Australasian Concrete Repair Association — Concrete Connections November 2017

CONCRETE CONNECTIONS

In This Issue

Cover photo courtesy of ACOR Consulting

CONCRETE CONNECTIONS

ACRA Outgoing President's Message 2015-2017

It is truly hard to believe how quickly two years have passed and that I am writing this article to the ACRA members as I prepare to transition to immediate past-president. It was certainly a busy 2 year period, which is probably why it passed in the blink of an eye. To recount, we had numerous successful technical meetings with other organisations, such as the Concrete Institute of Australia (CIA), and the Australasian Corrosion Association (ACA), to name a few; increased participation and membership in several state chapters, *although we continue to strive to improve in this area with all state chapters*; successful Trade Shows in Victoria, and a great success with our combined ACA 2-day concrete repair training program.

We honoured our award recipients for their efforts in representing our profession at the highest levels during the ACRA biennial Concrete Repair Awards, and again a success under the previous leadership of Daniel Rowley.

It takes a collective effort to make an association like ours viable, and I think it is only fair that special thanks also go out to all the volunteer members on our ACRA Board, including our treasurer, Grant Dowling, and Promotions officer, Matthew Ball, who will both be relinquishing their board positions after many years of dedicated service to the organisation. Thank you to for all your hard work and we wish you well on your ongoing careers in the industry.

While there is still much to do, a new Board of Directors will be invigorated and motivated and anxious to work with the ongoing leadership of the members who remain on the board. I would like to thank Hamid Khan for taking on the responsibility of the ACRA Presidency and also wish him well for the next two years.

ACRA plays a vital role in our profession, and I hope that this year each member will find a way to serve the organisation that serves you. We will continue to provide affordable networking and continuing-education opportunities. If you have stepped up in the past, we thank you. If you have not yet, now is the time and I look forward to seeing you at upcoming ACRA events in the New Year

Lastly, special thanks to our ACRA office staff, Nicole, for making this a very successful year. Nicole has proven to be an outstanding representative for our organisation, and with the continued support of the ACRA Board we will only get better.

- Henk van den Heuvel

> "It takes a collective effort to make an Association like ours viable"
>
> *- Henk van den Heuvel*

ACRA Incoming President's Message 2017-2019:

I would like to thank all for nominating and electing me as the ACRA President which is a great honour. I would also express my sincere gratitude and thanks to Henk van den Heuvel for taking up the role of ACRA President and leading it with great enthusiasm over the last two years. I would try my best to keep up with the pace and the precedent set, together with the Board Members.

Our primary focus is to increase the membership numbers.
I encourage all members and non-members to become active members of the Australasian Concrete Repair Association. It is vital to keep your suggestions flowing freely through to the ACRA Executive Officer for further improvements. The more involvement we have from the members the higher the commitment will be. Through active participation, we can work together towards improving the Association and adding value to the industry. The increased construction activity in the region also brings along various challenges. ACRA plays an important role in addressing to those challenges by conducting technical seminars, courses, trade shows and professional networking sessions. We need to continue to inform and educate our new and existing members through such valuable events.

> "Through active participation, we can work together towards improving the Association and adding value to the industry"
>
> *-Hamid Khan*

Narrow approach in concrete repairs is a clear barrier to achieve a long lasting and durable repair. Refurbishment and rectification of concrete structures require complex design work rather than mere selection of products. This has led the Board to consider broadening the scope of the Association by adding other elements that are enablers for the holistic concrete repair solutions.
The details will be released in the new year.

- Hamid Khan

2017 ACRA AGM

Industry News….

ACRA not only has a new President in Hamid Khan but we are thrilled to have new some new Corporate Members on the ACRA Board. Meet your new ACRA Board for 2017-2018.

Hamid Khan—ACRA President

Henk van den Heuvel
Immediate Past President

Daniel Rowley

Grahame Vile

Harvey Welman

Peter Johnsson

Michael Batty

Greg Zambesi

Kieran Smith

ACRA thanks *Immediate Past President* Henk van den Heuvel for all his efforts over the last few years and its great to see him back on the Board where he will continue to be as proactive with new and fresh ideas as has his always been. Daniel Rowley represents the ACT and will be introducing seminars and courses into the ACT in 2018 which will extend our exposure to the industry within Canberra and the surrounding suburbs.

Recently Peter Johnsson who is new to ACOR Consulting in St Leonards NSW, was voted onto the board of ACRA. We also have the fresh new face of Grahame Vile from BAAM Consulting who brings with him a wealth of experience and knowledge within the Industry and who will be redeveloping the **ACRA full day Concrete Repair and Protection Technical Training Course**. Both Peter and Grahame are available as speakers for this course and will once again be travelling the country along with Peter Trinder from BG&E (WA) in 2018 and passing on their wealth of knowledge on the subject.

If you would like to have one of these experts come to your place of work and hold a course for staff, which **can be tailored for your needs** or we are happy to do the full course for you, give ACRA a call on 02 9645 3692 or email info@acrassoc.com.au. If you have 10 people this will be a huge saving OR perhaps you would collaborate with another company in your area and go halves in having a speaker come to you. Call us today and have a chat about your needs and you'll be surprised at how cost effective having the Trainer come to you can be.

ACRA will be kicking off in February 2018 full day course in QLD, so stay tuned for more details. Email us if you would like reserve your spot info@acrassoc.com.au . Cost will stay the same at $495 for ACRA Members and $595 for non members.

Keep your eyes peeled for the release of our 2018 calendar.

ACRA Awards 2018 — sneak peek

Now's the time to start thinking about next year's 2018 ACRA Awards for Excellence in Concrete Repair and Protection which will be taking place in Melbourne, Victoria in October 2018. In this issue of *Concrete Connections,* we take a brief look at last years' winner Repair Industry Excellence Award:

Waverton Coal Loader Platform Adaptive Re-use Greenroof Project – ACOR Consultants

ACOR was commissioned by North Sydney Council in January 2015 to undertake site investigations and modelling to determine a suitable remedial strategy that would allow the Coal Loader site in Waverton, NSW to be restored and successfully adapted into a public recreation area, museum and learning facility.

The site has significant Aboriginal and 20th century industrial heritage significance. The Cammeraygal people lived on the peninsula for thousands of years and one hundred years ago the site was developed into a Coal Loader Bunkering and export facility.

The facility included a series of tunnels and storage rooms constructed of reinforced concrete. The concrete was not like modern concrete, and had been constructed with a range of aggregates including river pebbles from the Thames River in the UK.

ACOR utilised varying methods to investigate and analyse the concrete, including visual inspection, hammer sounding surveys, cover meter, resistivity, surface friability, half-cell potential, galvanic pules, core sampling (chlorides, cement content, carbonation and sulphate ion) testing together with destructive inspection techniques to complement our structural modelling.

As part of the documentation process ACOR undertook trial repairs to ensure that contractors would be able to achieve acceptable finishes that mimicked the heritage concrete finishes. This included re-using the Thames River gravel aggregate salvaged from the hydrodemolition process. A detailed repair specification including mark-out of more than 2,000 defects was developed.

ACOR's role transitioned from investigation and specification to undertaking the Superintendent's representative role during the repair process. Almost 35,000 litres of concrete repair, more than 2,000m^2 of surface coatings, 1,450 anodes and 600 metres of crack repair were undertaken. Due to extensive condition investigations undertaken, ACOR confidently estimated the quantities of repair required resulting in.

ACOR CONSULTANTS

For more detail contact Peter Johnsson pjohnsson@acor.com.au or Sam Parker sparker@acor.com.au at ACOR on **02 9438 5098.**

To watch a YouTube video on the project go to:
https://www.youtube.com/watch?v=Yg5fJnAGch8
https://www.northsydney.nsw.gov.au/Waste_Environment/The_Coal_Loader/Coal_Loader_Platform

The Corrosion Conundrum

Durability Risks and Protection to Bridge Structures

Over the past few decades, the desire of extending the useful service life of infrastructures has become of paramount significance. Where the aging infrastructure is a serious problem faced by countries across the world, the premature deterioration has also emerged as the major problem that results in reduced service life of the reinforced concrete structures. The construction industry has recently been witnessing ambitious designs and specifications to achieve this desired design service life. The adoption of high standards of design and construction of new concrete structures has become a major focus. Despite the ambitious project specifications and design parameters, reinforced concrete structures are always subjected to numerous durability risks. This article attempts to highlight the carbonation and chloride attack risks to the reinforced concrete bridges.

Bridge Hierarchy - *Bridge Structural Elements and Exposure to Risks:*

There are different types of bridges and a general classification of bridge components is shown in Figure 1. Concrete bridge structural elements constantly subjected to multiple risk factors result in deterioration over the course of their service lives. The causes of deterioration and concrete distress are due to multiple expository variables such as aging, corrosion, cracking, vehicular overload, environmental factors, climates, material properties, inadequate design and poor asset management. Natural hazards, floods and collisions are also primary causes of bridge failures.

Bridge failure may be defined as the inability of a bridge to serve its intended function with the desired levels of safety and serviceability. Failure of a bridge may be attributed to a number of independent and interrelated factors. Corrosion of the steel generates iron oxides and hydroxides, resulting in 6 to 10 times increase of volume than the original size. This increase in volume causes expansive forces to accumulate within the concrete around reinforcement and results in concrete spalling. American National Bridge Inventory, 2006, reported that environment induced corrosion has structurally effected 73,764 bridges in USA. The US department of transportation report suggested in 2012 the country's 11% bridges, that account for 607,380, fall under the classification of structurally deficient assets due to traffic loads, aging of construction materials and other factors. Considerable number of bridges located on the coastal areas of Japan, experienced early onset concrete deterioration due to corrosion within ten to 15 years of construction completion.

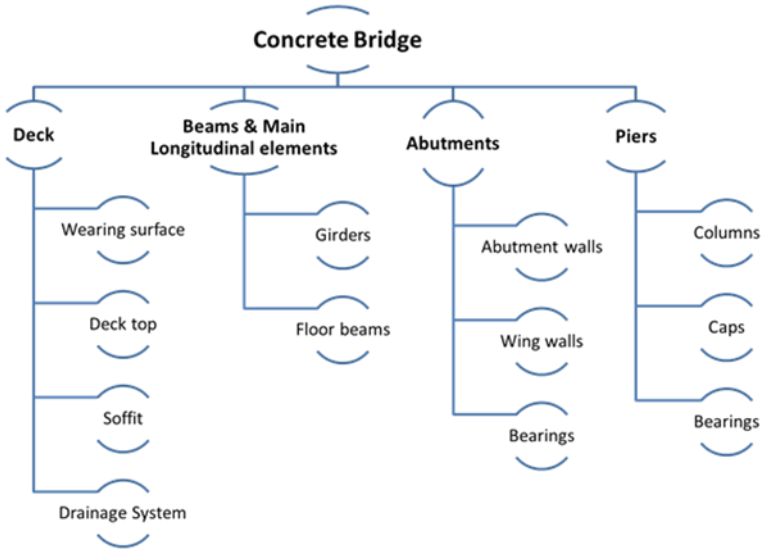


Figure 1. Bridge hierarchy—concrete bridge components and elements
Source: Moufti, Zayed and Dabous (2014)

The Environment - *Understanding the Climate Change and Carbonation*

Concrete deterioration rate depends not only on material specifications and construction practices, but also relies on the on-going climatic environment during the life cycle of the structures. Atmospheric CO_2 is a main culprit of corrosion in bridges, buildings and other concrete infrastructure in Australia, United States, United Kingdom and other countries. Using probabilistic and reliability-based approach, Stewart et al. researched on “Climate Change Impact and Risks of Concrete Infrastructure Deterioration” and concluded that carbonation-induced damage risks can increase by over 400% by 2100 for inland arid or temperate climates in Australia.

During the last two and half centuries, the concentration of carbon dioxide in the atmosphere has significantly

increased by 36% from 280 ppm to 380 ppm. An interesting article in Sydney Morning Herald, 2015 by Nicky Philips highlighted the detrimental effects of carbon dioxide to something as simple as a loaf of bread. A nicely risen loaf of bread (Figure 2, right) might turn to a ‘not so appealing’ bread (Figure 2, left) due to the high concentration of carbon dioxide effecting the grains quality if greenhouse gas emissions are not abated significantly. With CO_2 expected to rise from 380ppm to 550ppm by 2050, the future bread would be like the loaf of bread on left.

Interestingly enough, one of the most damaging agents to the concrete structures, CO_2, is produced as a by-product during the cement production. Concrete, being the second most consumed material after water, contributes to more than 5% of annual global CO_2 emissions. Such large amount of undesirable CO_2 emission can be reduced by the use of new concrete additives and supplementary cementitious materials to increase the durability and workability of concrete. Repair mortar manufactures such as Fosroc, have also started manufacturing high performance repair materials based on supplementary cementitious materials making it environmental friendly and sustainable with lower carbon foot print.

Figure 2: The larger loaf on the right was made with wheat grown in standard conditions. The loaf on the left was grown in high carbon dioxide conditions. Baked at the Australian Grains Free Air CO_2 Enrichment facility (AgFace) in Victoria by a research group.

Photo: Simone Dalton, *Source: The Sydney Morning Herald (2015)*

The super-structure exposed elements of bridges are subjected to risks of carbonation – the process that results in reduction of the concrete pH. The formation of the passive layer protects the steel in concrete due to inherent alkaline environment in concrete. As a result of carbonation, the passivity of steel is disrupted and electrochemical process of corrosion is initiated. The protective film around the steel reinforcement is broken down through 'carbonation'. Carbonation takes place as a result of the penetration by atmospheric carbon dioxide, which reacts with the calcium hydroxide in the concrete to form calcium carbonate. This consumption of calcium hydroxide drops the pH level of concrete which is the primary effect of carbonation. This process begins almost as soon as the concrete structure is built but takes time for the carbonation process to change the alkalinity at a depth to effect the concrete.

As a secondary effect, carbon dioxide could also cause leaching and additional shrinkage due to the transformation of CO_2 into carbonic acid (H_2CO_3) and its reaction with calcium hydroxide to form calcium carbonate and water. The reaction is described by:

$$H_2CO_3 + Ca(OH)_2 \longrightarrow CaCO_3 + 2H_2O$$

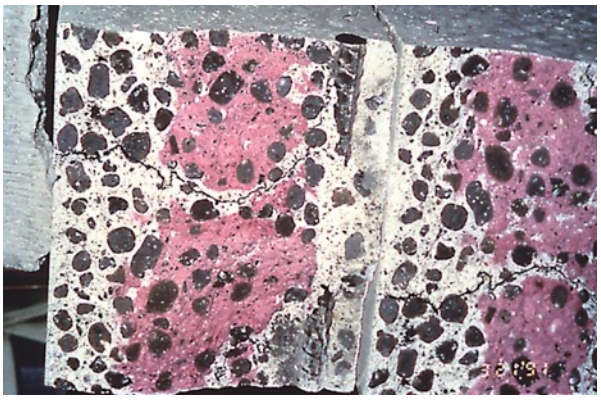


Figure 3: Carbonated reinforced concrete - Spraying freshly broken concrete with phenolphthalein indicates pink, non-carbonated areas.

Figure 4: Using phenolphthalein indicator solution check the alkalinity of the concrete and the depth of change

The external relative humidity range of 40% to 80 % increases carbonation. The carbonation below 30% relative humidity is almost negligible. The diffusion of carbon dioxide is, however, hindered under higher relative humidity due to water filling the concrete pores and low rate of CO_2 diffusion in water. In addition to other factors such as relative humidity, time, temperature, atmospheric CO_2 concentration, design, the rate at which the carbonation front progresses through the reinforced concrete is reliant on the quality of the concrete (porosity, permeability, water-cement ratio). By using high quality concrete and adequate depth of concrete cover, the risk of corrosion due to carbonation is reduced. The high quality concrete mix design is achieved with the presence of supplementary cement materials such as fly ash, slag and micro silica. These similar standards of quality are important while using cementitious repair materials for remediation of concrete. The carbonation resistance of repair mortars used for remediation and rectification of concrete should conform to EN 13295:2005. Repair mortars and engineered protective coatings such as Fosroc Renderoc and Dekguard provide an effective barrier against atmospheric carbon dioxide and other corrosive agents.

Chloride Induced Corrosion and Additional Factors – *Salt Bae vs Salt Spray*

The role of the chloride ion in inducing reinforcement corrosion is well documented. Chloride ions can enter into the concrete from de-icing salts or from salt spray in marine environments. Other sources include chloride containing admixtures, contaminated materials and water, air born salts and chlorides in ground water. Higher concentration of chlorides, disrupt the passive film and subject the reinforcing steel to corrosion. Chloride attack form pitting action to the reinforcement that could result in sudden collapse of a structure if remained unattended.

Salt Bae, (renowned Turkish chef Nusret Gokce with millions of followings), brings out the best flavours in steak by sprinkling salt on it in his iconic way but the same salt spray brings out the worst of concrete durability. Where sprinkling salt on meat leads to a scrumptious and succulent steak, sprayed salt on structures leads to a disastrous concrete.

Figure 5: Salt Bae (Chef Nusret Gokce) sprinkling salt on a piece of meat is sensational. *Source: Instagram*

Figure 6: Salt spray is detrimental for concrete. *Source: www.fosroc.com*

The strength degradation mechanisms can be classified as affecting either the concrete or the steel reinforcement, or both. Concrete deteriorates due to the chemical reactions in the cement (sulphate attack) and the formation of internal pressure. Concrete also gets challenged by chemical reactions between the cement and aggregate (alkali-silica reaction), or by freeze-thaw cycle attack. The deterioration of reinforcement steel results primarily due to the initiation stage of ingress of chloride ions or carbonation process and the propagation (material loss) stage. Additionally, the internal pressures formed by corrosive agents can lead to cracking and spalling of the concrete.

A macro corrosion cell can easily be developed due to difference in chloride ion concentration. A simple example is the use of de-icing salts to a bridge deck where the top reinforcement receives more chloride than the bottom reinforcement matt. This uneven distribution of chloride ions results in the formation of macro corrosion cell.

In marine environment, although chloride ion concentration in fully submerged bridge elements far exceeds the threshold level required for the onset of corrosion of reinforcing steel, the insufficient oxygen level hinder the corrosion process. The diffusion of oxygen in fully saturated concrete is very slow associated with very low corrosion rates. The pile caps and piers in splash and tidal zones are the most critical zones that are subjected to the chloride attack. Galvanic protection using distributed anode system has a proven track record for corrosion control and cathodic protection of bridge structures. These anodes are widely used across the world to provide long term corrosion solution to bridge piers in splash and tidal zones, abutments and decks.

Conclusion

Corrosion in concrete structures is an alarming situation of serious concern. The scope of this article is to highlight the risks of carbonation and chloride induced corrosion. However, all risk factors are important and affect the performance of a structure, over a period of time. Failure of a bridge cannot be attributed to a single factor. All the stages in the life cycle of a structure are important and need to be taken into consideration during planning and designing stages. Any defects during the new construction, concrete structures should be rectified using sustainable, high performance, high strength and high resistivity mortars. In marine environment, distributed anode system provides long term galvanic solution for corrosion control and cathodic protection of existing bridge structures.

References

Moufti, S., Zayed, T. and Dabous, S., (2014), “Defect-based condition assessment of concrete bridges – Fuzzy hierarchical evidential reasoning approach”, *Journal of the transportation research board, No 2431, Transportation research board of the national academies, Washington.* PP88-96.

Apostolopoulos, C., (2010), "Coastal bridges and the 120 Life Span – the Rio-Antirio case study", *International Journal of Structural Integrity*, Vol. 1 Issue 2 pp. 173 – 183

Salomoni, V., Mazzucco, G. and Majorana, C., (2007), “Mechanical and durability behaviour of growing concrete structures”, *Engineering Computations*, Vol. 24 Iss 5 pp. 536 – 561

Phillips, N., (2015), “What climate change will do to your loaf of bread”, http://www.smh.com.au/environment/un-climate-conference/what-climate-change-will-do-to-your-loaf-of-bread-20150619-ghshcq.html

Ali, R., (2017), “Who the Hell is Salt Bae?”, https://www.thewrap.com/who-the-hell-is-salt-bae/

Steward, M., Wang, X. and Nguyen, M., (2010), “Climate Change Impact and Risks of Concrete Infrastructure Deterioration” https://publications.csiro.au/rpr/download?pid=csiro:EP101172&dsid=DS1

About the Author:

Hamid Khan working presently as Product Segment Manager – Repairs and Grouts at Parchem, Australasia, holds a bachelor degree in Civil Engineering discipline. He also holds a double Master in Business and Strategy from the University of Wollongong. Hamid is certified in Concrete Technology and Construction, by City & Guilds of London Institute (UK) and is a qualified expert in concrete repair and refurbishment with 20 years of experience in the industry.

Hamid is a regular presenter at various industry related National and International Conferences and Seminars. Hamid contributed to articles for Australasian Concrete Repair Association (ACRA)- *Concrete Connection*, Concrete Institute of Australia (CIA) – *Concrete in Australia*, Australasian Corrosion Association (ACA) – *Corrosion and materials*, The Australian Institute of Building (AIB) – *Construct for Chartered Building Professionals* and other leading construction magazines.

Hamid is also an active board member and President of Australasian Concrete Repair Association (ACRA). He was associated with Fosroc International in Dubai for 14 years taking up various roles in technical and management. Hamid’s experience comes from the Gulf, Middle East, Europe, East Asia and Central Asia.

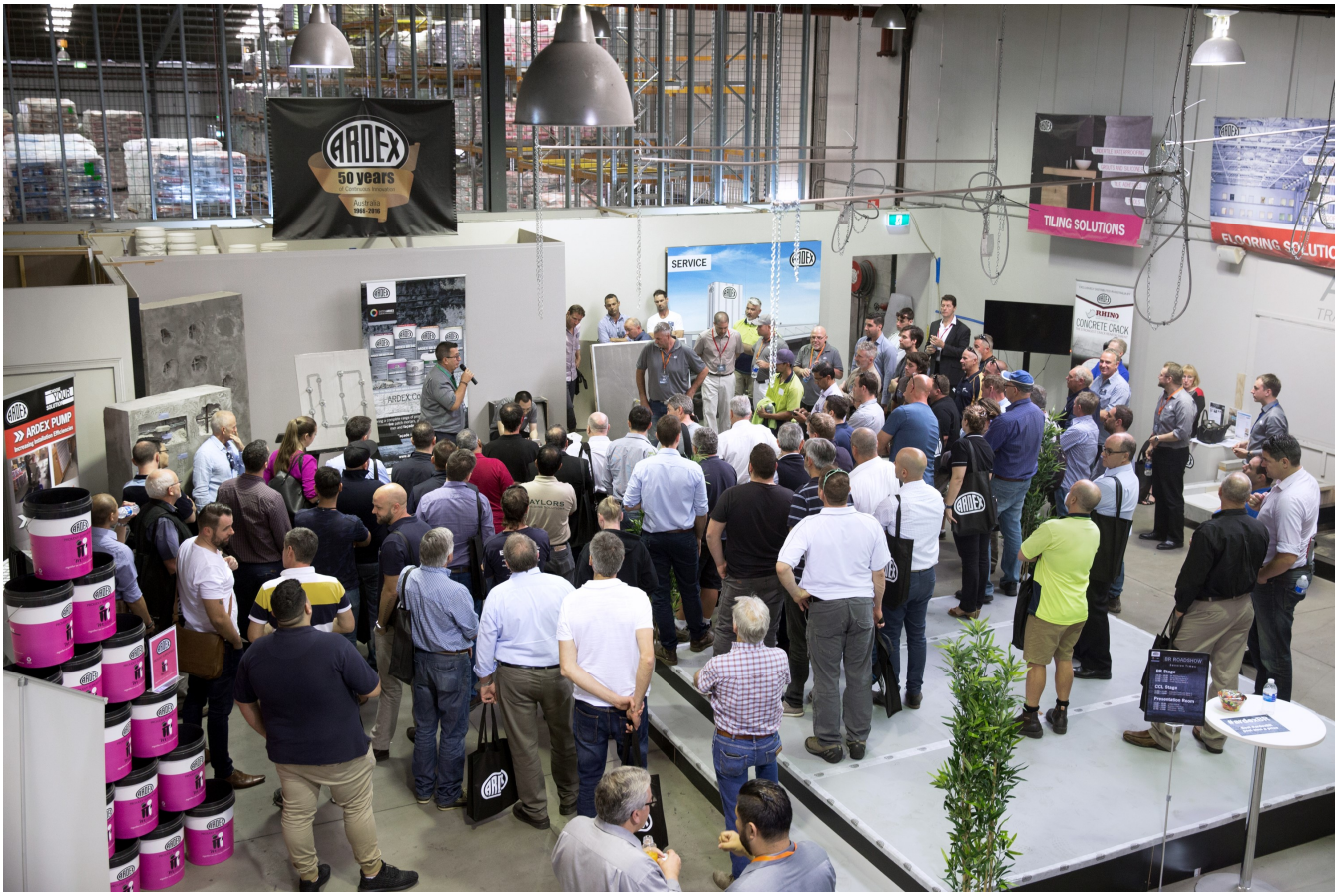
ARDEX BR Roadshow - Launch of the new ARDEX Concrete Repair System

ARDEX Australia are proud to announce that we're breaking new ground as a serious player in the national building and concrete repair market. This announcement was made at the inaugural BR Roadshow, a new annual nationwide exhibition of ARDEX Australia's latest technology and new product development initiatives.

The new Concrete Repair System is a testament to ARDEX' continual innovation and growth, and demonstrates our capability to providing systematic and effective solutions. While concrete is versatile and ideal for modern infrastructure, long-term exposure to intense environmental conditions can lead to deterioration of the material, endangering the long-term viability of the structure.

Our revolutionary, state-of-the-art Concrete Repair Systems are designed to make concrete repair more efficient and less labour intensive. This means we can extend the life of our clients' projects by years, and provide a better service.

The revolutionary new product introduced as an Australian first at the BR Roadshow – called Rhino Concrete Crack Lock – works by stitching cracks with an approved ARDEX Epoxy Resin, permanently bonding both sides of the crack together. The Concrete Crack Lock System can be used for cracks in virtually any circumstance, from hairline cracks right through to structural repairs. As an example, it can even be used to increase seismic strength to repairs after an earthquake.



Our Concrete Crack Repair and Injection Range is ideal for repairing holes, spalls and cracks in concrete, as well as situations where heavy duty vehicle traffic is anticipated. Once cured, the repaired concrete cracks will be stronger than the original concrete, guaranteeing a long lasting and durable repair solution. And as with all ARDEX products, we strive for absolute quality. Everything we do has an ISO 9001 accreditation, and all production, raw materials and packaging is subjected to rigorous quality control.

The BR Roadshow is just another example of how ARDEX Australia, after more than 50 years, is still striving for innovation and new frontiers.
By continuing to build on our already-successful platform, we look forward with confidence to a successful future. We continue to source technical excellence to develop new products that are embraced on the global market.

The roadshow aims to showcase a cross-section of new innovations, product development initiatives, as well as existing systems that many of our clients are familiar with. Along with our new and revolutionary Concrete Repair System, we also showcased our range of high-performance specialty building materials including; Weldtec Sheet Membranes, Innovations in Torch-applied Membranes, Green Roof Solutions, Flexbone Decoupling Mat, Tiling Systems, and Flooring Pumps.

The first BR Roadshow was held in the ARDEX Training Academy at the New South Wales Head Office on Friday, 13th October 2017. The BR Roadshow will continue across the nation in 2018, with events scheduled in every state.

WorkSafe NZ initiative promotes cleaner air for concrete workers

By Safety Solutions

The risks posed by airborne hazards at work have been identified for precast concrete companies in New Zealand. A WorkSafe New Zealand clean air awareness campaign was conducted with nine Manukau companies, designed to help them manage health risks and protect their workers.

A number of risks were identified during WorkSafe visits, including:

- high potential for long- and short-term exposure to respirable dust including silica for operational workers;
- deficient controls around respirable dust, including silica dust, in the workplace;
- poor understanding of duties to measure respirable dust including silica exposure levels; poor controls around the use of hazardous substances.

Once the risks were identified, WorkSafe inspectors worked with the respective workplaces to put in place new procedures and improve access to information to enable workers to go about the daily tasks in a safer environment.

“The Manukau Inspectorate identified potential risks for our local pre-cast concrete industry and its workers. It was important for us to work collaboratively with them to raise awareness about the health issues and share learnings so local industry had a better idea how to protect its workforce’s health,” said WorkSafe Manukau Assessment Manager Jason Papuni.

“The fact local Manukau companies worked closely with us shows they are committed to doing that.” Business and worker awareness was particularly low for silica dust contamination prevention outside work — for example, in cars and homes.

The initiative was welcomed by the national precast industry, which believes the entire industry could benefit from the initiative.

“Precast concrete involves potentially hazardous processes and our members are committed to safe processes,” said Precast NZ Executive Director Rod Fulford.

“The approach of WorkSafe’s Manukau office to work collaboratively with industry to understand the processes and develop practical improvements was a significant change from the ‘there is the law; it is your responsibility to interpret and apply it’ approach of old.”

WorkSafe is considering options to expand the assessment program nationwide.

An estimated 600–900 people die in New Zealand from work-related disease every year. While a work-related injury is immediately visible, the effects of exposure to a work-related health hazard may not become visible for days, weeks, months or even decades.

Changing the face of Kirribilli, one façade at a time

Following the success of our 44-50 Kirribilli Ave project earlier this year, Buildcorp's Asset Solutions team are back to work on another apartment block, just one street away!

Residents of our recently completed Kirribilli Ave project are now enjoying a new-look, better performing building, complete with a new façade that provides a 2 x bigger and better view of Sydney Harbour.
After months of careful pre-planning on our next project, we're now undertaking a $10m façade upgrade (over eight storeys) and the first lot of precast balconies are currently being installed. The final result will transform the residents' enjoyment of their homes, as well as the Kirribilli skyline.

Website: http://www.buildcorp.com.au
Phone: NSW **(02) 9565 0000**
QLD **(07) 3139 0800**
VIC **(03) 9975 8800**

Concrete Deck Detailed Design

RKF Engineering Services was engaged by our client, a ports corporation, with regard to its salt expert berth in the Northern part of Western Australia.

The berth is a salt export facility and subject to adverse environmental conditions that had accelerated the deck's deterioration by corroding the reinforcement. The extent of damage was so severe that replacing the entire deck was determined to be a more cost effective solution than conducting remedial repairs.

RKF Engineering Services was briefed to investigate the condition of the concrete deck and supporting steel structure to develop a scope of replacement. Once the scope was developed, we were to design the replacement deck including concrete, cathodic protection and prepare the tender documentation.
The existing steelwork was deemed acceptable to remain although the steel directly supporting the shiploader rails was to be removed and replaced with a deep concrete beam section.

The design included precast shiploader rail beams for the length of the berth and cast in situ concrete slabs between and behind them to complete the deck. All of the new concrete will be protected against further damage by corrosion of the reinforcement by integrating cathodic protection throughout the new works. The design of this system, including arrangements and schematics was provided by RKF Engineering Services as part of the design.

Construction sequencing was also developed allow construction in occur in between ship movements to minimise shutdown times and disruption to the port operations. Construction of the new berth is expected to commence in the near future and once completed, the design will provide a new concrete deck and shiploader rail support with a minimum service life of 50 years.

For further information on this project or in general, phone **+61 2 4225 7519** or email simpsonm@rkfes.com

rkf ENGINEERING SERVICES

7 December 2017—NSW

ACRA and the CIA have joined forces for one MEGA Christmas event with raffles and barefoot bowls.

Along with the usual ACRA Christmas Drinks we will be holding a fundraiser with some great prizes and all profits will be going to CanTeen Australia, a charity that helps teens and their families that are going through dreaded Cancer.
AND the **ACRA CONCRETE CANCER CUP IS BACK!** this year we will be playing barefoot lawn bowls at The Greens North Sydney.
Click below for more details.

If you are interested in donating something as a prize please contact Nicole on **042 9890 761.**
So far we have 2 bottles of Moet (one for each hand) and other ACRA Members have said they are interested in donating prizes. GHD have already donated $500 CASH!
The CIA are putting together a basket of CIA goodies as a prize so this is shaping up to be a great event. If you would like to purchase raffle tickets prior to the event you can do this via VISA or MasterCard.
Tickets are $10 each and you can phone or email Nicole to make your purchase or you can purchase tickets on the night via any of our ACRA Board Members who will be selling tickets on December 7.

Contact email: info@acrassoc.com.au
Phone: **042 9890 761** Nicole direct.

ACRA and CIA members are entitled to 3 free tickets to this massive event and Individual members get 1 ticket. If you have other people you would like to bring along its an extra $30pp. Click the link for more details.

CLICK HERE TO REGISTER

ACRA is already taking team lists so get your teams together or we will put people in a team on the night. Email us your list of team members info@acrassoc.com.au

Sponsored by: Kennards Concrete Care

All profits will go to CanTeen

KENNARDS HIRE

canteen

Setting the Standards in Concrete Repair in Victoria

13 December 2017—VIC

Melbourne ParkView Hotel, Melbourne VIC

ACRA Victoria will be showcasing 3 award winning projects.

The next biennial ACRA Awards will be held in Victoria in October 2018. These awards are seen as the premier awards within the concrete repair industry which highlight some of the more prestigious, complex and outstanding projects to be undertaken over the 2 year period. The seminar on December 13 will showcase some of the best projects we have seen to date.

The speakers are:

Nick Critchley from Freyssinet
Nathan Power from SRG Limited
Andy Caddy from Absafe

Following this seminar will be the ACRA Victoria Members Christmas drinks.
A separate invite will be sent around shortly to all Members regarding the Christmas drinks.

If you would like to sponsor this HUGE event please phone
Nicole on **042 9890 761** or email **info@acrassoc.com.au**

Click Here
TO REGISTER!

City West Receptions - FREE event for ACRA Members

RSVP is a must

6 December 2017—WA

Drinks and Canapes will start at 6pm for approx. 3 hours.
3 free tickets per Corporate Membership (per company)
1 per individual membership
If you would like to invite anyone extra its a small fee of only $30pp.

Register your interest with who is attending to
info@acrassoc.com.au

We look forward to sharing in the Christmas cheer with our members in WA.

ACA/ACRA Corrosion & Protection of Concrete Structures & Buildings - 2 Day Courses—2018

This course has been updated and provides an understanding of the mechanisms of the corrosion, protection and repair of reinforced concrete structures and buildings. It has been particularly designed for those who have the task of resolving the problems of corrosion of steel reinforced, pre stressed and post tensioned concrete elements.

Who Should Attend:

This course will provide essential training for Asset Managers, Port Engineers, Bridge Maintenance Managers, Building Managers, Heritage Structure Engineers, Plant Engineers, Consulting Engineers, Architects, Specialist Contractors, Construction Material Suppliers, Asset Condition Inspectors and Overseers.

Cost: $1170.00 for Members $1465.00 for Non Members.

Click the dates below for more information and to register.

Melbourne **19 March 2018**
Sydney **4 June 2018**
Brisbane **6 September 2018**

A Certificate for the course will be forwarded to those students who have passed the exam, and a certificate of attendance issued otherwise.

ACRA Guide to Concrete Repair and Protection

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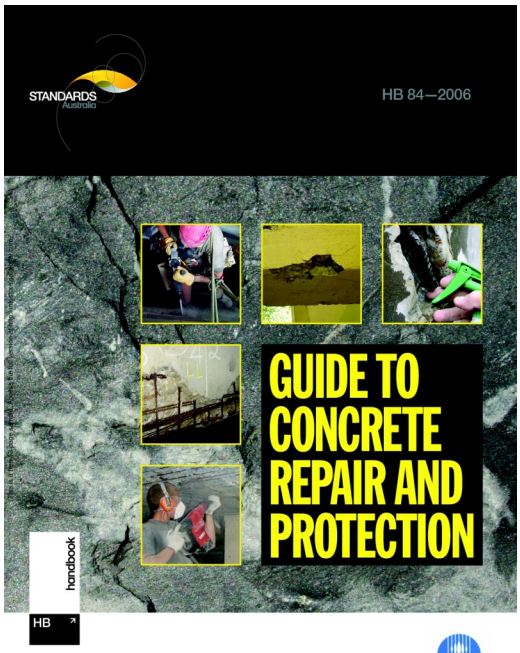

Building owners and managers, consultants, builders and repairers will welcome publication of Guide to Concrete Repair and Protection.

The Guide, which is published as a Standards Australia handbook, is the result of over a year's work by the Australasian Concrete Repair Association (ACRA) and the CSIRO's Division of Building, Construction and Engineering. The aim of the reference is that it "...can be read and understood by a diverse group of persons, ranging from professionals and technicians to those engaged in specifying or carrying out repairs to concrete structures, and those involved with the management of buildings and structures".

In short, the Guide is indispensable for all those who have a stake in ensuring high standards of concrete repair and protection. With over 50 illustrations, tables, graphs and diagrams, the 80-page A4 book imparts an understanding of sound practices and quality workmanship in the light of the state-of-the-art in both diagnostic equipment and remedial techniques.

The book comprises seven chapters and three appendices. Each chapter ends with a list of recommended reading for more in-depth study of the subjects covered. The Guide begins by discussing concrete as a material and the causes of its deterioration. It categorises cracks and how they form.

A chapter is devoted to inspection including advanced techniques using electrical and ultrasound technologies. Another details protective and remedial systems from simple patching to the latest advances such as cathodic protection, chloride extraction and realkalisation. Details are also given on repair practices. Case histories are included for a high-rise building, a marine structure, commercial complex, apartment building and retaining wall. Also presented, are repair strategies for both carbonation-induced and chloride-induced steel corrosion.

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President, Hamid Khan
Parchem Construction Supplies
hamid.khan@parchem.com.au

Executive Officer, Nicole Raymond
Australasian Concrete Repair Association Inc.
info@acrassoc.com.au

Editorial contributions are welcomed.
Please contact the ACRA (02) 9654 3692
Email: info@acrassoc.com.au
Postal: PO Box 452, Chester Hill NSW 2162
www.acrassoc.com.au

Publisher/Editor
Nicole Raymond
042 9890 761

ACRA CORPORATE MEMBERS

Contact Us

Give us a call for more information about Memberships & Benefits

PO Box 452
Chester Hill NSW 2162
Australia
+61 2 9645 3692 (wed-fri)
042 9890 761 (Nicole)
info@acrassoc.com.au

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www.acrassoc.com.au