Feature

MALCOLM DRILLING COMPANY PERFORMS The Columbia River Crossing Test Program

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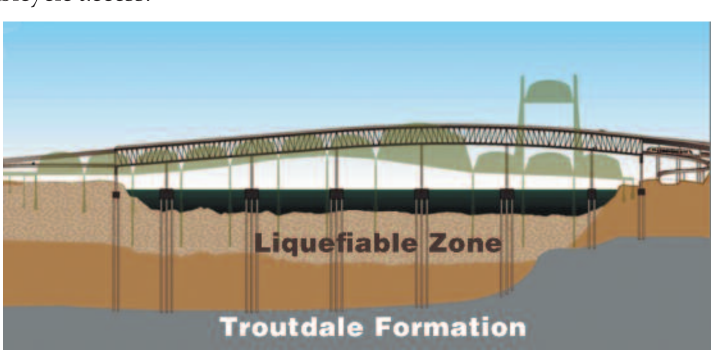
Located on Interstate 5 and crossing over the Columbia River connecting the state of Oregon and Washington, the Columbia River Bridge is the last active drawbridge on the U.S. Interstate Freeway system. It is an old and seismically vulnerable bridge that not only serves as the main artery between Portland, Oregon and Vancouver, Washington, but is also the main trucking lane for commerce from the West Coast into Canada. The existing bridge is founded on timber piles in very questionable soils.

As a result of the "necking down" of heavy traffic on the bridge, over 400 crashes occur per year. It is projected that the number of accidents will increase to over 700 by year 2030. Traffic delays of four to six hours occurring daily are common. Delays of freight delivery result in business costs of millions each year. In its current configuration, there are limited transit options to accommodate bus and bicycle traffic.

The plan is to construct a new modern concrete structure that would wrap around the existing bridge and improve the functionality of several closely spaced interchanges. The intent is to dramatically improve traffic flow as well as to provide a right-of-way for light rail transit running from Portland, Oregon, to Vancouver, Washington. The project would also include pedestrian and bicycle access.



Columbia River Bridge illustration.

Due to the location of the project it was necessary to involve several government agencies in the decision process. These included the Washington DOT, Oregon DOT, Federal Highway Administration, City of Portland, City of Vancouver, SW Washington Regional Transportation Council, Metro, C-Tran and "Trimet."

The existing ground conditions posed significant challenges in determining the best method to support the new structure. The riverbed is characterized as having a significant layer of liquefiable materials above catastrophic flood deposits. These lie over the Troutdale Formation which is made up of cemented gravels, cobbles and boulders. This condition required that the depth of the foundations would have to be in excess of 250 feet. As a result, the agencies decided to circulate a special project to perform a test program. The test consisted of the installation of three drilled shafts and one driven pile. This was to be undertaken in order to test capacities and installation methods that had been assumed for the project. The shafts consisted of one 6 foot diameter shaft 120 feet deep; one 8 foot diameter shaft 150 feet deep; and one 10 foot diameter shaft 250 feet deep. The driven pile was 2 feet in diameter, installed to a depth of 130 feet. The 10 foot diameter shaft was specified to include permanent casing to a depth of minus 215 feet. The other shafts called for temporary casing. All three shafts were to be constructed using Osterberg Load Cells, and string gages, and were to be tested using Cross Hole Sonic Logging (CSL) and Thermal Integrity methods. Due to the planned loads and how the 10 foot shaft was to be tested and loaded, it was necessary to use two separate layers of Osterberg Load Cells. The configuration called for one set of five 6,000 kip cells 6.9 feet up from the bottom, and a layer of three 6,000 kip cells 22.9 feet from the top. Installing such extensive instrumentation in a single 250 foot long cage, and allowing for only one splice, presented a significant challenge.

Since the planned project covered an area that boarded two states, and due to the fact that there was a significant distance from beginning to end, two of the test shafts (the 10 foot diameter and the 6 foot diameter) were located on an island on the Oregon side, with the 8 foot diameter shaft located on the Washington side. In that many of the shafts were planned to be constructed over water, the test shaft locations were selected to replicate the conditions expected to be encountered in the river. The project went out for bid in early spring. It was awarded to Max J. Kuney Construction of Spokane, Washington with the drilled shaft specialty subcontractor being ADSC Contractor Member, Malcolm Drilling Co., Inc., (MDCI), headquartered in San Francisco, California. This project was to be managed out of Malcolm's Kent, Washington office. The load test was to be performed by ADSC Associate Member, Loadtest, Inc. The CSL and Integrity testing were to be undertaken by the Washington Department of Transportation.

In May of 2012, the contract was awarded and construction began. MDCI utilized the Oscillator method of construction for the installation of the permanent and temporary casing. The

Cage with testing apparatus.

equipment of several ADSC Associate Members was used for this phase. Included were a Hans Leffer Machine Co. oscillator machine, and Liebherr's 885 and 895 heavy-duty cycle digging cranes for the excavation component.

Casing being installed.

Installation and testing of the 6 foot and 8 foot diameter shafts went without incident. However, during excavation and casing installation of the 10 foot diameter shafts, an unknown layer of very dense boulders in a "fixed condition," resulted in damage to an installation tooth ring to the point that excavation to the planned shaft depth was impossible. Excellent and prompt coordination along with partnering with the General Contractor and WSDOT created an opportunity

to arrive at a timely solution. A decision was made that required the shaft to be backfilled with gravel, and the casing removed. The tooth ring was repaired, reinforced, and installation of the shaft

It is interesting to note that the Osterberg Load Cell data indicated that this was one of the largest Osterberg Cell tests ever conducted.

was restarted within just a few days. When the obstruction was once again encountered at depth, great care, along with a combination of tooling techniques were utilized. This allowed the excavation to move past the obstruction advancing the shaft to tip elevation. The shaft was then poured successfully. It is interesting

Oscillator worked well.

to note that the Osterberg Load Cell data indicated that this was one of the largest Osterberg Cell tests ever conducted. This is of particular note as Osterberg Load Tests have been "record breakers" throughout the world for many years.

As a sidebar to this article, it is unfortunate that we report that as of this writing the project has been cancelled due to funding issues. It is hoped that the "cancellation" becomes a "postponement" and that this important project can be taken to completion.

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