

# LOADTEST O-Cell<sup>®</sup> Technology in St. Louis, MO



**Project** I-70 Bridge over the Mississippi River  
**Location** St. Louis, Missouri  
**Client** Massman, Traylor Bros. and Alberici, JV

## Project Description



*Lowering Reinforcing Cage*

With a main span of 1,500 feet, the new Mississippi River Bridge in St. Louis, Missouri will be the third longest cable-stayed bridge in the United States. But it did set a new world record for the highest load ever recorded during a static load test. The previous world record of 62,700 kips (278 MN) was set in South Korea by Loadtest at the site of the new Incheon Bridge. The old record was surpassed by 9,400 kips on July 17, 2010. The maximum load applied during the St. Louis load test was 72,100 kips (320 MN).

The Mississippi River crossings in downtown St. Louis and southwestern Illinois are some of the busiest in the U.S. where several interstates carry traffic across the river. The new bridge is expected to transport up to 55,000 vehicles daily, re-routing Interstate 70 from an overly-congested nearby bridge.

When the massive eight-lane original bridge design was deemed uneconomical, co-owners Missouri DOT and Illinois DOT opted for a sleek 1,500ft main deck carrying four lanes across the Mississippi, although the design calls for room to restripe to six lanes as needed.



*O-cell Assembly Placement*

The \$640 million project includes the 1.22-mile bridge, supported by symmetrical cable-stayed delta towers, over 400 feet tall. Two large concrete footings, one near each bank, anchor the bridge below. Each pier rests on a series of concrete-filled drilled shafts, extending over 100 feet socketed into the limestone bedrock.

Massman, Traylor Bros. and Alberici (MTA) presented an Alternative Technical Concept that included plans for six 11.5 ft. diameter drilled shafts, as opposed to the fourteen 10 ft. diameter shafts initially proposed. This new design, using fewer but wider supporting columns, is significantly more cost-effective since it halves construction time for the bridge foundation. The design has the additional advantage of a reduced environmental footprint with fewer drilled shafts.



*Final Assembly Check*



*Rendering of the New River Bridge, scheduled to open in early 2014*

# LOADTEST O-Cell® Technology in St. Louis, MO



Automated O-cell Test Apparatus

## Bi-directional load test arrangement

To perform the world record test, a 119ft deep test shaft was drilled into the sub-surface, which consisted primarily of sand and gravel underlain by solid rock. A core barrel roller bit and core extractor were used to excavate the rock socket, which was then airlifted after drilling was completed. A SONICALIPER was then used to profile the shaft excavation sidewalls.

Four 34in O-cells attached to a steel reinforcing frame were installed at the base of the 11.5ft diameter drilled shaft and reinforced concrete poured in to fill the socket and encase the cell. After concrete curing, the O-cell assembly was pressurized, loading the shaft in 19 loading increments with each successive load increment held constant for eight minutes.

The shaft was loaded to a maximum bi-directional load of over 18,000 tons, mobilizing a combined end bearing and side shear resistance of 36,067 tons (321 MN).

## Summary

As is the case on many projects, the results of the O-cell test confirmed the use of an optimized engineering design, by verifying MTA's alternative technical concept and allowing them to utilize a much more economical alternative than the original conventional design. Additionally, the testing footprint was minimal, despite the record-breaking loads applied. Loadtest's company objective, which is to provide an accurate, high-quality tool for value-engineering, proved to be an invaluable benefit to this project.



A world record assembly  
= 4 x 34" O-cells



Ready to go!



Architectural rendering of the New River Bridge - St. Louis, MO.

