

# Geotechnical Testing Journal

## Contents:

- 257 Application of Ground Penetrating Radar (GPR) to Detect Joints in Organic Soft Rock**—*Ali Tolooiyan, Ashley P. Dyson, Mojtaba Karami, Tahereh Shaghaghi, and Mohsen Ghadrddan*
- 275 Assessment of Bentonite Compatibility with Salinity Using Centrifugation-Based Water Retention**—*Andras Fehervari, Will P. Gates, Abdelmalek Bouazza, and Charles D. Shackelford*
- 296 Creating Tensile Fractures in Colorado Shale Using an Unconfined Fast Heating Test**—*Biao Li and Ron C. K. Wong*
- 307 Experimental Study of Factors Controlling Tilt-Test Results Performed on Saw-Cut Rock Joints**—*Ignacio Pérez-Rey, Leandro R. Alejano, and José Muralha*
- 331 Fatigue Characteristics of Coal Specimens under Cyclic Uniaxial Loading**—*Y. J. Yang, H. Q. Duan, L. Y. Xing, and L. Deng*
- 347 Strength Criteria Based on Shear Failure Planes and Test Verification on Loess**—*Shuai Shao, Sheng-jun Shao, and Qiang Wang*
- 365 Study on the Application of Ultrasonic Wave in Foundation Settlement Monitoring**—*Le-fan Wang, Xing-zhong Weng, Ye Li, Bo-wen Guan, Zhi-hua Yao, and Qu Bo*
- 385 The Loading Test on the Single Pile with Pile Cap in Transparent Soil Model**—*Yong Sang, Zhongtao Wang, Shenkun Yu, and Honghua Zhao*
- 407 Tracer Tests in Stratified Alluvial Aquifers: Predictions of Effective Porosity and Longitudinal Dispersivity versus Field Values**—*R. P. Chapuis*

## REVIEW PAPER

- 433 Performance of Fully Grouted Piezometers under Transient Flow Conditions: Field Study and Numerical Results**—*Vahid Marefat, François Duhaime, Robert P. Chapuis, and Vincent Le Borgne*

## TECHNICAL NOTES

- 457 Soil Plasticity Variability and Its Effect on Soil Classification—**  
*Masoud S. G. Manafi*
- 471 Soil–Water Characteristic Curve and Permeability Function of Recycled Concrete Aggregates Coated with Oil or Wax—***Harianto Rahardjo, Arun Prasad, Sugeng Krisnanto, Eng-Choon Leong, and Chien Looi Wang*
- 485 Surface Smoothness Evaluation of Etched and Unaltered Sand Specimens with Mechanical Behavior Assessment—***Anthony Tessari, Mark R. Muszynski, and Joseph Colletti*

## DISCUSSION

- 500 Discussion of “Axial Uplift Behavior of Belled Piers in Sloping Ground” by X.-L. Lu, Z.-Z. Qian, and W.-Z. Yang, This Article was Published in *Geotechnical Testing Journal*, Vol. 40, No. 4, 2017. [DOI: 10.1520/GTJ20150202]—***Fernando Artur Brasil Danziger, Claudio Pereira Pinto, Aureo Pinheiro Ruffier, and Marcus Peigas Pacheco*

## CLOSURE

- 505 Closure to “Discussion of ‘Axial Uplift Behavior of Belled Piers in Sloping Ground’ by F. A. B. Danziger, C. Pereira Pinto, A. P. Ruffier, and M. P. Pacheco”—***Xian-long Lu, Zeng-zhen Qian, and Wen-zhi Yang*



ASTM INTERNATIONAL  
Helping our world work better

ISSN: 0149-6115  
Stock #: GTJ1903

[www.astm.org](http://www.astm.org)

## CO-EDITORS

### Dr. William J. Likos

Department of Civil and Environmental Engineering  
University of Wisconsin-Madison  
Madison, WI 53706, USA  
Tel: 608-890-2662  
E-mail: likos@wisc.edu

### Dr. Majdi A. Othman

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

## 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. – Loadtest  
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. Andrew Corkum

Dalhousie University  
Halifax, Nova Scotia, Canada

### 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

### Dr. Michael A. Mooney

Colorado School of Mines  
Golden, CO, USA

### Majdi Abou Najm

Beirut, Lebanon

### Dr. Phillip S. K. Ooi

University of Hawaii at Manoa  
Honolulu, HI, USA

### Dr. Anand J. Puppala

University of Texas at Arlington  
Arlington, 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. Vincent Silvestri

Ecole Polytechnique de Montreal  
Canada

### 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. Nazli Yesiller

Global Waste Research Institute  
California Polytechnic  
State University  
San Luis Obispo, CA, USA

### 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

Taco van der Maten, **Chairman**  
Andrew G. Kireta, Jr., **Vice Chairman**  
John R. Logar, **Vice Chairman**  
Vicky J. Taylor, **Chairman of Finance**  
and **Audit Committee**  
D. Thomas Marsh, **Past Chairman**  
Dale F. Bohn, **Past Chairman**  
Katharine E. Morgan, **President**

## DIRECTORS

Amer Bin Ahmed  
Dale F. Bohn  
Klas M. Boivie  
Gregory J. Bowles  
Joannie W. Chin  
Oliver S. Delery, Jr.  
William Ellis  
John Fletcher  
John Germaine  
William C. Griese  
Alan Kaufman  
Andrew G. Kireta, Jr.  
John R. Logar  
D. Thomas Marsh  
R. Christopher Mathis  
Rebecca S. McDaniel  
Katharine E. Morgan  
David W. Parsonage  
Irving S. Scher  
Arman Shakkaliyev  
Rina Singh  
Vicky J. Taylor  
Taco van der Maten  
Jeff Weiss  
Terry O. Woods

## COMMITTEE ON PUBLICATIONS

Dee Magnoni, **Chairman**  
William J. Likos, **Vice Chairman**  
Taco van der Maten, **ex officio**  
Jay Bhatt  
K. Russell DePriest  
Donya Germain  
Nikhil Gupta  
John E. Haddock  
Jason H. Ideker  
M. R. Mitchell  
Richard W. Neu  
Majdi A. Othman  
Sudarsan Rachuri  
George E. Totten

## 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 © 2019 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 \$252.00

**Institutional subscriptions**  
(one geographic site via IP access)  
1 year online access \$473.00

Single copies \$55.00

**For multi-site subscription and pricing**  
[sales@astm.org](mailto: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](http://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/>