concrete

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UPFRONT

A myriad of industry associations currently occupy the cement and concrete 'space' in New Zealand. While their *raison d'êtres* are entirely justifiable in isolation, it is perhaps time to seriously consider a comprehensive programme of consolidation.

There are currently at least six organisations which represent specific cement and concrete sector interests. At a time when globally there is amalgamation amongst concrete related industry associations, some stakeholders and industry leaders in New Zealand are questioning the effectiveness of our fragmented network.

The main protagonists at the moment are CCANZ, Precast NZ, the NZ Ready Mixed Concrete Association, the NZ Concrete Masonry Association, the NZ Portland Cement Association and the (learned) NZ Concrete Society.

It is unsurprising that this number of organisations creates a little blurriness in the minds of the engineering and architectural fraternities.

Whilst the associations are differentiated in terms of their target audiences, they have similar names and share a common goal in ensuring the optimum use of concrete - albeit for a defined sector.

Furthermore, each association competes for membership, sponsorship, event registrations, publication sales etc. in what is a small market. Is this sustainable over time?

If the industry wants to promote excellence in all things concrete, in an efficient and cost effective manner that reduces transaction costs and provides better value for all, it has to be done through a single organisation.

Such an organisation would have one consistent voice driving advocacy, education, training, information exchange, research and quality assurance, whilst serving engineers, architects and anyone with an interest in concrete.

It is also entirely possible for the NZ Concrete Society, a learned organisation with no commercial bias, to become the educational wing of the single entity.

Our concrete colleagues in South Africa are currently grappling with a similar scenario and have coined the term "Consolidution" - a concrete consolidation solution - to encapsulate their predicament.

John Sheath, CEO of the Concrete Society of South Africa, has proposed that the meaningful and effective promotion of excellence in concrete be driven through a single organisation, leading activities across the board.

He envisages an all-inclusive, member-based (company and individual) body, recognised as truly independent and impartial. One that would be built on its technical base to be the main provider of information serving the needs of clients, architects, engineers, specifiers, suppliers, contractors and users of concrete, with emphasis on quality and service.

The cement and concrete industry in New Zealand will be closely monitoring developments in South Africa, as I suspect will the wider construction industry, which is more than well catered for in terms of advocacy and technical support organisations.

To help challenge the status quo and encourage the concrete related industry associations to take up the gauntlet and work collaboratively to define a long-term and sustainable solution I presented the paper *An Aggregation of Associations, or 6 into 1 Does Go?* at the 2014 NZ Concrete Conference in Wairakei 9-11 October.

No doubt opinions will be strong, and possibly divided, as the three "Ps" – (patch) protection, personality and politics, come into play.

However, a sustainable way forward is ultimately required, one that will help to ensure that the cement and concrete industry remains competitive.

Rob Gaimster
CCANZ, CEO

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NEWS

INTRODUCING IAN JONES - GENERAL MANAGER, GOLDEN BAY CEMENT

In early March Golden Bay Cement welcomed new General Manager, Ian Jones. Ian also remains General Manager of Pacific Steel during the transition of that business to its new owners, New Zealand Steel.

The career of Ian Jones has spanned 23 years with Fletcher Building. He started with Pacific Steel as a Quality Technician, followed by two years with the same business in Fiji before returning home to a position with Fletcher Easy Steel. From there he had a stint with Humes Pipeline Systems before heading up manufacturing at Pacific Steel. He became General Manager of Pacific Steel in 2009.

A passion for manufacturing in New Zealand, borne out of his time with Fletcher Building, was what led to him taking the Golden Bay Cement role. "The opportunity really appealed to me," says Ian. "I am looking forward to understanding the challenges of the business and playing a part in leading and innovating, ensuring our relevance remains strong in the market."

"As a leader, I get a kick out of seeing people working together to solve problems and achieve great outcomes. This can range from highly technical engineering challenges through to exceeding customer expectations by improving our performance. This will remain my approach at Golden Bay Cement."

Ian is looking forward to shaping an even stronger business for the future. He intends getting amongst the industry to gain an understanding of the best way to meet customer needs. This will include developing capability and making improvements that stand the test of time.

"I am a real fan of the recent work that has been done developing Golden Bay Cement's brand promises and overall commitment to its customers," adds Ian. "Clear messages around delivery, being here for our customers now and into the future, technical expertise, ensuring customers never run out of cement and that the cement we provide is consistently reliable."

Ian views Golden Bay Cement to be an iconic brand in the industry with its almost 100 years of history, but is determined not to take anything for granted. "Continuing to enhance the brand in the changing environment is ultimately what we will be judged on; taking tangible actions that lead to good outcomes for our customers," says Ian.

Like every business, Golden Bay Cement faces challenges over the next few years. "Competition is stronger than ever," says Ian, "and exchange rates, as a result of the world economic situation, are challenging. We can't control these things, but what we can control is the agility of our business. We need to focus on improvements that ensure we are more sustainable through all periods of the economic cycle."

CCANZ WELCOMES NEW BOARD MEMBERS

HR Cement Limited and Drymix NZ Limited have both recently assumed positions on the CCANZ Board. Their current representatives are Bary Williams and Gordon Crossan respectively.

COMMERCE COMMISSION LAUNCHES WEBSITE FOR CONSTRUCTION INDUSTRY

The Commerce Commission has launched a new website for the construction industry. The website will help industry members increase their understanding of competition and consumer laws so they can improve their compliance.

Overseas experience indicates that the sector is particularly susceptible to cartel, or price-fixing conduct, mainly due to structural characteristics of many construction markets.

The Commission has therefore been actively working with the sector since 2010 to raise awareness of competition and consumer laws.

Visit the website – http://construction.comcom.govt.nz

COMMERCE COMMISSION NEW ZEALAND

DRAFT CONCRETE STANDARDS AVAILABLE FOR COMMENT

Two important concrete related Standards have recently been updated, and are now available for comment:

- *NZS 3101:2006 A3 Standard - NZS 3101:2006 Concrete Structures Standard Part 1 - Standard Amendment No. 3.*
- *NZS 3101:2006 A3 Commentary - NZS 3101:2006 Concrete Structures Standard Part 2 - Commentary Amendment No. 3.*

This Standard specifies minimum requirements for the design of reinforced and pre-stressed concrete structures. It is applicable only to structures and parts of structures complying with the materials and workmanship requirements of NZS 3109:1987. Closing date for comments 19 November 2014.

- *NZS 1170.5 Structural Design Actions – Part 5: Earthquake actions – New Zealand – Standard Amendment 1.*
- *NZS 1170.5:2004 Supplement 1: Structural Design Actions – Part 5: Earthquake actions – New Zealand – Commentary Amendment 1.*

This Standard sets out procedures and criteria for establishing the earthquake actions to be used in the limit state design of structures and parts of structures within New Zealand that are within the scope of AS/NZS 1170.0:2002. Closing date for comments 17 November 2014.

To download the draft Standards and feedback forms visit the Standards New Zealand website – www.standards.co.nz

MAJOR CONCRETE POUR AT MARSDEN OIL REFINERY

IN LATE 2013 THE NEW ZEALAND REFINING COMPANY'S MARSDEN PT OIL REFINERY WAS THE SITE OF ONE OF THE MOST AMBITIOUS CONCRETE POURS NEW ZEALAND HAS EVER SEEN.

Over a 16 hour period a convoy of 60 concrete trucks delivered 550 separate loads (2,746m^3 of concrete) to form the base for the refinery's $365 million Continuous Catalyst Regeneration (CCR) Platformer project.

The $365-million CCR project will lift the refinery's capabilities to around 80 per cent of all New Zealand's fuel needs, which will bring security to the country's fuel supplies.

Building work will also create about 300 on-site jobs and hundreds more off-site over the next two years, with the CCR due for commissioning late 2015.

The pour - believed to be one of the largest single-day off-site batched concrete pours in the country - started at 3:30am on a Saturday morning and continued through until 9:00pm at night.

Concrete truck deliveries were required from 5 batch plants owned by 3 separate ready mixed concrete companies in Whangarei and Ruakaka.

At any one time there were 15-20 trucks on the refinery site, with a truck delivery to the concrete pour about every 90 seconds.

The concrete mix used on the day was a special blend which included flyash - with a variation in moisture and slump - designed to keep the core temperature down due to the thickness of the slab, which is around 2 metres in parts.

Once completed the slab for the refinery's new CCR unit was carefully monitored for over a month to ensure the concrete was curing appropriately.

Months of planning and double checking went into making sure every possible contingency was covered.

The pour was directed by United Civil with assistance from Allied, Firth, Atlas, Golden Bay Cement, Winstones, Marsden Industrial Solutions (formerly MPCL), Stan Semenoff Sand Supplies, Opus Laboratories and Sika (concrete admixtures). Special assistance was provided by the NZ Police and the NZ Transport Agency (NZTA).

3	Ready mixed concrete companies
5	Batching plants
5	Concrete pumps
11.4	Ton of reinforcing steel craned in per day
16	Hours to pour
60	Concrete trucks
90	Seconds between trucks
100	Kilometres of reinforcing steel
250	People on site
400	Ton of reinforcing steel
550	Truckloads of concrete
2746	Cubic metres of concrete

Watch a fantastic time lapse video on YouTube. Search for "large concrete pour successful".

The refinery pour will be the subject of a paper presented by Blair Macfarlane of Allied Concrete at the 2014 New Zealand Concrete Industry Conference.

HOLCIM ANNOUNCES START OF NEW IMPORT CEMENT TERMINALS

HOLCIM NEW ZEALAND LIMITED [HNZL] RECENTLY ANNOUNCED THAT IT HAS ALL THE FINAL APPROVALS REQUIRED FOR CONSTRUCTION TO BEGIN ON ITS TWO NEW IMPORT CEMENT TERMINALS.

Holcim provides competitive access to a basic, essential building material used in nearly all commercial, industrial and residential buildings. Its cement supply strategy is of critical importance to the construction sector of New Zealand.

The company had previously announced that it was moving to a business strategy of importing and distributing bulk cement for supply to the New Zealand market and that this would mean a move out of manufacturing.

HNZL will concentrate its business on importing and distributing cement and the downstream businesses of ready-mix concrete and aggregates.

The company now has all the final approvals to go ahead with its investment of more than $100 million to build two 30 000 tonne import terminals, one in Timaru and one in Auckland [Waitemata].

Managing Director, Jeremy Smith says HNZL can now confirm that construction will start at the Port of Timaru during August 2014 with construction in Auckland planned to commence in December 2014. Each site will employ up to 50 people during the construction phase. Once operational each terminal will have 6 employees.

"This confirmation of start dates can be taken as a sign of the global company's confidence in the strength of the New Zealand market and in particular the opportunities with the rebuild of Christchurch post earthquake."

"The confirmation that construction dates have been set will be welcomed by all in the construction industry and it will give confidence to those planning major projects and developments about security of supply of one of the key basic construction materials required."

"The investment is significant and the terminals will be a demonstration of the best in global fit for purpose design and port environments. All the necessary consents for the two new terminals have been obtained."

The Port of Auckland terminal enables HNZL to supply direct into one of its major markets.

The Port of Timaru terminal provides effective access to the major market of Christchurch, utilising the new $5 million silo capacity completed in January 2014 at the Lyttelton Port of Christchurch.

This terminal also provides effective distribution to the whole of the South Island market and the lower North Island as well.

Building an import terminal at Timaru is also consistent with the option of eventually building a new cement plant at Weston in North Otago, which remains on hold for the foreseeable future. HNZL intends to retain all the assets associated with the Weston site and project.

The timeframe for having both new terminals operational is planned for the second half of 2016. As with all construction projects, there may be changes to timeframes and these will be fully communicated.

HNZL announced in August 2013 that imported cement would replace local production at the company's Westport cement plant, which will close once the two import terminals are fully operational.

The company has again updated Westport staff and confirmed that the window for the wind down of the operation is targeted for the second half of 2016.

HNZL is working hard to provide support to Westport staff and the community and to make sure they receive regular updates about the business strategy and progress.

NEW ZEALAND LIME BUSINESSES

Jeremy Smith also announced that HNZL is reviewing its options for its lime businesses and that could include divesting part or all of the lime operations.

"The lime operations sit outside the future core focus of the company."

McDonald's Lime Limited is majority owned by HNZL and part owned by New Zealand Steel. Presently McDonald's Lime owns and mines the country's largest single lime quarry at Oparure, just north of Te Kuiti. The company has manufacturing plants at Otorohanga and Te Kuiti.

HNZL has been in discussion with its joint venture partner New Zealand Steel about this decision and has also briefed all McDonald's staff.

Taylor's Lime is based at Dunback in North Otago and is wholly owned by HNZL and those staff have also been briefed on this options assessment process.

Jeremy Smith says the lime businesses have a long history of success within the New Zealand operation and any potential part or full divestment is likely to attract international interest.

"There is a comprehensive process to go through to assess the options and HNZL has appointed a specialist advisor to assist with the process."

HNZL MANAGEMENT STRUCTURE

The refining of the company's strategic business plan and the significant decisions made in recent times means it was also timely to review the New Zealand management structure.

Jeremy Smith says the changes to the business model will eventually reduce the scale and scope of the New Zealand business over the coming years and it will in effect, require a smaller corporate management operation.

"This means that the decision has been taken that it would be logical to now combine the New Zealand and Australian operations.

"The New Zealand and Australian operations will become one business in effect. This also provides the opportunity for the New Zealand operation to leverage the presence and capability of the Australian operation which has more than 3000 people across 300 sites."

"This combining of the two businesses will provide customers with the benefits of access to the technical resources and expertise of the company's largest ready-mix and aggregates business in the region," says Jeremy Smith.

The HNZL Managing Director position currently held by Jeremy Smith is being disestablished from the end of 2014, however, he will remain with the company into 2015 to assist with the handover and transition process.

Glenda Harvey has been appointed HNZL Country Manager and will report to the CEO Holcim Australia and New Zealand from 1 January 2015. The new CEO of the combined entity will be Mark Campbell, currently CEO of Holcim Australia.

A plan for the handover of responsibilities from the current HNZL Managing Director to the CEO Holcim Australia and New Zealand and the [NZ] Country Manager has been put in place.

Jeremy Smith says that whilst his role is being dis-established, he personally has full faith and confidence in what is being planned and proposed and believes this is the right strategy for the industry and for the New Zealand operation.

M.V. GOLDEN BAY DELIVERS 10 MILLION TONNES

GOLDEN BAY CEMENT'S SUPPLY SHIP – M.V. GOLDEN BAY – REACHED A MILESTONE OF DELIVERING 10 MILLION TONNES OF CEMENT DURING APRIL.

The ship started delivering cement for Golden Bay Cement in 1980 when it first arrived in New Zealand. It initially operated out of the Tarakohe Golden Bay Cement plant (top of the South Island) until its closure in the late 1980's when the ship then began operating out of the Golden Bay Cement Portland plant, which is located eight kilometres south of Whangarei in Northland.

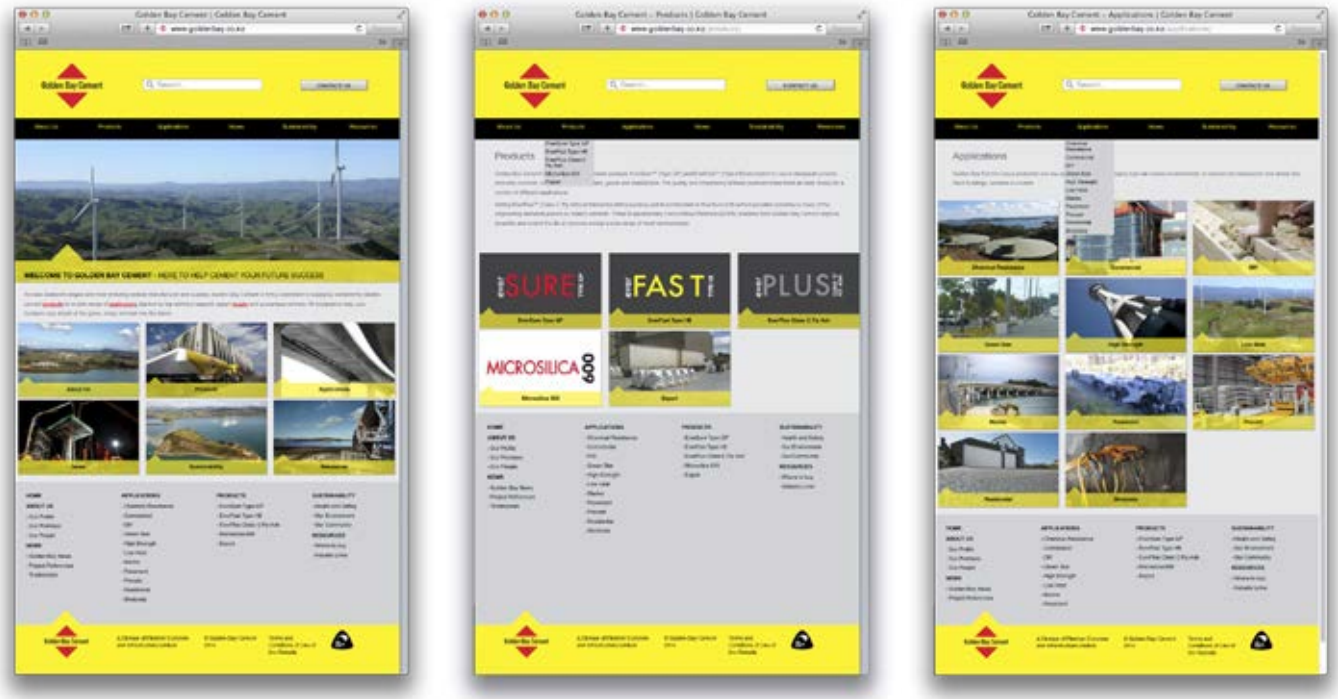
From its Portland base, the ship's destination ports are Auckland, Mt Maunganui, Napier and Wellington. The ship works on a cycle of delivering replenishing silos – Portland to Auckland; Portland to Mt Maunganui; Portland to Napier; Portland to Wellington.

The ship has a total crew of 15. The crew changes every 28 days.

The combination of the ship and our tankers' ability to work around the clock, ensures the customer never runs out, explains Sean Dillon, who is the Designated Person Ashore for the M.V. Golden Bay, based in central Auckland.

"We are also fortunate to have a hugely dedicated crew focused on ensuring the supply of cement to our customers."

The M.V. Golden Bay has undergone additional maintenance expenditure over the last half decade, which has extended her operational life. This has been critical in ensuring reliability of delivery.



NEW WEBSITE FOR GOLDEN BAY CEMENT

AS PART OF ITS COMMITMENT TO SUPPORTING CUSTOMERS, GOLDEN BAY CEMENT HAS LAUNCHED A NEW WEBSITE. THE SITE REFLECTS THE REFRESHED BRAND AND IS DESIGNED TO BE MUCH MORE USER FRIENDLY.

"In the building and construction industry, access to accurate, up-to-date information anywhere, anytime is a must", says Shane Coutts, Golden Bay Cement Sales & Marketing Manager. "We wanted the website to be a real tool for our customers, providing not only information about our products but relevant industry information as well."

The navigation is via traditional drop downs as well as the newer visual structure and allows information to be found quickly via product or application searching. The site is optimised for both phone and tablet meaning that wherever customers are, vital information will be right at their fingertips. "We have more plans for the website over the coming 12 months," notes Shane. "This first stage builds a strong foundation and we will be adding more tools and videos as well as constantly updating the information."

Golden Bay Cement might have been around for almost 100 years, but it plans to be up-to-date in the new online world.

TWO WEEKS PREVENTION

50 YEARS CURE

SIKA'S NEW ANODE SYSTEM DELIVERS UP TO 50 YEARS CONCRETE CORROSION PROTECTION WITHOUT MONITORING OR MAINTENANCE! OWNERS OF LARGE, CORROSION PRONE CONCRETE ASSETS SUCH AS WHARVES, BRIDGES, SEA WALLS AND THE LIKE CAN NOW SIGNIFICANTLY REDUCE THE MAINTENANCE COSTS OF THOSE REINFORCED CONCRETE ASSETS.

Sika, New Zealand's leading supplier of concrete protection and maintenance products, recently launched two new systems that take concrete repair and protection to a whole new level.

The Sika Ferrogard Patch system increases the durability of traditional concrete patch repairs by providing protection against incipient anode corrosion.

The Sika Ferrogard Duo system provides up to 50 years of reinforcement corrosion protection in chloride or carbonation contaminated concrete – without the need for regular monitoring and maintenance – and it is fully compatible with prestressed concrete structures.

The launch of these two new systems is very timely. A large proportion of New Zealand's infrastructure is now over 50 years old and much of it is located in aggressive coastal environments. It is not surprising therefore that there is an increasing demand from asset owners for extended service lives and reduced maintenance costs of reinforced concrete.

Both Sika Ferrogard Patch and Sika Ferrogard Duo use galvanic protection to prevent reinforcement corrosion, which in turn extends asset life and reduces maintenance costs.

Although using galvanic anodes in concrete patch repair is not new, the Sika Ferrogard Patch anodes deliver improved performance and reliability over previous systems. This is partly due to their installation just outside the patch repair.

Paul Tanner, Sika New Zealand's Market Field Manager for Refurbishment and Strengthening explains "By placing the Sika Ferrogard Patch anodes outside the repair, they are closer to the area where corrosion is most likely to occur and are therefore more effective at preventing corrosion initiation. This external placement means we can also use a higher specification repair mortar for the patch repair, further improving repair durability. The repair mortar can also be spray applied without risking damage to the anodes."

The improved reliability over previous systems is reinforced by the Sika Ferrogard Patch system being active without the traditional requirement to pre-soak the anodes in water, therefore eliminating

one critical installation step that is frequently overlooked in anode installation. This also means the anodes are immediately active when installed, irrespective of whether the contractor has completed the patch repair.

The Sika Ferrogard Duo system, used for targeting concrete at risk of reinforcement corrosion, is a long term solution for protecting reinforced concrete against reinforcement corrosion.

Sika Ferrogard Duo greatly extends asset life and reduces ongoing maintenance costs to almost nothing. It is a hybrid system using discrete zinc anodes that are operated initially in a temporary impressed current corrosion protection phase before switching to galvanic protection phase.

The impressed current phase, which typically uses a 12V power supply for just two weeks, halts reinforcement corrosion and ensures the steel reinforcement is fully passivated and in a non-corrosive environment.

Once this phase is completed the power supplies are removed from the site and the anodes are connected directly to the steel reinforcement where they provide up to 50 years of galvanic protection against initiation of reinforcement corrosion - even in aggressive marine environments.

"The greatest benefit to the asset owner is that after two weeks, when the power supplies are removed from site, no further monitoring, maintenance or adjustment of the system is required, so there are no ongoing costs'" says Mr Tanner. "The whole-of-life costs of the system are therefore much lower than traditional cathodic protection systems."

The Sika Ferrogard Duo system is also compatible with prestressed concrete structures which are generally difficult to repair. Engineers are often concerned about breaking out areas of contaminated concrete that may cause the tension to be lost and are wary of hydrogen embtittlement problems if cathodic protection is employed. The Sika Ferrogard Duo systems overcome both of these concerns.

CELEBRATING 50 YEARS OF OUTSTANDING CONCRETE STRUCTURES

AS MENTIONED IN PREVIOUS ISSUES OF *CONCRETE* MAGAZINE, THE NZ CONCRETE SOCIETY IS MARKING ITS 50TH ANNIVERSARY IN 2014. WE HAVE ALREADY TAKEN A LOOK BACK AT "CONCRETE TRAILBLAZERS", INDIVIDUALS WHO HAVE MADE A LASTING IMPRESSION ON THE NEW ZEALAND CONCRETE INDUSTRY. NOW IT IS TIME TO EXPLORE HOW MANY NOTABLE CONCRETE STRUCTURES HAVE BEEN REALISED BY THE TECHNICAL AND COLLEGIAL SUPPORT OFFERED BY THE SOCIETY.

NOTABLE CONCRETE STRUCTURES

INFORMED BY THE WORK OF THE SOCIETY, INNOVATION, MORE THAN ANY OTHER CHARACTERISTIC, HAS MARKED THE ADVANCEMENT OF NEW ZEALAND'S CONCRETE CONSTRUCTION OVER THE LAST 50 YEARS. THE INDUSTRY HAS EVOLVED ON MULTIPLE FRONTS AND IS BEST REFLECTED IN THE DIVERSE MIX OF STRUCTURES BUILT OVER THE DECADES – EACH A UNIQUE RESPONSE TO PERVADING SEISMIC, COMMERCIAL OR ENGINEERING IMPERATIVES. THESE STRUCTURES REPRESENT SOME OF THE MOST ADAPTIVE SOLUTIONS IN THE HISTORY OF CONCRETE CONSTRUCTION, WITH SEVERAL NOTEWORTHY EXAMPLES SUMMARISED BELOW.

LOWER SHOTOVER BRIDGE

This vital piece of South Island roading infrastructure features an innovative pre-tensioned deck, and was designed to blend aesthetically with its surroundings.

Described at its 1975 opening as "mathematical precision combined with beautiful form" the bridge is a two-lane carriageway. Measuring 320m long, it's made up of 169 precast, pre-tensioned concrete box girder sections. On the tourist route between Cromwell and Queenstown, the Remarkables mountain range forms the site's spectacular backdrop.

It replaced the original 172m Lower Shotover Bridge (1915) which for 60 years was the main route into Queenstown from the north and east.

Governed by aesthetics, the design is a slender, curving structure that blends easily with the landscape. Opting for a precast, box girder bridge was appealing because construction crews wouldn't have to truck aggregate from a considerable distance to a tricky site.

The bridge's cross section is 23 per cent smaller in area than for a standard 100-foot I-beam span. Its superstructure contains 35m^3 of concrete, versus the I-beam design's 45m^3. This saving in dead load on the pier foundations reduced the number of piles needed for each pier from five to four – a significant cost saving.

The shape of the piers is functional as well as aesthetic, in that the height had to be adaptable from 17 feet to 25 feet, and wide enough at the top to collect the reaction from bearings under the outer webs. The load from the middle web was transferred at the piers to the outer webs by means of transversely pre-stressed diaphragms.

The bridge received a Merit Award from what was to become the NZ Concrete Society in 1977, and its aesthetic attributes were celebrated by NZ Post with the issuing of a 35c stamp in 1985.

Design	*Ministry of Works and Development*
Construction	*Fletcher Construction Company Ltd, Stresscrete New Zealand Ltd, BBR NZ Ltd*

NAC HANGAR – CHRISTCHURCH

At the time of its construction the NAC Hangar's 124.5m pre-stressed concrete span, which holds up the doors and roof, was the country's longest such span.

National Airways Corporation (NAC) was the country's domestic airline from 1947 until 1978, when it amalgamated with Air New Zealand. The new hangar was part of an improved facility for aircraft maintenance. Its design called for an internal, column-free area of 122m by 61m to allow the simultaneous servicing of multiple aircraft.

Four separate designs were considered and costed by the designers Beca. The alternatives included structural steel, reinforced concrete arches and an internal steel box girder spine beam.

The pre-stressed concrete box girder solution – spanning 124.5m across the hangar door – was selected because it would have the best appearance and offer superior performance in the event of a fire. Given the militant trade union activity of the period, there were also concerns about the reliability of steel supplies. Furthermore, the maintenance costs for concrete would be lower than those of steel.

The concrete girder was constructed by Downer in segments on conventional ground falsework. First, the end span was constructed, with the main span progressively built out for each side of the hangar. This construction sequence is similar to that used in cantilever construction of pre-stressed box girder bridges, the girder being sequentially pre-stressed to cantilever from the main columns. After the closure of the two cantilevers, the girder was made continuous with post-tensioned cables.

The project received the NZ Concrete Society's Award for Excellence in Prestressed Concrete at the Society's annual conference at Wairakei in 1981.

Design	*Beca, Carter Hollings & Ferner*
Construction	*Downer*

MOTUNUI SYNTHETIC FUELS PLANT – NEW PLYMOUTH

This was the first facility of its kind – internationally – to apply seismic design in accordance with recommended criteria laid down for a petrochemical plant. This included continuous dewatering of a saturated sub-strata sand layer to reduce the likelihood of site liquefaction under a severe earthquake.

Opened in 1986, the Motunui Synthetic Fuels Plant was the world's finest commercial production facility converting natural gas to synthetic fuels. It was also the world's largest methanol production facility, and was built in response to the OPEC oil crisis, a period when New Zealand was 85 per cent dependent on foreign oil.

The twin reformer furnace/waste heat recovery duct structures are the plant's major components, and were traditionally built in steel. Beca, the structural designer, opted to replace the conventional steel structure with large, reinforced concrete cantilevers detailed to sustain post-elastic rotations near their base ("plastic hinges").

Simple rocker bearings isolate the trusses when the columns flex under lateral load, to increase the overall stiffness of the columns. Below hearth level smaller-scale reinforced concrete cantilevers with a similar plastic hinge capability at their base have replaced the steel columns. Rocker bearings provide a pin connection to the furnace hearth.

The project – completed within budget and on schedule – received much international interest and demonstrated the capability of New Zealand's engineering resources.

Design	*Davey McKee Corp, Foster Wheeler Energy Corp, Works Corp*
Construction	*Bechtel Petroleum Inc. & New Zealand subcontractors*

Other notable concrete structure that have risen to grace the New Zealand landscape over the past 50 years include the first Newmarket Viaduct, Bluff Smelter, Jerningham Apartments in Wellington, Mangaweka Viaducts, Pakuranga (Waipuna) Bridge, Eden Park's private boxes, Wellington's Ngauranga Interchange and Chaffers Marina, Otira Viaduct and of course the Sky Tower.

These structures, along with many more, are all indebted to the vision, foresight and courage embodied and fostered by the NZ Concrete Society.

A CELEBRATION OF 50 YEARS

A range of activities are planned over coming months to help celebrate the Society's 50th anniversary, including acknowledging its distinguished members. These activities will feature a commemorative publication that examines a complete list of notable concrete structures.

Celebrations will culminate with the 2014 NZ Concrete Industry Conference to be held in the Society's spiritual home of Wairakei, the venue of the first conference – 50 years ago.

Image Credits
Lower Shotover Bridge images courtesy of NZTA.
NAC Hangar image courtesy of Beca.
Motunui Synthetic Fuels Plant images courtesy of Methanex Corporation.

EXQUISITELY FORMED BRIDGING THE GAP WITH FORMLINER TECHNOLOGY

ESTABLISHED IN 1977 JACKSON ELECTRICAL INDUSTRIES IS A LEADING SUPPLIER OF PORTABLE POWER SOLUTIONS AND INDUSTRIAL POWER APPLICATIONS. HOWEVER, THE COMPANY IS BRANCHING OUT INTO FORMLINER SOLUTIONS FOR ARCHITECTURAL CONCRETE FINISHES, AND THE RESULTS ARE STARTING TO BE RECOGNISED BOTH IN NEW ZEALAND AND OVERSEAS.

Point Resolution Bridge, with its distinctive curved concrete soffit, links Tamaki Drive and the Parnell Baths in central Auckland, and was selected in this year's Chicago Athenaeum and European Centre's International Architecture Award.

Such international acknowledgment follows on from domestic honours that include the 2013 NZ Concrete Society's Monte Craven Architectural Award and the 2013 NZ Institute of Architect's Auckland Architecture Award for Public Architecture.

Kirk Ricketts, Project Engineer for Jackson Electrical explains how they are keen to demonstrate to architects, designers, construction companies, and their clients, the possibilities of architectural concrete.

"We have spent the last several years honing our procedures and upgrading our equipment in relation to flexible formliner solutions using a product that offers superior durability, flexibility, reusability and minimal maintenance. This has enabled more sophisticated and complex decorative concrete finishes."

"We specialize in high quality master tool, formliner and formwork manufacturing," says Kirk. "At our Onehunga facility we have some of the largest privately owned 5 axis CNC machines in New Zealand, which have the capability to produce extremely accurate 3-dimensional shapes of any size."

"This equipment along with our unique tooling material and machining skill set enable us to work closely with some of the largest construction companies in the country, as well as meet the demands of more unusual clients such as Team New Zealand and Prada, both of whom turned to us for assistance with their hydro foil master tools."

"We realise that a rapid turnaround time from concept stage to finished product is crucial to our clients' business success," says Kirk. "With our excellent design team, machinists, ground crew and specialist materials we are in a position to facilitate this."

Jackson Electrical has been producing concrete tools for various clients over the past ten years, and has worked on projects such as the Onewa and Rimu Road over-bridges in Auckland using traditional formwork techniques - laminated board, machined design, and protective coatings.

Kirk points out that this procedure, while producing a viable end result, is labour intensive, time consuming and has its own restrictions and inherent problems.

"We have advanced to the next stage of master tool creation, in which post finishing/protective coatings are not required. This means that the future looks bright for industrial tooling applications, particularly formliner creation, which in turn will help realise more concrete architecture, similar to Point Resolution Bridge, worthy of celebration."

Images: Patrick Reynolds Photography.

Images: Jackson Electrical Industries.

Images: Patrick Reynolds Photography.

FLEXIBLE FORMLINER - THE PROCESS

STAGE 1

The first step in Jackson Electrical's flexible formliner creation process for the Point Resolution Bridge was the casting of the CaroC™ master block. CaroC™ is a unique industrial tooling material developed by Jackson Electrical in conjunction with a well-known chemicals company. Dimensions of the cast block were 2500mm x 2850mm x 25mm thick, with a weight of 320kg.

STAGE 2

The CaroC™ master block was then machined with the required design. Four machined master blocks were joined together to create a single 5.7m x 5m master tool. Due to the inherent properties of CaroC™ no spray coats or sanding were necessary after machining. This is a revolutionary advancement in the ability to make master tools for any mould making application and perfectly suited for flexible form liner creation.

STAGE 3

Jackson Electrical's formliner material was then poured onto the master tool. Five flexible components were joined together to create the required overall length of 28.5m, with a total weight of approx. 1600kg. A smaller section was also formed, to be used at the bridge site as a joining segment for the three main bridge sections.

STAGE 4

The completed form liner was then delivered to the pre-cast site. The requirement was to form three separate bridge sections 23m to 28m long, with the longest having a prow like variation. The liner was then placed inside the prefabricated steel formwork via on-site crane. Reinforcing cage, conduits and polystyrene were placed and self compacting concrete poured. The three bridge sections were cast using the same formliner.

STAGE 5

The three concrete sections were then delivered to site and lifted into place. Each section weighed approx. 90 tonnes. The entire bridge was then painted on-site to the desired finish.

For more information visit the Jackson Electrical website www.jackson.co.nz.

POINT RESOLUTION BRIDGE

Designs for the new Point Resolution Bridge commenced in early 2012 following extensive stakeholder consultation by Auckland Council. Paralleling the consultation process, representations were also made to Auckland Council's Waitemata Local Board in order to verify budget. A full Design Team was established around the pairing of Warren and Mahoney as architects, with Peters & Cheung as engineers.

The level of interest in the high-profile location could not be addressed with anything less than a landmark bridge. Integral to the design was the commissioning of an Iwi artist to work with the Design Team to manifest the original concept imagery of the bridge. Henriata Nicholas was appointed on the basis of her proposed pungarungaru (ripples on water) design.

Progressing the technical aspects of the design, Peters & Cheung created the unique twin-celled post tensioned concrete bridge deck as the most structurally appropriate method of achieving the large spans demanded. Concrete was chosen for its ability to display the artist's curvilinear patterns and its low maintenance qualities.

The deck comprises three precast beams, installed on site and stitched together to make a 67m long continuous beam. A key element of the design was to have the lightest possible precast beams so that they could be lifted into place with a 400 tonne mobile crane. To achieve this, the deck slab, central web and curved soffit were reduced to the minimum practicable thickness and reinforced with a single layer of reinforcing.

50MPa concrete with 8% microsilica was specified to provide the minimum cover for a coastal environment. One very large tendon with up to twenty five 250kN strands was used in each beam rather than several smaller tendons because it gave the most efficient cable profile and the minimum web width. BBR Contech imported the large pre-stressing jack required to stress the tendons.

The laminated rubber bearings supporting the deck at the piers are inclined and aligned through the shear centre (of rotation) of the deck so that the large torsion forces created by the stairs are transmitted along the deck to where its anchored into the Point Resolution abutment rather than down the slender piers supporting the deck.

The precast beams were constructed by Wilson Precast, sub-contractors to Hawkins, contractors for the project. A curved steel form was made to cast all three of the beams. A special flexible formliner produced locally by Jackson Electrical with the artist's design moulded into it.

The two internal void formers were made of expanded polystyrene and held down to prevent uplift when the deck concrete was poured. Self-levelling concrete was used in the first concrete pour up to deck level. Once that had hardened a normal mix was poured in the raised kerbs on either side of the deck.

Multiple lifting points were used to raise the unstressed beam out of the form. This was done to avoid damaging the flexible liner due to shortening of the beam when it was stressed. Once out of the form the beams were stressed and the tendons grouted up.

Once the beams were lowered into position on site they were connected together with stitch pours. A complex arrangement of grouted bars, and lapping pre-stressing strands and reinforcement was required to provide structural continuity at the stitches.

Finally a thin topping was poured onto the deck, which was screeded to give the final skid resistant surface for pedestrians. Holcim Concrete designed the special 30MPa low shrinkage fibre reinforced mix with basalt aggregate which was used to prevent shrinkage cracking in the topping.

Text from 2013 NZ Concrete Society Awards entry.

Images: Patrick Reynolds Photography.

THE NEW ALTERNATIVE IN WATERTIGHT CONCRETE

SIKA CRYSTALLISES 100 YEARS OF WATERPROOFING EXPERIENCE WITH THE LAUNCH OF THEIR WT-200P SELF-HEALING CRYSTALLINE ADMIXTURE.

SIKA IS A GLOBAL MARKET LEADER IN CONCRETE ADMIXTURE TECHNOLOGY. THE VERY FIRST SIKA PRODUCT WAS AN ADMIXTURE DEVELOPED OVER 100 YEARS AGO TO WATERPROOF A TUNNEL THROUGH THE SWISS ALPS.

The company's latest waterproofing innovation is Sika® WT-200P. The Sika WT Series is already well proven on significant projects around the world and Sika® WT-200P is a new admixture powder that is added directly to the ready-mix load on the truck. The crystalline admixture enables concrete cracks to self-heal and therefore block water, even when under extreme hydrostatic pressure. And it will continue to reactivate whenever water is present.

The need for such a solution is simple. Concrete is a porous material. The many pores or voids in concrete are created by the excess water in the mix that is not used in the chemical reaction that hardens the concrete. Once the concrete is dry, external water finds these pores and seeps through.

There are many instances however where it is essential that water is unable to travel though concrete. Swimming pools, water retaining structures, dams and waste water treatment structures need to keep water in. Basements, parking garages, utility or plant rooms and tunnels need to keep water out.

When present in hardened concrete, Sika® WT-200P forms a non-soluble crystalline material throughout the pore and capillary structure and seals the concrete permanently against penetration of water or other liquids. In addition, the special formula and ingredients of Sika® WT-200 enhances the self-healing properties of concrete.

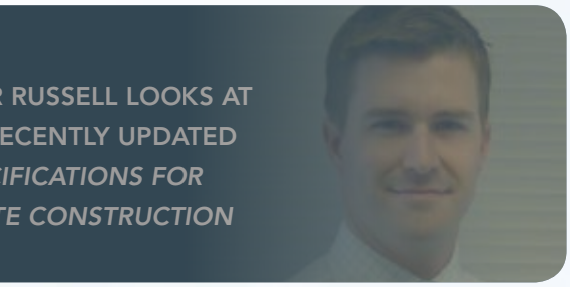
The use of Sika® WT series in waterproof concrete delivers the following advantages:

- The service life of the structure is increased
- The durability and sustainability of the hardened concrete is significantly improved
- Water-tightness is ensured without other expensive measures
- Maintenance costs are reduced

Sika WT-200P is packaged in plastic pails, each pail containing 6 x 1.75kg bags. These bags are disposable so they can be thrown directly into back of the ready-mix truck. The dose rate is 1% by weight of cement.

ASK ALISTAIR

CCANZ STRUCTURAL ENGINEER ALISTAIR RUSSELL LOOKS AT THE SALIENT POINTS COVERED IN THE RECENTLY UPDATED CCANZ TECHNICAL REPORT *TR 15 - SPECIFICATIONS FOR CONCRETE PRODUCTION AND CONCRETE CONSTRUCTION*



SPECIFICATIONS FOR CONCRETE PRODUCTION AND CONCRETE CONSTRUCTION

This CCANZ publication has been developed to show how concrete specifications might be dealt with. It utilises, as the primary Standards for compliance, *NZS 3109:1997 Concrete Construction* in conjunction with *NZS 3104:2003 Specification for Concrete Production*.

HOW SHOULD I SPECIFY CONCRETE IN TERMS OF ITS PRODUCTION?

Thorough planning should be given to specifying concrete in terms of the concrete being provided to site (refer to NZS 3104:2003) as well as the way that the concrete is constructed in the project (refer to NZS 3109:1997).

Whether the concrete is *normal* or *special* depends on the project requirements. *Normal Concrete* has a specified compression (characteristic) strength, f'c, in the range of 17.5MPa to 50MPa, and generally the concrete producer (ready mix supplier) assumes responsibility for the mix design of *Normal Concrete*.

For *Special Concrete*, which is where the strength is above 50MPa or where the concrete properties other than the characteristic strength form the basis of the specification, the purchaser is generally responsible for the properties required, as well as any testing and compliance requirements.

The supplier then generally assumes responsibility for providing concrete that meets those specified requirements.

Special Concrete may have other properties than *Normal Concrete* such as cement type, Supplementary Cementitious Materials (SCMs), extraordinary aggregate types/sizes, specified shrinkage values, or specified chloride or sulphate values.

WHAT SHOULD I SPECIFY FOR READY MIX CONCRETE?

Detailed planning at the specification stage can greatly reduce the likelihood of problems when the concrete is delivered, as well as improving the long term performance of the structure.

It is useful to have the following information available when needing to order concrete from a ready mix supplier.

Apart from the day, time and location requirements for delivery of the concrete the environmental conditions can impact the concrete performance and should be taken into consideration. For example, hot and windy conditions can cause concrete to dry out more rapidly, and cause plastic shrinkage cracking.

The volume required, as well as the rate of delivery, access constraints and means of delivery (chute, pump or skip) should be planned.

The distance that each truck has to travel from the ready mix plant to the project site and whether a pump is required when on site, can influence the concrete mix design. These should be discussed with the concrete supplier early in the planning stage.

The concrete should be specified in terms of the following:

- Grade (strength)
- Nominal aggregate size
- Workability (slump)
- Admixtures
- What (if any) additional testing is required

HOW SHOULD I SPECIFY CONCRETE IN TERMS OF ITS CONSTRUCTION?

The Standard for concrete construction in New Zealand is NZS 3109:1997. Among the many elements to be taken into account when specifying concrete for construction, the following should be considered.

- Formwork
  - Compliance with NZS 3109
  - Tolerances
  - Form finish requirements
- Sub-base requirements (for slab-on-grade)
  - Finished sub-base surface
  - Tolerances of sub-base
- Placing and fixing reinforcement
  - Reinforcement materials
  - Quality control – reinforcement traceability
  - Compliance with NZS 3109
  - Dowels and tie bars
- Placing and Finishing
  - Compliance with NZS 3109
  - Placing and finishing tolerances
  - Elimination of plastic shrinkage cracking
  - Compacting
  - Floating and trowelling
- Curing
  - Sides to be cured
  - Curing equipment
  - Initial and final curing
  - Water curing or sprayed membrane curing or impermeable sheet curing
- Joints
  - Free joints and tied joints
  - Isolation joints
  - Construction joints

More detail can be found in both TR 15 as well as NZS 3109:1997.

WHAT ARE THE RULES ON ADDITION OF WATER?

Sometimes there can be disputes between the concrete supplier and the concrete receiver as to the slump and workability of the concrete.

Both NZS 3104:2003 and NZS 3109:1997 provide details of the controlled circumstances when water can be added to concrete which has left the ready mix plant and been delivered to site, as follows.

Where the slump of the concrete delivered to site is less than specified, the concrete supplier is permitted to add a limited amount of water to the concrete in the truck. This concrete must not be special concrete and must be less than 1 hour old. Up to a maximum of 10 L of water per m^3 of concrete can be added, but only as required to increase the slump. The concrete truck must then mix the concrete for at least 30 revolutions, and the slump re-measured and recorded on the delivery docket from the ready mix supplier.

It is implicit that the slump should be measured prior to the addition of water, so that it can be determined if it actually is outside of the specification.

Download *TR 15 - Specifications for Concrete Production and Concrete Construction* from the CCANZ website – www.ccanz.org.nz

Images courtesy of Golden Bay Cement.

CCANZ LIBRARY

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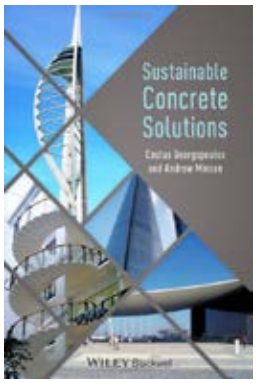

SUSTAINABLE CONCRETE SOLUTIONS BY COSTAS GEORGOPOULOS AND ANDREW MINSON

Sustainable Concrete Solutions serves as an introduction to and an overview of the latest developments in sustainable concrete construction. It provides useful guidance, with further references, to students, researchers, academics and practitioners of all construction disciplines who are faced with the challenge of designing, specifying and constructing with concrete.

SEISMIC ASSESSMENT OF EXISTING REINFORCED CONCRETE BUILDINGS

This CD provides eleven papers summarizing new developments in the assessment and retrofit of concrete buildings, with a particular focus on the collapse prevention performance level.

Many of the papers report on efforts by task groups of ACI 369, Committee for Seismic Repair and Rehabilitation. Several papers in this CD summarize research efforts related to the ACI 369 proposals under development, including modelling parameters and acceptance criteria for existing and jacketed columns, slender walls, and slab-column connections.

Other papers report on retrofit case studies, a new assessment procedure for concrete buildings in Turkey, and practical numerical models for existing beam-column joints, in filled frames, and collapse simulation.

LIBRARY QUIZ

To go in the draw to win a copy of *Sustainable Concrete Solutions* by Costas Georgopoulos and Andrew Minson answer the following simple question:

Where will Holcim (New Zealand) Limited's planned distribution terminals be located once constructed?

Email your answer to library@ccanz.org.nz. Entries close Friday 31 October 2014.

Congratulations to Tim Hunt of Golden Bay Cement, who correctly answered the Vol 57 Iss 2 Library Quiz to receive a copy of *Curing Concrete* by Peter C. Taylor.

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NEWS FROM AROUND NEW ZEALAND

conslab
concrete flooring professionals

AN EVENING WITH KEN HOVER

Following the 2014 Concrete Industry Conference, Conslab is proud to host renowned keynote speaker and former American Concrete Institute president Professor Ken Hover in a seminar series throughout New Zealand.

When & Where
Christchurch - Monday 13 October
Wellington - Wednesday 15 October
Auckland - Thursday 16 October

Seminar Programme
5.30 – 6.30pm Registration, Networking & Refreshments
6.30 – 7.30pm Seminar, Discussion, Q&A

Join Ken and industry colleagues at this special complimentary event. Learn from the best as Ken delves into what is happening in your concrete over the first 24 hours, and how this explains the common issues with concrete floors.

"The first 24-hours in the life of a simple concrete slab is an exciting time from the perspectives of the engineer, construction manager, or the workers responsible for installing a quality product. As industrial floor guru Alan Face said, "After you place and finish a concrete slab, while you are sleeping at home, down inside the concrete slab, Wild Things are happening!" – Ken Hover

Don't miss this exciting opportunity to engage with one of the industry's most acclaimed experts and speakers.

To register your place visit the Eventbrite website (www.eventbrite.co.nz) and search for "Ken Hover".

IPENZ NEW ZEALAND ENGINEERING EXCELLENCE AWARDS 2014

Successful infrastructure projects don't happen by chance. Everyone from the architect to the engineer, the contractor to the project manager, is responsible for delivering excellence.

Celebrate the projects that stand out and the people who delivered them at this year's New Zealand Engineering Excellence Awards Dinner.

As the 10th anniversary of the awards, this year's celebration is expected to be the most spectacular yet.

Join the finalists, business and industry leaders and senior figures from politics for a celebration of engineering excellence in all its forms.

When & Where
Friday 28 November 2014
Pullman Hotel
Auckland

- Early Bird ticket: $165 valid from 1 July until midnight 30 September
- Standard ticket: $180 valid from 1 October – 15 November when online ticket sales close
- A Late Bird ticket rate of $200 applies to tickets purchased after online sales close.

Tickets can be purchased from the www.nzeeawards.org.nz

Secure your table now.

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