Ohio River Bridges Downtown Crossing

Rendering of Downtown Crossing courtesy of http://kyinbridges.com/

Summary

The Louisville-Southern Indiana Ohio River Bridges Project is a massive design-build infrastructure project intended to improve safety, alleviate traffic congestion, increase cross-river mobility, connect highways and provide a major economic stimulus to the entire region. The project includes both the Downtown and East End Crossings over the Ohio River along with the associated highways that connect them, the reconstruction of the Kennedy Interchange and the reconstruction of ramps along Interstate 65 between I-264 and downtown. The project budget is approximately $2.5 billion and will be the largest transportation project ever constructed between the two states.

The foundations for both the Downtown and the East End Crossings utilized O-cell® bi-directional static testing for foundation design confirmation, economization and risk management.

Project Info	
Owner:	INDOT and KYTC joint project
Prime:	Walsh Construction Company
Engineer:	Jacobs Engineering
Completion Date:	May 2013
Project Budget:	$2.5 billion total
Maximum Tested Load	72,666 kips

Services Provided

- Four 34-inch diameter Single Level O-cells

O-cell placement at the end of reinforcement cage

Project

The Downtown Crossing is being built roughly parallel to the existing John F. Kennedy Memorial Bridge, to accommodate six lanes of northbound I-65 traffic with separate pedestrian and bicycle lanes. The joint Indiana and Kentucky project is being managed by Kentucky Transportation Cabinet (KYTC) and delivered through a design-build contract with Walsh Construction Company.

Geotechnical conditions throughout the bridge locations indicated the presence of a significant layer of high strength limestone into which the bridge foundations could be founded. Accommodating the bridges' lateral loading conditions required a minimum rock socket length. With a standard geotechnical design approach, the axial design loads required socket lengths deeper than those required

for the lateral loading conditions. Recognizing conventional geotechnical design's inherent conservatism, the design-build team sought a means to remove it for the large diameter high capacity drilled shafts. The O-Cell's bi-directional method was selected as the best solution for removal of this conservatism. Use of the O-cell produced added advantages by confirming a more competitive design with shorter drilled shaft rock sockets, thus producing more economical foundations. This in turn managed project schedule and time risks for the design-build team.

Bi-directional load test arrangement

A technique/test drilled shaft was required to be tested at the Downtown Crossing. A dedicated test shaft was drilled into overburden and socketed into the underlying limestone. The O-cell configuration in the test shaft used four 34-inch diameter O-cells arranged in a single level located 3.9 feet above the shaft base to provide the maximum test load required of 48,000 kips.

Conclusions

Loadtest performed a bi-directional static load test using the patented Osterberg Cell® method. The Quick Load Test Method for Individual Piles (ASTM D1143) was used to govern the O-Cell's load increments applied to the test shaft. This resulted in a bi-directional gross load of 36,333 kips.

Reinforcement cage installation with O-cells

Setup preparation for O-cell test

The resulting maximum test load of 72,666 kips on a shaft represents a new O-cell World Record for a static load test of a single foundation element! It exceeded the previous O-cell World Record, established in 2010 in St Louis, Missouri on the I-70 Mississippi River Bridge project by 532 kips (2.4 MN). Although the old record wasn't exactly shattered, proving once more that tests of this magnitude are achievable and that higher than average unit skin and end bearing resistances are possible in hard rock formations is a satisfying advancement of the drilled shaft industry.