DESIGN AND CONSTRUCTION OF AN INSTRUMENTED PILE CLUSTER

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ABSTRACT

It has long been established that piles driven into low permeability soil gain capacity over time. This capacity gain, called “set-up” or “freeze”, is believed to be controlled by two mechanisms: (i) the increase of effective stresses due to the dissipation of excess pore pressures built up during driving and (ii) stress independent phenomena such as strength increase due to thixotropic bonding (Paikowsky, et al., 1995). Recent research initiatives at the University of Massachusetts - Lowell focused on quantifying the gain in pile capacity. These efforts include the development of a practical analysis/approach and its evaluation through (i) the collection and analysis of several data sets of previous instrumented pile programs (LaBelle, 1995) and (ii) the use of a Multiple Deployment Model Pile (MDMP) (Hart, 1998).

In order to investigate capacity gain on a full scale, an instrumented test pile cluster was designed and constructed for a bridge reconstruction site in Newbury, Massachusetts. This location contained a thick deposit of Boston Blue Clay (BBC) and several MDMP tests were conducted at the site. Extensive field and laboratory research examined and quantified the various soil properties at the site (Chen, 1998).

The instrumented test cluster consists of three major components: (1) three instrumented test piles; (2) a ground piezometer field and (3) an extensive testing program. These three components were designed to observe the build-up and dissipation of excess pore pressure on and away from the pile surface as well as determine capacity gain over time using dynamic and static load tests.

The design, calibration, construction, and installation of the pile cluster is presented and evaluated.