concrete

VOLUME 61 ISSUE 1

concretenz
BUILDING RESILIENCE

+ CONCRETE INDUSTRY ON TRACK TO MEET 2030 EMISSIONS REDUCTION TARGET

+ CONCRETE ROAD PAVEMENTS COULD HOLD THE KEY TO NZ'S DURABILITY ISSUES

UPFRONT

ACCOUNT FOR CARBON OVER A BUILDING'S WHOLE-OF-LIFE

While New Zealand looks to recover from the effects of COVID-19, it must also remain focussed on emissions reduction, a key aspect of which will be adopting a whole-of-life approach to determining the environmental impact of construction.

Recovery from the pandemic is the absolute priority, not just for the building and construction sector, but for all New Zealand.

Government stimulus through fast-tracked, large-scale projects, and plans to address deferred maintenance in schools, hospitals, is required to create jobs and help New Zealand emerge from recession.

At the same time however, another national priority is to remain on-track to meet our part in reducing emissions under the Paris Agreement.

A crucial mechanism to ensure net zero carbon is achieved by 2050 will be climate change regulations across all sectors, including building and construction.

While the *Climate Change Response (Zero Carbon) Amendment Act* offers a defined, long-term, emissions target, with an assured framework for managing the transition to a low-emissions future, decisions must be evidence-based and deliver pragmatic results.

It was therefore, concerning to hear Urban Development Minister, Phil Twyford, announce that Government procurement rules now require departments constructing new buildings to select materials (and processes) with the lowest 'upfront' carbon emissions.

While the concrete industry acknowledges that the built environment, including infrastructure, is a significant contributor to New Zealand's emissions, the most appropriate way to compare the environmental impact of buildings is a 'cradle-to-cradle' (not 'cradle-to-gate') Life-Cycle Assessment (LCA).

An LCA from a recognised provider uses robust science and independent data to assess a building's impact across its entire life cycle. Such a methodology considers the product, construction, use, end-of-life and recycling / recovery / reuse stages.

As with the new Government procurement rules, the Ministry of Business, Innovation and Employment's (MBIE) *Building for Climate*

Cover images: The sustainability properties of concrete in use.

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A Advertorial

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BUILDING RESILIENCE

Change programme appears to have adopted an upfront approach to assessing embodied carbon.

MBIE's *Whole-of-life embodied carbon emissions reduction framework,* which seeks to improve the operational efficiency of buildings by reducing emissions, reducing water use and improving occupant health and wellbeing, is proposing an LCA approach that stops at the gate not the grave.

We acknowledge that extensive consultation, including with industry, is being undertaken by MBIE, and look forward to collaborating in the development of a sustainable final framework.

At the same time, Concrete NZ will continue to advocate for a whole-of-life approach with Waka Kotahi NZ Transport Agency (NZTA), which has just formed a partnership with the Infrastructure Sustainability Council of Australia (ISCA) to deliver sustainable outcomes.

We encourage the partnership to consider the whole-of-life, cost effective case for concrete road pavements, particularly as a review of pavement failures on the Kapiti and Waikato Expressways emphasised the need for procurement and construction to provide quality and productive outputs.

In targeting net zero carbon by 2050 New Zealand must learn the lessons of recent decades when rapid reform led to unintended consequences such as the weathertightness debacle, the costs of which will have to be met by generations to come.

Rob Gaimster
Concrete NZ, Chief Executive

FEEDBACK SOUGHT ON TECHNICAL SPECIFICATION FOR CONCRETE FLOOR SURFACE REGULARITY

CONCRETE NZ IS SEEKING FEEDBACK ON ITS DRAFT *TECHNICAL SPECIFICATION 01:2020 SURFACE REGULARITY REQUIREMENTS FOR CONCRETE FLOORS.*

The technical specification provides surface regularity requirements for internal concrete floors that are either supported by the ground or are suspended.

The technical specification's provisions can apply to a range of building uses including industrial, warehousing, institutional, retail, commercial, office and accommodation, where different tolerances are required for the specific use (e.g. high reach forklifts) and/or take account of final floor finishes that may be applied (e.g. tiles).

Guidance on methods for measuring surface regularity is also provided.

The requirements in the technical specification modify and/or supersede surface regularity requirements currently provided in *NZS 3109 Concrete construction* and *NZS 3114 Specification for concrete surface finishes.*

Copies of the draft *Technical specification 01:2020 Surface regularity requirements for concrete floors* can be downloaded from the Concrete NZ website - www.concretenz.org.nz

You can submit your feedback by e-mailing admin@concretenz.org.nz

The closing date for providing feedback is 30 October 2020.

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BUILDING RESILIENCE

Justin Bragg
Concrete NZ Precast
Sector Group

PRECAST CONCRETE PANEL LIFTING ANCHORS – DO NOT TAKE SHORTCUTS

THOSE WHO WORK WITH PRECAST PANELS ARE BEING WARNED BY CONCRETE NZ AND WORKSAFE TO ENSURE THEY MEET INDUSTRY STANDARDS FOLLOWING A SERIOUS NEAR-MISS INCIDENT.

In December 2019, a precast concrete panel which weighed 20 tonnes was being lifted at an Auckland construction site when the cast-in lifting anchor failed and the panel fell. While no one was injured the risk of serious injury was high.

Following the incident WorkSafe carried out testing which confirmed the failed lifting anchor was made from a brittle material and therefore should not have been used. The lifting anchors had been self-imported by the manufacturer.

WorkSafe's Principal Engineer, Stuart Wright said WorkSafe engaged with the manufacturer of the precast panels to determine if any other panels existed with the same brittle lifting anchor.

"WorkSafe is satisfied all panels containing anchors from the same batch as the failed anchor have already been erected or positioned without further incident. The manufacturer of the precast panels has voluntarily surrendered to WorkSafe, all of the unused lifting anchors that were supplied in the same batch."

Justin Bragg, of the Concrete NZ Precast Sector Group, said the design and installation of lifting anchors should only be carried out by those with experience.

"It is critical that the material of the installed anchors meet the requirements of specified industry Standards. Anchors and the lifting clutches should both be made of an appropriate ductile material to avoid brittle failure."

Justin is confident that Precast Sector Group members are well aware of the risks and source lifting anchors from reputable suppliers, but is reminding non-members of the risks around purchasing a non-compliant product.

"The risks of this are potentially increased when sourcing offshore products where the quality and testing regimes may not meet the specified requirements. We are reminding everyone to keep in mind that when self-importing products additional testing may be required to ensure the product conforms to New Zealand requirements."

Further guidance on the roles and responsibilities for the safe handling, transportation and erection of precast concrete elements can be found in the WorkSafe document *Safe work with precast concrete: Handling, transportation and erection of precast concrete elements* - www.worksafe.govt.nz

concretenz PRECAST

Richard Sands
Concrete NZ Readymix
Sector Group Chair

CONCRETE PUMPING HEALTH & SAFETY GUIDANCE UPDATED

THE CONCRETE NZ READYMIX SECTOR GROUP HAS ISSUED AN UPDATED *SAFETY ALERT: BLOW-BACK & PUMP-BACK*[1] DOCUMENT, THAT URGES ITS READY MIXED CONCRETE PRODUCER MEMBERS TO NO LONGER ACCEPT BLOW AND PUMP BACK FROM CONCRETE PUMPS.

Richard Sands, Chair of the Readymix Sector Group, believes the procedure poses significant health & safety hazards for all those involved and should not be undertaken.

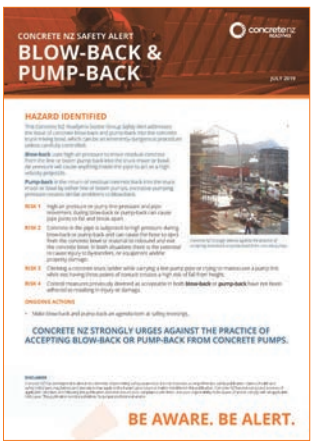
"Blow and pump back entails moving residual concrete from the line or boom pump back into the truck mixer bowl under pressure, and can be very dangerous."

Concrete NZ is advising against the practice of accepting blow and pump-back from all line and boom concrete pumps due to the potential risks involved," says Richard.

The Readymix Sector Group also strongly encourages those involved in concrete pumping to adhere to the Ministry of Business, Innovation and Employment's (MBIE) *Concrete Pumping Health and Safety Guidelines*[2].

"This Guide provides practical advice about the safe operation and maintenance of concrete pumping equipment and the environment this equipment is used in."

"Health & safety vigilance needs to be maintained across the supply, acquisition, disposal, inspection, maintenance, registration and safe operation of all types of concrete pumps and associated placing equipment used in pumping or spraying concrete."



1. The Safety Alert - Blow-Back & Pump-Back can be downloaded from the Concrete NZ website – www.concretenz.org.nz

2. The Concrete Pumping Health and Safety Guidelines can be downloaded from the WorkSafe NZ website – www.worksafe.govt.nz

concretenz READYMIX

Genuine.

We produce and supply consistent quality cement that you can rely on. We call it NZ grade - you know where it's made, what it's made of, who made it and that it's made for the NZ market. It's Genuine so you can trust it.

Being Genuine is part of our fundamental approach to do business.

ENVIRONMENTAL CHOICE NEW ZEALAND
Cert.TM

Declare.

AUSTRALASIA EPD®
ENVIRONMENTAL PRODUCT DECLARATION

Our NZ made cement is genuine NZ grade cement

Golden Bay Cement

CONCRETE MASONRY SITE PRACTICE AND WORKMANSHIP GUIDE PUBLISHED

Ralf Kessel
Concrete NZ Masonry
Sector Group Convenor

THE MASONRY SECTOR GROUP HAS PUBLISHED A CONCRETE MASONRY - SITE PRACTICE AND WORKMANSHIP GUIDE TO HELP DEVELOP COMPETENCY LEVELS ACROSS THE MASONRY TRADES.

"This Guide is intended for use by all members of the building team, including site supervisors and brick and block layers," says Concrete NZ architect and Masonry Sector Group convenor Ralf Kessel.

The *Concrete masonry - Site practice and workmanship guide*:

- covers the key points for preparing and carrying out masonry work onsite,
- includes extracts from relevant Standards and Codes of Practice for easy reference; and
- provides a handy action checklist.

"High levels of workmanship and site practice should result in durable brick and blockwork that has a consistent appearance and needs little or no maintenance during its design life," says Ralf.

"Units, mortar, grout, rebar and other ancillary components such as beams and columns must also be designed and specified in accordance with the *New Zealand Building Code* and relevant Standards."

The *Concrete masonry - Site practice and workmanship guide* can be downloaded from the Concrete NZ website – www.concretenz.org.nz

concretenz MASONRY

MISSED THE SEMINARS? TRY WEBINARS

THE WRECKAGE FROM COVID-19'S SLIPSTREAM INCLUDES THE DISRUPTION OF THE SOCIETY'S SEMINAR PROGRAMME – THE FIRST EVENT WON'T TAKE PLACE UNTIL LATER THIS YEAR.

But members may be interested in the pair of webinars we have created from two seminars held last year – particularly if you were not able to make those events. If we can take anything 'positive' from the virus, it is the proof that webinars are an effective way of reaching people – even in extraordinary circumstances.

The two webinars are Strut & Tie (held in September last year), and *Assessment of existing concrete buildings using the revised C5 guidelines*, held in June.

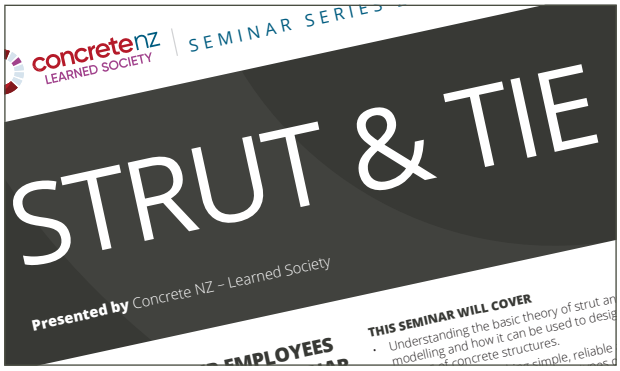
STRUT & TIE SEMINAR

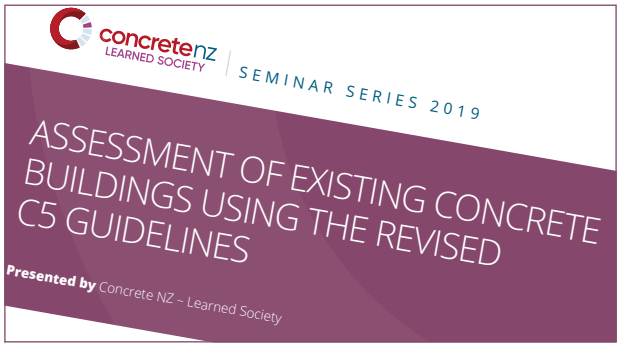
Always a well-attended seminar, the *Strut & Tie* method of analysis and design is a unified approach that considers all load effects (M, N, V, T) simultaneously. It has evolved as one of the most useful design methods for shear critical structures.

The method relies on a first-principles approach to explain how forces are transmitted through reinforced concrete and is particularly effective when trying to explain the complex actions occurring in diaphragms, deep beams, prestressed members, and members with penetrations.

Though the *Strut & Tie* procedure is detailed within *NZS 3101 Concrete structures standard*, it has not (until recently) been widely covered during structural engineering courses.

The seminar (webinar) was (is) presented by Des Bull (a Technical Director of Holmes Consulting Group LP), and Rick Henry (senior lecturer in the Department of Civil and Environmental Engineering at the University of Auckland).





REVISED C5 GUIDELINES SEMINAR

The *Assessment of existing concrete buildings using the revised C5 guidelines* seminar explores a simpler and more comprehensive means of assessing existing concrete buildings prevalent throughout New Zealand.

The revised Guidelines were released in late 2018 and was developed through the combination of international guidance and local research.

The seminar/webinar was (is) presented by Professor Ken Elwood (the MBIE Chair in Earthquake Engineering and Director of QuakeCoRE: New Zealand's Centre of Research Excellence for Earthquake Resilience), and Nicholas Brooke, Principal at Compusoft Engineering and Learned Society President.

SEMINAR COSTS

The *Strut & Tie* webinar comprises four sessions priced at $160+GST. The C5 webinar comprises six sessions priced at $240+GST. Once purchased, they are available to view for seven days (Note: the webinars must be viewed on-line – they cannot be downloaded – and they must be accessed before the seven-day window expires.

They can, however, be viewed session-by-session at different times (to suit viewers' schedules) within the seven-day window).

The webinars can be accessed at www.avpeople.co.nz/concretenz

Dr Nicholas Brooke, Concrete NZ Learned Society President

BCITO CEO WARWICK QUINN APPOINTED NZ INSTITUTE OF SKILLS & TECHNOLOGY (NZIST) DEPUTY CHIEF EXECUTIVE

BCITO CHAIR, MIKE KING, RECENTLY ANNOUNCED THAT CEO WARWICK QUINN HAS BEEN APPOINTED NZIST DEPUTY CHIEF EXECUTIVE, EMPLOYER JOURNEY AND EXPERIENCE. QUINN WILL TAKE UP THE NEW ROLE IN NOVEMBER 2020.

In announcing Mr Quinn's departure, Mr King said, "While we are disappointed that Warwick is moving on from BCITO, we look forward to continuing to work closely with him in his new capacity. Warwick's deep knowledge of vocational education and on-job learning along with his energy and huge drive to make it the best it can be, have contributed immensely to BCITO's success and will continue to be of enormous value to the industry."

In accepting the role Mr Quinn said, "Vocational education is something I care passionately about, so this is an opportunity I could not refuse. At BCITO we've developed a robust on-job training system that works efficiently and is tailored to the needs of the individual industry sectors under our coverage. I look forward to continuing to work closely with employers across a range of sectors to ensure we deliver great training outcomes for New Zealand."

Mr King commented that it has never been more important to have a strong, unified, and sustainable system for vocational education. He said, "We need to do everything we can to retain apprentices and trainees in the system, so we don't waste their learning and we have a capable workforce ready to support the recovery."

BCITO has just over 14,000 active trainees and apprentices. Apprenticeship sign-ups reached an all-time high in July, and this trend has continued into August. Last year, building and construction was New Zealand's third largest sector, directly contributing $19 billion to the country's GDP.

Mr King commented that BCITO has a strong leadership team in place, "I have complete faith and confidence in the BCITO leadership team. They are well-positioned to pick up from Warwick in the interim and lead BCITO forward as we move into the new RoVE environment," he said.

Warwick Quinn, Chief Executive Officer, BCITO

The BCITO Board has appointed Greg Durkin as Interim Chief Executive until a permanent candidate is secured.

CONCRETE NZ

CONFERENCE 2021

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BUILDING RESILIENCE

14-16 OCTOBER 2021
ENERGY EVENTS CENTRE
ROTORUA

FEEDBACK RECEIVED ON FUTURE OPTIONS FOR CONCRETE STANDARDS

Dave McGuigan, Concrete NZ Technical Director

THE PREVIOUS ISSUE OF *CONCRETE* MAGAZINE OUTLINED WHY IT IS TIME TO CONSIDER A MORE STREAMLINED FRAMEWORK FOR THE SUITE OF STRUCTURAL DESIGN STANDARDS.

In particular, the options proposed in my 2019 Concrete NZ conference paper - *The building code system and a future direction for Standards that support the NZ concrete industry*, should be considered.

In early 2020, Concrete NZ conducted an online survey seeking its members' feedback on options to rationalise, maintain and fund the current collection of Standards, as well as potentially adopt international Standards.

The survey findings provided some interesting and useful responses, the key elements of which are outlined here.

RATIONALISE STANDARDS

The survey indicated strong support (90 percent) for rationalising the current framework of concrete Standards, reducing the number to around four which would cover design, production, concrete materials, and construction

Of the twenty plus current New Zealand Standards for concrete the three considered to be most in need of updating were:

- *NZS 3109:1997 Concrete construction*
- *NZS 3101:2006 Concrete structures*
- *NZS 3114:1987 Specification for concrete surface finishes*

It must be noted that *NZS 3104:2003 Specification for concrete production* is currently under review, with a 2020 version expected to be published shortly.

MAINTAINING STANDARDS

The survey also revealed overwhelming support for the establishment of 'Standing Committees' (94 percent).

This was seen as a way to provide more consistent monitoring of the maintenance and development needs of Standards, facilitate succession planning and better inform the ongoing research needs to support Standards revisions.

Most survey respondents had not been on a Standards Committee (79 percent), with some respondents expressing the view that the Standards development process required improvement and that Standards committees need to be more balanced and have 'relevant' representatives.

The belief that committee members should be compensated for their time also came through clearly in the responses.

INTERNATIONAL STANDARDS

The survey asked participants if they favoured maintaining existing New Zealand Standards versus adopting international design Standards, with opinion divided equally.

Of those that supported adopting international Standards preference was spread between American Concrete Institute (ACI) and Eurocode documents, with a lower level of support for developing joint AS/NZS Standards.

FUNDING STANDARDS

The survey indicated that the funding for the development of Standards should come primarily from Government and/or the Building Levy, respecting that Standards support the *New Zealand Building Code* and the wider building regulatory system.

Survey respondents also signalled their belief that secondary funding should come from industry, as has been the case with New Zealand ready mixed concrete producers funding – through Concrete NZ - the review of NZS 3104.

Other themes expressed from survey participants included the requirement for more regular updates of Standards, and that the documents themselves be simplified to make them more user friendly and enable compliance to be more easily demonstrated.

MOVING FORWARD

Next steps may include widening the survey audience to seek feedback from other groups, such as members of the Structural Engineering Society of New Zealand (SESOC), a key user group of structural design Standards.

The direction of the Ministry of Business, Innovation and Employment's (MBIE) Building System Performance branch to implement a long-term Standards development programme will also be clarified.

This will help broaden discussion, inform decision making and ultimately set the future direction that the construction sector, in partnership with MBIE as the building regulator, will take to safe guard these important documents that help achieve consistent outcomes for the built environment.

The upgrade and extension of 133 Molesworth Street in Wellington showcases many of concrete's sustainable attributes.

CONCRETE INDUSTRY ON TRACK TO MEET EMISSIONS REDUCTION TARGET

Rob Gaimster, Chief Executive, Concrete NZ

THE NEW ZEALAND CONCRETE INDUSTRY IS HALFWAY TOWARDS MEETING ITS TARGET OF A 30 PERCENT REDUCTION IN CARBON DIOXIDE EMISSIONS BY 2030, AND IS FULLY COMMITTED TO BECOMING NET CARBON NEUTRAL BY THE GOVERNMENT'S TARGET DATE OF 2050.

A recent review by independent sustainability consultancy *thinkstep*, found the New Zealand concrete industry is well placed to meet climate change commitments the New Zealand government signed up to under the Paris Agreement.

The independent review confirmed that the New Zealand concrete industry has reduced its emissions from cement by 15 percent between 2005 and 2018.

The emissions reduction occurred against a 13 percent increase in demand, which demonstrates how committed we are to sustainability.

We are pleased that our initiatives to reduce cement's carbon footprint have avoided about 400,000 tonnes of carbon dioxide emissions in 2018 alone.

The reduction in emissions has been achieved through a range of measures, including the use

Concrete is critical to wastewater management as demonstrated by the recent BNR upgrade of Mangere Wastewater Treatment Plant.

Wood waste (biomass) at Golden Bay Cement's Portland works is used as a partial replacement for coal as kiln fuel.

Shredded vehicle tyres will soon be used at Golden Bay Cement's Portland works as a partial replacement for coal as kiln fuel.

of waste products such as wood biomass to fuel cement kilns.

Concrete NZ's Sustainability Committee has met Climate Change Minister Hon James Shaw and Dr Rod Carr (Chair of the Climate Change Commission) to share the *thinkstep* results and discuss how concrete is part of the transition to a net zero carbon New Zealand by 2050.

A game-changer for the industry here in New Zealand is that we have available naturally occurring minerals that can be used to replace a percentage of cement clinker, which is the main ingredient of concrete production associated with carbon dioxide emissions.

Waste from other industries are also being used to lower the cement clinker content in concrete and help to significantly reduce concrete's carbon footprint.

At the same time, moving to new technologies, such as more energy efficient equipment and vehicles to produce and transport concrete, is part of our plan to be net carbon neutral by 2050.

Concrete is the second most consumed substance in the world after water and is central to supporting communities and economies around the world.

Our kids walk to school on concrete footpaths, they learn in schools that rest on concrete foundations, we receive healthcare in hospitals built from concrete, and many of us work in concrete buildings.

Concrete also underpins our water and sewerage systems and will be crucial in the development of low energy infrastructure that includes electricity generation and public transport.

As we adapt to climate change and our planet warms, concrete will offer protection against fire and floods, while its mass will help regulate the internal temperature of buildings to reduce our reliance on energy intensive air conditioning.

The environmental benefits of concrete are significant. Concrete structures act as carbon sinks, they can also be recycled, redesigned and repurposed. Concrete structures require little maintenance, and don't rot or burn.

Our industry knows how important concrete is to everyone's future wellbeing. That's why we're working so hard to reduce our carbon footprint and maximise the benefits of concrete.

thinkstep anz

concretenz BUILDING RESILIENCE

FACTSHEET

NZ CONCRETE INDUSTRY EMISSIONS REDUCTION

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BUILDING RESILIENCE

The New Zealand concrete industry is halfway towards meeting its target of a 30 percent reduction in carbon dioxide emissions by 2030.

Independent sustainability consultants - *thinkstep* - confirm that emissions from cement have been reduced by 15 percent between 2005 and 2018.

thinkstep anz

NATIONAL

15% ↓
reduction in CO_2 from cement

↓ 11%
reduction in CO_2 from concrete

PER CAPITA

27% ↓
reduction in CO_2 from cement

↓ 24%
reduction in CO_2 from concrete

PER UNIT (PER TONNE)

17% ↓
reduction in CO_2 from cement

↓ 21%

reduction in CO_2 from concrete

PACIFIC STEEL
CERTAIN STRENGTH

Your building could be put to the ultimate test.

So we do the same to our steel.

At Pacific Steel, we put all our products through a rigorous testing regime. Our dedicated laboratory has full IANZ certification and we're the only local manufacturer of reinforcing steel to have third party ACRS certification. So when we say our SEISMIC® reinforcing steel is tested to meet the AS/NZS 4671 standard, you can be sure it's been put to the ultimate test.

SEISMIC®
A PACIFIC STEEL PRODUCT

ACRS

NEW ZEALAND MADE

COMMERCIAL CHOICE

A steel bar about to be tested in one of five testing machines at our laboratory in Otahuhu.

PAC0015CCT

Hunter Expressway, NSW, Australia. Images: CCAA

A SUSTAINABLE CONCRETE ROADMAP FOR THE FUTURE

CONCRETE ROAD PAVEMENTS ARE A COST-COMPETITIVE, DURABLE, SAFE AND SUSTAINABLE ALTERNATIVE TO ASPHALT ROAD PAVEMENTS.

In New Zealand the case for concrete roads is now more compelling than ever.

Waka Kotahi NZ Transport Agency (NZTA) has adjusted its assessment criteria for future roading projects to favour durable materials, while at the same time evaluating the cause of recent pavement failures on the Waikato and Kapiti Expressways.

Add to this, the fact that Government has made a commitment to huge infrastructure spending post-COVID-19 and to being zero carbon by 2050, and the scene is set for concrete roads to play a significant role in ensuring a resilient and sustainable New Zealand.

ECONOMIC ADVANTAGES

In early 2020 the NZTA increased the life cycle of roading tenders to 40-years, and reduced the discount rate (the time value preference of money) to 6 percent.

As demonstrated by Infometrics in a recent update to *The Case for Concrete Roads* report, the effect of these changes means that concrete roads are now potentially 29.4 percent less expensive than asphalt alternatives.

Concrete roads typically have an extended service life, during which they require minimal maintenance. In contrast, asphalt roads demand regular repairs, more so as vehicle loads and volumes increase, interrupting traffic flow and compromising safety.

The greater price volatility of bitumen relative to cement / concrete further tilts the economics in favour of concrete roads.

SAFER ROADS

As asphalt roads require frequent maintenance, they may exist in a sub-standard state for a significant part of a 40-year life, which can impact on driver comfort and safety.

Concrete roads can be textured to provide skid resistance and quietness. They reflect high levels of light, especially street lighting, improving driver visibility.

Another important safety consideration is that as concrete roads require less maintenance, the exposure of roading crews to traffic hazards is reduced.

FUEL SAVINGS

Concrete roads are 'rigid', preventing heavy vehicles from deflecting the road surface and creating the 'rolling resistance' experienced with 'flexible' asphalt roads.

Research by the Massachusetts Institute of Technology in the United States indicated that the direct result is lower fuel costs per truck journey, which could total about 0.5 percent of transport related emissions over 50 years - see pages 20-21.

LOWER CARBON FOOTPRINT

The Cement Association of Canada[1] commissioned a study showing that the primary energy costs of concrete roads over their lifetime are one-third that of asphalt roads.

The difference in New Zealand will be less pronounced with our renewable electricity. However, this is still an important consideration, as is the fact that concrete absorbs atmospheric CO_2 over time, especially when crushed and recycled.

There is also the albedo effect, which sees light-coloured surfaces, such as concrete roads, reflect solar radiation back into space, resulting in less heat and in turn less global warming.

Tenders for new roads are increasingly specifying a lower carbon footprint in construction, up to 30 percent over a time period. Efforts the concrete industry is making to reduce emissions will help in this endeavour.

Measures include replacing a proportion of the fossil fuels in cement kilns, introducing low-carbon cement replacements such as fly ash, slag and natural pozzolans (pumice), improving vehicle efficiency, and greater recycling and reuse of concrete.

CIRCULAR ECONOMY

At the end of their long service-life, concrete roads are recyclable. Once crushed, the concrete can be re-used in a range of applications, including as road base.

This avoids having to dump end-of-life concrete roading materials in landfills, meeting a New Zealand government objective of waste minimisation.

CONCRETE ROADMAP

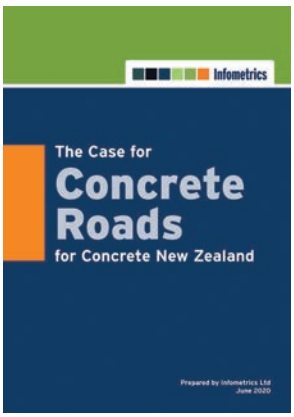
As New Zealand moves forward, balancing the need for economic stimulus post COVID-19 with carbon zero aspirations, the benefits of concrete will come to the fore.

The Government's infrastructure investment package is welcomed as a means to kick-start the economy in the wake of the pandemic.

It is an opportunity to future proof our bult environment by taking advantage of concrete's durability and cost-competitiveness.

At the same time, the concrete industry's ongoing commitment to decarbonise, will play an important role in ensuring New Zealand's aim to be net carbon zero by 2050 remains achievable.

1. Athena Sustainable Materials Institute for Cement Association of Canada, A life cycle perspective on concrete and asphalt roadways: Embodied primary energy and global warming potential, Athena Sustainable Materials Institute for Cement Association of Canada, 2006



STIFFER ROADWAYS COULD IMPROVE TRUCK FUEL EFFICIENCY

David L. Chandler | MIT News Office

STUDY FINDS SIMPLE CHANGES IN ROAD RESURFACING PRACTICES COULD IMPROVE GAS MILEAGE FOR HEAVY VEHICLES AND REDUCE GREENHOUSE GAS EMISSIONS.

Every time you hear a deep rumble and feel your house shake when a big truck roars by, that's partly because the weight of heavy vehicles causes a slight deflection in the road surface under them. It's enough of a dip to make a difference to the trucks' overall fuel efficiency.

Now, a theoretical study by MIT researchers suggests that small changes in roadway paving practices could reduce that efficiency loss, potentially eliminating a half-percent of the total greenhouse gas emissions from the transportation sector, at little to no cost.

The findings are detailed in a paper in the journal *Transportation Research Record,* by MIT postdoc Hessam Azarijafari, research scientist Jeremy Gregory, and principal research scientist in the Materials Research Laboratory Randolph Kirchain. The study examined state-by-state data on climate conditions, road lengths, materials properties, and road usage, and modeled different scenarios for pavement resurfacing practices.

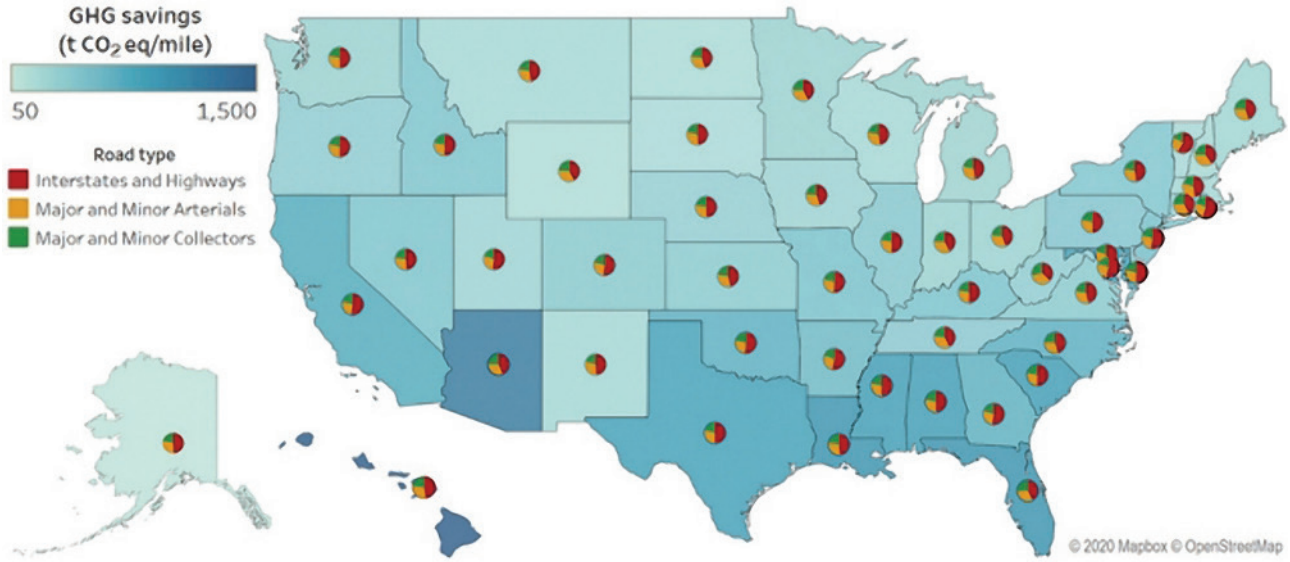
They found that that one key to improving mileage efficiency is to make pavements that are stiffer, Kirchain explains. That reduces the amount of deflection, which reduces wear on the road but also reduces the slightly uphill motion the vehicle constantly has to make to rise out of its own depression in the road.

"When we as individuals walk on pavements, they seem like perfectly rigid things. They're not responding to us," he says. "But for trucks, that is not the case. There is enough of a deflection in that surface that some amount of energy is expended to overcome the little divot that you create as you drive along." He likens it to the difference between walking on a hard surface versus walking on sand, which takes more effort because you sink in with each step.

Looking to the future, Kirchain says that while projections show a slight decline in passenger car travel over coming decades, they show an increase in truck travel for freight delivery — the kind where pavement deflection could be a factor in overall efficiency.

There are several ways to make roadways stiffer, the researchers say. One way is to add a very small amount of synthetic fibers or carbon nanotubes to the mix when laying asphalt. Just a tenth of a percent of the inexpensive material could dramatically improve its stiffness, they say. Another way of increasing rigidity is simply to adjust the grading of the different sizes of aggregate used in the mix, to allow for a denser overall mix with more rock and less binder.

"If there are high quality local materials available" to use in the asphalt or concrete mix, "we can use



them to improve the stiffness, or we can just adjust the grading of the aggregates that we are using for these pavements," says Azarijafari. And adding different fibers is "very inexpensive compared to the total cost of the mixture, but it can change the stiffness properties of the mixture significantly."

Yet another way is to switch from asphalt pavement surfaces to concrete, which has a higher initial cost but is more durable, leading to equal or lower total lifecycle costs. Many road surfaces in northern U.S. states already use concrete, but asphalt is more prevalent in the south. There, it makes even more of a difference, because asphalt is especially subject to deflection in hot weather, whereas concrete surfaces are relatively unaffected by heat. Just upgrading the road surfaces in Texas alone, the study showed, could make a significant impact because of the state's large network of asphalt roads and its high temperatures.

Kirchain, who is co-director of MIT's Concrete Sustainability Hub, says that in carrying out this study, the team is "trying to understand what are some of the systemic environmental and economic impacts that are associated with a change to the use of concrete in particular in the pavement system."

Even though the effects of pavement deflection may seem tiny, he says, "when you take into account the fact that the pavement is going to be there, with thousands of cars driving over it every day, for dozens of years, so a small effect on each one of those vehicles adds up to a significant amount of emissions over the years." For purposes of this study, they looked at total emissions over the next 50 years and considered the reductions that would be achieved by improving anywhere from 2 percent of road surfaces to 10 percent each year.

With a 10 percent improvement rate, they calculated, a total of 440 megatons of carbon dioxide-equivalent emissions would be avoided over the 50 years, which is about 0.5 percent of total transportation-related emissions for this period.

The proposal may face some challenges, because changing the mix of materials in asphalt might affect its workability in the field, perhaps requiring adjustments to the equipment used. "That change in the field processing would have some cost to it as well," Kirchain says.

But overall, implementing such changes could in many cases be as simple as changing the specifications required by state or local highway authorities. "These kinds of effects could be considered as part of the performance that's trying to be managed," Kirchain says. "It largely would be a choice from the state's perspective, that either fuel use or climate impact would be something that would be included in the management, as opposed to just the surface performance of the system."

The research was supported through the Concrete Sustainability Hub by the Portland Cement Association and the Ready Mixed Concrete Research and Education Foundation.

AGGREGATES' CONTRIBUTION TO THE SUSTAINABILITY OF CONCRETE

James Mackechnie, Education, Training & Research Manager, Concrete NZ

THE SUSTAINABILITY OF CONCRETE MOSTLY FOCUSES ON THE CONTRIBUTION OF CEMENTITIOUS BINDERS SINCE THESE MATERIALS HAVE HIGHER EMISSIONS AND ENERGY REQUIREMENTS.

Concrete aggregates are generally shown to have much lower embodied energy and carbon in comparison but this assumes optimum materials that minimise binder contents in concrete without compromising strength, dimensional stability and durability.

This assumption is not always true especially as concrete suppliers sometimes have to use more marginal deposits due to economic, logistic and/or environmental reasons.

When new concrete aggregates are being considered there are several performance requirements that need to be considered.

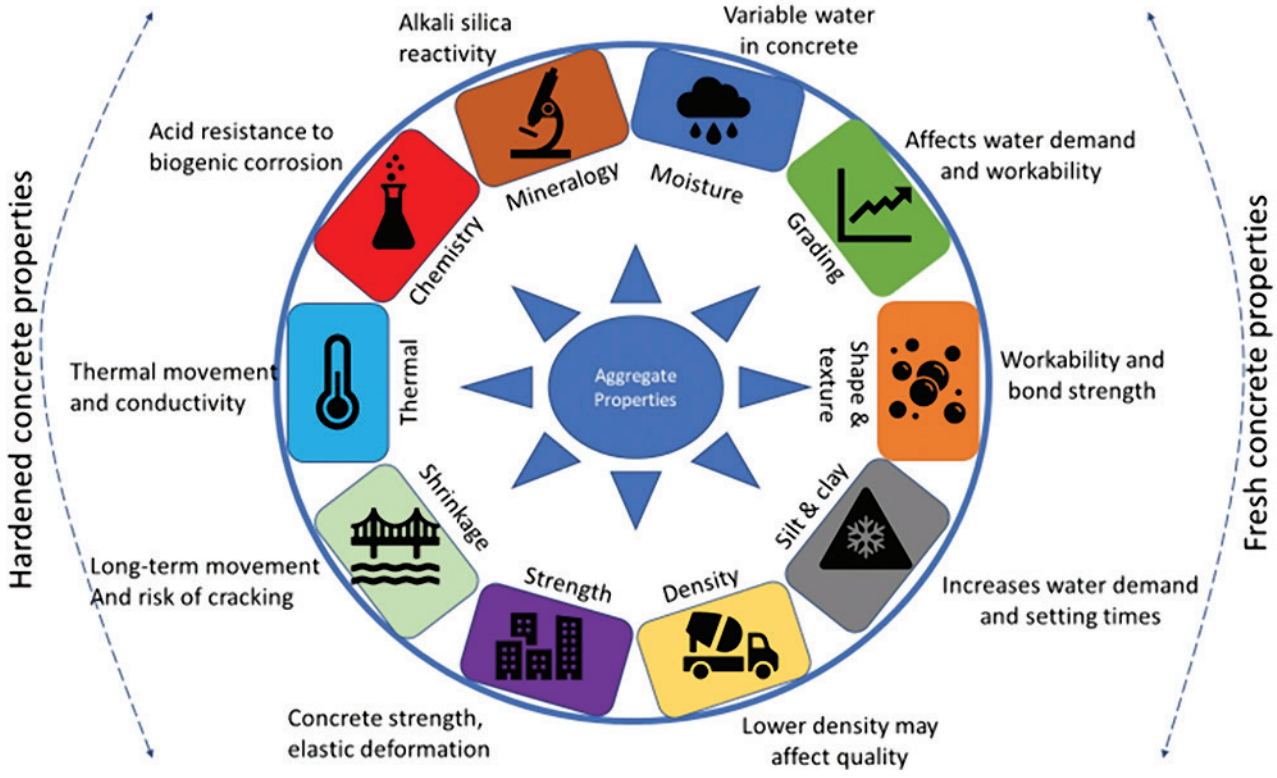


Figure 1: Characterisation of concrete aggregates for use in structural concrete

Typical characterisation of aggregates properties for consideration in concrete are shown in Figure 1.

FRESH CONCRETE PROPERTIES

The quality of aggregates has a direct effect on the fresh concrete properties and this in turn affects hardened properties such as strength and dimensional stability.

Examples of this include the following:

- Variable moisture content of fine aggregate makes consistent concrete production more challenging, especially when not using moisture probes. These fluctuations may not just affect slump tolerances but often affect strength and yield of concrete supplied.
- Grading of aggregates needs to be consistent to produce uniform workability and strength of concrete. This is particularly important for fine aggregate where extra fines and silt contamination can have a dramatic effect on water demand affecting not just workability but also compressive strength.
- Shape of aggregate particles is an important but often overlooked aspect of concrete aggregates. Figure 2 shows how this affects water demand and in turn increases cement content and drying shrinkage of concrete.

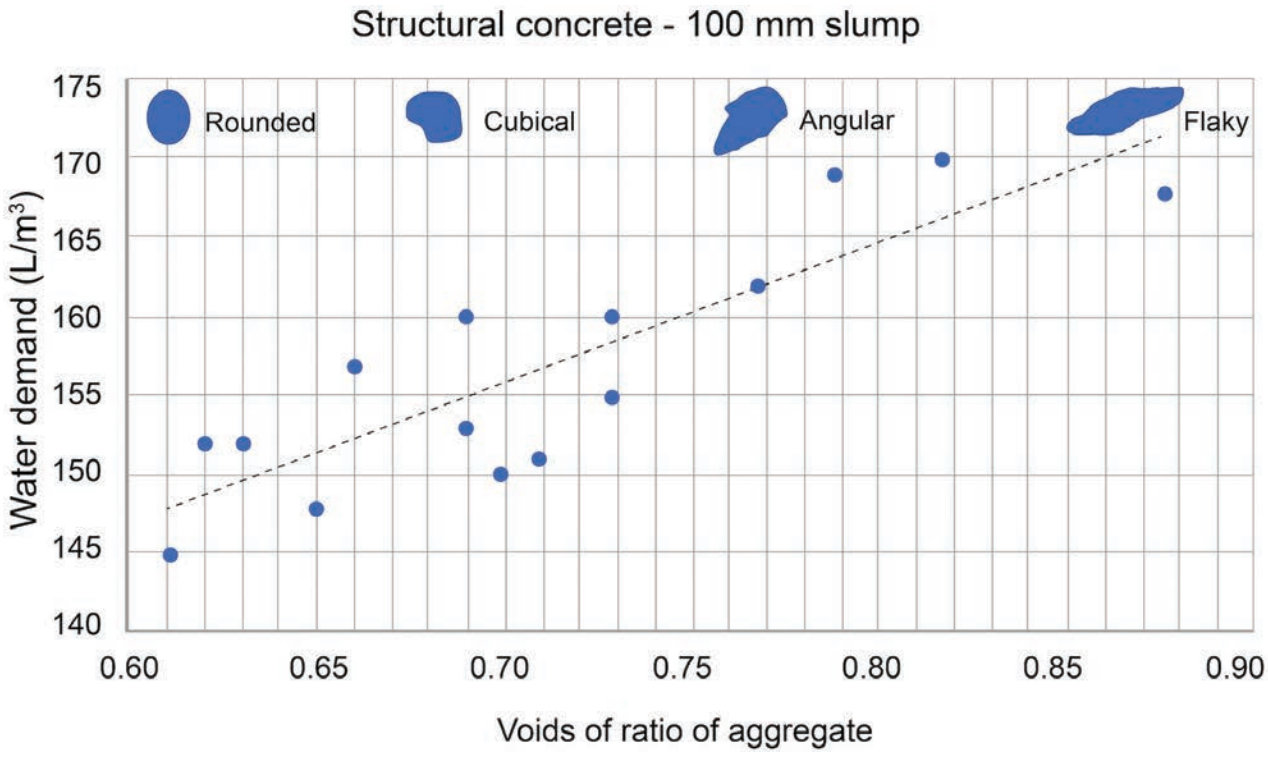


Figure 2: Typical water demands used for structural concrete in New Zealand

HARDENED CONCRETE PROPERTIES

Some properties of concrete aggregates have a more obvious relationship with the hardened properties of concrete such as density, strength and stiffness.

While most aggregate sources have consistent strength, stiffness and dimensional stability this cannot be assumed for all materials due to the relatively young and diverse geology of New Zealand.

This is illustrated when the elastic modulus of concrete made with different geological types is compared as shown in Figure 3.

CONCRETE AGGREGATE QUALITY AND SUSTAINABILITY

When concrete suppliers view quarry resources there is sometimes the misconception that the cheapest materials produce the most cost-effective concrete.

Pressure on quarries to deliver low-cost concrete aggregates often end up costing more for concrete since extra cementitious material is required to compensate for sub-optimal fresh and hardened properties of structural concrete.

Financial incentives need to be built into supply agreements that encourage optimum aggregate properties such that moisture contents are controlled, grading is consistent, aggregate shape is optimised and aggregate strength and stiffness are monitored.

Experience in New Zealand has shown that when concrete aggregates are optimised there is the potential to reduce the cementitious content by 15-20 percent compared with material that is poorly produced.

This would benefit not just material costs of concrete but also reduce emissions associated with Portland cement.

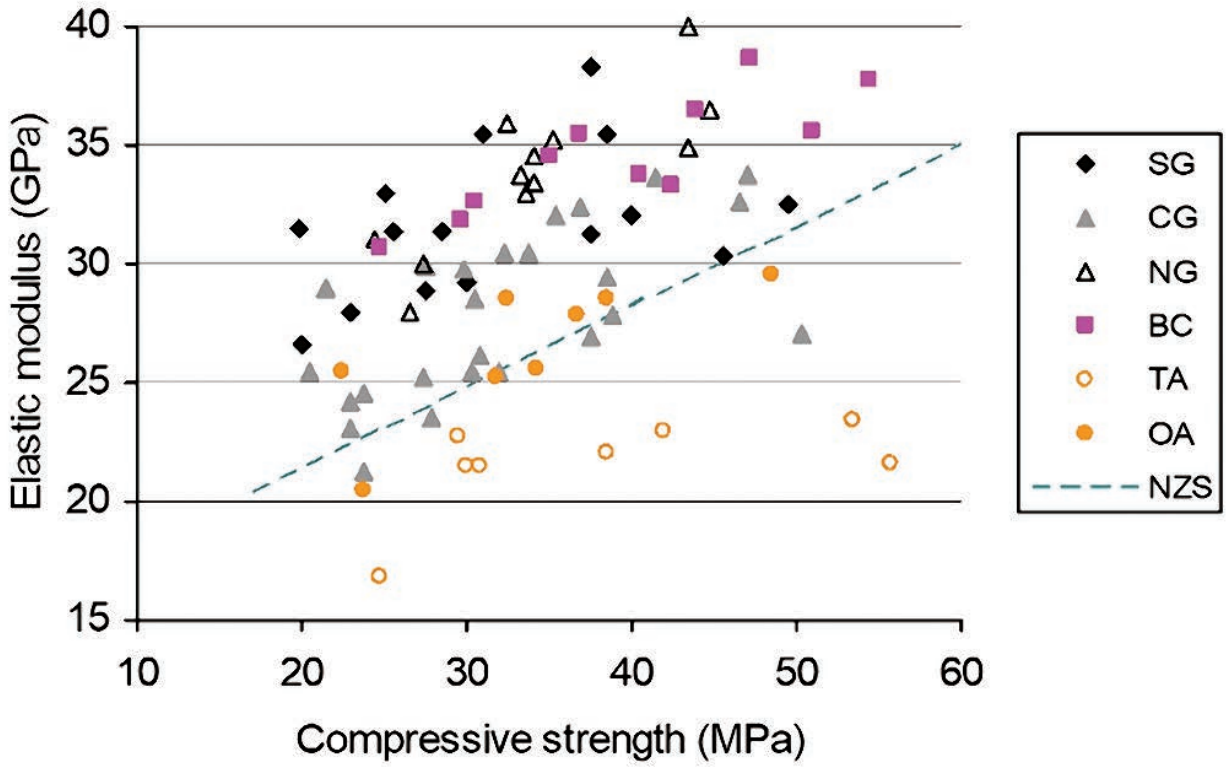


Figure 3: Elastic modulus versus compressive strength at 28 days

Image: Quarry Magazine

Wayne Scott
Chief Executive,
AQA

PLAN FOR QUARRIES OR FACE MORE TRANSMISSION GULLY DEBACLES

THE NATIONAL QUARRY ORGANISATION SAYS IT HOPES THAT THE DELAYS AND COST BLOW-OUT FOR TRANSMISSION GULLY MAY FINALLY SEE A CHANGE IN GOVERNMENT AND COUNCIL PLANNING FOR MAJOR PROJECTS.

Aggregate and Quarry Association Chief Executive Wayne Scott says Transmission Gully is only a signal of what will happen unless the authorities address the need to plan for the quarries to supply major infrastructure initiatives, climate change mitigation, and affordable housing.

"The Government has now asked the Infrastructure Commission to investigate why Transmission Gully's costs have gone through the roof and time delays mount.

"We've been telling this, and previous, Governments that they must put in place planning to provide for quarries. You cannot expect existing quarries with set caps on production to meet the mega-requirements of a project of the scale of Transmission Gully."

Wayne Scott says both major parties are now promising a huge lift in infrastructure spend as a key policy to address COVID-19's economic impacts.

"Unless we make the first step of a rapid identification of available rock resource, we will find the delays and cost blow-outs of Transmission Gully will be replicated around the country."

He says rock for the Wellington motorway project was in such short supply that some was trucked from Mt Taranaki.

"You can imagine what a 600 km round trip added to the cost."

The AQA has already shown the benefits of identifying local supplies of quarry material with the Ōpōtiki wharf project. The estimated cost blew-out to $150M partly due to having to truck rock nearly 100 km. The AQA worked with GNS Science to identify local sources of supply which contributed to a near halving of the wharf project cost.

"While not the total answer, similar gains can be made if we complete a national survey of rock resources which GNS has started but can't complete for the sake of $600,000 in funding. If the Government is serious about avoiding more Transmission Gully events, that's where it should start."

RECAST FLOORS PROGRAMME ANALYSES PRECAST RETROFITS

Iain MacIntyre

A COMPREHENSIVE RESEARCH PROGRAMME IS UNDERWAY TO SCIENTIFICALLY VALIDATE AND, WHERE POSSIBLE, ENHANCE THE RETROFITTING TECHNIQUES USED TO IMPROVE THE PERFORMANCE OF PRECAST CONCRETE FLOORS IN MULTI-STOREY BUILDINGS, PARTICULARLY THOSE INSTALLED IN NEW ZEALAND PRIOR TO 2006.

Concerns over the seismic vulnerability of such floors – which feature extensively in the country's multi-storey building stock – surfaced after the 1994 Northridge earthquake in Los Angeles and have subsequently been borne out in local seismic events.

With industry having progressively developed retrofit techniques for affected buildings based largely on "sound principles", Compusoft Engineering principal and ReCast Floors project manager Dr Nicholas Brooke says formal validation was long overdue.

"The retrofit techniques being used in theory work very well, but there might be unresolved issues such as exactly how wide a piece of support steel should be or whether it needs to be hard against an existing floor unit or set down slightly," he says.

Due to be completed by October 2021, the collaborative work is being directed by an eight-person research team.

"So some of it is validation of techniques that everyone expects to work, some of it is refinement of the methods of designing and installing these techniques."

With a $2 million budget – funding provided by BRANZ from the Building Research Levy, the Earthquake Commission and a number of other organisations – the ReCast Floors project formally commenced in October 2018.

Due to be completed by October 2021, the collaborative work is being directed by an eight-person research team, representing the key New Zealand groups involved in precast floor research.

Driven by four full-time PhD students at the universities of Auckland and Canterbury, with another to join soon, the project is also being guided by an industry advisory group consisting of other key stakeholder representatives.

Encompassing several different investigations being undertaken at a number of facilities, the project's planned research is split into two streams of work.

One of those streams, laboratory and analytical research, entails:

- sub-assemblage testing of single units,
- super-assemblage testing of multiple units supported by moment resisting frames; and
- computer simulation by developing finite element analysis tools.

The other stream revolves around the interpretation of real-world performance, and comprises:

- processing of damage assessment data,
- forensic analysis of case study buildings,
- documentation of damage in buildings; and
- in-situ testing of precast concrete floors (dependent on opportunities).

Dr Brooke describes the super assemblage test being built specifically for the project at the University of Canterbury as "spectacular".

As well as seeking to validate existing retrofitting techniques, the project will test new and refine methods.

"It is basically a representation of a substantial part of a single floor in a building – something like six columns with beams joining those together and whole floor units spanning across."

"That's one of the larger test specimens that's ever been put together in New Zealand. We'll have some really quite complex control systems to ensure the right parts go in the right directions at the right times."

At the time of being interviewed halfway through the project, Dr Brooke says "many good findings" are consistently being revealed.

"For example, there were concerns that some of the retrofits already done could have actually made certain aspects of seismic behaviour worse. However that, in most instances, now seems unlikely to be an issue."

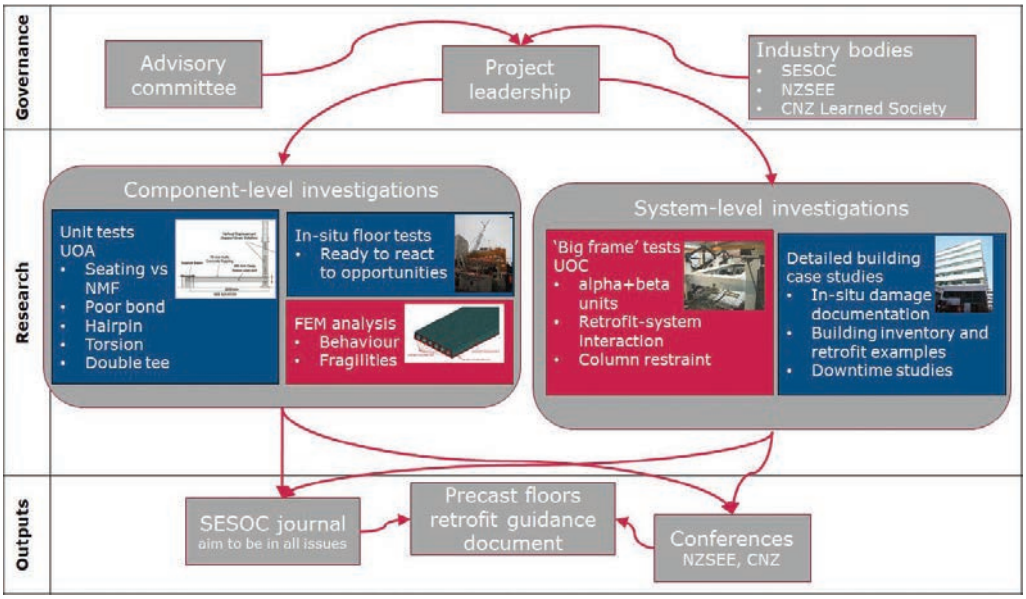
As well as seeking to validate existing retrofitting techniques, Dr Brooke emphasises the project will test new and refine existing methods, potentially leading to the development of less-expensive solutions.

"You hear ideas or suggestions that people are contemplating but may not actually implemented because they are uncertain about how that approach might perform. A number of these ideas are being fed into the research, developed further and be proven to be effective (or not) by the ReCast Floors project."

"In particular that could result in less-invasive solutions. A typical retrofit solution involves some relatively low-cost steel work to basically provide the load paths that aren't reliably there. The cost of the structural parts would only be something like 20 percent of the total, whereas the disruption to the existing fit out would be the other 80 percent."

"So, there is a drive to look for retrofits that can either be done from underneath or above a floor – but not both – as obviously, that gives you much less disruption."

"One of the overarching goals of the project is for it to serve as the focal point for the collation and investigation of issues related to precast



Overview of research projects, oversight arrangements and expected outputs.

concrete floors and the dissemination of findings to industry," says Dr Brooke.

"At the time that the project was conceived there was a concern that different organisations seemed to be picking up different parts of the precast floor research – a lot of the same people were involved. However, it was less an issue of conflicting advice, more a risk of being inefficient."

"The project has succeeded in pulling everyone together under one roof and becoming the focal point it was aimed to be."

Dr Brooke says another potentially "ground-breaking" aspect of the project is the work being undertaken by one of the PhD students at the University of Canterbury to develop complex analytical models of the hollowcore floors.

"If that is successful, then it will basically allow consideration of a far wider range of floors than is possible in a lab."

Emphasising the "excellent job" being done by all students involved, Dr Brooke says the collaborative nature of the relationships forged between the universities, industry and academics is a particular highlight of the project.

"As far as I know it is probably the first time in structural engineering and, maybe more generally, where a large programme of research is being run at two universities in parallel, with day-to-day collaboration."

IMPORTANT MESSAGE

An important message that Concrete NZ's Technical Director Dave McGuigan hopes the ReCast Floors project will deliver is that industry is prioritising the issue of life safety of buildings with potentially vulnerable floor systems in a seismic event.

"The key output of this project is that it restores confidence amongst building owners and practitioners that we are making sure the building stock achieves life safety objectives," he says.

"The Canterbury and Kaikoura earthquake events demonstrated the vulnerability of these buildings – in particular Statistics House in Wellington where three floor units lost their support."

"While the focus is on addressing something that could have major life safety consequences people still need to be mindful that these buildings will have performance characteristics that might render them uneconomic to repair after an earthquake."

The upgrade was undertaken as the approximately 50-year-old reservoir was beginning to suffer durability issues and pose seismic resilience concerns.

UPGRADE GIVES RESERVOIR NEW 50-YEAR LEASE ON LIFE

A RANGE OF MARLBOROUGH DISTRICT COUNCIL STIPULATED OUTCOMES HAVE BEEN SUCCESSFULLY DELIVERED IN A CHALLENGING PROJECT TO UPGRADE AND PROVISION FOR ANOTHER 50 YEARS' WORKING LIFE FOR THE WITHER HILLS (WELD STREET) RESERVOIR.

Rather than demolition and replacement, a more sustainable approach involving upgrades and additions to the existing 36 metre diameter prestressed concrete structure was adopted.

The construction had many challenges such as a tight programme, as-built details that differed from the drawings, along with existing (and new) concrete issues.

These challenges were overcome through a collaborative and innovative problem-solving approach between Marlborough District Council, CH2M Beca and Fulton Hogan.

The upgrade was undertaken as the approximately 50-year-old reservoir – which stores 5.3 million litres of unchlorinated, potable water for Blenheim – was beginning to suffer durability issues and pose seismic resilience concerns.

Amongst issues targeted for remedy in the reservoir's upgrade, which is a critical regional water resource following earthquakes and for firefighting, were:

- Re-profiling design of the slope above the reservoir with a flatter angle to minimise the

potential impacts of slope failure or earthquake debris on the facility.

- Placing a new reinforced concrete topping slab to provide a roof diaphragm, which also sealed the reservoir contents from rainwater ingress.
- Installing external post-tensioning to strengthen the roof tee beams for the increased mass of the topping slab and to also maximise reuse of the existing structure.
- Fitting a new reinforced concrete roof ring beam to allow for thermal movement of the roof while accommodating a seismic shear load transfer from the roof to the walls.
- Installing an internal reinforced concrete floor ring beam, with dowels cored through the walls around the perimeter, connected to the existing floor slab and foundation with reinforcement starters to provide an enhanced seismic base shear transfer mechanism.
- Installing external wall post-tensioning to compensate for a shortfall in the hoop tension capacity under Ultimate Limit State seismic loading, while also providing new active hoop compression to the wall joints for leak mitigation at the vertical construction joints.
- Fitting new, larger-dimensioned stainless steel pipework to provide additional flow capacity, with a new chamber constructed to house sensor-controlled seismic isolation valves.
- Undertaking remedial work, including internal surface remediation of wall and columns, floor slab sealant replacement and crack injection of active leaks in the walls.

Other challenging aspects of the construction phase included:

- Cutting a large access hatch into the roof at the beginning of construction to provide ventilation, lighting and access for scissor lifts and other large construction equipment. This also meant the reservoir could be classed as a 'restricted space' instead of a 'confined space' due to alternative access/egress routes and additional ventilation.
- Staged external roof post-tensioning and roof topping slab pours to maintain stress limits in the existing roof tee beams. A survey was carried out at each stage to monitor deflections which were compared with predicted.
- A unique roof topping slab pour shape and sequencing of a series of concentric rings to achieve tight construction tolerances and complement external roof beam post-tensioning.
- Casting post-tensioning anchorage pockets into the concrete using three dimensional printed inserts.

The key target for successful construction was recommissioning the reservoir before the summer peak demand.

To address challenges which arose during construction, the following remedies were devised:

- Unique communication tools to allow for rapid problem solving on issues that arose due to the tight construction programme. One example was a virtual reality model of the existing and proposed structure created by Beca and used by Fulton Hogan prior to construction to help planning and highlight potential health and safety issues. Another example was the use of digital calling software to enable each party to share screens for sketching issues and allow remote, live brainstorming.
- Raising the dead-end anchorage at the inner end of the roof tee beam as the level of the bottom existing reinforcement was found to be higher than shown on the shop drawings. This meant the beam needed to be reassessed and external post-tensioning redesigned to address a flow-on clash with some of the existing prestressed strands.
- Revising the construction sequence developed for the roof topping slab due to issues created by the undulating nature of the existing roof surface and a tight slab thickness tolerance.
- Crack injecting blemishes in the roof topping slab; the performance of which were confirmed by subsequent water-proof testing.
- Re-finishing the wall surface with acid-resistant repair mortar to address cement paste loss.

A water drop test confirmed that water levels in the upgraded reservoir were dropping about 3 mm in seven days, well below the 10 mm drop performance limit that is specified for a new concrete reservoir in that time period.

The key target for successful construction was recommissioning the reservoir before the summer peak demand. However, while the start date for the works was agreed to enable that timing, due to the unexpected issues highlighted above, the actual construction took longer than anticipated. Fortunately, there was a wet start to summer, and the reservoir was recommissioned before the dry period commenced.

Article based on *Wither Hills reservoir upgrade* by Fletcher Bruce, Simon Edmonds and Doug Stirrat presented at the 2019 Concrete NZ Conference, Dunedin, New Zealand with John Steele.

CONCRETE AFICIONADOS FARRELL AND MCNAMARA RECEIVE THE 2020 PRITZKER ARCHITECTURE PRIZE

YVONNE FARRELL AND SHELLEY MCNAMARA OF GRAFTON ARCHITECTS, HAVE BEEN SELECTED AS THE 2020 PRITZKER PRIZE LAUREATES, ANNOUNCED TOM PRITZKER, CHAIRMAN OF THE HYATT FOUNDATION, WHICH SPONSORS THE AWARD THAT IS KNOWN INTERNATIONALLY AS ARCHITECTURE'S HIGHEST HONOR.

Town House Building, Kingston University, UK. Image: Dennis Gilbert.

Yvonne Farrell and Shelley McNamara

Town House Building, Kingston University, UK. Image: Dennis Gilbert.

"Architecture could be described as one of the most complex and important cultural activities on the planet," remarks Farrell. "To be an architect is an enormous privilege. To win this prize is a wonderful endorsement of our belief in architecture. Thank you for this great honour."

As architects and educators since the 1970s, Farrell and McNamara create spaces that are at once respectful and new, honouring history while demonstrating a mastery of the urban environment and craft of construction.

Balancing strength and delicacy, and upholding a reverence of site-specific contexts, their academic, civic and cultural institutions, as well as housing developments, result in modern and impactful works that never repeat or imitate, but are decidedly of their own architectural voice.

"For their integrity in their approach to both their buildings, as well as the way they conduct their practice, their belief in collaboration, their generosity towards their colleagues, especially as evidenced in such events as the 2018 Venice Biennale, their unceasing commitment to excellence in architecture, their responsible attitude toward the environment, their ability to be cosmopolitan while embracing the uniqueness of each place in which they work, for all these reasons and more, Yvonne Farrell and Shelley McNamara are awarded the 2020 Pritzker Architecture Prize," states the 2020 Jury Citation, in part.

"Within the ethos of a practice such as ours, we have so often struggled to find space for the implementation of such values as humanism, craft, generosity, and cultural connection with each place and context within which we work. It is therefore extremely gratifying that this recognition is bestowed upon us and our practice and upon the body of work we have managed to produce over a long number of years," says McNamara. "It is also a wonderful recognition of the ambition and vision of the clients who commissioned us and enabled us to bring our buildings to fruition."

Their native Ireland, an island replete with mountains and cliffs, informs their acute sensitivities to geography, changing climates and nature in each of their sites. Their buildings consistently remain purposefully rich, yet modest, enhancing cities and lending to sustainability while responding to local needs.

University Campus UTEC Lima (Lima, Peru 2015) is located on a challenging site with a highway sunk in a ravine on one side and a residential neighbourhood on the other. The result is a vertical and cascading building responding to both site and climatic needs. Its open spaces were designed to deliberately welcome cooling

University Campus UTEC Lima, Lima, Peru. Images: Iwan Baan

breezes of the ocean and minimize the need for air-conditioning.

At the Offices for the Department of Finance (Dublin, Ireland 2009), the selection of local limestone used in thick panels grants strength to the building. Windows recessed or flush with the façade have grills below them to circulate fresh air throughout the building. Exposures on all sides of the building, atypical of the architecture in this city, offer panoramic views.

The architects are continuously conscious of the dialogue between the internal and external, evidenced by the mingling of public and private spaces, and the meaningful selection and integrity of materials. "What we try to do in our work is to be aware of the various levels of citizenship and try to find an architecture that deals with overlap, that heightens your relationship to one another," illustrates Farrell.

Universita Luigi Bocconi (Milan, Italy 2008) fosters community between its occupants and the vibrant city that extends well beyond the vertical campus through its ground floor public space, which continues indoors, and its floating canopy that overlaps the ground below, engaging passers-by with students.

Université Toulouse 1 Capitole, School of Economics (Toulouse, France 2019) features brick buttresses, ramps and courtyards, which are metaphors for the city filled with bridges, walls, promenades and stone towers.

North King Street Housing (Dublin, Ireland 2000) is intentionally void of external design elements to resonate with the restraint of the neighbouring warehouses.

"The collaboration between Yvonne Farrell and Shelley McNamara represents a veritable interconnectedness between equal counterparts," states Pritzker. "They demonstrate incredible strength in their architecture, show deep relation to the local situation in all regards, establish different responses to each commission while maintaining the honesty of their work, and exceed the requirements of the field through responsibility and community."

Farrell and McNamara have mastered proportion to maintain a human scale and achieve intimate environments within tall and vast buildings.

"They have tried, with considerable success, to help us all overcome what is likely to evermore become a serious human problem," explains Justice Stephen Breyer, Jury Chair. "Namely, how do we build housing and workplaces in a world with over half of its population dwelling in urban environments, and many of them who cannot afford luxury?"

A contoured theatre floor at the Solstice Arts Centre (Navan, Ireland 2007) creates a physical nearness between audience members and performers. The generous placement of open spaces, windows, glass curtain walls and exposed ceilings allows natural light to filter through a passage of rooms, creating impressions of light through large and small spaces, and within the interlocking areas that compose Institut Mines Télécom in Palaiseau (Paris, France 2019).

McNamara states, "Architecture is a framework for human life. It anchors us and connects us to the world in a way which possibly no other space-making discipline can." Farrell continues, "At the core of our practice is a real belief that architecture matters. It is a cultural spatial phenomenon that people invent."

The pair established Grafton Architects in 1978 in Dublin, where they continue to practice and reside. In just over forty years, they have completed nearly as many projects, located in Ireland, the United Kingdom, France, Italy and Peru.

Farrell and McNamara are the 47th and 48th Laureates of the Pritzker Prize, and the first two recipients from Ireland.

ABOUT THE PRITZKER ARCHITECTURE PRIZE

The Pritzker Architecture Prize was founded in 1979 by the late Jay A. Pritzker and his wife, Cindy. Its purpose is to honour annually a living architect or architects whose built work demonstrates a combination of those qualities of talent, vision and commitment, which has produced consistent and significant contributions to humanity and the built environment through the art of architecture.

Universita Luigi Bocconi, Milan, Italy. Images: Federico Brunetti.

AN ARCHITECT'S VIEW

Ralf Kessel – Concrete NZ Architect

Back in the early 2000s I was fortunate to work for James Smyth Architects and then Ashlin Coleman Heelan Architects, both based in Dublin, Ireland.

Although almost 20-years ago now, Grafton Architects, and the names Farrell and McNamara, were held in high-regard for a unique style, often expressed through the use of concrete.

With a reputation for being steadfastly principled, Grafton Architects have realised concrete buildings that balance durability and endurance with fine detailing, an awareness of the surrounding environment and their clients' requirements.

To be recognised with the 2020 Pritzker Architecture Prize elevates Farrell and McNamara up amongst the greats, such as Jean Nouvel, Zaha Hadid, Norman Foster, Tadao Ando and Richard Meier.

CONCRETE NZ LIBRARY

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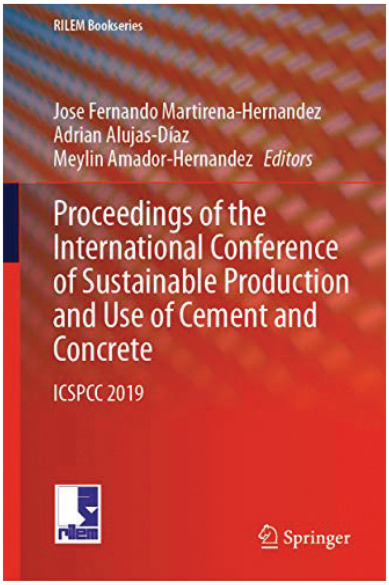
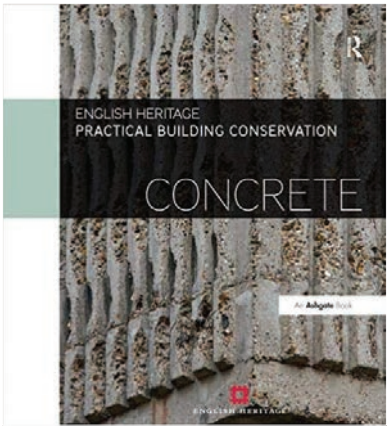
REFASHIONING CONCRETE: DESIGN

This publication explores Chinese designer Xu Gang and the earth-conscious, innovative design brand - Bentu. Founded in 2011, this cutting-edge company is known for product engagement, lighting design and manufacturing, alongside their emphasis on day-to-day sustainability and reuse of raw material. The design team experiments with the debris of industry, including concrete, ceramic, metal and plastic pipes, and terrazzo. Told through a serious of stunning photos of raw materials and work sites, the text follows the process from start to finish, creating a visual storyline of environmental impact, innovative design, sustainability, reusability, local sourcing and usage.



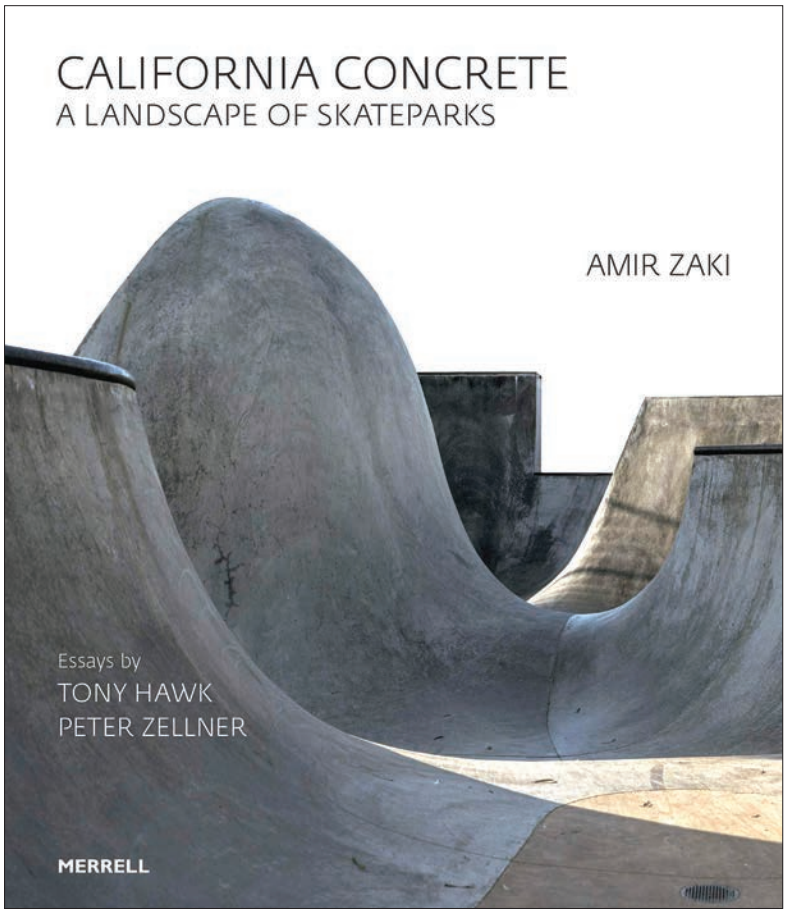
PROCEEDINGS OF THE INTERNATIONAL CONFERENCE OF SUSTAINABLE PRODUCTION AND USE OF CEMENT AND CONCRETE: ICSPCC 2019

This volume gathers the latest advances, innovations and applications presented by leading international researchers and engineers at the International Conference on Sustainable Production and Use of Cement and Concrete (ICSPCC 2019). It covers highly diverse topics, including sustainable production of low-carbon cements, novelties in the development of supplementary cementitious materials, new techniques for the microstructural characterization of construction materials, Portland-based and alkaline-activated cementitious systems, development of additives and additions in the sustainable production of concrete, sustainable production of high-performance concrete, durable concrete produced with recycled aggregates, development of mortars for historical patrimony restoration, environmental and economic assessment of the production and use of cement.



PRACTICAL BUILDING CONSERVATION: CONCRETE

The *Practical Building Conservation* series is a comprehensive guide for professionals involved in repairing historic buildings. Featuring structures from England, this series helps guide architects, surveyors, engineers, conservators, contractors, conservation officers, homeowners, curators, students and researchers alike. *Concrete* explores how the conversance, character and appearance of these structures should be executed. This volume, told through case studies and bibliographies, includes a brief history of the use of the material and explains the criteria for listing before assessing decay mechanisms and determining appropriate repair strategies.



CALIFORNIA CONCRETE: A LANDSCAPE OF SKATEPARKS

Artist Amir Zaki captures Southern California's most iconic concrete structure of its contemporary landscape, the skatepark. Theses significant sculptural forms belong to a tradition of architecture and public art. Zaki interviews the world's best-known professional skateboarder, Tony Hawk, as he recalls experiences within the concrete pools and bowls featured in this book. Through Zaki's professional photography and perspectives from Los Angeles architect Peter Zellner, the text explores how each concrete form represents ocean waves, mountainous terrain and other features from nature.

LIBRARY QUIZ

To go in the draw to win a copy of *California Concrete: A Landscape of Skateparks* by Amir Zaki and Tony Hawk answer the following question:

Between 2005 and 2018 the New Zealand concrete industry has reduced its emissions from cement by how much?

Email your answer to **library@concretenz.org.nz**. Entries close Friday 6 November 2020.

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