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ESTIMATING THE INCREASE IN PILE RESISTANCE WITH TIME (OR SETUP) BASED ON SOIL PROPERTIES

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ABSTRACT

This paper presents the analyses of twelve prestressed concrete (PSC) instrumented test piles that were driven in different locations of Louisiana to develop analytical models to estimate the increase in pile resistance (soil set-up) with time. The twelve test piles were driven mainly in cohesive soils. Detailed soil characterizations including laboratory and in-situ tests were conducted to determine the different soil properties. The test piles were instrumented with vibrating wire strain gauges, piezometers and pressure cells. Several static load tests (SLT) and dynamic load tests (DLT) were conducted on each test pile at different times after end of driving (EOD) to quantify the magnitude and rate of set-up. Measurements of load tests confirmed that pile resistance increases almost linearly with the logarithm of time elapsed after EOD. Case Pile Wave Analysis Program (CAPWAP®) were performed on the restrikes data and were used along with the load distribution plots from the SLTs to evaluate the increase of shaft resistance of individual soil layers along the piles. The logarithmic set-up parameter "A" for unit shaft resistance was calculated for 70 individual clayey soil layers, and the database set of A was correlated with different soil properties. Nonlinear multivariable regression analyses were performed between A and different soil properties, and three different empirical models are proposed to predict the soil set-up parameter "A" as a function of soil properties.