



# Geotechnical Testing Journal

## Contents:

---

**435 A New Laboratory Short Encapsulation Pull Test for Investigating Load Transfer Behavior of Fully Grouted Cable Bolts**

Jianhang Chen, Paul C. Hagan, and Serkan Saydam

---

**448 An Apparatus for Testing Static Fatigue at Sand Grain Contacts**

Zhijie Wang and Radoslaw L. Michalowski

---

**459 An Automated Large-Scale Apparatus for 3-D Cyclic Testing of Soil-Structure Interfaces**

Jian-Min Zhang, Da-Kuo Feng, and Wen-Jun Hou

---

**473 An Experimental Parametric Study of Segregation in Cohesionless Soils of Embankment Dams**

Sajad Asmaei, Piltan Tabatabaie Shourijeh, Seyed Mohammad Binesh, and Mohammad-Hassan Ghaedsharafi

---

**494 An Experimental Study on Mechanical Behavior of a Calcite Cemented Gravelly Sand**

Mohammad Reza Shakeri, S. Mohsen Haeri, M. Mahdi Shahrabi, Ali Khosravi, and Ali Akbar Sajadi

---

**508 Automatic Static and Cyclic Shear Testing Machine under Constant Normal Stiffness Boundary Conditions**

S. M. Mahdi Niktabar, K. Seshagiri Rao, and Amit Kumar Shrivastava

---

**526 Axial Monotonic and Cyclic Testing of Micropiles in Loose Sand**

R. Matos, P. Pinto, C. Rebelo, M. Veljkovic, and L. Simões da Silva

---

**543 Characterization of Self-Weight Consolidation of Fine-Grained Mine Tailings Using Moisture Sensors**

Faustin Saleh-Mbemba and Michel Aubertin

---

**555 Determining the Geotechnical Characteristics of Some Sedimentary Rocks from Iran with an Emphasis on the Correlations between Physical, Index, and Mechanical Properties**

Davood Fereidooni and Reza Khajevand

---

**574 Experimental Fracture Analysis of Individual Sand Particles at High Loading Rates**

Andrew M. Druckrey, Khalid Alshibli, Daniel T. Casem, and Emily Huskins

---

**590 Miniature Centrifuge Modeling for Conventional Consolidation Test**

Mehmet C. Balci, Kamil Kayabali, and Ramin Asadi



Volume 41, Number 3  
May 2018  
Coden: GTJODJ

(Contents continued on back cover)



ASTM INTERNATIONAL

## 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. Giovanni Cascante**  
University of Waterloo, Canada

**Dr. Andrew Corkum**  
Dalhousie University  
Halifax, Nova Scotia, Canada

**Dr. Pierre Delage**  
CERMES  
Ecole Nationale des Ponts et Chaussées  
France

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

**Dr. Vincent P. Drnevich**  
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**  
Ecole 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.

Printed in the USA.

View our website: [www.astm.org](http://www.astm.org)

## EXECUTIVE COMMITTEE

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

## DIRECTORS

Ferdinando E. Aspesi  
Dale F. Bohn  
Joannie W. Chin  
Cesar A. Constantino  
Oliver S. Delery, Jr.  
William Ells  
John Fletcher  
R. James Galipeau  
John Germaine  
William C. Griesse  
Alan Kaufman  
Andrew G. Kireta, Jr.  
John R. Logar  
D. Thomas Marsh  
R. Christopher Mathis  
Katharine E. Morgan  
Deryck M.S. Omar  
Ralph M. Paroli  
Irving S. Scher  
Arman Shakkaliyev  
James A. Tann  
Vicky Taylor  
Taco van der Maten  
Jeff Weiss  
Terry O. Woods

## COMMITTEE ON PUBLICATIONS

Dee Magnoni, Chairman  
William J. Likos, Vice Chairman  
Dale F. Bohn, ex officio  
Jay Bhatt  
K. Russell DePriest  
Nikhil Gupta  
John E. Haddock  
Jason H. Ideker  
Michael R. Mitchell  
Richard W. Neu  
Majdi A. Othman  
Suzanne Pecore  
Sudarsan Rachuri  
George E. Totten  
W. Jason Weiss

## 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** (ISSN 0149-6115) 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** © 2018 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** include two formats—online access only or online access plus printed volumes. Individual subscriptions: \$252.00 for 1 year online access and \$366.00 for 1 year online access plus printed volumes. Institutional subscriptions (one geographic site via IP access): \$473.00 for 1 year online access and \$693.00 for 1 year online access plus printed volumes. Single copies are \$55.00. For Multi-site subscription and pricing, please contact Sales or call 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 the Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923, Tel: (978) 646-2600; <http://www.copyright.com/>

---

**601 Stress-Strain Response and Dilation of Geogrid-Reinforced Coarse-Grained Soils in Large-Scale Direct Shear Tests**

Xiaobin Chen, Yu Jia, and Jiasheng Zhang

**TECHNICAL NOTES**

---

**611 A Thermal Direct Shear Device for Testing Polymer-Bonded Sands**

Louis Romero, Lenny Mendoza, Ali Nasirian, Douglas D. Cortes, and Julio R. Valdes

---

**619 Experimental Investigation into the Influence of Roundness and Sphericity on the Undrained Shear Response of Silty Sand Soils**

Abdellah Cherif Taiba, Youcef Mahmoudi, Mostefa Belkhatir, and Tom Schanz

**DISCUSSION**

---

**634 Discussion of "Correlations for Fully Softened Shear Strength Parameters" by B. A. Castellanos, T. L. Brandon, and D. R. VandenBerge, This Article Was Published in *Geotechnical Testing Journal*, Vol. 39, No. 4, 2016. [DOI: 10.1520/GTJ20150184]**

Thomas J. O'Meara

**The *Geotechnical Testing Journal* is online.**

**TAKE ADVANTAGE OF THESE BENEFITS:**

- Search Papers and Authors
- View Abstracts
- View Table of Contents
- Download Individual Papers
- IP access is available

**For information, visit: [www.astm.org](http://www.astm.org)**