

Pitt River Bridge Design-Build Project, Pile Design and Testing

The Pitt River Bridge is part of the Gateway Program, a long-term initiative to improve roads and bridges throughout Greater Vancouver in British Columbia, Canada. The bridge was designed to accommodate different lane allocations and to allow for one lane to be added in the future.

In early 2007, Peter Kiewit Sons was awarded the design build (DB) contract to construct a new 400 m long, high level, cable stay, multi-lane bridge to replace the existing swing span bridges. The cable towers and back stays of the bridge, as required by contract, had to be supported on piles terminating in very dense Pleistocene deposits (glacial till or drift and inter-glacial sediments) encountered at approximately 100 m below ground surface.

To validate the foundation design for the main piers of the new Pitt River Bridge, a high-strain dynamic testing and a conventional, head down, static pile loading test were carried out using production piles for both the test and reaction piles to minimize costs. The piles comprised driven 1824 mm diameter, open-toe, steel pipe. The 45 MN loading test was completed successfully in late 2007 by Peter Kiewit Sons. Design of the piles was based on information provided by the owner to the DB proponents and included results of test holes and static pile loading tests conducted in the 1970s on 36 m and 55 m long, open toe-steel pipe piles, CPT and SCPT profiling conducted in the 1990s and mid-2000s, and high-strain dynamic testing conducted on an 100 m long, 1067 mm diameter, open-toe indicator pile installed in 2005. Test pile installation records, static and dynamic loading test records and signal matching analyses were used to calibrate the design and confirm pile installation requirements. Supplementary test holes, CPTs and SCPTs were conducted to over 100 m depth to estimate the pile toe resistance. DLTs were also conducted on several of the production piles to validate the design. This presentation will present how the various layers of testing were used to advance the pile design and ultimately confirm the compressive resistance and reduce the total number of piles required to support the bridge.