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CPT Pore Water Pressure Correlations with PDA to Identify Pile Drivability Problem

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Abstract : At certain depths during large diameter displacement pile driving, rebound well over 0.25 inches was experienced, followed by a small permanent set during each hammer blow. High pile rebound (HPR) soils may stop the pile driving and results in a limited pile capacity. In some cases, rebound leads to pile damage, delaying the construction project, and the requiring foundations redesign. HPR was evaluated at seven Florida sites, during driving of square precast, prestressed concrete piles driven into saturated, fine silty to clayey sands and sandy clays. Pile Driving Analyzer (PDA) deflection versus time data recorded during installation, was used to develop correlations between cone penetrometer (CPT) pore-water pressures, pile displacements and rebound. At five sites where piles experienced excessive HPR with minimal set, the pore pressure yielded very high positive values of greater than 20 tsf. However, at the site where the pile rebounded, followed by an acceptable permanent set, the measured pore pressure ranged between 5 and 20 tsf. The pore pressure exhibited values of less than 5 tsf at the site where no rebound was noticed. In summary, direct correlations between CPTu pore pressure and rebound were produced, allowing identification of soils that produce HPR.

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