



TECHNICAL EDITOR

Dr. Howard J. Pincus
P. O. Box 27598
San Diego, CA 92198-1598
Tel/Fax 619-487-8466

NOTE: Manuscripts, reviews, and all related correspondence should be sent to Kathy Dernoga, Acquisition and Review, ASTM, 1916 Race St., Philadelphia, PA 19103.

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 Committee D-18 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 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. Gilbert Y. Baladi, D-4 News Editor
Dept. of Civil Engineering
Michigan State University
East Lansing, MI 48824-1212

Dr. Gualtiero Baldi
I.S.M.E.S.
Viale Giulio Cesare 29
24100 Bergamo, Italy

Dr. Christopher R. I. Clayton
University of Surrey
Dept. of Civil Engineering
Guildford, Surrey GU2 5XH
United Kingdom

Dr. Sergio W. Covarrubias
Tecnologia y Sistemas, S.A.
AP60-613
03800 Mexico, DF Mexico

Dr. Vincent P. Drnevich, D-18 News Editor
Dept. of Civil Engineering
Purdue University
W. Lafayette, IN 47907

Dr. Richard J. Frigaszy
Consulting Geotechnical Engineer
1091 Summit Circle
Watkinsville, GA 30677-2022

Dr. John T. Germaine
Civil Engineering Department
Massachusetts Institute of Technology
Cambridge, MA 02139

Dr. Charles J. Haas, Book Review Editor—
Rock Mechanics
Department of Mining Engineering
University of Missouri—Rolla
Rolla, MO 65401

Mr. Paul Knodel, Past Technical Editor
50 Ammons Street
Lakewood, CO 80226

Dr. Poul V. Lade, Testing Tips Editor
Dept. of Civil Engineering
The Johns Hopkins University
Baltimore, MD 21218-2686

Dr. W. Allen Marr
Geocomp Corp.
66 Commonwealth Ave.
Concord, MA 01742

Dr. Paul W. Mayne
Georgia Institute of Technology
School of Civil Engineering
Atlanta, GA 30332

Dr. Harold W. Olsen
U.S. Geological Survey
P. O. Box 25046, MS 966
Denver, CO 80225-0007

Dr. John F. Peters, Book Review Editor,
Soil Mechanics
U.S. Army Corps of Engineers
Waterways Exp. Sta.
107 Enchanted Drive
Vicksburg, MS 39180

Dr. Harry G. Poulos
University of Sydney
School of Civil and Mining Engineering
Sydney NSW, 2006 Australia

Dr. Ernest T. Selig
University of Massachusetts
Marston Hall 235
Amherst, MA 01003

Dr. Vincent Silvestri
Ecole Polytechnique, Montreal Univ.
P.O. Box 6079 A
Montreal, Quebec, Canada H3C 3A7

Dr. Stein Sture
Dept. of Civil, Environmental, and
Architectural Engineering
University of Colorado, Campus Box 428
Boulder, CO 80309-0428

Mr. L. David Suits, D-35 News Editor
New York State Dept. of Transportation
1220 Washington Avenue
Albany, NY 12232

Dr. Fumio Tatsuoka
University of Tokyo
22-1, Roppongi 7 Chome
Minato-ku, Tokyo 106, Japan

Dr. Fernando H. Tinoco
600 Biltmore Way, Apt. 113
Coral Gables, FL 33134-7534

Geotechnical Testing Journal (ISSN 0149-6115) is published quarterly by ASTM as part of the Testing and Evaluation Series, which includes the **Journal of Testing and Evaluation** (published bimonthly), **Journal of Composites Technology & Research** (published quarterly), and **Cement, Concrete, and Aggregates** (published semiannually).

Copyright © 1994 AMERICAN SOCIETY FOR TESTING AND MATERIALS, Philadelphia, PA. 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: United States and Canada for 1 year \$95.00 (members \$86.00), for 2 years \$162.00 (members \$146.00), for 3 years \$214.00 (members \$193.00). Foreign for 1 year \$105.00 (members \$95.00), for 2 years \$178.00 (members \$160.00), for 3 years \$235.00 (members \$212.00). Single copies are \$35.00. To subscribe, please send prepaid order to ASTM, Customer Service, 1916 Race St., Philadelphia, PA 19103. The **Geotechnical Testing Journal** is indexed regularly by Engineering Information, Inc., and is available on microfilm from University Microfilms, a Xerox company, Ann Arbor, MI.

Photocopy Rights: Authorization to photocopy items for internal or personal use, or the internal or personal use of specific clients, is granted by the AMERICAN SOCIETY FOR TESTING AND MATERIALS for users registered with the Copyright Clearance Center (CCC) Transactional Reporting Service, provided that the base fee of \$2.50 per copy, plus \$0.50 per page is paid directly to CCC, 222 Rosewood Dr., Danvers, MA 01923; (508) 750-8400; (fax) (508) 750-4744. For those organizations that have been granted a photocopy license by CCC, a separate system of payment has been arranged. The fee code for users of the Transactional Reporting Service is 0149-6115/ISSN 0149-6115/93-91 \$2.50 + .50.

Change of Address: Please return entire addressing label on wrapper to ASTM, Journal Subscriptions Dept.—GTJ, 1916 Race St., Philadelphia, PA 19103. **Printed in the U.S.A.**

ASTM

Editorial Staff

David D. Jones, *Editor, Books and Periodical Publications*
Barbara Stafford, *Administrative Assistant, Acquisition & Review*
Kathy Dernoga, *Manager, Acquisition & Review*
Susan L. Gebremedhin, *Manager, Books and Journals*
Roberta Storer, *Director, Editorial Services*
M. Bruce Vieth, *Director, Production and Graphic Arts*

Officers

C. Ross Thomson, *Chairman*
George C. Moran, *Vice-Chairman*
Arthur Cohen, *Vice-Chairman*
Sheldon W. Dean Jr., *Treasurer*
James A. Thomas, *President*

DIRECTORS

James R. Bihr	John E. Kean
Gilbert F. Bourcier	Richard S. Ladd
Lawrence C. Bradbury Jr.	Paul H. Langer
G. Thomas Castino	James J. Lichtenberg
William M. Edmunds	Donald E. Marlowe
John L. Ferrante	Michael M. O'Mara
Rodolfo I. Godinez	Richard M. Park
James L. Hazen	James S. Pierce
David C. Jeanes	Garland W. Steele

PAST CHAIRMEN

Nancy M. Trahey
Emery Farkas

Committee on Publications

Leonard Mordfin, <i>Chairman</i>	Robert J. Goode
Kenneth R. St. John, <i>Vice-Chairman</i>	Douglas Hooton
C. Ross Thomson, <i>Ex-officio</i>	Mark F. Marcus
George Beestman	John E. Masters
Victor Chaker	Howard J. Pincus
	Roger E. Stoller
	Kurt H. Strauss
	Mona B. Wolf

Information for Authors

The original manuscript and four clear copies, including the original illustrations, should be submitted to Kathy Dernoga, Manager, Acquisition and Review, ASTM, 1916 Race St., Philadelphia, PA 19103. Papers are eligible for the following ASTM awards: the C. A. Hogentogler Award (papers on soils for engineering purposes), the Sanford E. Thompson Award (papers on concrete and concrete aggregates), and the Richard L. Templin Award (papers on new and useful testing procedures and apparatus). See "Additional Information for Authors" after the Testing Forum.

General

This publication is one of many issued by ASTM in connection with its work in promoting knowledge of the properties and performance of materials, products, systems, and services, as well as in developing standard specifications and test measurement techniques to establish their value. Much of the information results from the voluntary contributions of many of the country's leading technical authorities from industry, scientific agencies, and government. A list of publications and information on the work of ASTM will be furnished on request.

In Appreciation

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 and the authors as well, we acknowledge with appreciation their important contribution to the success of this journal.