

Lessons learned from one of New Zealand's most challenging civil engineering projects: rebuilding the earthquake damaged pipes, roads, bridges and retaining walls in the city of Christchurch 2011 - 2016.

Safety first – thanks to Bill Perry

Story: Bill Perry Safety Awards

Theme: Programme Management

A document which describes the purpose of the Bill Perry Safety Awards and outlines each winning submission.

This document has been provided as an example of a tool that might be useful for other organisations undertaking complex disaster recovery or infrastructure rebuild programmes.

For more information about this document, visit www.scirtlearninglegacy.org.nz



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Safety first – thanks to Bill Perry

Contractors' outstanding safety performance initiatives were recognised by SCIRT. Many of the initiatives acknowledged by the Bill Perry Safety Awards were adopted across the construction industry.



Bill Perry: A powerful force for workplace safety across the industry.

Safety was paramount for both SCIRT and senior construction industry figure **Bill Perry**.

The Bill Perry Safety Awards recognised the fundamental importance SCIRT placed on safety throughout its five-year programme.

The awards were named after Perry, a former Fulton Hogan chief executive and original SCIRT board member, who died suddenly in 2011.

Perry had a fierce commitment to workplace safety in construction. He was focused on ensuring that everyone who worked on the horizontal infrastructure rebuild, and the public, were kept safe.

Perry helped establish a “zero harm” culture at SCIRT, via key performance indicators (KPIs). These included “safety conversations”, near miss reporting, hazard reporting, safe acts audits and safety initiatives.

The Bill Perry Safety Awards recognised outstanding safety initiatives that had the potential to impact on organisations across SCIRT or the wider industry.

They awards were presented each quarter.

Below are the main award winners and several runners-up and “highly commended” entries.

Proactive traffic management (2011)

City Care's Traffic Management Team picked up the inaugural safety award.

Good traffic management on any worksite was critical to the safety of both workers and those people travelling through the area. The team undertook a large number of recorded safety conversations as part of its “Behave Safe” programme. Team members showed that more safety conversations corresponded with a reducing rate of injuries over a six-month period.

City Care's Traffic Management Team also highlighted a concern over drivers speeding through worksites, and helped to develop a solution.

Protective permit to excavate (2012)

The MacDow Fletcher team was recognised for the development of the “permit to excavate” process.

Contractors and SCIRT agreed that there was room to improve after several excavations inadvertently struck key underground services. The MacDow Fletcher team was dedicated to reversing the trend by revising the process. The results were excellent, with a big reduction in strikes. The revised permit was adopted by SCIRT as a standard requirement for all sites.

Innovative protection under pressure (2012)

Barrs Ltd, a subcontractor of Fulton Hogan's Infrastructure Rebuild Team, was recognised for safety innovation: a method of pressure-testing sewer main renewals from ground level.

Specially designed and resourced pneumatic plugs were lowered into manholes and inserted with a custom-made tool. The pressure test was controlled

from ground level and the plug removed. Plugs were available to cover pipes from 100 millimetres to 600 millimetres in diameter. This meant there was no need for workers to enter sewers. It avoided the hazard (of confined spaces), and improved safety and saved time. Productivity was boosted by cutting out lengthy preparation for confined space work.

A second initiative used a safety railing for trench shields. This robust, clip-on device protected workers from falling into a trench, as well as having an extension to the internal ladder to make trenches easier to access. A hinged gate could be closed during work breaks to secure the trench.

Third, with regard to the high electrical hazard posed by overhead lines, Barrs sourced a fibreglass automatic measuring pole to measure clearance spaces for trucks and other big machinery on worksites.



Protective shield: A worker uses trench safety railings.

Trailer aids pipe monitoring (2012)

Pipe profiling was a key part of SCIRT's work, alongside obtaining CCTV footage of pipes.

Pipe profiling measured the ups and downs of underground pipes between manholes. A device was sent through the pipe. It sent depth readings back to the profilometer trailer to help determine the appropriate level of repair for each length of pipe.

The Geotechnics Pipe Monitoring Team designed its

own trailer to house a pipe profilometer, eliminating the need to lift the pressure machine on and off the truck for each pipe assessment. The trailer covered the manhole, protecting technicians from traffic as well as providing protection from the weather. The team also designed an ingenious manhole hatch in the trailer's floor that eliminated the risk of slipping or falling down an open manhole. The handrails and non-slip floor surface were further safety features.

At the water-jet end of the operation, the nozzle extension was redesigned to reduce the instances of "blowback" that property owners might experience.

By designing a rigid extension, the nozzle was unable to bend into a private property lateral pipe.



Trailblazers: An innovative pipe profilometer trailer boosts site safety.

Underground surgical precision (2012)

Drain Surgeons carried out CCTV operations, including investigative work, videoing wastewater and storm water systems and identifying issues caused by the earthquakes in preparation for repairs.

This work was often carried out during 24-hour operations on multiple sites and manholes, often in the middle of the road, requiring traffic management.

Drain Surgeons introduced several safety innovations to eliminate or isolate workers from any hazards, including a modified snowboard to transport equipment over silty ground.

Mentors matter (2013)

Barrs Ltd, a Fulton Hogan subcontractor, was recognised for innovation in safety and staff health and well-being.

The firm worked with other subcontractors, such as Ryan Contracting, to improve the safety culture.

Barrs also supported a one-person operation company, Enviroclean, to buy new machinery for hydro excavation and pumping.

Electronic permit (2013)

Fletcher initiated a new programme after an investigation to understand and eliminate service strikes. The company developed an electronic “permit to excavate” that did not allow engineers to continue until all steps were completed.

Bridge to zero harm (2014)

Fulton Hogan was recognised for work on the Bridge Street Bridge, a challenging site that achieved “zero harm” for 20 months.

Fulton Hogan demonstrated safety performance, embedded policy and procedures on-site and selected contractors not just on value for money but on their commitment to safety. The company communicated openly with contractors, agreeing on methodologies.

These included inspecting the pier head and piles for damage, working with the river/estuary tidal conditions, the jacking of the bridge, and the demolition of the western abutment (bridge deck).

Work-around services (2014)

The Downer team in the central city spent a lot of time and energy focusing on “working around services”.

The key areas of their progress included improving and developing processes, implementing initiatives, tracking performance, and sharing lessons.

Telescopic leg edge (2014)

The team at Downer worked to come up with a cost-effective solution to improve safety and awareness

around excavated trenches to improve fall and edge protection.

No obstacle to safety (2015)

City Care’s Training and Development Facility, an obstacle course about safety, was hailed as a safe and controlled environment where crews could learn about potential risks on a construction site.

City Care developed a range of training modules in consultation with experts.

The training facility balanced theoretical and practical hands-on learning.

First, safe practice was taught in a classroom environment. Then trainees moved to the physical course, a series of mock construction sites, to put what they had learnt into practice. Modules covered critical risks and included working around live services, in confined spaces, at height and depth, with powered plant and tools, around mobile plant and lifting operations, and in trenches and excavations.

Other contractors, including City Care’s subcontractors and SCIRT’s other delivery teams, also used the training facility.

The confined space facility was recognised as one of the best in New Zealand. The New Zealand Fire Service regularly used the site for rescue training.



Reach new heights: City Care’s safety-focused Training and Development Facility.

Memorable arch work (2015 runner-up)

Downer utilised several safety initiatives to minimise the time a crew member would have to spend working inside the narrow columns of the Memorial Arch.

These included using 3D imaging to verify the internal and external measurements of the arch. Normally, this would involve accessing the hollow columns from above, the tallest of which was 13 metres, with a construction worker being suspended from ropes.

Downer also used a modified hand-held jaw crusher to remove concrete slabs from inside the columns. This method also reduced the need for crew to enter a confined space. Work in confined spaces could not always be avoided. The crew needed to access the base of the structure to remove some concrete from inside the columns. A rescue plan was trialled with the help of a dummy specially created for the job.

The trial was successful, confirming the right procedures were in place to ensure the safety of crew members when working in the confined space.



Concrete approach: A remotely operated hydraulic jaw crusher has proved invaluable for tight spaces.

Robotic cutting edge of health and safety (2015)

Hydro demolition robot “Geo” provided safer, faster results for SCIRT’s McConnell Dowell team working on the Southern Relief project. The wastewater trunk main was significantly damaged in the earthquakes.

Using high-pressure water in a confined space at the

flow rate required to carry out the repairs combined with using a long handheld lance would pose a serious risk to an operator’s safety. The solution was the purchase by CTNZ (Concrete Treatments NZ) of an automated robotic hydro excavation tool. “Geo” had the ability to be used remotely, replacing handheld lancing. The robot’s compact nature allowed it to enter and repair the box culvert safely and efficiently.

Using “Geo” meant that crew members weren’t placed in an unsafe position to deal with flying concrete debris in a restricted space. The robot was the only one available in the southern hemisphere.



Crowd pleaser: “Geo”, an automated robotic hydro excavation tool, on show at a primary school.

‘Good to Go’ safety video (2016)

City Care was recognised for its “Good to Go: Working Safely Around Services” video and supporting reference guide.

The City Care video and guide was developed for the company’s internal teams and subcontractors to encourage greater safety practice. Service strikes were a risk across the SCIRT programme.

A professional film company was engaged and City Care sites, crews and equipment were used for the filming. The video was based on the SCIRT working around services guide, using the same sequence of steps as a real task in the field.

The material was shared with other SCIRT delivery teams and the video was included in Environment

Canterbury's Builders Pocket Guide online site.

The video can be viewed at:

<https://www.youtube.com/watch?v=2maRcxFQ0go>

Bank on protection (2016 highly commended)

Fulton Hogan built an embankment (known as a bund) to protect McCormacks Bay Road properties from possible slope stability issues.

The bund was made of wire baskets filled with gravel and soil, with coconut matting on the external face, and at its highest point reached 15 metres up the slope.

Before the construction work could begin, the risk of rockfalls prompted the team to come up with an award-winning safety initiative. The progressive fall protection system protected workers while the bund was created.

As each layer of the bund was constructed, the fall protection system was extended upward so the workers were always protected.

The bund provided the neighbourhood with protection from slope stability issues. Christchurch City Council landscaping also meant the bund provided protection for the residents and blended into the landscape.

Mobile platforms (2016)

SCIRT's Fletcher Delivery Team devised an innovative solution to the risk of flooding during the complex heritage project of repairing and strengthening the 130-year-old Gloucester Street Bridge.

Initially, traditional scaffolding with a boarded and sealed deck was to be used for access and environmental protection under the bridge while the team worked. Protecting the environment was important as the paint on the original cast iron bridge girders contained lead which had to be removed.

Early in the construction phase, a risk assessment identified an increased chance of the Avon River flooding from debris carried in the water flow which could become trapped around the legs of the scaffolding deck. This could have restricted the flow and led to flooding of public areas around the bridge.

The team decided to substitute most of the scaffolding

with four mobile work platforms running on rails placed on top of the remaining scaffolding. The mobile platforms did not require supporting legs into the river and so allowed the river to flow freely underneath.

The mobile platforms could span the river and move on the rails back and forward across the width of the bridge. They had built-in kickboards and safety rails around the edges and could be efficiently and safely removed in about 20 minutes if there was a flood risk.

The mobile platforms were designed to collect any environmental contamination and prevent it from entering the river.

For the removal of the lead paint and the repainting of the cast iron girders, the bridge was wrapped in plastic which prevented air dispersion of the lead, and kept the area warm and moisture out. The debris left by the garnet blasting of the girders was removed by vacuum suction and manual sweeping.



Bridging a need: A mobile work platform in operation at the Gloucester Street Bridge.

Hydro excavation safety guide (2016)

Best practice guidelines for the critical risk area of hydro excavation were unavailable.

McConnell Dowell developed a guide for managing risks from high-pressure water jets/hydro-excavation.

This led to the tactical group representing hydro excavation companies developing the SCIRT Delivery Guideline for Working Safely at Heights during Hydro Excavation.