

## APRIL 11, 2012 MEETING

Wednesday, April 11, 2012 (1.0 PDH)

### TECHNICAL PROGRAM

#### Advances in Designing and Monitoring Field Compaction: M-D Relations

**Speaker:** Cumaraswamy Vipulanandan, Ph.D., P. E., University of Houston 4800 Calhoun Road Houston, Texas 77204, Tel. No. (713)743-4278

**Cumaraswamy Vipulanandan (Vipu)** is a professor of civil and environmental engineering at the University of Houston (UH), Houston, Texas and has been with UH since 1984. He is the Director for the Center for Innovative Grouting Materials and Technology (CIGMAT) and the Texas Hurricane Center for Innovative Technology. He received his MS and PhD in Civil Engineering from Northwestern University, Evanston, Illinois. His work has resulted in more than 190 refereed journal and conference papers and over 120 presentations at national and international conferences.

#### PRESENTATION SUMMARY

### Field Vs. Lab Compaction

To an audience of about 90 at the HESS Club, Dr. Vipu, who has authored or co-authored over 150 papers on grouting and soils, gave a slide presentation and discussed the importance of accurately monitoring compaction of soil in the field to improve soil and foundation stability. Dr. Vipu began his presentation by asking the question: What have we done since 1930?



In answer to his own question, Dr. Vipu noted that compactor technology has advanced by utilizing multiple energy sources for compaction. Monitoring technology has also advanced although most testing measures only density and moisture content. Little work has been done to create a correlation between field compaction and laboratory testing and compaction. Dr. Vipu went on to present the factors affecting field compaction and their relation to the design properties of the project. A number of graphs were presented to illustrate the relation between soil properties, compaction and final soil densities.

Dr. Vipu discussed the fact that we are lacking, at the present time, a correlation between field compaction and laboratory compaction. Dr. Vipu then presented data undergoing research at CIGMAT that will compare field versus laboratory compaction results. This will allow more precise and consistent field results with a closer relationship to laboratory and design results. Dr. Vipu noted that in the future the industry will move away from density testing and may instead employ soil modulus testing using a plate modulus such as the Briaud Plate Test (BPT) or a new penetrometer under development such as the SP-CIGMAT.

The relationship between the type of soil and the method of compaction was addressed leading to the topic of intelligent compaction. In practice the intelligent compaction ensures that the compaction job is completed in a minimum of number of passes, the result is monitored, and the compaction energy is automatically adjusted while measuring soil stiffness.

In summary, Dr. Vipu concluded that:

- field compaction is not laboratory compaction,
- new advances in compaction technology (computer generated curves) can be used for design and monitoring
- intelligent compactors can be used for QA/QC of field compaction
- other new methods such as SP-CIGMAT penetrometers can be used during construction to achieve proper compacted soil characteristics

To download a copy of the slide show, [click here](#)

To view Dr. Vipu's previous FPA presentations, click on one of these links

August 2009 - [Grouting Materials and Applications: Research at CIGMAT](#)

May 2008 - [Coatings and Sealers for Protecting Concrete Facilities](#)

June 2005 - [Designing, Constructing and Testing ACIP Piles in Texas Gulf Coast Soils](#)

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