Civil Engineering for Sustainability and Resilience International Conference, CESARE '14
Amman, Jordan, 24-27 April 2014

A CASE STUDY ON INSTRUMENTING AND TESTING FULL-SCALE TEST PILES FOR EVALUATING SET-UP PHENOMENON

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Keywords: Test pile; Static Load Test; Dynamic Load Test; Pile Set-up; Excess Pore Water Pressure.

ABSTRACT

Piles driven in cohesive soils usually experience a large increase in resistance over time, known as set-up or freeze. Dynamic load tests (DLT) and Static load tests (SLT) are usually performed to verify the axial resistances of piles at specific times after end of driving (EOD) and to quantify these resistances. An extensive field testing program was performed on full-scale instrumented precast prestressed concrete (PSC) piles driven in cohesive soils at the Bayou Lacassine Bridge, Louisiana, to evaluate the pile set-up phenomenon. The testing program includes instrumenting two full-scale test piles with a network of vibrating wire strain gages, pressure cells, and piezometers, and instrumenting the surrounding soils with multilevel piezometers. Five SLTs and three DLTs were conducted on each test pile at different times after EOD in order to quantify the magnitude of set-up. Measurements from the load tests on both piles confirmed that the pile set-up after EOD follows a logarithmic linear rate with time. An increase in piles' total resistances (or set-up) of 1.60 to 1.77 times the EOD resistances were observed after the final restrikes. Piezometers data demonstrated close relationship between the dissipation of excess pore water pressures that were generated during pile driving, following EOD, and pile set-up. The load transfer curves derived from the strain gage measurements were used to separate the side and tip resistance profiles from the total resistance. Piezometers installed in the ground showed that the influence zone, caused by pile driving, extends beyond the 3B distance (B: Pile width).