

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.

Canterbury Heritage Awards application

Story: Bridge of Remembrance and Memorial Arch

Theme: Construction

A copy of the award application for the Canterbury Heritage Awards 2016.

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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Canterbury Heritage Awards application

1. Name of project/Attraction: Saving Christchurch's Triumphal Arch
2. Number of Structures/buildings: 1
3. Location of Project/attraction: Cashel Street, Christchurch
4. Type of project: Structure
5. Please provide 20 to 30 words briefly summarising your organisation and project:

SCIRT is in the final year of its \$2 billion programme repairing Christchurch's earthquake damaged infrastructure. Damaged and at risk of collapse, SCIRT strengthened the city's iconic Triumphal Arch, while retaining its beauty.

[Provide a description of pertinent work and tell us why this project merits a heritage award (400 words maximum). Refer to media clippings, letters of support and other relevant material illustrating the project or achievement.]

Spanning the Avon River in the heart of the city, the Bridge of Remembrance and Triumphal Arch were built in 1924 as a monument to commemorate those New Zealanders lost in the First and Second World Wars and subsequent conflicts overseas. The Monument is both locally and nationally significant and has Category 1 Heritage status with NZHTP and is listed as a Group 1 Heritage Structure by CCC.

The iconic Arch structure was damaged by Christchurch's 6.3 magnitude February 2011 earthquake and was assessed to be at risk of collapse from earthquakes. Fenced off from the public, the structure was no longer able to serve as a pedestrian gateway to the city, or provide visitors and Christchurch people with a close up, personal opportunity to honour the fallen.

SCIRT's \$6.7 million project to restore the earthquake-damaged war memorial was fully supported and funded by the Christchurch City Council and Government.

SCIRT's engineers worked closely with the Christchurch City Council, CERA and Heritage New Zealand, to design repairs that would save and strengthen the 360 tonne, 14 metre high, 20 metre wide Arch and make it more resilient to ensure it would remain standing for future generations.

The challenge for the SCIRT team was to strengthen the structure with minimal impact on the heritage fabric and appearance. This was achieved by adopting an innovative form of base isolation utilising rocking, which significantly reduces earthquake forces on the structure. Significant modifications to the articulation of the structure were made to allow this rocking action to occur in any direction.

SCIRT's Downer Delivery Team arrived on site in May 2013 and strengthening took two years of complex work to complete. The original foundation for the structure was only three metres deep. SCIRT's repairs involved boring 32 new, micro-piles to a depth of 25 to 30 meters. Rather than the old, rigid structure prone to damage in seismic activity, the new design incorporated an octagonal rocking collar laced with reinforcing bars that connected each end of the Arch to the micro-piles.

The rocking collars allow the Arch to rock backwards and forwards in response to ground movement. Sliding joints were installed in the top of the three arches to allow the arch to move from side to side. Giving added stability, the hollow interior was then filled with both steel columns and concrete increasing the weight of the Arch to 470 tonnes. These new features combine to allow the structure to move in a controlled manner if there is a seismic event and reduce the likelihood of major damage.

This was a complex piece of work that involved a considerable amount of risk. The strengthening efforts involved work inside the confined space of the Arch for SCIRT's specially trained contractors and the crew had to work meticulously to ensure that they did not damage the structure in any way.

The project had the full support of the RSA, the people of Christchurch, and received media attention. Throughout, visitors to the city and members of the public were kept up to date with progress via SCIRT website, and information panels on the site.

SCIRT captured the attention of technically minded students in the city by running a Triumphal Arch model competition at Christ's College, which was incredibly well received. Groups of students had their models judged by SCIRT engineers and the winning team were able to visit the site to see the repairs taking place.

The structural work was completed in September 2015 and is currently having new paving and lighting installed sensitive to its appearance and heritage. It is expected that the Arch and Bridge of Remembrance will be reopened to the public for Anzac Day.

[Provide additional information that demonstrates your organisations/projects achievement as related to the particular Award category; refer to the Award category description (400 words maximum).]

The Triumphal Arch is a Christchurch icon, and a site of reflection for many people. It is also one of the city's few remaining historic structures following the 2011 Canterbury earthquakes. SCIRT's work on this historic site has preserved the structure for future generations. The improvements also provide a symbol that inspires confidence in the people of Christchurch that their city is being rebuilt, and important structures are being saved.

The earthquake caused in many cases irreparable, damage to a large number of Christchurch's heritage structures. The Arch and Bridge of Remembrance are the first of these to be reinstated to their former glory.

While completing the structural changes to the Arch, the SCIRT team was careful to respect the wishes of those for whom the Arch has special spiritual significance, and who felt it important to leave the aesthetic elements of the Arch unchanged. SCIRT worked closely with Heritage NZ to ensure that visually the Arch is left unchanged.

One of the first tasks was to remove and repair the two lions that sat either side of the Arch with earthquake damaged tails. The lions were originally removed and stored in pieces to protect them. They were then returned in pieces and the stonemasons repaired the damaged pieces on site as well as carving new blocks for sections where the damage was too great. The team's commitment to the visual restoration of the Arch extended to sourcing replacement masonry from the Tasmanian quarry that supplied the original blocks so ensure that the new stone matched the original colour.

SCIRT has developed a special relationship with the RSA while working on the Arch. In 2015, SCIRT team members took returned soldiers out to the Arch to see how repairs were progressing. From there, the team visited Rannerdale home in

Christchurch to spend time with the men, and help out around the home in any way they could, gardening, reading the paper to them, or just visiting and providing company.

Christchurch Returned Services' Association president Pete Dawson endorsed the restoration programme saying, "We're disappointed the bridge and arch won't be available to us for Armistice Day this year (November 11 2015) but we can see the overall concept that's been worked on here is absolutely brilliant.

"We're really pleased and proud of our city for doing it properly, making it a far stronger memorial for the guys that marched under it to go to war."

This project allowed SCIRT to increase the public awareness and knowledge of this historic structure through newspaper, radio articles, and community engagement activities such as the Christ's College competition and an open day.

SCIRT is proud not only to have restored this special structure but also to have been instrumental in increasing the awareness of the special nature of this structure in the community.

Supporting material:

SCIRT Website:

Bridge of Remembrance Triumphal Arch rebuild involves city boys' school

<http://strongerchristchurch.govt.nz/article/bridge-of-remembrance-triumphal-arch-rebuild-involves-city-boys%E2%80%99-school>

SCIRT hosts information day at Triumphal Arch

<http://strongerchristchurch.govt.nz/article/scirt-hosts-information-day-at-triumphal-arch>

Bridge of Remembrance Kids Zone attracts central city school pupils

<http://strongerchristchurch.govt.nz/article/bridge-of-remembrance-kids-zone-attracts-central-city-school-pupils>

Lions roar back into the city centre

<http://strongerchristchurch.govt.nz/article/lions-roar-back-into-the-city-centre>

Technology gets College boys out of classroom

<http://strongerchristchurch.govt.nz/article/technology-gets-college-boys-out-of-classroom>

Triumphantly future-proofing Christchurch's heritage

<http://strongerchristchurch.govt.nz/article/triumphantly-future-proofing-christchurch%E2%80%99s-heritage>

When are the lions coming back?

<http://strongerchristchurch.govt.nz/article/when-are-the-lions-coming-back>

ANZAC poppy on top

<http://strongerchristchurch.govt.nz/article/anzac-poppy-on-top>

Out of the classroom, onto high-vis, noisy, wet SCIRT sites

<http://strongerchristchurch.govt.nz/article/out-of-the-classroom-onto-high-vis-noisy-wet-scirt-sites>

The Press 17 September 2015.

Christchurch's Bridge of Remembrance restoration complete

<http://www.stuff.co.nz/the-press/news/72131942/Christchurchs-Bridge-of-Remembrance-restoration-complete>

Social media – YouTube

Bridge of Remembrance - Triumphal Arch Flyover

<https://www.youtube.com/watch?v=EKSUfmg1jzY>