

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.

## Bridge of Remembrance posters

**Story:** Bridge of Remembrance and Memorial Arch

**Theme:** Construction

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Posters which describe the earthquake damage, planned restoration methods and historic information about the Bridge of Remembrance and Memorial Arch. These posters were hung on the fencing around the Bridge and Arch to inform the public about the work taking place.

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](http://www.scirtlearninglegacy.org.nz)



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# Triumphal Arch and Bridge of Remembrance Earthquake Repair

## Earthquake damage

Historic Christchurch landmarks the Bridge of Remembrance and its Triumphal Arch were structurally damaged in the 2010/2011 earthquakes.

The damage includes cracking through the structure and its heritage stonework. The stability of the Arch has been compromised.

Downer, which is part of the Stronger Christchurch Infrastructure Rebuild Team (SCIRT), are repairing and strengthening the Arch and Bridge.

## Project Overview

SCIRT designers are working closely with structure specialists and co-ordinated with Christchurch City Council's heritage specialists to restore the Bridge and Arch back to their former glory.

Downer will be improving the foundations, strengthening the structure and undertaking significant technical repairs to reduce the risk of damage in any future earthquakes.

Downer has engaged the services of Goldfield Stone to source replacement stone with identical characteristics to the original stone. His team will also undertake the delicate and painstaking work of repairing and replacing the damaged and cracked stone throughout the structure.

The purpose of this design is to prevent damage or collapse of the structure and reduce the risk of severe cracking of the heritage stonework.

The complex internal strengthening work will ensure the structure meets the new building standards.



Image of Bridge of Remembrance and Triumphal Arch post-earthquake  
- October 2011



Historic image of Bridge of Remembrance and Triumphal Arch

## THE BRIDGE OF REMEMBRANCE

### Repairs include:

Remove the damaged stone and the immediate surrounding stone

Once the stone is removed grout is injected into any cracks in the concrete behind the stone

Repair and replace significantly damaged stone

Strengthen the parapets, bridge sides, with 1.2m pins that will be inserted vertically under the capping



Images of Bridge of Remembrance—significant cracking caused by 2011 earthquakes

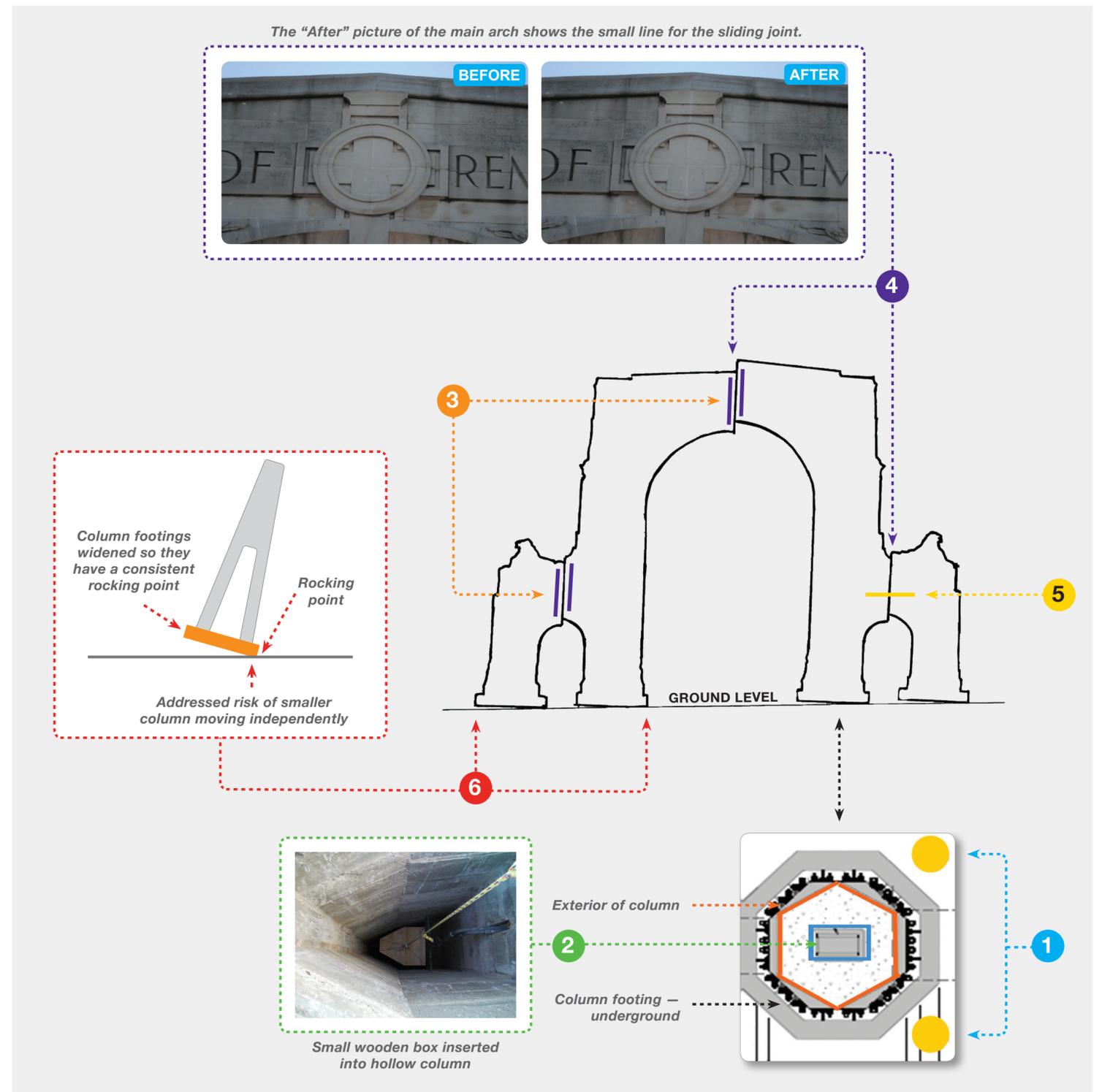
# Structural Strengthening of the Arch

Technical repairs and strengthening work will enable the structure to move in a controlled manner when a seismic event occurs and will reduce cracking and damage to parts of the structure.

This work will be undertaken in several stages:

- 1 Piles will be installed up to 26m deep to support the structure
- 2 Steel boxes will be inserted inside the hollow columns of each arch to strengthen the columns and prevent them from buckling. See adjacent image 2 of a small wooden box inserted into the minor columns during the investigation stages
- 3 Steel plates will be inserted to create a smooth surface for the sliding joints
- 4 Fine cuts will be made at the top of the three arches creating joints which will allow the arches to slide
- 5 A Post-tensioning system will be inserted at the top of the arches. These will act like a rubber band holding the two sides of the arches together
- 6 Rocking columns will be constructed below ground level at the base of each arch. These will allow the columns to move independently

The stone is cut to create a space between the bridge balustrade and the arch column to allow for movement. This will avoid cracking and damage in a seismic event.



# History and Symbolism



**Arch** The Arch symbolises victory and should remind us of the patriotic sacrifices made by the men who fought for the Commonwealth

**Cross** A cross is a symbol of life. Depicted here in the centre of the Arch with a circle around it means eternal life. It can also mean sacrifice. In this instance with its downward stem forming the keystone of the Arch conveys the idea that the spirit of sacrifice is the basis of human character.

**Bridge** The way the bridge stretches across the width of the river is symbolic of the short span of human existence and of the great beyond.

**Bridge** Scripted on the span of the Bridge— QUID NON PRO PATRIA— "What will a man not do for his country"

**Rosemary** Seen alongside the Wreaths and Fascines on the Bridge and major Arch and inside the minor Arches is Rosemary. This symbolises remembrance and is accompanied by the words "There's Rosemary—that's for remembrance".



**Fascines** a bundle of sticks tied together — symbolising "the strength of Union of the British Empire" - Fascines were often used to fill trenches in World War I and World War II.

**Lion** Sitting on top of the buttresses above the minor Arches are two British lions as a symbol of the British Empire. Each lion is shown with one paw on its spoils of conquest and in a crouching position showing its readiness for action.



**Torches** On either side of the main Arch are uplifted torches, standing for the remembrance of all the battle fronts inscribed on the panels above. Gallipoli, Egypt, Palestine, Mesopotamia (Greece), France and Belgium.

**Laurel Wreaths** Depicted on the Bridge and the major Arch are Laurel Wreaths used to honour the soldiers that went to war.

**The Position of the Arch** The Arch faces East and West. The East is symbolic of the dawn of life and the West symbolic of the evening of life or the end of our earthly journey.



**Coat of Arms** Depicted above the minor Arches are panels showing the British Coat of Arms and the Canterbury Coat of Arms.



*Referenced from "Extracts from an Address by J. Wyn Irwin, M.A., Hon. Secretary, Bridge of Remembrance Committee. Armistice Day, November 11, 1924"*