Selected Papers from the Proceedings of the Fourth Geo-China International Conference

Geotechnical Special Publication No. 257



Advances in Numerical and Experimental Analysis of Transportation Geomaterials and Geosystems for Sustainable Infrastructure

Edited by

Rifat Bulut, Ph.D.

Xinbao Yu, Ph.D.

Shu-Rong Yang, Ph.D.

ASCE

G-I GEO-INSTITUTE

GEOTECHNICAL SPECIAL PUBLICATION NO. 257

GEO-CHINA 2016

ADVANCES IN NUMERICAL AND EXPERIMENTAL ANALYSIS OF TRANSPORTATION GEOMATERIALS AND GEOSYSTEMS FOR SUSTAINABLE INFRASTRUCTURE

SELECTED PAPERS FROM THE PROCEEDINGS OF THE FOURTH GEO-CHINA INTERNATIONAL CONFERENCE

July 25–27, 2016
Shandong, China

SPONSORED BY

Shandong University

Shandong Department of Transportation

University of Oklahoma

Chinese National Science Foundation

Geo-Institute of the American Society of Civil Engineers

EDITED BY
Rifat Bulut, Ph.D.
Xinbao Yu, Ph.D.
Shu-Rong Yang, Ph.D.

Published by the American Society of Civil Engineers

Published by American Society of Civil Engineers
1801 Alexander Bell Drive
Reston, Virginia, 20191-4382
www.asce.org/publications | ascelibrary.org

Any statements expressed in these materials are those of the individual authors and do not necessarily represent the views of ASCE, which takes no responsibility for any statement made herein. No reference made in this publication to any specific method, product, process, or service constitutes or implies an endorsement, recommendation, or warranty thereof by ASCE. The materials are for general information only and do not represent a standard of ASCE, nor are they intended as a reference in purchase specifications, contracts, regulations, statutes, or any other legal document. ASCE makes no representation or warranty of any kind, whether express or implied, concerning the accuracy, completeness, suitability, or utility of any information, apparatus, product, or process discussed in this publication, and assumes no liability therefor. The information contained in these materials should not be used without first securing competent advice with respect to its suitability for any general or specific application. Anyone utilizing such information assumes all liability arising from such use, including but not limited to infringement of any patent or patents.

ASCE and American Society of Civil Engineers—Registered in U.S. Patent and Trademark Office.

Photocopies and permissions. Permission to photocopy or reproduce material from ASCE publications can be requested by sending an e-mail to permissions@asce.org or by locating a title in ASCE's Civil Engineering Database (http://cedb.asce.org) or ASCE Library (http://ascelibrary.org) and using the "Permissions" link.

Errata: Errata, if any, can be found at http://dx.doi.org/10.1061/9780784480007

Copyright © 2016 by the American Society of Civil Engineers.
All Rights Reserved.
ISBN 978-0-7844-8000-7 (PDF)
Manufactured in the United States of America.

Preface

This Geotechnical Special Publication (GSP) contains 23 papers addressing a variety of current issues in Soils and Rock Instrumentation, Behavior, and Modeling; Earth Retaining Walls and Slope Stability; and Seismically Induced Hazards and Mitigation. These papers were presented at the GeoChina International Conference held on July 25-27, 2016 in Shandong, China. The technical programs for the GeoChina International Conference struck a balance between the fundamental theories and field applications. Sustainable civil infrastructures using innovative technologies and materials are endorsed by a number of leading international professional organizations. This GSP includes investigations and solutions from numerous countries. It expands ranges of tools that are available to engineers and scientists.

Acknowledgments

The following individuals have assisted in reviewing the papers:

Tejo vikash Bheemasetti, Sao-Jeng Chao, Cheng-Wei Chen, Lizhou Chen, Xiang Chen, Yi Dong, Ceki Harman, G.T. Hong, Quan Gao, Jeffrey Lee, Zhen Liu, BooHyun Nam, Fatih Oncul, Aravind Pedarla, Asheesh Pradhan, Elmira Riahi, Hakan Sahin, Zhiming Si, Xiaoming Yang, Xinbao Yu, Bin Zhang, and Nan Zhang.

© ASCE

Contents

Exploring the Geomechanics of Sinkholes: A Numerical Study of Sinkhole Subsidence and Collapse 1
Kishor Rawal, Zhong-Mei Wang, and Liang-Bo Hu

Reliability Assessment of Wedge Failure in Rock Slopes by the Random Sets Theory 9
Rodrigo Hernández-Carrillo and Gloria Inés Beltrán

Experimental and Numerical Analysis on the Specific Storage of Low Permeable Sandstone for Supercritical CO_2 18
Ardy Arsyad and Yasuhiro Mitani

Experimental Study on the Drained Shear Strength of Unsaturated Clayey Sand 35
Nigui Qian, Duanyi Wang, and Qingyan Tian

Application of the Low Strain Method to the Nondestructive Detection of the Integrity of Highway Bridge Rock-Socketed Piles 43
Laisheng Xue and Xiangxing Kong

Performance Evaluation of Pier Foundation Excavations at an Existing Freeway Embankment 50
James C. Ni and Wen-Chieh Cheng

Microstructural Damage-Induced Localized Fracturing of Brittle Rocks 58
Tao Xu, Shengqi Yang, Mike Heap, Chongfeng Chen, and Tianhong Yang

Numerical Simulation of Built-In Oblique Circular 3D Crack Propagation under Uniaxial Compression by the Element Free Galerkin Method 66
Dun-Fu Zhang, Sheng-Hua Huang, Bo Zhang, Shu-Cai Li, and Wei-Shen Zhu

Seismic Stability Analysis of Un-Reinforced and Reinforced Soil Slopes 74
S. Sahoo, B. Manna, and K. G. Sharma

Use of Retaining Walls with Relief Shelves as an Economic Solution 82
Hany Farouk Shehata

Effect of Supporting Soil Rigidity on the Apparent Earth Pressure 91
Hany Farouk Shehata and Tamer M. Sorour

© ASCE

Reliability Analysis of Strain-Softening Slopes Using the First Order Reliability Method (FORM) 100
Subhadeep Metya, Gautam Bhattacharya, and Robin Chowdhury

Probabilistic Stability Analysis of Unsaturated Soil Slopes under Rainfall.....108
Bai Tao and Deyu Zhang

Rainfall-Induced Failure of Volcanic Embankments Subjected to Cyclic Loadings in Cold Regions 116
Shima Kawamura, Seiichi Miura, Hieu Minh Dao, and Ryoichi Yamada

Computation of the Rotational Displacements of Gravity Retaining Walls by the Pseudo-Dynamic Method.....124
Anindya Pain, Deepankar Choudhury, and S. K. Bhattacharyya

Statistical Correlations between Pressuremeter Tests and SPT for Glacial Tills.....133
Kanagaratnam Balachandran, Jinyuan Liu, Laifa Cao, and Scott Peaker

Prediction of the Field Response of Soil-Support Systems in Deep Excavations.....141
A. M. Hefny, T. M. Sorour, and M. E. Ezzat

Sustainable Mitigation of Slope Failure by Compacted Soil-Cement Fill.....152
Jason Y. Wu, Kaiming Huang, and Munira Sungkar

A Numerical Approach to Solve 3D Geotechnical Problems with 2D Codes....160
Guangxian Hou and Shanzhi Shu

Risk Assessment Study on Long Oil and Gas Pipeline Construction-Induced Landslide Disasters.....167
Mingzhou Bai, Yanqing Du, Zhihua Da, Yujian Xing, and Pingyuan Zhao

Probabilistic Assessment of Fill Slope Stability 175
Kelvin Lim, Alexander Schmid, and An-Jui Li

Probability of Liquefaction in Sabkha Soils under Different Earthquakes.....183
Ahmed T. M. Farid

Site-Specific Seismic Response Analyses of a Municipal Solid Waste Dump Site at Delhi, India 191
B. J. Ramaiah, G. V. Ramana, and B. K. Bansal

© ASCE