

concrete

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LNG storage facilities – preparing to meet demand

Over the past few decades, global consumption of liquefied natural gas (LNG) has increased more than five-fold and it is predicted that growth will continue to be strong. The demand for this resource from both large and small markets has resulted in the development of many new LNG facilities around the world, say Hudson Lun, Frank Filippone, Diana Cobos Roger and Marcel Poser.

With between five and ten years required for planning and construction, there is currently a lot of activity underway in the LNG supply chain in preparation for current and predicted demand. Post-tensioned concrete tanks are ideally suited to meet the storage demands of this important resource.

About LNG

LNG is a natural gas that has been super cooled to a temperature of around -162 Celsius, upon which it is condensed into a liquid form. The main benefit of this cooling process is that the LNG is reduced to around 1/6000th of its volume as a gas. In this state it weighs about 45% of an equivalent amount of water, which has obvious benefits for transportation. It is also stable and safe, because even though compressed in volume, the liquid remains at normal atmospheric temperature.

Once the gas has passed through the LNG processing and distribution network, it can be used in conjunction with, or in place of, domestic natural gas, as their properties are very similar. Due to the cryogenic temperatures required to keep LNG in its liquid state, storage tanks are an essential part in the process.

LNG is stored at atmospheric pressure in double-walled tanks; the space between the tanks being filled with insulation. The outer walls of the tanks are most commonly constructed from post-tensioned concrete.

Design configuration

Tank dimensions are typically around 80 – 90metres in diameter and 50metres in height, with a wall thickness of 750mm. The post-tensioning tendons are very large and can run both vertically and horizontally.

LNG tanks are typically constructed in a design-build fashion with the principal contractor responsible for determining the specific design requirements for the pre-stressed concrete. The post-tensioning specialist will examine the required force profile, and detail the spacing and tendon size of the post-tensioning.



Darwin LNG tank near completion.

Case study: Darwin LNG tank

The LNG processing plant at Darwin receives gas via an undersea pipeline from the Bayu-Undan gas field in the Timor Sea, some 5000km north west of Darwin. The liquid is then pumped to the storage tank prior to shipment to Japan. The plant is expected to supply gas to Japan over a 17-year period.

Specialist post-tensioning contractor Structural Systems was engaged to install, stress and grout approximately 570 tonnes of post-tensioning tendon for the storage facility, which was one of the largest aboveground tanks in the world at the time. Features of the massive structure include:

- A 550mm thick post-tensioned exterior concrete wall
- The inner tank is made of a special steel/nickel alloy to accommodate cold LNG
- The tank is approximately 47metres high and 94metres in diameter
- There are 172 x 32metre long vertical tendons which are stressed to approximately 4,000kN with an ultimate capacity in the order of 5,000kN
- Each vertical tendon is prefabricated at ground level then

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Cement & Concrete Association of New Zealand

Upfront...



Patrick McGuire,
CEO.

It has been a busy and successful year for the Cement and Concrete Association of New Zealand.

Our industry has continued to mature and grow, and over the past year CCANZ has remained dedicated to working with the construction sector to address the issues and challenges ahead. This year's achievements were celebrated at the annual New Zealand

Concrete Industry Conference and CCANZ AGM, held in Christchurch recently. The news that the funding members of CCANZ have increased the level of funding for the Association also demonstrates the value of the work CCANZ has done over the past year.

This year, CCANZ has worked to establish strategic relationships in the sector and strengthen existing ones with government bodies and associations. For example, CCANZ has been working closely with Standards New Zealand to implement NZS 3101 and to run a series of seminars across the country. We've also worked with other key government departments such as the Ministry for the Environment, Transit New Zealand and the Energy Efficiency and Conservation Authority (EECA). CCANZ has also actively engaged stakeholders throughout New

Zealand to maintain a high profile within the sector. Some of our staff also work as Executive Officers for a number of industry associations.

Fostering CCANZ's partnership with BRANZ has also been a significant project this year and will play a major role in helping our industry mature and grow. The sustainability of infrastructure, the economy and the built environment is a hotly debated topic and CCANZ's work with BRANZ in developing the "Sustainability of Concrete" document is an example of our industry's commitment to the progression of New Zealand's sustainable development.

Another exciting development this year is the re-appointment of Andrew Moss as chairman of the Board. Andrew's knowledge, extensive experience in the industry, enthusiastic leadership and vision have played a major part in the development of the Association over the past year. CCANZ would also like to welcome Rob Gaimster, a senior engineer from the United Kingdom, onboard as Project Manager. Rob started in November and brings a wealth of experience in concrete technology to the Association.

I would like to thank you all for your ongoing work and support for CCANZ throughout the year. On behalf of the staff here, we wish you a safe and very happy Christmas and we look forward to continuing the good work in 2007.

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lowered through the top anchorage by crane as a complete tendon

- There are 114 x 150metre long horizontal tendons which are stressed to as much as 5,000kN with an ultimate capacity of over 6,000kN
- Each horizontal tendon spans half the circumference of the tank
- The vertical tendons are anchored at the top and bottom of the tank's wall. Access to the bottom anchorage is via inverted concrete culverts, measuring 750mm wide x 600mm high, installed below the base slab
- Access to the horizontal tendons is via mast climbing work platforms measuring 10metres long. The work platforms were shaped to suit the geometry of the workforce and allow access to any level
- The facility cost AUS\$1.5 billion to construct.

The post-tensioning configuration involves a number of large tendons which require high capacity jacking equipment. The 6,000kN capacity stressing jacks, weighing about 2.5 tonne, were supported by a winch mounted on a steel framework that cantilevered over the top of the tank wall. The winch system was mounted on a rail so that the jack could easily slide over protruding stands. The winches are controlled at the work platform to provide the operators with complete control.

Other examples of concrete storage tanks developed for LNG are the 5th and 6th LNG tanks in Barcelona, the Adriatic LNG terminals in Spain and Italy, and the Southhook LNG terminal in Wales.

New Zealand prospects

The case has been investigated for New Zealand to import LNG as an alternative fuel source to the diminishing

natural gas supplies available locally. There are various studies underway to investigate the feasibility and cost of constructing an LNG storage facility and a decision will have to be made in the near future to ensure that predicted energy demands in the next five to ten years can be satisfied. Several suitable sites have been identified and preliminary planning is underway.

Although future energy requirements and power generation sources for New Zealand continue to be politically contentious, there is no question that the local infrastructure, resources and capability to build an LNG facility are accessible domestically.

Conclusion

LNG storage tanks are ideally suited to construction methods employing slip formed or climbing in-situ concrete construction, combined with post-tensioning. The specific design and installation techniques are specialised and require the use of specially certified and tested materials, along with highly skilled contractors.

With the expected growth in demand for LNG storage facilities throughout the world and the rapid pace with which these facilities will need to be constructed, the specialised teams, equipment, materials, and associated innovative solutions, will be crucial in preparing to meet future demand.

Acknowledgments

The authors would like to acknowledge the contributions from numerous members of the international BBR network in Spain, the UK and Australia, who contributed material for this paper.

People News...

Len McSaveney receives Honorary Membership

Over 42 years, the NZ Concrete Society has awarded 13 honorary memberships to notable champions in the concrete industry. At the New Zealand Combined Concrete Industry Conference Dinner in September, NZCS President Paul Wymer announced Len McSaveney, market development manager for Golden Bay Cement, as the latest member of this exclusive club.



Marilyn and Len McSaveney.

Paul Wymer said: "Len truly has a passion for the concrete industry. It has been said that he regards his role in concrete engineering as both his occupation and his hobby. He firmly believes that you can do anything with concrete and he has been associated with the development and promotion of concrete technology in a career that spans more than 40 years."

Len has played an instrumental role in promoting research, product development, the mentoring of young engineers, and the general use of concrete. He was President of the NZ Concrete Society from 1989-1991, and has been a member of the NZCS Council for more than 20 years, greatly assisting the technical seminars run by the Society. Len has also been NZ Vice President of a *fib* for the past 10 years.

In 2004, in recognition of Len's wider contributions to New Zealand's engineering development, he was elected a Fellow of the Institution of Professional Engineers New Zealand. His citation included reference to his leadership in the development of lightweight structural concrete for a variety of applications and his continued input into the concrete structures standard. It also remarked on the contribution he has made to students at both Auckland and Canterbury Universities, where he has passed on his knowledge over the years through numerous research advisory roles.

CCANZ re-appoints Chairman of the Board

The Cement and Concrete Association of New Zealand (CCANZ) announced the re-appointment of Andrew Moss as Chairman of the Board, at its Annual General Meeting held at the New Zealand Combined Concrete Industry Conference recently.



Andrew Moss, CCANZ Chairman of Board.

Andrew has been a CCANZ Board member for three years and Chairman of the Board for one year. He is currently Marketing Manager of Golden Bay Cement (GBC) and has more than 13 years experience in the industry, working in a variety of business and marketing development, logistical and customer management roles since joining the company in 1991.

Industry News...

NZRMCA Awards 2006

The 2006 NZRMCA Awards Presentation was held at the Combined Industry Conference Formal Dinner on Saturday, 30 September. NZRMCA President, Rob Green, presented the following awards:

Zone Awards: Awarded in recognition of commitment to quality ready mixed concrete. Plants are divided into four zones and assessed for compliance over a rolling three-year period by the Plant Audit Committee, who look at annual test results, make site visits and check compliance with New Zealand standards. The winners of the NZRMCA 2006 Zone Awards were:

Zone 1 (South Island):	1st Equal - Allied Concrete (Timaru); Cromwell Certified Concrete; Firth Industries (Queenstown).
Zone 2 (Wellington):	1st Equal - Allied Concrete (Paraparaumu); Allied Concrete (Wanganui); Firth Industries (Napier).
Zone 3 (Northland/Auckland):	1st Firth Industries (Albany); 2nd Stevensons Concrete (Albany); 3rd Firth Industries (Pukekohe).

Zone 4 (Central North Island):	1st Firth Industries (Hamilton); 2nd Firth Industries (Mt Maunganui); 3rd Allied Concrete (Tairua).
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Technical Excellence Award: This award recognises projects that demand innovative technical solutions. It was awarded to Allied Concrete for its work in developing a solution for sealing a dewatering sump in the basement of the Museum Apartments (Wellington) while subject to high water pressure. The basement is located below the water table and the technical challenge was to design a mix that could be used to plug the sump through which water was bubbling.

Extra Distance Award: This award recognises uncompromising commitment to customer satisfaction and was awarded to Firth Industries for its work on the Waitangi Park Project on Wellington's waterfront. The project involved transforming a wasteland site into New Zealand's largest urban park through innovative landscaping of walkways/pedestrian areas for visual appeal. It also involved constructing a new skate park. Extra distance challenges included sourcing the aggregates/seashells used for visual impact, preparing test panels, providing concrete loads as small as 1.4m³, and pouring between 5.00-8.00 a.m. on Saturday mornings to minimise traffic disruptions.

Concrete is the weathertight solution

A new Guidance Document on weathertightness is set to promote the use of concrete in residential building as the best solution to the construction industry's biggest problem, says the New Zealand Concrete Masonry Association.

The most common “buzzword” in the New Zealand construction industry over the past five years has been weathertightness. With New Zealand’s love of timber as a building material and the desire for fast and cost-effective building, the leaky homes saga has continued to be a major thorn in the construction industry’s side.

Concrete is generally considered to be the most weathertight of building materials, and so the New Zealand Concrete Masonry Association and the Department of Building and Housing have supported the Building Research Association of New Zealand in the development of a guidance document on weathertightness that is planned for release before the end of 2006.

The current regulations concerning weathertightness are for traditional lightweight timber materials and construction methods, and equivalent resources are not available for concrete masonry. This makes the approval process for concrete masonry and other alternative systems more difficult, regardless of the competency of the design.

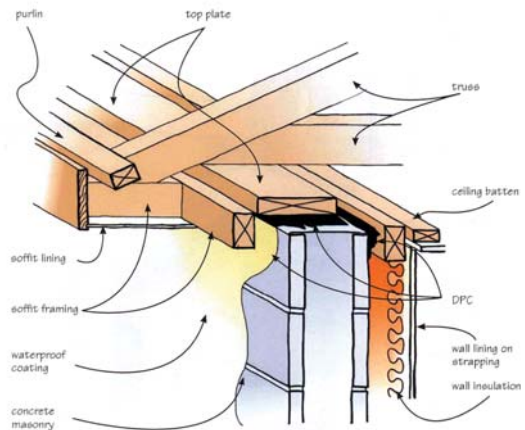
Despite several strategic projects to provide resources for concrete masonry design and construction information, the use of lightweight systems far outweighs that of concrete. It is imperative that the industry provides an appropriate array of design and construction tools to promote the benefits of concrete for weathertightness.

The soon to be released Guidance Document is the result of a project to provide useful guidance for those considering Alternative Solutions for compliance with Clause E2 of the Building Code, External Moisture. It will provide backup to enable these decisions to be made in favour of concrete masonry and will offer details that are tailored to align with the specifics of the project.

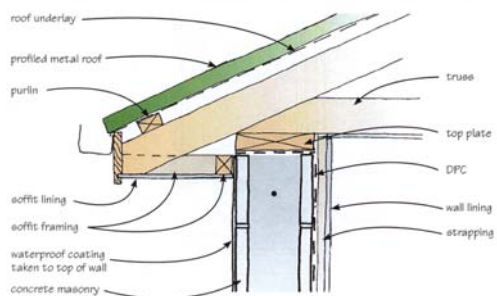
The document aligns itself with NZS 4229: Concrete Masonry Buildings Not Requiring Engineering Design, and means designers and building officials will now have a comprehensive suite of reference documents for the non-specific design of most aspects of concrete masonry in residential scale buildings. The guideline refers to low-rise, single skin concrete masonry used on its own or in combination with other materials, and will be reviewed periodically to help ensure it remains relevant to industry needs.

The guide identifies common areas of weakness where weathertightness is concerned, such as the interface between mortar and the masonry. The guide stresses the need to create appropriate mix characteristics before use to ensure hydration of all cement, and highlights the need to re-tool the joint after initial set and water loss have taken place to compact the outer surface of the mortar.

The benefits of waterproof coating are strongly emphasised. The guide also identifies shrinkage control joints as an area of weakness, advising that walls are detailed to ensure cracking and future thermal moisture induced movement will take place across the control joint.



Cross-section of typical eaves



An example of construction details presented in the new Weathertightness Design Guide for Concrete Masonry.

The guide also identifies appropriate measures to avoid and/or rectify the areas of weakness and mentions four key weathertightness success factors:

Deflection: providing overhangs above or around penetrations.

Drainage: ensuring that any water that does get in is conducted to the bottom edge where it is allowed to drain out.

Drying: by leaving the bottom edge unsealed some air circulation within the frame/wall joint will be encouraged which will assist in drying any residual moisture.

Sealing: an air seal around the inside edge of the wall/frame interface is critical. This will ensure that wind-driven moisture will not penetrate to the inside.

The development of this resource is of high strategic importance to the concrete masonry industry given the changes that have taken place in New Zealand’s construction industry over the past five years. The guide will provide designers, builders and Building Consent Authorities with a useful tool to design, construct and evaluate weathertight concrete masonry buildings, while minimising risk and enabling users to focus on the strengths of single skin concrete masonry construction.

Cook's Clinic... Specifying concrete floors

The NZ Concrete Society and CCANZ have just completed a seminar series on specifying concrete for slab on grade construction. A specification template was presented and a copy of this can be obtained from the CCANZ website (www.cca.org.nz). Many attendees thought the following key points were valuable:

- The most common non-compliance issue was cracking, with plastic and restrained early thermal contraction being the predominant cause. For more information on cracking and its causes, visit the NZRMCA website (www.nzrmca.org.nz) and download a publication called 'Cracking in Concrete Floors'.
- Cutting the reinforcement at saw cuts is not a good idea, even though it is still occasionally specified. If your specification suggests doing this you should follow the new guidelines.
- When concrete dries, it shrinks. The solution to accommodate this is careful design and layout of joints. The specification of low shrinkage concrete mixes for slabs on the ground can reduce the amount of opening that occurs at the joints, but this small benefit is often dwarfed by the potential negatives associated with low shrinkage mixes. Low shrinkage concretes are typically more difficult to place and finish, and more prone to plastic shrinkage cracking.
- Workability issues need to be co-ordinated with the proposed placement techniques. It is preferable that the concrete supplier, placer and contractor work together to determine the best wet concrete characteristics for the project. It is a good idea for the job specification to include a requirement that all parties attend a pre-pour meeting to discuss the potential risks associated with the proposed construct and how to lessen these risks.
- The terminology which appears in NZS3109 and NZS3104 has changed. Specifications should now call up either Normal or Special concrete supplied from a plant with a current certificate of audit. So, if your specification still refers to high and special grade plants, download the typical specification from the CCANZ website and look at updating your specification.

Dene Cook awarded Meritorious Award

CCANZ would like to congratulate Dene Cook, Project Manager at CCANZ, for recently being awarded a Meritorious Award from Standards New Zealand for his outstanding contribution to the development of concrete Standards in the industry.

Dene chaired the concrete structures Standard committee NZS 3101, a key Standard for the design of concrete buildings. He presented the seminar series on the concrete structures Standard, in conjunction with Standards New Zealand, to improve understanding of the Standard. Dene has also been involved with a number of other Standards committees for concrete Standards, including the design of reinforced concrete masonry structures NZS 4230 and concrete segmental paving NZS 3116.

Dene holds a Master of Engineering from the University of Canterbury and has had extensive

experience in various areas of the civil and structural engineering discipline. Dene provides on-the-ground technical advice and support for CCANZ on a daily basis and is actively involved in identifying barriers to the use of concrete and areas for further research. He is also a fellow of the Institution of Professional Engineers and the Chair of the Canterbury Structural Group.

Dene is an instrumental member of the concrete industry and CCANZ is proud to have such a dedicated and committed person as part of its team.



Dene Cook, Project Manager, CCANZ.

Revolutionary first for New Zealand's concrete industry

Following two in-depth University of Auckland doctoral studies, an array of designers and product manufacturers constructed a post-tensioned concrete masonry house for the Habitat for Humanity organisation. The house is an exciting first for New Zealand's concrete industry and is now an effective showcase, exposing and demonstrating the technology to all New Zealanders, say Gavin Wight, Jason Ingham and Andrew Wilton.

New Zealand is a country that experiences a high number of earthquakes, which means it will benefit substantially from the improved seismic performance that post-tensioned walls provide. Therefore, the University of Auckland undertook research to successfully design and construct a house that incorporated post-tensioned concrete masonry. In collaboration with Habitat for Humanity Manukau (a global non-profit Christian housing organisation that assists low-income families into their own homes), and numerous consulting and supply companies, the University of Auckland helped construct New Zealand's first post-tensioned concrete masonry house, which is located in Auckland.

The single story house comprised a simple and clear floor plan. The exterior walls of the house were constructed of post-tensioned Formblock® mortarless concrete masonry blocks. This was one of the first projects in New Zealand to use this type of mortarless block, which had only recently become available on the local market. The use of mortarless blocks is currently outside the scope of the non-specific masonry design standard, and therefore a specific design was required for this project.

The walls had a thickness of 190mm and were fully grouted using a specially developed block fill concrete. This concrete exhibits low shrinkage and self-compaction properties and has a target 28 days compressive strength of 20 MPa. The use of mortarless blocks required full grouting of the walls. A plaster finish was applied to the exterior of the building, with insulation and lining installed on the interior face of the block walls.

The interior partitions of the new home were made of triboard, a high density timber panel. The floor was a concrete raft design, typical of the floors used in residential masonry construction in the Auckland area. The existing site had a sloping profile and two public drains running through the proposed house footprint, resulting in a more complex floor design. The raft floor sat on the ground surface and comprised an edge beam, internal ribs with a depth of 285mm, and an 85mm floor thickness. Finally, a simple timber truss roof with iron cladding enclosed the home.



Pouring of floor slab (post-tensioned couplers shown extending out of the foundation).

The prestressing tendons were 12mm diameter, 500 MPa threaded Reid bars, and their layout was determined by ensuring that all wall panels contained at least one tendon, and that the tendons were distributed evenly around the structure. The top tendon anchorage consisted simply of a steel plate and nut bearing on the masonry wall top. A short length of prestressing tendon was hooked around the foundation reinforcement and terminated with a coupler at floor level, providing the lower prestress anchorage. The walls were prestressed one week after grouting using simple stressing equipment, consisting of a small hollow core jack and jacking chair, and a hand pump.

The finished project illustrates that a post-tensioned wall system can be simply integrated into existing floor and foundation design with minimal effort. The use of mortarless blocks significantly enhanced the speed of wall construction. Overall, the success of the Manukau Habitat for Humanity and University of Auckland home proves that post-tensioned concrete masonry is a construction technique that holds great promise for the future.

Concrete caving creation

Visitors to Waitomo can now enjoy a unique new caving experience in one of New Zealand's top tourist attractions thanks to the use of concrete, say Martin Hansen and Tanya Wylie.

In October 2003, Thorburn Consultants was appointed by Tourism Holdings and its subsidiary, The Legendary Blackwater Rafting Company, to work with them to develop the Ruakuri Cave into a visitor experience that could be accessed and enjoyed by the public, including those requiring wheelchair assistance. At an early stage in the project Hawkins Construction joined the team. The project's successful completion has confirmed concrete as one of the most versatile and durable construction materials.

Construction of Ruakuri Caves was completed in five key sections. The first was the construction of a new entrance into the cave. Visitors to Ruakuri Caves now enter through a manmade entrance at ground level which has been themed with shotcrete to give the appearance of a limestone outcrop and cave. Then entering a 10m diameter concrete shaft they descend 12 metres below ground along a spiral ramp within the shaft.

The concrete shaft was constructed using top down construction with a 300 metre thick sprayed concrete wall. The 160 metre long suspended spiral walkway was constructed with steel beams and posts supporting a traydeck slab, which creates a stunning visual effect with the use of subtle lighting in the shaft. At the base of the shaft visitors walk through a 20 metre long air-controlled tunnel into the cave. This tunnel was constructed with 2.5m diameter precast concrete pipes. Over a three week period the 2.5m diameter pipes were lowered into the base of the shaft, and thrust 20m through the ground into the cave.

After the entrance tunnel was constructed, the removal of 300 cubic metres of silt which had built up over hundreds of years within the cave could begin. Completion of this phase signalled a significant milestone in the project, as workers constructing suspended walkways and concrete paths within the cave no longer needed to swim to work, providing an enormous logistical benefit.

Walkways constructed within the cave included 500 linear metres of concrete paths and 100m of suspended steel walkways.

The link tunnel through the ancient rockslide was a key component in the project as it would provide continuity for the cave tours. Once the tunnel was excavated, scaffold tubes were used to support the excavated face. One side of the excavation was a



Laying the concrete paths within Ruakuri Cave.

solid limestone wall, and the other side varied from calcified rock that looked quite stable to an unstable matrix of mud and rock. Steel sets were installed and braced against the limestone face with a concrete wall constructed between the sets and at the ends of the tunnel.

Adding to the complexity of the project, careful consideration was needed to adhere to the strict environmental controls required by the Department of Conservation and Environment Waikato. These restrictions were to prevent any significant impact on the cave environment from changes in the existing air temperature, relative humidity, air-flow and levels of carbon dioxide.

Specially installed doors to control air flow and low-wattage lighting systems to maintain the optimal temperature of 12 degrees Celsius were used. Protection of the unique geological features was also paramount.

The project also had logistical challenges. For instance, it was essential that visitor experiences such as the rafting tours conducted by The Legendary Blackwater Rafting Company, be able to continue while construction was underway.

Despite these challenges, the development of Ruakuri Caves has opened a new frontier for Tourism Holdings and The Legendary Blackwater Rafting Company - an exceptional caving experience which can be enjoyed by the wider public. With the use of concrete throughout the project, and the steel walkways and ambient lighting effects, the new Ruakuri Caves entrance is a truly unique and memorable visitor experience.

NEWS from the ASSOCIATIONS

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DIARY DATES 2007:

January:

18 PCNZ Executive Meeting - Auckland

February:

15 CCANZ Board Meeting - Wellington

CCANZ will be closed from 22 December 2006, and will reopen on 3 January 2007.

New council for NZCS

NZCS

NZCS elected a new Council at its AGM recently. Council members are as follows: President, Paul Wymer; Vice President, Chris Munn; Immediate Past President, Andrew Dallas; Council Members (Business), Sheldon Bruce, Opus International Consultants and Warren South, Golden Bay Cement; Council Members (Individual), Morten Gjerde, Victoria University, Tim Jones, Hawkins Construction and Jeff Mathews, Holmes Consulting Group; *fib* New Zealand Vice President, Len McSaveney, Golden Bay Cement; and Co-opted member of Council, Patrick McGuire, CCANZ CEO.

Sandy Cormack Award

NZCS

The 2006 recipients of the Sandy Cormack Award are Nicholas Brooke and Jason Ingham of the University of Auckland, for their paper entitled 'Advanced Fibre Reinforced Precast Concrete Beam-Column Joints'. The Sandy Cormack Award recognises the best paper presented at the Annual Technical Conference of the New Zealand Concrete Society.

New Zealand Concrete Industry Conference

NZCS

This year's Combined Concrete Industry Conference was a huge success with more than 500 delegates in attendance. The Conference showcased great industry work on a national and international level and the keynote speakers Rob Fisher of Simpson Grierson and Greg Sang of Emaar Properties PJSC set a high standard that other presenters rose to. (The full proceedings can be ordered online at www.concretesociety.org.nz.)

On the Friday night, delegates took a trip back in time to the Boogie Woogie Bugle Boys of World War II at an informal dinner that was a real highlight of this year's Conference. The formal dinner on the Saturday night was another highlight with the announcement of Len McSaveney's honorary membership.

NZCS would like to thank the Conference Patrons - Allied Concrete, Golden Bay Cement, Sika (NZ) Ltd, and BASF Construction Chemicals; and the Conference Sponsors - Acrow Ltd, BBR Contech, Firth Industries, Fulton Hogan Ltd, Holcim (New Zealand) Ltd, Novocon (New Zealand) Ltd, Seismic Reinforcing Steel and Truck Investment Group.

NZRMCA

For the first time this year, NZRMCA ran four concurrent sessions at the Combined Concrete Industry Conference - 'Drug and alcohol free workplace', 'Human resources in the concrete industry', 'Competition law and its importance to the concrete industry' and 'Basic rheology principles for New Zealand concrete'. All sessions were well attended and despite the seriousness of the subjects, the four presenters - Susan Nolan (ESR), Janet Copeland (Janet Copeland Law), Ian Mutton and James Mackechnie (University of Canterbury) delivered very interesting and amusing presentations.

New council for NZRMCA

NZRMCA

NZRMCA recently confirmed its new Council members for the 2006-2007 year. They are: National President, Rob Green (Southern North Island); Maurie Hooper (Northland); Graham Payne (Auckland); Karl Campbell (Central North Island); Rob Uffindell (South Island); Kevin Mischewski (Past President); and seconded members Brett Haldane, Des Krammer, Don McDonald, Bob Officer and Bary Williams.

Publications

NZRMCA

New Zealand Territorial Authorities recently received two copies of NZRMCA's 'Site environmental guidelines for on-site management of concrete washwater'. NZRMCA has received positive feedback from a number of authorities with some requesting extra copies for distribution to staff and private contractors.