

Geotechnical Testing Journal

Contents:

Special Issue on Advances in Laboratory Experimentation for Unsaturated Soils

Guest Editors: Oliver-Denzil S. Taylor, Laureano R. Hoyos, William J. Likos, and John S. McCartney

- 235 Editorial: Special Issue on Advances in Laboratory Experimentation for Unsaturated Soils**—*Oliver-Denzil S. Taylor, Laureano R. Hoyos, William J. Likos, and John S. McCartney*
- 237 Redesigned Filter Paper Method: Protocol and Assessment Using Reconstituted Samples**—*Lucas Walshire, Woodman Berry, and Oliver-Denzil Taylor*
- 255 Test Apparatus for Rapid Determination of Soil-Water Retention Curve under Isotropic Loading Condition**—*S. Roy and S. Rajesh*
- 274 Assessment of Water Retention Test by Continuous Pressurization Method**—*Byeong-Su Kim, Masanori Hatakeyama, Seong-Wan Park, Hyun-Su Park, Yuji Takeshita, and Shoji Kato*
- 290 Development of a Near-Surface SWRC Device (NSD) for Measuring Suction under Low Stress Environments**—*Oliver-Denzil S. Taylor, Amy L. Cunningham, and Lucas A. Walshire*
- 308 Measurement of Suction Stress and Soil Deformation at High Suction Range**—*Yi Dong and Ning Lu*
- 323 Experimental Techniques for the Study of the Cracking Mechanisms in Drying Clays**—*X. Wei, K. V. Bicalho, A. El Hajjar, S. Taibi, M. Hattab, and J.-M. Fleureau*
- 339 Comparison of Two Laboratory Methods for Measuring Soil Critical Temperature**—*Hyunjun Oh and James M. Tinjum*
- 358 Apparatus for Coupled Effects of Suction, Temperature, and Stress on Thermal Conductivity of Unsaturated Sand**—*Jun Yao, Aşkın Özocak, Tengfei Wang, William J. Likos, and Tuncer B. Edil*
- 373 Evaluation of the At-Rest Coefficient of Earth Pressure in Unsaturated Residual Soil with a New Suction-Controlled Device**—*Tácio M. P. de Campos, Ana Carolina de C. Viana, Thaiana A. Silva, and Lorena G. Abrantes*
- 392 Total Volume Change Measurement of Unsaturated Soil in Triaxial Tests: A New Approach**—*Tácio M. P. de Campos, Taíse M. de O. Carvalho, and Ana Carolina de C. Viana*

- 407 Effect of Suction and Confining Pressure on Shear Strength and Dilatancy of Highly Compacted Silty Sand: Single-Stage versus Multistage Triaxial Testing**—*Xavier A. Rivera-Hernandez, Farshid Vahedifard, and Ghada S. Ellithy*
- 422 Development of a Multifunctional Triaxial System for Unsaturated Soils: Addition of Permeameter Function**—*Hailong Wang, Jaylord U. Tan Tian, Junichi Koseki, and Takeshi Sato*
- 440 Methodology to Characterize the Seismic Compression of Unsaturated Sands under Different Drainage Conditions**—*Wenyong Rong and John Scott McCartney*
- 462 An Apparatus to Measure Gas Diffusion and Gas Permeability of Unsaturated Cap Barriers Subjected to Distortion**—*S. Rajesh and V. Khan*
- 483 Osmotic Oedometer Using Sodium Chloride Solution and Reverse Osmosis Membrane**—*Sam Bulolo and Eng-Choon Leong*
- 502 New X-Ray Microtomography Setups and Optimal Scan Conditions to Investigate Methane Hydrate-Bearing Sand Microstructure**—*Thi Xiu Le, Patrick Aïmedieu, Michel Bornert, Baptiste Chabot, Andrew King, and Anh Minh Tang*
- 520 Laboratory Tests on Mitigation of Soil Liquefaction Using Microbial Induced Desaturation and Precipitation**—*Liya Wang, Leon van Paassen, Yunqi Gao, Jia He, Yufeng Gao, and Daehyun Kim*

TECHNICAL NOTE

- 535 Simple Testing Method for Measuring the Triaxial Stress-Strain Relations of Unsaturated Soils at High Suctions**—*Bo Chen, You Gao, De'an Sun, and Jie Li*



ASTM INTERNATIONAL
Helping our world work better

ISSN: 0149-6115
Stock #: GTJ2103

www.astm.org

CO-EDITORS

Dr. Majdi A. Othman
Geosyntec Consultants
1255 Roberts Blvd., NW
Suite 200
Kennesaw, GA 30144
Tel: 678-202-9508
E-mail: mothman@geosyntec.com

Dr. Nazli Yesiller

Global Waste Research Institute
California Polytechnic State University
1 Grand Ave.
San Luis Obispo, CA 93407
Tel: 805-756-2932
E-mail: nyesille@calpoly.edu

EDITORIAL OBJECTIVES

The *Geotechnical Testing Journal* is published in six issues per year by ASTM International, a nonprofit technical organization that develops and publishes voluntary consensus standards and related information for materials, products, systems, and services. Some issues, in whole or in part, may be Special Issues focused on a topic of interest to our readers. Contributions are peer reviewed prior to publication.

EDITORIAL SERVICES — SUBMISSIONS

Sara Welliver
Supervisor, Peer Review Services
Geotechnical Testing Journal Editorial Offices
J&J Editorial Services
201 Shannon Oaks Cir #124
Cary, NC 27511, USA
Tel: (919) 650-1459 ext. 210
E-mail: astm@jjeditorial.com

PURPOSE AND SCOPE

The purpose of the *Geotechnical Testing Journal* is (1) to provide a high-quality publication that informs the profession of new developments in soil and rock testing and related fields; (2) to provide a forum for the exchange of information, particularly that which leads to the development of new test procedures; and (3) to stimulate active participation of the profession in the work of ASTM International Committee D18 on Soil and Rock and related committees.

Contributions include papers, technical notes, letters to the editor, discussions of previously published papers, and book reviews. The editorial scope of

this journal covers test methods for soil and rock, sampling, nomenclature, and practices relating to the determination of properties and behavior of soil and rock for engineering purposes, and for soil as a medium for plant growth. Topics of interest include: new testing equipment, apparatus, and procedures for both field and laboratory applications; evaluation of existing ASTM International standards and recommendations for new standards for apparatus or test procedures; and test results that give insights into test procedures, techniques, and data interpretation. Topics must be related to soil and rock, but may include use and testing of geosynthetic materials in conjunction with soil and rock, highway materials testing such as aggregate properties or pavement performance measurement, geophysical exploration, marine sediments, groundwater investigations, testing and stabilization of contaminated soils and soil and rock engineering related to waste management.

EDITORIAL BOARD

Dr. David W. Airey
University of Sydney, Australia

Dr. Khalid A. Alshibli
University of Tennessee
Knoxville, TN, USA

Dr. Charles Aubeny
Texas A&M University
College Station, TX, USA

Dr. Richard J. Bathurst
Royal Military College of Canada
Kingston, Ontario, Canada

Dr. Paul J. Bullock
Fugro Consultants, Inc.
Gainesville, FL, USA

Dr. Andrew P. Bungler
University of Pittsburgh
Pittsburgh, PA, USA

Dr. Guojun Cai
Southeast University
Nanjing, China

Dr. Giovanni Cascante
University of Waterloo, Canada

Dr. Bernardo Castellanos
Virginia Tech
Blacksburg, VA, USA

Dr. A. Viana da Fonseca
University of Porto
Porto, Portugal

Dr. Pierre Delage
CERMES
École Nationale des Ponts
et Chaussées, France

Dr. Mandar Dewoolkar
University of Vermont
Burlington, VT, USA

Dr. Vincent P. Drnevic
Purdue University
W. Lafayette, IN, USA

Chadi El Mohtar
University of Texas at Austin
Austin, TX, USA

Dr. Dante Fratta
University of Wisconsin-Madison
Madison, WI, USA

Dr. Majid Ghayoomi
University of New Hampshire
Durham, NH, USA

Dr. Karen S. Henry
United States Air Force Academy
USAF Academy, CO, USA

Dr. Laureano R. Hoyos
The University of Texas at Arlington
Arlington, TX, USA

Dr. Zoubair Lafhaj
École Centrale de Lille
Lille, France

Mr. Michael W. Laney
Terracon Consultants, Inc.
Olathe, KS, USA

Professor Fook-Hou Lee
National University of Singapore
Singapore

Garland E. Likins
Pile Dynamics, Inc.
Cleveland, OH, USA

Dr. Michael Long
University College Dublin, Ireland

Dr. Ning Lu
Colorado School of Mines
Golden, CO, USA

Mr. Robert Mackey
S2L Inc.
Maitland, FL, USA

Dr. Ali Maher
Rutgers University
Piscataway, NJ, USA

Ms. Gabriela Mariscal
National Concrete Masonry
Association
Herndon, VA, USA

Dr. John Scott McCartney
University of California San Diego
La Jolla, CA, USA

Mr. James A. McKelvey
Earth Engineering, Inc.
East Norriton, PA, USA

Dr. Jay N. Meegoda
New Jersey Institute of Technology
Newark, NJ, USA

Paola Monaco
University of L'Aquila
L'Aquila, Italy

Dr. Michael A. Mooney
Colorado School of Mines
Golden, CO, USA

Dr. Phillip S. K. Ooi
University of Hawaii at Manoa
Honolulu, HI, USA

Dr. Anand J. Puppala
Texas A&M University
College Station, TX, USA

Donald T. Robertson
Applied Foundation Testing, Inc.
Green Cove Springs, FL, USA

Dr. Joel Sarout
Commonwealth Scientific and
Industrial Research Organization
Bentley, Australia

Dr. Devendra N. Singh
Indian Institute of Technology
India

Dr. Khaled Sobhan
Florida Atlantic University
Boca Raton, FL, USA

Dr. Muhannad T. Suleiman
Bethlehem, PA, USA

Ingrid Tomac
San Diego, CA, USA

Dr. George Veyera
University of Rhode Island
Kingston, RI, USA

Dr. Dharma Wijewickreme
University of British Columbia
Canada

Dr. Xiong Yu
Case Western Reserve University
Cleveland, OH, USA

POSTMASTER send address change to:

ASTM International—GTJ, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959

EXECUTIVE COMMITTEE

John R. Logar, **Chair**
Cesar A. Constantino, **Vice Chair**
William A. Ells, **Vice Chair**
Bill Griese, **Finance and Audit Committee Chair**
Taco van der Maten, **Past Chair**
Andrew G. Kireta, Jr., **Past Chair**
Katharine E. Morgan, **President**

DIRECTORS

Amer Bin Ahmed
Klas M. Boivie
Francine Bovard
Gregory J. Bowles
Michael J. Brisson
Scott Fenwick
Linda Freeman
Bonnie McWade-Furtado
Timothy J. Morris
Elise Owen
David W. Parsonage
Carol Pollack-Nelson
Christopher R. Reid
Casandra W. Robinson
Julia C. Schimmelpenninck
Rina Singh
Brian P. Shiels
Dalia Yarom

COMMITTEE ON PUBLICATIONS

William J. Likos, **Chair**
K. Russell DePriest, **Vice Chair**
John R. Logar, **ex officio**
Jay Bhatt
John E. Haddock
Yinlun Huang
Jason H. Ideker
Ibironke Lawal
M. R. Mitchell
Richard W. Neu
Majdi A. Othman
Sudarsan Rachuri
Donya Stubbs
Theresa A. Weston
Nazli Yesiller

INFORMATION FOR AUTHORS

For details regarding paper submission go to <http://mc04.manuscriptcentral.com/astm-gtj>. The subject matter must not be of a speculative nature and the contents must not include materials of an advertising nature. The paper must not be seriously defective as to literary form and structure, continuity of thought, and clarity of expression. The substance of the paper should not have been published previously in the open literature.

Authors preparing papers for submittal should observe the conventions of style explained in the ASTM Style Manual. Since the journal does not request page charges, the author is expected to conform to these standard conventions for style and the inclusion of complete references and high-quality figures. SI units are to be used throughout; if data were not measured in SI units, a note should appear to that effect and the original units should be included in parentheses after the SI units.

IN APPRECIATION OF THE REVIEWERS

The high quality of the papers that appear in this publication is a tribute not only to the obvious efforts of the authors represented but to the unheralded, though essential, efforts of their reviewers. It is to the reviewers' dedication to upholding the high standards of their profession that this note pays tribute. On behalf of ASTM International and the authors as well, we acknowledge with appreciation their important contribution to the success of this journal.

AWARDS FOR PAPERS

Papers are eligible for the following ASTM International awards:

- The C.A. Hogentogler Award — papers on soils for engineering purposes.
- The Sanford E. Thompson Award — papers on concrete and concrete aggregates.
- The Richard L. Templin Award — papers on new and useful testing procedures and apparatus.
- The *Geotechnical Testing Journal* Award — papers on the practice of geotechnical testing.

PAST TECHNICAL EDITORS

Dr. Ernest T. Selig
(March 1978 to September 1985)

Dr. Vincent P. Drnevich
(December 1985 to December 1989)

Mr. Paul Knodel
(March 1990 to December 1992)

Dr. Howard J. Pincus
(March 1993 to December 1995)

Dr. Ronald C. Chaney
and Dr. Kenneth R. Demars
(March 1996 to June 2002)

Dr. Thomas C. Sheahan
(July 2002 to December 2008)

Mr. L. David Suits
(September 2002 to December 2017)

Geotechnical Testing Journal

(Print ISSN 0149-6115; E-ISSN 1945-7545) is published in six issues per year by ASTM International. Some issues, in whole or in part, may be Special Issues focused on a topic of interest to our readers. The views expressed in this journal are not those of ASTM International. The data and opinions appearing in the published material were prepared by and are the responsibility of the contributors, not of ASTM International.

Copyright © 2021 ASTM

International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959. All rights reserved. This material may not be reproduced or copied, in whole or in part, in any printed, mechanical, electronic, film, or other distribution and storage media without the written consent of the publisher.

Subscriptions are in an online-only format

Individual subscriptions
1 year online access \$259.00

Institutional subscriptions (one geographic site via IP access)
1 year online access \$487.00

Single copies \$55.00

For multi-site subscription and pricing
sales@astm.org
tel +1.877.909.ASTM

To subscribe
Please send prepaid order to ASTM International, Customer Service, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959 or visit www.astm.org.

Photocopy Rights

Authorization to photocopy items for internal, personal, or educational classroom use, or the internal, personal, or educational classroom use of specific clients, is granted by ASTM International provided that the appropriate fee is paid to:

Copyright Clearance Center
222 Rosewood Drive
Danvers, MA 01923

tel +1.978.646.2600
<http://www.copyright.com/>