

TECHNIQUE

THE CLIENT PUBLICATION OF CONSTRUCTION TECHNIQUES GROUP LIMITED



The BBR Contech Board of Directors joined with staff, clients and business partners at each function to celebrate 50 years of serving construction in New Zealand. From left, Andrew Dallas, Des Mataga, David Dorrington, Paul Wymer and Dr Ian Parton.

August 2013 was a major landmark for the BBR Contech team, as the company celebrated 50 years of business operations in New Zealand. And what a party it was, with cocktail functions held in Auckland, Wellington and Christchurch to mark the occasion and thank clients, consultants, contractors and other business associates for their valued support.

BBR Contech's story began in the 1950s, when the Government called for tenders for the Roxburgh Dam. That contract was won by an international joint venture that included Conrad Zschokke, a contractor from Switzerland.

Once the project was complete, Zschokke established a local presence, joining a Masterton company to form Rigg Zschokke. When in the early 1960s projects started requiring post-tensioning technology, Zschokke's Swiss-based business associate BBR was in the perfect position to help – and the rest, as they say, is history. BBR New Zealand was established in 1963.

Committed to innovation and excellence

In the half-century since then, a series of mergers and acquisitions has seen the company change names, market new skills and techniques and undertake a diverse range of projects in New Zealand and overseas. And while there have inevitably been some ups and downs, we've weathered the storms owing to our enduring affiliation with the global

BBR Network, our strong relationships with clients, and our agility in identifying and responding to new opportunities.

Today we comprise a team of some 70 specialists, and are widely recognised for our innovative, proactive approach, both in project design and delivery and in the development of new products, processes and technology. Our capabilities have been recognised in more than 20 awards from the New Zealand Concrete Society, and the Supreme award in the 2007 New Zealand Engineering Excellence Awards.

The birthday functions were an opportunity to look back at the many significant projects with which BBR Contech has been involved, including many well known landmarks and nationally important infrastructure projects. They were also a time to recognise the secret to our success: the people who make up the BBR Contech team, of whom many have been with us for decades.

Now we're looking forward to the future. With a strong foundation of knowledge, experience and performance and a commitment to innovation through service and technology, we plan to be around for the next 50 years and more!

www.contech.co.nz

EASTERN INTERCEPTOR

Going underground for good

The term 'Eastern Interceptor' may sound like a Russian fighter jet, but for the BBR Contech team it has a distinctly different meaning.

Completed in 1962, the Eastern Interceptor is a large-diameter, reinforced-concrete wastewater pipe that follows a 19km path from Auckland's Okahu Bay to the Mangere Wastewater Treatment Plant. It's a vital part of the city's wastewater management system, carrying about two-thirds of its wastewater and acting as the main collection point for many large and small sewers.

For this reason, Watercare – the company that provides water and wastewater services to the Auckland region – maintains a rigorous monitoring, maintenance and, where necessary, repair programme. BBR Contech was most recently involved in 2005, when we repaired several sections in what was thought to be the first large-scale remedial concrete works to be carried out in a fully live, man-entry sewer in New Zealand.

We've recently been called on again, this time to remove and replace damaged concrete in two other parts of this critical element of Auckland's infrastructure – one a 205m-long section at the wastewater plant itself, and the other a 440m-long section in Mt Wellington. The latter is posing some particularly complex challenges for the team, as it's located in a heavily populated residential area that includes a primary school. This has required us to take a scrupulous approach to planning and implementing the project, and to keeping the affected community informed along the way.

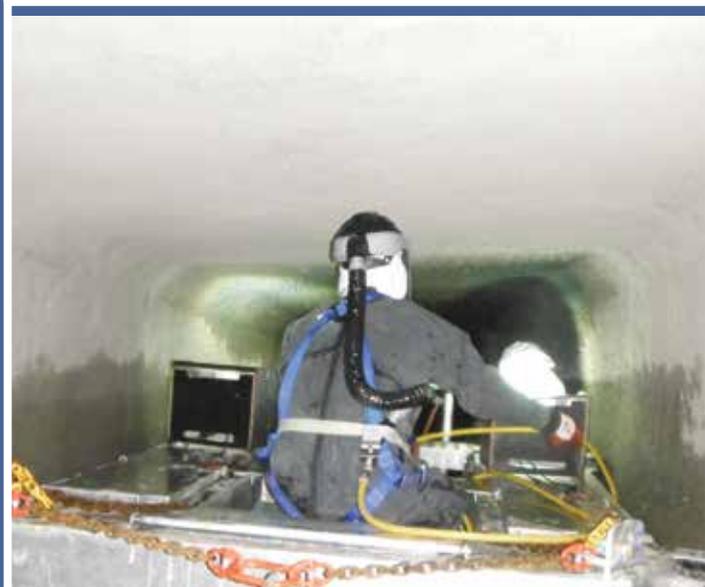
A meticulous approach

Work like this is never pleasant for the BBR Contech team, with a hazardous working environment in which everyone is required to follow stringent health and safety policies. These include wearing dry suits equipped with adequate supplies of fresh air, and maintaining a strict limit on the time spent in the underground pipe environment. In Mt Wellington, the team also has to work overnight, with a constant focus on minimising noise and other disruptions to the residents nearby.

Spread over two stages and due for completion in mid-2014, the project involves:

- preparing the surface using robotic high-pressure water blasting, which is very effective in removing the affected concrete without disturbing raw sewage
- applying 350 tonnes of Kerneos SewperCoat® – a technologically sophisticated calcium aluminate product that's sprayed on to provide highly effective, high-strength, corrosion-resistant protection against biogenic sulphide corrosion.

While those working on the project will no doubt be relieved to see it completed, they can be very proud of their role in helping to ensure that Auckland's wastewater system continues to perform well into the future.



Kerneos SewperCoat® is ideally suited to sewer repair and addresses the effects of biogenic sulphide corrosion – a bacterial process that attacks concrete and steel in these environments.

Client: Watercare Services
Engineer: AECOM

ENSURING LONG-TERM PERFORMANCE

A key element in the BBR Contech arsenal, fibre-reinforced polymer (FRP) is being deployed in a number of historic building projects around the country. This remarkable material – which we've used in more than 150 projects in New Zealand – offers all the benefits of strength, resilience, lightness and fire and corrosion resistance, while its low, discreet profile makes it ideal in spaces where the original character is being restored or preserved.

University of Canterbury Registry, Christchurch

The BBR Contech team continues to be a key part of Canterbury's post-earthquake rebuild programme. Current work includes an FRP strengthening project at the University of Canterbury's Registry building – a 1970s, seven-storey structure that was damaged in the quakes and has since been assessed as earthquake-prone.

Our role includes completely enveloping the building's under-floor beams with two layers of FRP – a complex task that includes drilling up through the floors and installing Sika Through Anchors to complete the beam confinement. Adding to the challenge, one end of the building is open to the chilly winter air; as FRP can only be installed in very specific temperature ranges, the target areas have had to be encapsulated with tent-like structures to contain heat.

This work is just one of a number of BBR projects at the University of Canterbury, including epoxy injection and FRP strengthening in the SBS building and external concrete repair work at the University's 11-storey James Hight building – one of the largest post-earthquake remedial projects being undertaken in the city.

Fork Farm homestead, Wanaka

When Phill Hunt and Lizzie Carruthers decided to protect their historic homestead for future generations, they did it properly. Calling on structural and civil engineering firm Batchelar McDougall Consulting, they undertook a comprehensive upgrade and structural strengthening project that also involved the BBR Contech team.

The two-storey homestead is part of Fork Farm, a sheep, deer and beef farming



Client: University of Canterbury
Main Contractor: Hawkins Construction South Island Ltd
Engineer: Holmes Consulting Group

enterprise in Wanaka that's been in the Hunt family since 1928. It was built by Scottish stonemasons more than 100 years ago, when the farm was part of Wanaka Station, and the couple is determined to see it survive for another century and beyond.

Our work included installing 221m of Sika® CarboDur® plate into full-height vertical slots cut into the walls. Measuring 20mm wide and 1.2mm thick, the strips of carbon fibre were mounted close to the surface to provide a near-flush finish.

We also applied 60m² of SikaWrap®-930G glass-fibre fabric to the internal walls. This will help to hold the stonework underneath in place – ensuring a safe, and strong, home that should deliver the performance that Phill and Lizzie are looking for.

Client: Phill Hunt & Lizzie Carruthers
Main Contractor: Tony Higgins
Engineer: Batchelar McDougall Consulting



Huddart Parker Building, Wellington

An historic building in central Wellington has been given a new lease of life with an \$8 million structural, services and cosmetic refit.

The Huddart Parker Building, located in the heart of Jervois Quay, has been a distinctive city landmark since 1925, when it earned the title of being the largest reinforced-concrete building in New Zealand. Today it's recognised for its bold, Chicago-style design, and with great harbour views, expansive floor spaces and a 3.7m stud height on the upper storeys, it's well placed to become a premier business location.

The restoration programme aimed to refresh the building's interior and lift its seismic strength rating from 29% to 100% of the new building standards. It also recognised the beauty of the exterior – so in an innovative approach, the elegant façade has been preserved with the installation of a concrete frame inside its walls, which absorbs and dissipates seismic energy. The building's existing structure has also been strengthened: BBR Contech has installed FRP on the interior column joints, wrapping them completely to provide additional shear strength in case of earthquakes.

With the work now complete, new tenants are enjoying all the benefits of the seismic upgrade, as well as heating, ventilation and environmental features that incorporate the latest in design and safety techniques.

Client: Fruitgrowers' Charitable Trust
Main Contractor: LT McGuinness
Engineer: Dunning Thornton Consultants
Architect: Seddon Architects

BUILDING FOR NOW AND THE FUTURE

Post-tensioning technology has been taken to new heights (literally) in some exciting new projects that deliver design innovation, construction excellence and long-term performance. Whether installed for strength or style – or both – it’s proving a solution of choice for clients, developers and construction professionals nationwide.

Point Resolution Bridge, Auckland

“The view is stunning, the artwork is beautiful. The design is sleek, graceful and refreshing.”

That’s a comment from one very impressed commentator on a brand-new footbridge gracing Auckland’s waterfront – a project in which BBR Contech was delighted to be involved.

The new Point Resolution Bridge replaces one originally built in two sections (in 1927 and 1972) to connect Tamaki Drive with the Parnell Baths. When engineering experts assessed it as in urgent need of refurbishment owing to corroded steelwork, the powers-that-be went looking for a long-term solution. The result is this glorious new structure, designed by award-winning architecture firm Warren and Mahoney.

The bridge is made up of three connected precast post-tensioned concrete beams – a hull-like shape that connects it to the harbour and yachts beyond – which is threaded through a delicate painted-steel structure of three sculpted arches connected by simple glass balustrades. Both the deck and the balustrades provide a palette for specially commissioned artwork that incorporates ‘pungarungaru’ (ripples on the water).

The bridge’s elegant simplicity belies the complexity of the project behind its construction. Wilson Precast managed the process of integrating the detailed artwork into the precasting moulds, coordinating all aspects of the fabrication and then finally getting the 90-tonne beams transported to site ready for lifting – no small feat.

“It was enormously challenging,” says Duncan Peters, a Director of Peters & Cheung, the bridge’s design engineers. “Here were these enormous, incredibly heavy concrete beams being held up by virtual



Client: Auckland Council
Main Contractor: Hawkins Infrastructure
Precaster: Wilson Precast
Engineer: Peters & Cheung
Architect: Warren & Mahoney

toothpicks – how could we ensure that the structure could be built, let alone stay stable and survive a disaster such as an earthquake?”

Duncan says that great teamwork was key to the project’s success, especially given a construction timeframe of just 12 months. That included working with Wilson Precast and BBR Contech to ensure integrity in the concrete beams through a comprehensive post-tensioning process.

The work started off-site, where the three precast beams were post-tensioned using tendons of between 22 and 25 strands, each 15.2mm in diameter. The beams were stressed in Wilson Precast’s yard using our brand-new 700-tonne jack, with the largest beam stressed to 460 tonnes.

“It was critical to get this process right,” says Duncan. “Fortunately we’ve worked with BBR Contech before, so we knew they’d deliver. It’s a credit to the whole team that this very complicated project went so well.”



Wilmers Road reservoir, Christchurch

The Christchurch suburb of Hornby is changing rapidly, largely owing to residential and industrial growth that's being encouraged as part of a long-term community plan.

Recognising that the community needs an additional water supply, Christchurch City Council has built a new water supply pump station in the area. The facility comprises a pump station and a freshwater holding tank, with the latter having a capacity of more than 3.7 million litres.

BBR Contech was called on to provide post-tensioning services for the precast concrete panels that form the tank wall – a huge structure standing 6m high and measuring 31m in diameter. The work involved:

- supplying the panel manufacturer with ducting for the tendons, which was cast into the panels
- once the panels were assembled on site, coupling the ducting and carefully installing the 11 tendons – comprising seven 12.7mm strands each – horizontally in the panels, effectively encircling the tank's circumference
- stressing the tendons to the desired load, then grouting them in place.

The project is now complete, providing the residents and businesses in the area with a much-improved water supply, and a structure that, thanks to the use of post-tensioning technology, can withstand the damaging forces of an earthquake.

Client: Stronger Christchurch Infrastructure Rebuild Team

Main Contractor: Downer

Engineer: Opus International Consultants

The 'Cardboard Cathedral', Christchurch

You won't find many new cathedrals built for just \$5 million these days, but in Christchurch they've done just that – and earned widespread acclaim to boot.

The new 'Christchurch Transitional Cathedral' (known as the Cardboard Cathedral) was commissioned after the devastating 2011 earthquakes that left the iconic Christchurch Cathedral severely damaged. The man behind the design was Shigeru Ban, a Japanese architect who's most well known for his innovative work with paper.

Ban's influence is clear in the new structure: mounted on a foundation of shipping containers, its walls and ceiling feature 320 cardboard tubes, each 600mm in diameter and 20m long. The tubes are protected by a polycarbonate roof and held in place with LVL (laminated veneer lumber) beams, which have been mounted on a structural steel frame. It's this last element that bears the mark of BBR Contech, because the braces for the frame are Macalloy 56mm-diameter tendons, complete with a fork, pin and locking cover at each end.

The Cathedral officially opened in August. Capable of seating 700 it's not, as its name might imply, a temporary structure. With a design life of at least 50 years, it will become a key feature of Christchurch's new architectural landscape, welcoming the community for church services, concerts, exhibitions and other public events.



Client: Christchurch Cathedral

Main Contractor: Naylor Love

Engineer: Holmes Consulting Group

Structural Steel Subcontractor: East Coast Steelwork

Networking opportunity for BBR Contech team

What started out as a really good idea became a reality in August, when BBR Contech attended a project managers' workshop with its Asia-Pacific colleagues in the BBR Network – with representatives from BBR VT International, based in Zurich, as facilitators.

Held in Brisbane, the workshop was attended by project managers from New Zealand, Australia, Singapore and Malaysia. Comprising three days of presentations, discussions and site visits, it was an opportunity for the group to share their experiences of the Asia-Pacific marketplace, discuss the similarities and differences in our work, and learn about the latest innovations in post-tensioning equipment from the Zurich team.

"It was a really valuable experience," says Rhys Rogers, Structural Engineer – R&D and Design, who joined us earlier this year and was one of the Kiwi team of six who attended the workshop.

"I enjoyed meeting the Asia-Pacific crew, learning about their perspectives and talking through the challenges and opportunities of our different businesses. It was also useful to hear about the European perspective from the BBR VT guys, and discuss ways in which we could improve the supply lines between them and us."



DIVERSITY IN PRESSS TECHNOLOGY

PRESSS (Precast Seismic Structural System) technology is taking New Zealand by storm, especially in Canterbury as part of the post-earthquake rebuild programme. Suited to steel, concrete and LVL (laminated veneer lumber) structures, it delivers protection against serious earthquakes while minimising seismic damage and the associated costs of smaller tremors.

Trimble Navigation offices, Christchurch

While Trimble Navigation's Christchurch office survived the 2010 and 2011 earthquakes, it wasn't destined to last for long: in 2011 the entire building was destroyed by fire.

Replacing it will be the first building in New Zealand constructed with post-tensioned LVL frames and post-tensioned LVL walls. Standing two storeys high, it will also include clever devices that reduce earthquake damage by dissipating the energy and controlling movement in the structure itself; and beam column joints with forced rocking points, which control joint movement and damage. The energy dissipators can be easily replaced after an earthquake, providing economical repair alternatives.

BBR Contech's role is to post-tension the building's nine LVL shear walls and 19 horizontal LVL beams. That means:

- installing 54 Macalloy 50mm-diameter bar tendons vertically through the walls, and connecting them to screw piles that terminate in the gravel layer
- installing six multi-strand, 15.2mm tendons in each beam. The tendons are greased and sheathed to protect against corrosion, and the ends are wrapped in Denso Tape and capped to provide an additional barrier against the elements.

In another innovation, the building's strength will be constantly monitored, with tendons easily removed and replaced if necessary. The project, and its impressive commitment to earthquake resistance, is already earning accolades: it won a 'highly commended' award in the 2012 Timber Design Awards.



Client: Birmingham Drive Properties Ltd
Main Contractor: City Care Limited
Engineer: Opus International Consultants

New office development, Addington, Christchurch

A three-level commercial building overlooking Addington Raceway in Christchurch has been constructed using PRESSS technology and post-tensioned concrete shear walls, and includes replaceable energy dissipators and self-centring mechanisms.

In this project BBR Contech began by supplying Macalloy 50mm starter bars, which were cast into the building's foundations. Then, once the precast walls had been installed, we coupled to the starter bars and tensioned 16 full-height Macalloy 50mm bar tendons. The tendons were tensioned from the top and left unbonded; this means that, should another significant earthquake strike, the load can be easily and quickly tested and, if necessary, adjusted.

Architecturally designed to meet 100% of the new construction standards, the building has the ability to resist a one-in-2,500-year seismic event with no additional structural expense.

Police station, Rotorua

Police officers serving in the Rotorua area will soon be based in a brand-new police station – and not a moment too soon according to those working in the existing premises.

The two-storey station is being constructed using PRESSS technology, with tensioning cables installed in the concrete shear walls, beams and columns to allow it to move in an earthquake without sustaining serious damage.

For this project the BBR Contech team is installing 62 BBR VT CONA 12-strand, greased and sheathed tendons into the precast walls.

The station is due to open in March 2014, offering an environment eminently suited to modern-day policing while reflecting the unique features of Rotorua, particularly the prominence of Māori art and culture.



Client: NZ Police
Main Contractor: Canam Construction
Engineer: Spiire



Client: NZ Metropolitan Properties Ltd
Main Contractor: Armitage Williams Construction Ltd
Engineer: Kirk Roberts Consulting Engineers Ltd

Kilmore Street Medical Centre, Christchurch

Thought to be the first building in New Zealand to use PRESSS technology for a steel structure, the Centre is being built using four pairs of structural steel frames, each vertically post-tensioned to the foundations with unbonded, high-strength steel bars. The frames are able to rock during earthquakes, with the post-tensioning providing a restoring force to help the building to return to centre.

The steel bars, at 75mm in diameter and 4,300 kN capacity, are the heaviest in the Macalloy range. Four of these tendons (factory-wrapped in Denso Tape to resist corrosion) have been fed into each steel frame, coupled to 75mm starter bars already cast into the foundations and tensioned at the top using a pair of 300-tonne jacks.



Client: Nobby Holdings Ltd
Main Contractor: Fletcher Construction
Engineer: Alan Reay Consultants
Structural Steel Subcontractor: John Jones Steel

GROUNDING IN EXCELLENCE

The growing demand for post-tensioned concrete floors is keeping the BBR Contech team busy. While the projects are diverse – from warehouses to function rooms – the benefits remain the same: smooth, hard-wearing, easily maintained surfaces that deliver strength and performance in the toughest of environments.



Air Force Museum of New Zealand, Wigram, Christchurch

The Air Force Museum of New Zealand is home to a superb collection of military aviation memorabilia, fully restored aircraft, such as the Havilland Vampire, Supermarine Spitfire and P-51 Mustang, to medals and parachute-silk wedding dresses.

In February this year the Museum celebrated a major milestone – the official opening by the Governor-General of a \$15 million, 6,500m² extension designed by Warren and Mahoney. The new 'Technology Centre', which effectively doubles the Museum's original size, includes an elegantly spacious, hangar-styled display gallery, a large restoration area and a number of workshops.

BBR Contech was involved in two floors in the Museum. The first was the floor in the display gallery – a 200mm-thick, 4,200m² expanse of post-tensioned, water-pipe-heated concrete, which was poured in two consecutive days. Created on a gentle slope, the floor has the strength to hold the 130kN axle load of a Bristol Freighter, with a smooth finish and comfortable ambient temperature to suit the room's role as a venue for displays and public functions.

The second post-tensioned floor, spanning 983m², was installed in the workshop area. Combined, these two projects have helped the Museum to improve both its public face and the working environment it provides for those responsible for its fascinating restoration projects.

Client: RNZAF Museum Trust Board
Main Contractor: Mainzeal Property & Construction
Flooring Contractor: Conslab Ltd
Engineer: Alan Reay Consultants

ABC Tissue warehouse, Wiri, Manukau City

ABC Tissue is a leading manufacturer of high-quality tissue products, including toilet tissue, facial tissue, kitchen towels, serviettes and a number of specialist tissue products in the commercial sector.

With business growth requiring it to increase its storage capacity, the company has added a new warehouse to its existing building in Wiri – and BBR Contech has created the post-tensioned floor.

Spanning a total 10,400m², the floor was created in four pours in two consecutive days, following the same pattern as that used in the Cardinal Logistics project. The result: a smooth surface for forklifts and other equipment in this busy warehouse environment.



Client: ABC Tissue
Main Contractor: Ebert Construction
Flooring Contractor: Conslab Ltd
Engineer: Brown & Thomson



Fonterra plant, Darfield, Canterbury

BBR Contech has recently completed a massive post-tensioning project for Fonterra – New Zealand's biggest company and the world's largest exporter of dairy products.

Working with main contractors Calder Stewart Industries and Ebert Construction, we installed a number of post-tensioned slabs for the new milk-processing plant at Darfield, 45 kilometres from Christchurch. The work included:

- drystore warehousing and load out areas, which were built in two stages (Stage 1, 18,000m², Stage 2 - 32,000m²)
- two packing stores (3,750m²)
- an external heavy-duty pavement area Stage 1 (5,562m²) and Stage 2 extension to service a full railway siding adjacent to the latest warehouse (14,500m²).

The project was staged to enable the earliest use of the new plant. It's now processing about 6.6 million litres of milk a day, producing high-quality whole-milk powder for markets such as the Middle East, Southeast Asia and China.

BBR Contech has undertaken 10 Fonterra projects comprising a mixture of warehousing and heavy-duty load-out aprons in the past six years, with a total floor area approaching 150,000m².

Client: Fonterra Co-operative Group Ltd
Project Manager: Babbage Consultants Ltd
Consultants: Connor Consulting – Drystore & ELAs, Opus International Consultants – Pavements, Silvester Clark – Packing Stores,
Main Contractors: Calder Stewart Industries Ltd (Drystores & External Pavements), Ebert Construction (Packing Stores)

Kapiti Landing business park, Paraparaumu

A new business park on the Kapiti Coast is set to boost the local economy and attract more businesses and visitors to the area, which is already experiencing significant growth.

Appropriately called Kapiti Landing (it's right next door to Kapiti Coast Airport), the new development has been designed to include 10 new buildings, including a retail-commercial block, a service station, a central hub featuring offices, shops, restaurants and bars, and a covered

boulevard area for a weekly farmers' market. Plans also include walking and cycling paths, outdoor artworks and more than 4,000 car parks. BBR Contech was engaged to carry out the post-tensioning component of four jointless floors for the retail-commercial block, which will house a supermarket and three retail stores. Covering 6,300m² in total, the floors were completed in four pours using approximately 1,000m³ of concrete.

Each floor had unique specifications, with different finishes and a wide range of cabling and other infrastructure requirements. The supermarket space alone required about 160 penetrations in the floor to allow for power, water, IT, heating and refrigeration connections. During construction of the slabs a large number of contractors were on site, requiring careful scheduling and considerable teamwork.

One interesting characteristic of the floors is that even though they are built at 'ground level', the slabs are actually suspended on piles as the sandy ground underneath lacks the bearing capacity necessary for their indented use.

Client: Kapiti Coast Airport Ltd
Main Contractor: Hawkins
Flooring Contractor: Conslab Ltd
Engineer: MSC Consulting Group



Cardinal Logistics warehouse, Wiri, Manukau City

A tight timeframe – and therefore the presence of a lot of other contractors on site – made this job a logistical challenge for the BBR Contech team. However, efficient planning and good relationships got it done on time, which means Cardinal Logistics is on track to move in soon to its new warehouse in Wiri.

With a total 20,000m² of floor space, the warehouse will be a key storage asset for this large warehousing and distribution business – and BBR Contech has ensured a smooth, strong durable and easily maintained post-tensioned surface for all those forklifts.

The floor was laid in eight pours to create four slabs, coupled in pairs with an opening joint down the middle length. Between pours (which were about two weeks apart), the tendons in each completed slab were stressed and the strands cut, then the pockets were sealed and filled with grout. The pressure was on, with the other subcontractors waiting in the wings!

Client: Cardinal Logistics
Main Contractor: Haydn & Rollett
Flooring Contractor: Conslab Ltd
Engineer: MSC Consulting Group

RESTORING MARINE INFRASTRUCTURE

It may well look benign, but water can be incredibly tough on concrete and metal structures, corroding surfaces and seriously shortening service lives in the process. Fortunately there are ways to repair and protect these structures – keeping them operational, and serving their communities, while protecting the aquatic environments that surround them.

Victoria Wharf, Devonport, Auckland

A \$24 million transformation underway in one of Auckland's most popular harbour-side suburbs includes a major redevelopment of its marine gateway.

First settled in 1840, Devonport is one of the oldest settlements in Auckland, and today is known for its charming village lifestyle and gracious villas. It's a popular visitor destination, especially as it's easily accessible via a short ferry ride from downtown Auckland. The wharf is just a short walk from Devonport's main shops, cafes and waterfront esplanade, and a key feature of this historic area.

Auckland Council's \$24 million investment aims to protect Devonport's unique character and public places, with a new \$7.8 million library, streetscape layout reconfigurations, infrastructure upgrades and a major redevelopment of the wharf area. That includes Victoria Wharf, which sits alongside the ferry terminal at Devonport Wharf.

Built in 1929 in the days of car ferries and cargo ships, Victoria Wharf has more recently become a popular fishing spot. However, since September 2012 it's been closed to the public, owing to a steady and now serious decline in its condition.

BBR Contech is helping to repair the wharf as part of a design-build consortium with Downer and design engineering firm Peters & Cheung. Our appointment to this high-profile project reflects both our extensive experience with this kind of work and our innovative approach to developing the design solution. We were also able to commit to the tight timeframe of just 12 months for completion, and a strict budget limit of \$6 million.

Now underway, the project involves removing deteriorated concrete from the piles and braces underneath the wharf, installing new reinforcing bars, extending the pile reinforcing and constructing a new



Client: Auckland Council
Main Contractor: Downer
Engineer: Peters & Cheung

decking slab on top of the existing surface. When the wharf reopens in 2014, it will be a significant commercial and recreational asset for the village, the surrounding community and the thousands of people who visit each year.



Client: Port of Napier
Engineer: Port of Napier

Port of Napier, Hawke's Bay

One of the Port of Napier's multi-purpose wharves is getting a spruce-up to ensure it continues to perform for many years to come.

The 50-year-old, 300m-long wharf is used by cruise ships and for loading and unloading cargo and fuel. It's an important feature of the port's operations, which include exporting apples, pears, stone-fruit and grapes, as well as large amounts of sheep wool, frozen meat, wood pulp and timber.

The wharf's beams and piles have gradually deteriorated with time and the corrosive forces of the sea. Our role is to remove the defective concrete using hydro-demolition then dry-spray gunite onto the exposed surfaces. Our challenge, as always with this kind of work, is to gain access to the affected areas – which means keeping a careful watch on the tides and the shipping activity around the port.

Kaikorai Estuary Bridge, Dunedin

BBR Contech has recently installed a self-monitoring cathodic protection system on Dunedin's Kaikoura Estuary Bridge – an important commuter link between the city and the coastal community of Brighton.

BBR Contech recommended that Dunedin City Council use the system as an effective way to address significant deterioration in the bridge's reinforced concrete, particularly in the pier heads, longitudinal beams and deck soffit. Using a low-voltage electrical current (too weak to be sensed by human touch), it attracts corrosion-causing chloride particles away from the reinforcing steel and on to sacrificial strips of zinc, which will corrode instead.

The project was completed ahead of deadline and under budget – two factors that, combined with effective traffic control and our efforts to protect the estuary's wetlands ecosystem, earned BBR Contech some very positive feedback. The Council has also indicated that it's likely to use the system on other bridges in the region in future.

It's a solution that makes good economic sense. Given that it's expected to extend the bridge's life by 25 years, for a cost of about \$760,000, it's a much more attractive alternative to the estimated \$2.5 million to replace it altogether!

Client: Dunedin City Council
Engineer: MWH



Ferrymead Bridge, Christchurch

A 'lifeline' bridge in Christchurch is being replaced with a completely new one that, in this post-earthquake environment, will be stronger and safer than ever before.

When the 6.3-magnitude earthquake struck Christchurch on 22 February 2011, it caused significant damage to the Ferrymead Bridge – a crucial connection between the city and the eastern suburbs and port of Lyttelton.

Securing work immediately after the earthquake enabled the bridge to be returned to use and resist further damage from aftershocks. However, further investigations revealed the true extent of the damage, as well as liquefaction in the bed of the Heathcote River below. After considering the options of repair or replacement, Christchurch City Council decided to build a new bridge, which will meet 100% of the new building standard.

The project is considered a top priority for the city, as the bridge carries about 30,000 vehicles a day (many with overweight and over-dimension loads), serves 11,000 people and carries vital water, wastewater, power, phone and other services.

Temporary bridges and approaches have now been built and the old, damaged bridge demolished, and construction work has begun on the new structure. The total project cost, including the securing works and the previous widening and strengthening contract, is about \$30 million.

The Council is taking a collaborative design approach, which includes its own design staff, Opus International Consultants, HEB Construction and BBR Contech. We're involved in the pile installation component for the new bridge – a difficult and complicated job that's required innovation and teamwork, especially in addressing the many risks involved, not least of which is another earthquake.

Given the ground conditions at Ferrymead, the piles – comprising a permanent steel casing filled with reinforcing steel and concrete – are being drilled approximately 26m through water and silt into the underlying bedrock; three at each abutment measuring 1.1m in diameter and four at the mid span pier at 2.4m. To ensure they're well secured into the rock, we're drilling down beside the piles and, in two stages, injecting high-pressure grout to fill the cavity formed between the casing and the surrounding rock during the piles' excavation.

The project is likely to take about 15 months to complete. Comprehensive environmental risk management is being employed to protect the estuary and river environment during this time.

Client: Christchurch City Council
Main Contractor: HEB Construction
Engineer: Opus International Consultants
Specialist Drilling: PRO-DRILL

TUNNELLING IN WELLINGTON

If you've ever travelled between Wellington city and the airport, you've probably been through the Mt Victoria tunnel – and maybe even participated in the symphony of tooting horns that's long been customary practice. With more than 620m to cover, there's plenty of time to raise a tune!

Opened in 1931, the tunnel was the first road tunnel in New Zealand to be mechanically ventilated. The technology remains an important feature today, as the tunnel's now a thoroughfare for about 45,000 vehicles a day, not to mention hundreds of pedestrians and cyclists.

Given the tunnel's role as a vital part of State Highway 1, it's important to keep it in top condition. That's why BBR Contech is working there right now, strengthening the concrete walls at its entry and exit portals.

The project will anchor the walls in place to reduce the risk of damage or collapse in an earthquake. A complex undertaking given the weak ground conditions at the site, it involves building a concrete beam to link the anchors through the walls, adding steel as extra reinforcing, installing the anchors, and cementing them in place with high-pressure grouting to ensure a firm, long-lasting bond.

Fortunately the work has had minimal impact on those using the tunnel, and thanks to some careful screening the workers are no distraction for drivers. Noise and traffic management plans are also helping to reduce the effects for those in the neighbouring community, while a communication strategy ensures that those directly affected are kept up to date on progress.



Client: New Zealand Transport Agency
Engineer: Opus International Consultants

ENHANCING OUR MARINE SERVICES

BBR Contech's specialist expertise in rehabilitating marine structures has been boosted with a new product range that's now available to our clients.

Manufactured by one of the world's leaders in corrosion prevention and sealing technology, Denso SeaShield Marine Systems are a great complement to the products and techniques we already offer our clients. They're particularly suited to repairing and strengthening bridge and wharf piles, whether they're constructed of steel, concrete or timber.

The Systems use a combination of fibreglass jackets and epoxy grout, and comprise two key products:

- The SeaShield Series 400 System protects timber piles from saltwater environments and marine borers, while also strengthening deteriorated piles with durable, lightweight and non-corrosive reinforcing materials. It's has been shown to double the strength of the original piles and offers a long maintenance-free service life
- The SeaShield Series 500 System can be applied above or below the waterline, either with inexpensive equipment or poured into the pile jacket. Tough and durable, it provides the ultimate protection in restoring steel, concrete and timber piles.

We're planning to host demonstration days so that our clients can see how the Denso SeaShield Marine Systems work in practice – but if you'd like to know more about them in the meantime, please contact a BBR Contech office near you.



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