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FACULTY OF SCIENCE AND TECHNOLOGY
DEPARTMENT of
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"Monitoring of Soil Nail Bars using FBG-based and BOTDA-based Sensor Technologies"

by

Dr. HONG Cheng-Yu, Joey

*Lecturer, Faculty of Science and Technology,
Technological and Higher Education Institute of Hong Kong, Hong Kong*

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Abstract

Soil nailing is commonly used as a permanent reinforcement technique for slopes, excavations and retaining walls. The long-term stability problems of a soil nailing system depends on the mechanical behavior of soil nails, particularly the tension force distributions along the axial directions of soil nails (or related friction resistance at the nail-soil interface). The measurement of axial force distributions of soil nails in slopes is critical for both researchers and engineers to carry out comprehensive analysis of slope stability conditions. This presentation describes two field research program for the measurement of the axial force distributions of cement grouted soil nails in permanent slopes. This research program lasted 4 to 6 months monitoring the mechanical behavior of a total of 42 soil nails in 7 permanent slopes. Strain information of all these soil nails was measured using fiber Bragg grating (FBG) strain sensors and Brillouin Optical time domain analysis (BOTDA). Temperature compensation was also conducted for all these soil nails. Typical installation methods of strain and temperature sensors, the protective measures of optical fiber cables and optical fiber sensors are introduced. Measured strain results were presented and analyzed to investigate how axial forces of soil nails formed and developed after grouting, and their relevance associated with the field construction works. The possible ground movement inside slope and its effect on the axial strain results of soil nails are also interpreted and discussed in the paper. All the measurement data are useful for a better understanding of the short-term and long-term behavior of cement grouted soil nails in a real field.

Biography

Dr. Cheng-Yu Hong (洪成雨) is currently a Lecturer in Technological and Higher Education Institute of Hong Kong. He received a PhD degree from The Hong Kong Polytechnic University in Oct 2011. Dr. Hong has published around 20 international journal papers and 20 conference papers. He also served as reviewers for several international journals including ASCE International journal of Geomechanics, and ICE Geoenvironmental Geotechnics, etc. His research concerns include pullout resistance of pressure grouted soil nails; long-term monitoring of conventional soil nails and GFRP bar soil nails, and application of different optical fiber sensor technologies (fiber Bragg grating sensor; Low Coherence Interferometry; Brillouin Optical Time Domain Analysis) in geotechnical engineering projects.

ALL ARE WELCOME!