# ABSTRACT

Ganju, Eshan. M.S.C.E., Purdue University, August 2014. Refinement of Quality Assessment and Quality Control Correlations for the Dynamic Cone Penetrometer. Major Professor: Monica Prezzi and Rodrigo Salgado.

The Dynamic Cone Penetrometer (DCP) is a device that is used for the estimation of *in situ* compaction quality. It is a relatively inexpensive, light-weight and easy to use device, which measures the dynamic penetration resistance, from which an estimate of the strength and stiffness characteristics of the compacted soil can be made. Owing to its ease of use, many DOTs in the US have employed the DCP in their quality control procedures, and over the past few decades extensive research has been carried out on the development of correlations between the results of the DCP test and the results of strength and stiffness tests performed on the compacted soils (California Bearing Ratio, Resilient Modulus etc.)

The objectives of this research are to refine the existing QA/QC correlations for compaction acceptability developed by previous research studies carried out at Purdue for the Indiana Department of Transportation, especially focusing on i) grouping of the soils based on their response to the DCP loading, and ii) the moisture sensitivity of soils with clay as the dominant fabric phase. The factors outlined above are studied, and in particular, soil grouping is reviewed critically. The AASHTO, 'A-based', classification employed previously for grouping of the soil is replaced by a new classification criteria specifically developed for the DCP test. Soils are grouped into one of the two categories of coarse-grained or fine-grained soils on the basis of the size of the dominant particle in the soil fabric. The criteria developed for the classification of soil in to one of the two categories is based on index properties of the soil such as standard Proctor

maximum dry density, optimum moisture content, plasticity index (PI) and fines content (percentage passing 0.075 mm sieve size).

For the purpose of refinement of the QA/QC correlations, extensive field and laboratory tests (more than 750 DCP tests) were carried out on soils found in Indiana to add to the existing database of DCP test results. The database was then statistically analyzed for extraction of the representative DCP test value (number of DCP blows required for a specific depth of penetration into the compacted soil) for different types of soil.

Results show that the DCP test for fine-grained soils have a good correlation with the PI, which is indicative of the clay content of the soil, while the DCP test for coarse grained soils have good correlations with the optimum moisture content of the soil, which is indicative of the targeted *in situ* density of the soil mass