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General Report — Session 11: Application of Case Histories in Education and Practice

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APPLICATION OF CASE HISTORIES IN EDUCATION AND PRACTICE – SESSION REPORT (SESSION 11)

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ABSTRACT

Geotechnical engineers frequently use information about subsurface conditions from other projects in the area to design new projects in the vicinity. However, this information is used more in a surfacial manner rather than an integral part of project design. This session on application of case histories in education and practice has been introduced for the first time in this conference to initiate formalization of the use case histories in engineering design and training of civil engineering students. This report summarizes the papers submitted by various civil engineering educators and professional practitioners. The readers are encouraged to review the complete papers to understand how the case histories are contributing to the advancement of the profession of civil engineering.

INTRODUCTION

Civil Engineering is a profession which has contributed enormously to human development and has always faced challenges of the future, i.e., continuously improving the quality of life, advancing civilization, and providing health and safety to the public. Even though advancements in technology and design methods, knowledge and skills of engineers, understanding of behavior of civil engineering materials and structural components have provided civil engineers with unprecedented tools to design and construct safe structures, failures do happen. However, when a failure happens even after designing and constructing a structure using the best tools available, strictly from an engineering point of view, it provides an excellent opportunity to advance the state of knowledge, practice, and art. Therefore, it is extremely important that we learn from the failures and modify our design tools to prevent them from happening again.

Geotechnical engineering is a branch of civil engineering which has been born out of necessity to understand failures in earth materials. Many of theoretical concepts and geotechnical models which are in use today were developed to match the features of geotechnical failures. These concepts and models are being updated regularly based on the new information learned from case histories. According to the father of soil mechanics, Dr. Karl Terzaghi, “A well documented case history should be given as much weight as ten ingenious theories” (Brandl, 2000).

Due to request by many geotechnical engineering educators and professional practitioners, this is the first time that a theme related to application of case histories in engineering education and practice was added to the conference. In order to have even a better view on how case histories are being applied, the theme was divided into two portions, i.e., Application of Case Histories in Education (Theme 11a) and Application of Case Histories to Practice (Theme 11b). A total of 15 papers were accepted for publication under Theme 11a and a total of 11 papers were accepted under Theme 11b. In addition, Dr. J. David Rogers of Missouri University of Science and Technology, Rolla was invited to submit a

distinguished paper on "A Historical Perspective on Geotechnical Case Histories Course."

Engineering educator and practitioners from 15 countries contributed their work to this session giving it a truly global view on geotechnical engineering education and practice. The papers presented show similarities in geotechnical engineering education all over the world.

APPLICATION OF CASE HISTORIES IN EDUCATION

It is a well understood fact that students learn the best when they participate as active learners not just passive observers. Therefore, the initiative behind adding this theme was to provide the readers a glimpse on how geotechnical engineering educators are using the case histories in engaging students as active learners and training them to face the challenges of real world engineering. As noted by Dr. Rogers in his distinguished paper for this session, the concept of using case histories in education is not new. According to Dr. Rogers, "Ralph Peck introduced the concept of using a geotechnical case histories course to teach students problem solving and technical communications skills, beginning around 1956."

Table 1 presents all the papers that were accepted for publication under this portion of the theme. Most of the authors (Scharie, Paper No. 11.01a; Kumar, Paper Number 11.02a; Akili, Paper No. 11.04a; Singh, Paper No. 11.12a; Harb, Paper Number 11.13a; Phillips, Paper No. 11.14a; Narayan and Sunil, Paper No. 11.15a; Djebbi and Bouassida, Paper No. 11.18a; Floess, Paper Number 11.19a; and Thamer et al., Paper Number 11.04b) have indicated the use of case histories in geotechnical engineering courses in a discussion format, i.e., students are given an actual situation and students discuss possible causes of problems, what analysis or construction details would have prevented the problems, and to remediate the problems. In addition, many of the authors use field trips, laboratory testing, and guest speakers in complementing the traditional classroom instruction. Kumar (Paper Number 11.02a) has presented information about a full three credit hour undergraduate level course related to geotechnical engineering in professional practice he introduced at his institution. Mauldon and Brennam (paper Number 11.07a) presented the information about a case study teaching unit they developed for an undergraduate geotechnical engineering course. Bapat (Paper Number 11.03) presented a case study on how some colleges were used to measure some geophysical parameters after a major earthquake in India.

Lawson (Paper Number 11.06a) discussed the use of D-Day of World War II story in grasping students' attention for presenting the significance of geotechnical site characterization and its relation to bearing capacity evaluation needed to land heavy vehicles and equipment on beaches of Normandy for the invasion. Baeverfjord and Thakur (Paper Number 11.17a) presented discussion on how they contribute to geotechnical engineering education through research on soils. Ali and Ali (Paper Number 11.10a) have presented their idea of developing "Geotechnical Information System (GTIS)" which will provide framework for increased understanding of world-wide geotechnical issues by sharing lessons learnt and other aspects of geotechnical engineering. Kolev (Paper Number 11.11a) has presented information about a case history in Bulgaria. However, it is not clear how the author uses this case history is being used for educating geotechnical engineering students.

APPLICATION OF CASE HISTORIES TO PRACTICE

The initiative for adding this theme was to provide a venue for engineers to discuss how case histories in geotechnical engineering are helping them in performing better and more cost effective designs while minimizing potential for failures. Lessons learned from challenges, successes, and failures on other projects are of tremendous value when designing and constructing projects for present and future. Table 2 presents all the papers that were accepted for publication under this portion of the theme. Ali and Ali (Paper Number 11.06) have stated it very nicely "case histories help us learn from the past without living in the past." They have presented an interesting case history of enhancing bearing capacity by using dynamic compaction. Several papers (Shuler, Paper Number 11.03; Kolev, Paper Number 11.05b; Groenewald and Legge, Paper Number 11.07b; Jagtap et al., Paper Number 11.10b; Ganpule and Mhaiskar, Paper Number 11.11b; and Escobar and Posada, paper Number 11.14b;) submitted in this section provide interesting actual case histories rather than discussing how the existing knowledge from other projects was used in designing their projects. Nonetheless, these papers provide much needed contribution to the geotechnical engineering database. Paper by Thamer et al. (Paper Number 11.04b) is actually related to using case history in education and therefore, is included in the previous section.

Papers by Emeriault et al. (Paper Number 11.02b), Koelewijn and Mens (Paper Number 11.08b), and Baxter et al. (Paper Number 11.09b) present information which directly catches the spirit of this session. Paper by Emeriault et al. presents the prototype of a new database for case histories of monitored construction of tunnels and deep excavation which will be useful for designing and constructing similar projects in future. According to the authors, the basic requirements for this database have been established by the members of the Technical Committee TC28 of the International Society for Soil mechanics and Geotechnical Engineering. Koelewijn and Mens have discussed the concept of GeoBrain, a database of geotechnical case histories, and its application to the feasibility of vibratory installation of sheet pile walls. The authors state that "collecting case histories as a kind of 'collective memory' can make us learn from the past." Baxter et al. presented a study in which they used past experience and a case history to enhance the design of pile foundations. It is well understood that the design of pile foundation requires a lot of judgment. Therefore, knowledge from other similar projects in similar ground conditions could result in substantial cost savings when pile foundations are used.

CONCLUDING REMARKS

All the papers presented in Session 11a have discussed the importance of using geotechnical engineering case histories in training civil engineers for facing the challenges of 21st century projects. Whenever project based or problem based instruction is adopted, instructors are faced with a challenge to develop practice and/or homework assignments, come up with innovative ways to assign grades to groups and individual students, ensure that students are focused and contributing equally in group assignments, etc. Therefore, we believe that more papers addressing these and similar topics will be submitted during future conferences.

The papers presented in Session 11b have discussed the importance of developing the database of geotechnical engineering case histories and using it for designing safe and cost effective projects. There is no doubt that this type of databases would not only be desirable but will be necessary to design future projects. We believe that the purpose of Session 11b needs to be clarified further so that more papers focused on the use of local experience and data from past case histories in professional practice could be included.

Table 1. Application of Case Histories in Education

Paper Number	Authors	Title
Distinguished Speaker	J. David Rogers (USA)	A Historical Perspective on Geotechnical Case Histories Courses
11.01a	Peter Scharle (Hungary)	Streamlining Case Studies for Education
11.02a	Sanjeev Kumar (USA)	Geotechnical Failures: An Excellent Tool to Teach Geotechnical Engineering
11.03a	Arun Bapat (India)	Monitoring Seismic and Geophysical Parameters with the help of College Instruments and Staff
11.04a	Waddah Akili (USA)	Case Histories in Geotechnical Engineering: Enhancing the Practice in an Interactive Learning Environment
11.06a	William D. Lawson (USA)	Soil Sampling at Sword Beach – Luc-sur-Mer, France, 1943: How Geotechnical Engineering Influenced the D-Day Invasion and Directed the Course of Modern History
11.07a	Matthew Mauldon and Kristin Brennan (USA)	Exploring Case Histories: Chocolatetown PA
11.10a	Liaqat Ali and Sarfraz Ali (Pakistan)	From Case Histories to Conceptual Models
11.11a	Chavdar V. Kolev (Bulgaria)	One Hundred Years Settlement of the Verna's Breakwater – Construction on Soft Clay like a Typical Example from University Program of Port Construction in Bulgaria
11.12a	Sukhmander Singh (USA)	Case Histories Oriented Teaching of Geotechnical Engineering
11.13a	Jacques Harb (Lebanon)	Addressing the Geotechnical Case Histories of Beirut
11.14a	Declan Phillips (Ireland)	Benefits of Case Based Instruction in Undergraduate Geotechnical Education
11.15a	B.M. Sunil and K.S. Babu Narayan (India)	Use of Case Histories to Enhance Practical Geotechnical Engineering
11.17a	Maj Goril Baverfjord and Vikas Thakur (Norway)	The Verdal and Rissa Landslides – Application of Case Histories in Education
11.18a	Mounir Bouassida and M. Djebbi (Tunis)	Educating Student through Understanding the Pathology of Geotechnical Projects
11.19a	Carsten H. Floess (USA)	Use of Case History Examples in the Classroom
11.20a	Jiri Slovak, Jiri Svoboda, Radek Vasicek, and Pavla Bauerova (Czech Republic)	Josef Exploration Drift - From Exploration of Gold to Unique Facility for Geotechnical Research, Education and Training
11.04b	Ahmed Mohammed Thamer, A.A. Aziz, and B.B.K. Huat (Malaysia)	Incorporating Case Study and Site Visit for Teaching of Earth and Hydraulic Structures at Universiti Putra Malaysia

Table 2. Application of Case Histories to Practice

Paper Number	Authors	Title
11.02b	Fabrice Emeriault, Richard Kastner, Rodolphe Louis-Sidney, and Elöd Egyed-Zsigmond (France)	A New International Database on Case Histories of Monitored Construction of Tunnels and Deep Excavation
11.03b	Scott Shuler (USA)	Implications of Swelling Clays on Asphalt Pavement Performance in Colorado
11.05b	Chavdar V. Kolev (Bulgaria)	Landslides in Balchik – the Biggest Nature Experiment for Shore Protection in Bulgaria
11.06b	Liaqat Ali and Sarfraz Ali (Pakistan)	Use of Case Histories to Enhance Practical Geotechnical Engineering
11.07b	Marlizé Groenewald and Francis Legge (South Africa)	Foundations of the Nation: The Hillbrow and Brixton Towers as Figuration of National Identity in South Africa
11.08b	A.R. Koelewijn and A.M.J. Mens (Netherlands)	Geobrain: Dutch Feasibility Database for Installing Sheet Pile Walls
11.09b	David J. Baxter, Neil Dixon, Paul R. Fleming, and Ken A. Cromwell (United Kingdom)	Using Experience and Case History Data to Enhance the Design of Piled Foundations and Predict Behaviour Characteristics
11.10b	Shubhada S. Jagtap, Annapurni Iyer, and Minimol Korulla (India)	Emerging Innovative Solutions Enhancing Practical Geotechnical Engineering
11.11b	V.T. Ganpule and S.Y. Mhaiskar (India)	Deterioration of Bored Cast In Situ Piles due to Aggressive Water
11.14b	Alberto Marulanda and Camilo Marulanda (Colombia)	Recent Experience on Design, Construction and Performance of CFRD Dams