



1 Wigram Magdala link bridge, photo courtesy of Victoria Worner. 2 Wigram Magdala Bridge site panorama, photo courtesy of Pixel Spatial Specialists. 3 Inorganic analysis of site soil. 3 Tidy visual finish of low damage bridge pier detailing, photo courtesy of Victoria Worner.

## WIGRAM MAGDALA LINK BRIDGE

WSP Opus for Christchurch City Council

Project Location: Sockburn, Canterbury



WSP Opus has designed the first bridge in New Zealand that incorporates a low-damage ductile-jointed system – the Wigram-Magdala Link Bridge. The unusual design constraints on this bridge compelled WSP Opus to develop an innovative solution for the seismic resisting system. This created an opportunity to incorporate low-damage ductile-jointed connection details into the pier columns based on recent developments at the University of Canterbury (UC) – an innovative design approach supported by the client, Christchurch City Council.

Whilst low-damage details have become relatively common features on new buildings constructed in Christchurch in the aftermath of the recent Canterbury earthquake sequence, this project is understood to be the first to use low-damage connection details on a bridge in New Zealand and possibly worldwide.

The bridge was designed with resilient low-damage joints using concrete-filled steel columns connected at rocking interfaces by internal un-bonded post-tensioning and special replaceable dissipater bolts. In an earthquake, this state-of-the-art technology:

- provides significant energy dissipation through yielding of replaceable dissipaters
- controls and minimises damage
- accommodates seismic displacements with self-centring capability
- behaves reliably beyond the design level earthquake
- minimises loss of service
- and enables easy, safe and rapid repair.

The project overcame significant aesthetic challenges and other challenges arising from scaling-up the prototype (developed and tested by UC) for application to a full-size bridge, and construction was completed early and within budget. The project also developed the basis for a step-change in seismic design philosophy for use with low-damage details, which will lead to more resilient structures with economic benefits into the future.

### Judging & Copyright Statement

This project is an entrant in the 2018 INNOVATE NZ Awards of Excellence competition. The winners will be celebrated at our Awards Gala Dinner on Friday, 3rd August 2018 in Hamilton.

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