

Tuesday 3/14/2017

3–4:30 p.m.

Field Construction QA and QC

Chairs: Stacey Kulesza, Kansas State University; Jason Hertz, Langan Engineering

Utilizing a Neighboring Weighted-Estimation Method for Anomaly Detection with a Continuous Compaction Control Data Set

William Baker and Christopher L. Meehan, University of Delaware

Continuous Compaction Control (CCC) systems utilize a mounted accelerometer, GPS unit, and data acquisition system on soil or asphalt compaction equipment, in order to collect data about the compaction process in real time and over 100% of the compaction evaluation area. During their use, CCC systems may collect anomalous data that can have an influence on reported compaction quality results, and which can lead to erroneous conclusions about the degree of compaction of the soil, or inappropriate regression models between CCC data and in situ measurement data. In the current study, an existing neighboring weighted-estimation method was applied to the results from a field study in which a variety of CCC and in situ test data had been collected, to quantify and filter out anomalous data. Other researchers have proposed that this approach can improve presented CCC data, resulting in improved regression relationships between CCC data and in situ measurement data. For the data set that was evaluated, the results indicate that the removal of anomalous data using this methodology did not yield a significant change in the relationships between the CCC and in situ test results.

Non-destructive Testing of Drilled Foundations at Cove Point using Thermal Integrity Profiling

Justin Zarrella, John Regan, Seth Hamblin, and James McDermott, GZA

The Dominion Cove Point LNG Terminal, located in Lusby, Maryland, recently began a \$3.8 billion-dollar terminal upgrade to expand capacity and facilitate export capabilities. Given the soil conditions, strict vibration thresholds, and site logistics at the active LNG facility, Dominion and the IHI-Kiewit Cove Point JV selected drilled, cast-in-place elements as the primary foundation type to support temporary/permanent structures. Over 4,750 Auger Cast-In-Place (ACP) piles and 700 drilled shafts were installed by Berkel & Company (Berkel) and Kiewit Foundation Group (KFG), respectively. Due to the sensitivity of the proposed structures, extensive Non-Destructive Integrity Testing (NDT) was required. The initial QC program included Pile Echo Testing (PET) and Cross-Hole Sonic Logging (CSL); however, due to site specific limitations, alternative NDT methods were required. Thermal Integrity Profiling (TIP) was ultimately selected and the results of large-scale testing highlight this new technology as a highly effective and cost-efficient method of testing drilled, cast-in-place foundations.

Variability of Intelligent Compaction Data on Embankment and Subgrade Geomaterials

Mehran Mazari, California State University, Los Angeles; Jorge Beltran, Raed Aldouri, and Soheil Nazarian, University of Texas at El Paso

Intelligent Compaction (IC) is an emerging technology for compaction quality control of embankment, base and hot mix asphalt layers. A number of roller manufacturers have implemented the IC technology in their compaction equipment. Each of these systems employs different instrumentation to collect vibration data and uses different algorithms to estimate the stiffness of the compacted layer. Variability of the IC data has significant impact on the compaction quality management process. To evaluate the

sources of variability, a study was performed on a section of a highway during compaction of earthwork and subgrade layers. The IC data were collected during pre-mapping of the existing embankment layer and mapping of the compacted subgrade layer. The geospatial variation of the IC data was evaluated at different construction stages. A number of modulus-based nondestructive spot tests were also performed to investigate any possible correlation with the IC data. Soil samples were also extracted at different spots for laboratory moisture content estimation. The results of the analysis showed that the geospatial variability of collected data, data reduction algorithm and accuracy of global positioning system affects the variability of collected IC data.

Field Measurement of Noise and Ground Surface Vibration during Pile Jetting and Grouting

Sudheesh Thiyyakkandi, Indian Institute of Technology, Palakkad, Kerala, India; Michael McVay, University of Florida; Peter Lai and Rodrigo Herrera, Florida Department of Transportation

Noise and vibration are critical issues associated with pile driving operations in an urban environment. Alternative foundations such as drilled shafts and augercast piles alleviate much of the operational noise and vibration. However, the cast-in place installation process may raise concerns in quality control if not adequately monitored. Post grouting the drilled shaft base has been widely used to mobilize a larger portion of the tip resistance prior to construction of the superstructure, thereby controlling the axial displacement during the service. In response to the operational challenges in urban environments, the Florida Department of Transportation and the University of Florida have recently developed a new generation of deep foundation, namely "Jetted and Grouted Precast Pile". The process consists of pressurized water jetting a concrete pile instead of a hammer-driven installation, and subsequent side and tip grouting the pile, which significantly improve skin and tip resistance, respectively, as well as lateral and torsional stiffness. Several studies have been focused on such increase in axial and torsional resistance by grouting techniques. However, there has been little field data available to support quantifiable noise and vibration reduction by jetting and grouting processes. This paper presents field measurements of noise and ground surface vibration during full-scale installation of jetted and grouted piles. Comparison of measured data to recommended noise and vibration limits suggests that jetting and grouting techniques are a viable solution for urban geo-infrastructure development.

Resistivity Measurement of Backfill for Mechanically Stabilized Earth Walls

Zachary Brady, Robert Parsons, and Jie Han, University of Kansas; Stacey Kulesza, Kansas State University; James Brennan, Kansas Department of Transportation

Mechanically stabilized earth (MSE) walls are widely used earth retention systems. MSE walls often contain galvanized steel strips as mechanical reinforcement between layers of specified backfill material. Inclusion of these strips creates a stronger composite material connected to a visually appealing wall facing; however, galvanized steel reinforcement is potentially vulnerable to corrosion. Corrosivity of MSE backfill may be characterized using electrical resistivity. Many designers currently use variations of the American Association of State Highway and Transportation Officials (AASHTO) standard T 288 to calculate resistivities of MSE backfill and require a minimum resistivity value for metal-reinforced backfill, typically 30 to 50 ohm-meters. A new procedure has been developed that appears to more accurately simulate field conditions. Material resistivities determined using this Proposed ASTM were up to two orders of magnitude higher than those determined for the same select materials using T 288 and matched well with field tests conducted by Kansas State University on the same compacted aggregate backfill.