

# R115 Armagh Street - Bridge Status Summary Report



## 1 Description of Structure

Armagh Street Bridge (R115) was constructed circa 1883 and consists of a masonry arch with a clear span of 12.2m, a rise of approximately 2m and a skew of 16°. The arch is stiffened by tapered, unreinforced concrete ribs, and is supported by unreinforced concrete thrust blocks, founded on unreinforced concrete footings. The bridge supports two traffic lanes and cycle lanes (including a tram track in the northern lane), with footways on each side.

## 2 Observed Earthquake Damage

The bridge suffered significant damage in the February 2011 earthquake. In particular, pavement damage was observed on the approaches and at midspan of the arch; a 20mm wide longitudinal crack (slightly skewed to the road centreline) was observed over  $\frac{3}{4}$  of the length of the arch; and vertical cracks were observed in the spandrel walls. For a more comprehensive discussion of the damage observed, refer to Work Package Concept Report WP0000467.

The bridge is currently cordoned off from all traffic use due its location along the perimeter of the “red zone”.



## 3 Residual Seismic and Live Load Capacity

The live load capacity of the masonry arch is not considered to have significantly altered as a result of the EQ damage, with loads still being supported by arch action either side of the longitudinal crack. The structure’s ability to distribute point loads across the crack at the apex of the arch may be compromised slightly; however the crack is smaller at this location and any damage would be localised, progressive and observable through ongoing monitoring.

The arch is prone to further cracking from seismic loading due to the skew of the structure and if settlement and lateral spreading occur in future sizeable aftershocks; however, this is not expected to present a sudden collapse scenario.

## 4 Bridge Monitoring

As the bridge is currently not in use, no crack monitoring is being undertaken at present. However, the arch crack has been measured at 20mm at its widest point. This should be checked following any significant aftershocks (i.e. Mag>5.5).

## 5 Current Status and Recommendations

To reduce impact loading and protect the arch from further damage, a 30km/h heavy vehicle speed restriction has been implemented. We recommend formalising this through gazetting in local newspapers, in accordance with the Heavy Motor Vehicle Regulations. The bridge is currently closed due to its location within the “red zone”. When the bridge is reopened, the southern lane could remain closed to protect the structure from further damage. Some temporary surfacing repairs should be undertaken prior to opening the structure to traffic. The serviceability of the tram rails over the arch is unknown at this stage.

Permanent recovery works are being progressed through the SCIRT Alliance and continued inspection and monitoring should be undertaken following significant aftershocks (i.e. Mag>5.5).

Michael Cowan MIPENZ, CPEng, IntPE(NZ)  
Principal Civil Structures Engineer