

## Technical Editor

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

## Purpose and Scope

The purpose of the *Geotechnical Testing Journal* is (1) to provide a publication of quality 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 or improves existing procedures; and (3) to stimulate active participation of the profession in the work of ASTM Committee D-18 on Soil and Rock.

The editorial scope of this journal includes papers, technical notes, letters to the editor, discussions of previously published papers, and book reviews that deal with test methods for soil and rock for engineering purposes. Similar material covering sampling, nomenclature, and practices relating to the determination of properties and behavior of soil and rock for engineering purposes will be included. 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 and techniques. Topics must be related to soil and rock, but can include highway materials testing, such as aggregate properties or pavement performance measurement, and geophysical exploration.

## Editorial Board

Dr. Richard G. Campanella  
Dept. of Civil Engineering  
University of British Columbia  
Vancouver, B.C. V6T 1W5 Canada

Mr. Clarence K. Chan  
Institute of Transportation Studies  
University of California  
47th and Hoffman  
Richmond, CA 94804

Dr. Gary N. Durham  
Ground Engineering and Testing Service  
4764 First Avenue North  
Birmingham, AL 35222

Mr. W. J. Eden  
Division of Building Research  
National Research Council of Canada  
Ottawa, Ont. K1A 0R6 Canada

Dr. Charles J. Haas  
Book Review Editor—Rock Mechanics  
Rock Mechanics and Explosives  
Research Center  
University of Missouri—Rolla  
Rolla, MO 65401

Dr. Syd S. Peng  
College of Mineral and Energy Resources  
West Virginia University  
Morgantown, WV 26506

Dr. Steve J. Poulos  
Geotechnical Engineers, Inc.  
1017 Main St.  
Winchester, MA 01890

Dr. John H. Schmertmann  
Schmertmann and Crapps, Inc.  
4509 N. W. 23rd Ave., Suite 19  
Gainesville, FL 32601

Mr. Woodland G. Shockley  
326 Lakehill Drive  
Vicksburg, MS 39180

Dr. Marshall L. Silver  
Dept. of Materials Engineering  
University of Illinois at Chicago Circle  
Box 4348  
Chicago, IL 60680

Dr. Frank C. Townsend  
Book Review Editor—Soils  
Department of Civil Engineering  
Weil Hall  
University of Florida  
Gainesville, FL 32601

### INTERNATIONAL CONTACT MEMBERS

Dr. Stephen F. Brown  
University of Nottingham  
Dept. of Civil Engineering  
University Park, Nottingham  
NG7 2RD U.K.

Dr. Yoshiaki Yoshimi  
Tokyo Institute of Technology  
4259 Nagatsuta  
Midori-ku, Yokohama 227, Japan

The American Society for Testing and Materials is not responsible, as a body, for the statements and opinions advanced in this publication.

*Geotechnical Testing Journal* (ISSN 0149-615) is published quarterly by ASTM as part of the *Testing and Evaluation Series*, which includes the *Journal of Testing and Evaluation* (published bi-monthly) and *Cement, Concrete, and Aggregates* (published semiannually). Publication office at 428 E. Preston St., Baltimore, Md. 21202. Editorial office at the Headquarters of the Society, 1916 Race St., Philadelphia, Pa. 19103.

**Subscriptions:** \$30.00 (\$15.00 to ASTM members). Single copies, \$10.00. To subscribe, please send prepaid order to: P.O. Box 64106, Baltimore, MD 21264, ATT: Journal Subscription. The *Geotechnical Testing Journal* is indexed regularly by Engineering Index Inc., and is available on microfilm from University Microfilms, a Xerox company, Ann Arbor, MI. Copyright 1984 by the American Society for Testing and Materials.

**Permission to Copy:** The appearance of the code at the bottom of the first page of an article in this journal indicates the copyright owner's consent that copies of the article may be made for personal or internal use, or for the personal or internal use of specific clients. This consent is given on the condition, however, that the copier pay the stated per copy fee through the Copyright Clearance Center, Inc. Operations Office, P.O. Box 765, Schenectady, NY 12301, for copying beyond that permitted by Sections 107 or 108 of the U.S. Copyright Law (The per copy fee appears as the last four digits of the code at the bottom of the first page of each article). This consent does not extend to other kinds of copying, such as copying for general distribution, for advertising or promotional purposes, for creating new collective works or for resale. Further information may be obtained from the Copyright Clearance Center's Administrative Office, 310 Madison Ave., New York, NY 10017 (212/697-2525).

**Change of Address:** Please return entire addressing label on wrapper to *Geotechnical Testing Journal*, P.O. Box 64106, Baltimore MD 21264, along with new address.

# ASTM

## Editorial Staff

Robert L. Meltzer, *Vice-President, Publications and Marketing*  
Rosemary Horstman, *Managing Editor*  
Susan L. Gebremedhin, *Assistant Editor*  
M. Bruce Vieth, *Manager of Production*

## Officers

Robert G. Redelfs, *Chairman*  
Lendell E. Steele, *Vice-Chairman*  
Gladys B. Berchtold, *Vice-Chairman*  
Robert Baboian, *Treasurer*  
William T. Cavanaugh, *President*

## DIRECTORS

Albert J. Bartosic	Donald R. Johnson
John A. Blair	J. Gilbert Kaufman
Stephen E. Chehi	Benjamin Levadie
F. Greg Clarke	John F. McLaughlin
William P. Dugan	Thomas D. Moreland
Robert E. Elliott	Roman F. Serra
W. DeWayne France, Jr.	Richard O. Simpson
John A. Gilligan	Nancy M. Trahey
Emanuel Horowitz	Alan H. Yorkdale

## PAST CHAIRMEN DIRECTORS

Richard H. Goodemote	William A. Goodwin
----------------------	--------------------

## Committee on Publications

J. A. Gilligan, <i>Chairman</i>	E. L. Lewis
E. P. Bartkus, <i>Ex-officio</i>	Robert Philleo
S. W. Dean	K. L. Reifsnider
R. C. Deen	C. G. Scott
W. G. Dukek	A. M. Siegel
J. H. Kanzelmeyer	P. G. Sullivan
Richard Kimerle	E. T. Wessel

## Information for Authors

Contributions to the *Geotechnical Testing Journal* are subject to peer review, in accordance with the policy established by the ASTM Committee on Publications. The paper must either contribute to the permanent literature or be of immediate interest to ASTM membership. 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. 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. Key words should be chosen in accordance with the latest edition of ASTM D 3584. Recommended Practice for Indexing Papers and Reports on Soil and Rock for Engineering Purposes.

The original manuscript and four clear copies, including original illustrations, should be submitted to Kathy Greene, Manager, Acquisitions 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).

## 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.