

## **APRIL 2007 MEETING**

Wednesday, April 11, 2007

### **TECHNICAL PROGRAM**

#### **Ground Modification Techniques for Projects in the Gulf Coast Area**

*Speaker:* [Dennis Boehm](#) is Chief Engineer - Central Region for [Hayward Baker](#), Inc.

#### **PRESENTATION SUMMARY**

##### **Ground Modification Techniques for Projects in the Gulf Coast Area**

To an audience of about 45, Dennis Boehm, Chief Engineer - Central Region for Hayward Baker, Inc., gave a slide presentation entitled, "Ground Modification Techniques for Projects in the Gulf Coast Area". Mr. Boehm has a BSCE from TAMU (1986) and has authored numerous technical papers on the use of ground modification methods for improvement of poor soil and support and remedial repair of structures.

Mr. Boehm discussed two methods for improving the support characteristics of in-situ soil: Vibro Techniques (i.e., Stone Columns) and Soil Mixing (both wet and dry). His company, Hayward Baker also performs many other types of soil improvement, including Physico-Chemical Alteration (e.g., lime injection), Soil Removal and Replacement (typically down to 15 ft or less), Water Injection (to reduce post-construction heave) and Densification (of granular soils).



Mr. Boehm said his company has installed over a hundred miles of 3 to 4 ft diameter stone columns penetrating 10 to 55 ft in the Houston area using limestone rocks up to 3" in size. They tend to pre-drill the hole if it will stay open, and if not, they will vibrate a hole and drop the rock around the annulus. They also can force the stone via air pressure to the bottom and vibrate as they pull out of the hole. They usually have to keep at least 25 ft away from existing buildings when vibrating.

The method Hayward Baker follows in designing their stone columns follows a 1995 paper by H. J. Priebe, entitled, "The Design of Vibro Replacement". Geotechnical information needed is primarily consolidation and strength data as well as the usual data. Normally stone columns are used to upgrade bearing capacity but they are also used to dissipate pore water pressure thereby controlling liquefaction. Quality control is done by SPT tastings along boreholes between stone columns and by static and quasi-dynamic loading.

The other method presented by Mr. Boehm was Soil Mix Columns in which a binder (usually cement or a cement/slag combination) is added to the in-situ soils to improve its bearing capacity. He gave an example of a project where they achieved 75 psi (28-day compressive strength) soil columns from untreated soil with a shear strength of 475 psf. They can install these columns in underwater situations, from a barge. Quality control is done by breaking standard concrete cylinders.

Mr. Boehm gave case histories where one or the other system was used to support soil embankments for TxDOT, a 75,000 SF Kroger on Galveston Island, and various large diameter tank foundations along the ship channel. In all cases the columns were spaced closely (say 4 to 6 ft apart) on a grid in very weak soils. In the case of the tank foundations, concrete ring foundations were not needed when these columns were used.

**[PAST PRESENTATIONS \(click here\)](#)**