicist and ordained priest in the 1920 and '30s - there are many paths to the truth.

The ACA's annual 'Corrosion and Prevention' conference and exhibition, which was held at Crown Promenade in Melbourne during November, also included the inaugural "Women in Corrosion Breakfast". Tracey Grantham, Trish Shaw and Sarah Furman were amongst the panellists for the event.

#### ABOUT THE AUSTRALASIAN CORROSION ASSOCIATION

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

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

For further information, please visit the web site:

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

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