LOADTEST
O-Cell® Technology in Brisbane, Australia

Project:	**Gateway Bridge Upgrade Project**
Location:	Brisbane, Australia
Client:	Leighton Abigroup Joint Venture

Project Description:

Loadtest performed the first Osterberg cell tests in Australia on the Gateway Bridge project in Brisbane. Due to the test loads required 88 MN, the O-cell was the perfect choice to determine the 1500 mm diameter pile capacities and socket friction parameters.

The original Gateway Bridge, opened in 1986, is close to vehicle capacity due to steady growth in Brisbane. To relieve congestion, the Gateway Project Upgrade was launched in 2005 as the largest road and infrastructure project undertaken in Queensland.

The scope involves construction of a second Gateway Bridge 50 m downstream from the existing bridge and several kilometres of motorway approaches.

The main bridge piers require a total vertical loading of 395 MN requiring 24 x 1.8 m diameter bored piles 46 m to 50 m long, socketed into the siltstone rock up to 6 m.

The piles would be constructed with steel liners driven into the weaker mudstone layers followed by the main rotary boring through the liners into the rock.

Verifying sufficient load capacity required a static load test on two dedicated test piles. These tests would also yield socket friction characteristics and end beating capacity. Conventional top-down loading techniques would not provide this valuable rock socket information.

O-cell Cage ready for lifting

O-cell Assembly ready for placement

Bi-directional load test arrangement:

Four 540 mm diameter O-cells were installed at a pre-determined elevation in each of the 1500 mm test piles, one on each bank of the Brisbane River. The O-cells would provide a minimum gross loading at rated capacity of 88 MN [44 MN in each direction].

To ascertain the properties and loading characteristics of the rock socket, the O-cell assemblies were positioned within the rock sockets, 3 metres above the base of the piles. Vibrating wire strain gauges (Geokon 4911-4 model) were placed within the pile section to assist with skin friction distribution characteristics of the piles.

May 2009-Construction of the main span
Source:gatewayupgradeproject.com.au

Test results:

The maximum sustained upward net load resistance on skin friction above the O-cell level was 51.81 MN with an upward top plate movement of 9 mm. Combined end bearing and lower skin friction below the O-cell level was 56.62 MN with a downward bottom plate movement of 19 mm, 1.3 mm of which was measured as compression within the lower shaft section.

The resulting overloading verified a factor of safety of approximately 3.7. At this loading, the calculated top loading equivalent would result in a maximum displacement of 10.7 mm, of which 9.8 mm is estimated to be the additional elastic compression of the pile.

Conclusions:

The two test piles confirmed the geotechnical design characteristics within the rock socket and the factor of safety required. Over 100 MN* total loading was applied providing the highest test load on any piles in Australia (**Capacity in excess of the rated capacity is possible using the O-cell method*).

Source:gatewayupgradeproject.com.au

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Artist's impression of Gateway Upgrade, scheduled for completion in 2010

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