Field Instrumentation *for* Soil *and* Rock

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EDITORS

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Foreword

This publication, *Field Instrumentation for Soil and Rock*, contains papers presented at the symposium of the same name held in Atlanta, Georgia, on June 18–19, 1998. The symposium was held in conjunction with the June 14–17, 1998 standards development meetings of Committee D-18 on Soil and Rock and its Subcommittee D18.23 on Field Instrumentation, the symposium sponsor. The symposium was chaired by Gary N. Durham, Durham Geo Enterprises Inc., GA; W. Allen Marr, Geocomp Corporation, MA, was the co-chairman. They also both served as STP editors of this publication.

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Overview

This overview summarizes the results of the Symposium on Field Instrumentation for Soil and Rock held in Atlanta, Georgia June 18–19, 1998 as part of Committee D18 scheduled meeting week. ASTM's subcommittee D 18.23 on Field Instrumentation sponsored the symposium. Major session topics include:

- Field Data Acquisition and Data Management
- Geotechnical Instrumentation of Landfills
- Instrumentation for Project Cost Management

The following is an overview of the information presented in this volume.

Instrumentation Associated with Soil Structure Interaction and Construction Monitoring

Three papers address field instrumentation associated with culverts and buried pipe. McGrath et al. presented the results of backfilling on pipe of various material and diameter. Unique methods were presented for instrumenting corrugated pipe. Webb et al. discussed instrumentation of concrete and corrugated steel arch culverts with spans of about 9 m. Various instruments were installed to monitor structural strain and deformation and culvert-soil interface pressure. The arches were backfilled and tested under live loads. Deformation measurements of the walls of the culverts were made with a custom-built laser device developed for this research. Yang et al. presented convincing evidence on earth pressure instrumentation of concrete box culverts beneath highway backfill that current ASSHTO guidelines underestimate earth pressures perhaps as must as 30%.

Barley et al. described instrumentation of strain gauged steel bars used in a soil nailed slope some 10–m high. Montannelli describes instrumentation of geogrid used in a reinforced slope. In situ pullout tests that were performed were in good agreement with scaled laboratory pullout tests. The study found good agreement between observed stress and deformations with those predicted from FEM modeling.

The paper by Chen et al. discussed the effectiveness of in situ instrumentation of diagnosing the pavement layer conditions under full scale accelerated traffic loading. Multi-depth deflectometers were used to measure both permanent deformations and transient deflections resulting from traffic loading and falling weight deflectometer tests.

Russel et al. presented a case history of monitoring preload performance for a highway alignment traversing deposits of organic silt and peat. Flentje and Chowdhury used a case history to point out the unique problems associated with instrumentation programs installed in urban areas.

Boston's Central Artery/Tunnel Project

Two papers were presented concerning the geotechnical instrumentation aspects of the Central Artery/Tunnel Project, Boston, Massachusetts. Bobrow and Vaghar discussed the Geographic Information System (GIS) that were developed for rapid analysis and reporting of instrumentation and

survey data on the Central Artery/Tunnel Project. The paper by Hawkes and Marr discussed the role of automation and reviewed the data management system developed for processing large quantities of field data on a daily basis.

Instrumentation to Monitor Landfills

Four papers were specific to geotechnical instrumentation of landfills. The paper by Taylor et al. discussed landfill liner lead detection systems. Their work indicated that a below liner monitoring grid combined with above line surveys to pinpoint leaks accurately offer a successful approach to leak detection of lined waste sites. The paper by Thomann et al. presented a case history of the unique problems connected with installing geotechnical instruments within refuse fill and the underlying foundation to monitor pore pressures, lateral and vertical movements and temperature. They reported that the attrition rate of instruments in a refuse environment is about 10 to 15% per year; therefore, redundancy of instruments is mandatory to insure a successful program. Byle et al. discussed instrumentation of a landfill liner constructed of dredge spoil. Moo-Young et al. presented a method using thermistor and conductivity probes for measuring frost penetration that might deteriorate the permeability of the landfill's liner or cap. Another paper by Benson and Bosscher discussed results of their study indicating frost depth can be more reliably measured using electrical resistivity or dielectric constant rather than with thermistors.

Data Acquisition and Data Management

A paper by Marr described the application of recent developments in electronics and instrumentation to three geotechnical cases to illustrate some of the benefits of good automated field instrumentation systems. He also reviewed the considerations involved in deciding whether to automate a geotechnical instrumentation sytem. Welch and Fields described the automation of the field instrumentation associated with a large dam. Fiber optic cable was used extensively from the various sensors to eliminate voltage surges. The automation included satellite as well as land line remote transmission of the data. A related paper by Brokaw discussed the use of geographic information systems (GIS) coupled with global positioning satellite technology for field data acquisition and data management. Hansen furthered the overall review with a discussion of relating field instrumentation data that has been incorporated into GIS framework and the implications to other geospatial data.

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