

Journal of Testing and Evaluation

A Multidisciplinary Forum
for Applied Sciences and Engineering

Editorial Objectives

The **Journal of Testing and Evaluation** is published bimonthly by ASTM, a nonprofit technical organization that develops and publishes voluntary consensus standards and related information for materials, products, systems, and services. All contributions are peer reviewed prior to publication.

The editorial objectives of this journal are to serve a broad-based audience by:

1. Publishing new technical information derived from the field and laboratory testing, performance, quantitative characterization, and evaluation of these materials, products, systems, and services.
2. Presenting new methods and data and critical evaluations of these methods and data.
3. Reporting the users' experience with test methods and the results of interlaboratory testing and analysis.
4. Providing the scientific basis for both new and improved ASTM standards.
5. Stimulating new ideas in the fields of testing and evaluation.

Technical Editor

Donald Peterson

Greenleaf Associates

P.O. Box 1785

Midland, MI 48641-1785

Editorial Board

George V. Aseff, Sr.
Law Engineering Testing
Company
396 Plasters Ave., N.E.
Atlanta, GA 30324

Ray Bartrikas
Institut de Recherche
d'Hydro-Quebec
1800 Descente, Ste-Julie,
Varennnes, Quebec, Canada
J0L 2P0

James P. Bell
Chemical Engineering and
Materials Science Dept
University of Connecticut
Storrs, CT 06269

Gary Burnett
GEC Turbine Generators Ltd.
3 Hawthorne Dr.
Ibstock, Leicester, U.K.
LE6 1 JB

Brigitte Decamps
Universite de Paris Sud
Institut de Sciences des
Materiaux (ISMA)
Laboratoire de Metallurgie
Structurale
Bâtiment 413
91405 Orsay, France

Harvey P. Hack
Marine Corrosion Branch
David Taylor Research Center
Code 2813
Annapolis, MD 21402

Gerald M. Hodgson
Moore Business Forms
Research Center
300 Lang Blvd.
Grand Island, NY 14072

Lyle R. Jenkins
Ductile Iron Society
4525 Williamsburg Dr
Decatur, IL 62521

Arthur H. Landrock
PLASTEC, U.S. Army ARDEC
Bldg. 355N
Picatinny Arsenal, NJ 07806

Richard E. Link
Department of the Navy
David Taylor Research Center
Bethesda, MD 20084

Theodore J. Louzon
AT&T Bell Laboratories
Whippany Rd
Whippany, NJ 07981

Robert Megargle
Department of Chemistry
Cleveland State University
Euclid Ave. at East 24th St
Cleveland, OH 44115

Raymond D. Pavlovich
Exxon Chemical Americas
Polybit
13501 Katy Freeway
Houston, TX 77079

Donald R. Petersen
Omni Tech International
P.O. Box 2237
Midland, MI 48641

Samuel J. Schneider
Institute for Materials Science
and Engineering
National Bureau of Standards
Gaithersburg, MD 20899

Robert S. Shane
Shane Associates, Inc.
238 Hemlock Rd
Wynnewood, PA 19096

Richard L. Sheehan, Jr.
3M Co.
Packaging Systems Division
3M Center 230-1E-03
St. Paul, MN 55144

Fraser Smith
SARCOS
261 E. 300 S
Suite 150
Salt Lake City, UT 84111

P. Aarne Vesilind
Department of Civil and
Environmental Engineering
Duke University
Durham, NC 27706

Richard J. Wallace
Fluor Daniel
Daniel Building DC07A
Greenville, SC 29602

Journal of Testing and Evaluation (ISSN 0000-3973) is published bimonthly by ASTM as part of the Testing and Evaluation Series, which includes the *Geotechnical Testing Journal* (published quarterly), *Journal of Composites Technology & Research* (published quarterly), and *Cement, Concrete, and Aggregates* (published semi-annually). Publication and editorial offices are located at ASTM Headquarters, 1916 Race St., Philadelphia, PA 19103.

Subscriptions. United States and Canada for 1 year \$95.00 (members \$77.00), for 2 years \$144.00 (members \$130.00), and for 3 years \$191.00 (members \$172.00). Foreign for 1 year \$94.00 (members \$85.00), for 2 years \$150.00 (members \$142.00), and for 3 years \$210.00 (members \$188.00). Single copies are \$25.00. To subscribe, please send prepaid order to ASTM, Subscription Dept.—JTE, 1916 Race St., Philadelphia, PA 19103. *Journal of Testing and Evaluation* is indexed regularly by Engineering Index, Inc., and is available on microfilm from University Microfilms, A Xerox Co., Ann Arbor, MI. Second class postage paid at Philadelphia, PA.

Copyright © 1992 by the 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.

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, 27 Congress St., Salem, MA 01970; Tel. (508) 744-3350. 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 0000-3973/92 \$2.50 + .50.

Postmaster. Send Form 3579 to ASTM Headquarters, Subscription Dept., 1916 Race St., Philadelphia, PA 19103.

Change of Address. Please return entire addressing label on wrapper to ASTM, Subscription Dept.—JTE, 1916 Race St., Philadelphia, PA 19103, along with new address.

Editorial Staff

Maureen S. Quinn, *Editor, Books and Periodical Publications*

Barbara Stafford, *Administrative Assistant, Acquisition & Review*

Kathy Demoga, *Manager, Acquisition & Review*

Susan L. Gebremedhin, *Manager, Books and Periodical Publications*

Roberta Storer, *Director, Editorial Services*

M. Bruce Vieth, *Director, Production and Graphic Arts*

ASTM Officers

Emery Farkas, *Chairman*

Nancy M. Trahey, *Vice-Chairman*

C. Ross Thomson, *Vice-Chairman*

Arthur Cohen, *Treasurer*

Joseph G. O'Grady, *President*

Directors

Donald S. Abelson

Norma L. Bottone

Frederick B. Clarke, III

Sheldon W. Dean, Jr.

Edward F. Diekmann

Betty I. Dunbar

Jon A. Epps

Allen W. Grobin, Jr.

Cyrus P. Henry, Jr.

John J. Henry

Ben M. Hillberry

A. Ivan Johnson

Anthony G. Keane

Harry E. Lunt

George C. Moran

John M. Scanlon, Jr.

C. Ross Thomson

Grover C. Williams

Past Chairmen

Albert J. Bartosic

David M. Greason

Committee on Publications

James S. Perrin, *Chairman*

Leonard Mordfin,

Vice-Chairman

John A. Millane,

Ex officio

George Beestman

Victor Chaker

Gerald Davis

Robert J. Goode

R. D. Hooton

Larry P. Jackson

W. Steven Johnson

Paul H. Langer

Howard J. Pincus

Sherilyn K. Rutenbeck

Kenneth R. St. John

Kurt H. Strauss

James Teal

Information for Authors

The **Journal of Testing and Evaluation** publishes original articles of the following types:

Full-Length Papers (3000–5000 words)

- Reports of **Original Investigations** (research and field applications papers).
- **Review Articles** (state-of-the-art or literature reviews).
- **Interlaboratory Research Reports** (including data and statistical analysis).
- **New Procedures** (currently under development by a committee or authored by an individual).
- **Case Studies** (reports and analyses of noteworthy events or situations).

Shorter Technical Communications (500–1500 words)

- **Technical Notes** (brief papers on specific topics).
- **Research Briefs** (advance communications that will be followed by full-length papers).
- **Conference Reports** (extended abstracts).

Commentary (500–1000 words)

- **Discussions of Previously Published Papers.**
- **Letters to the Editor.**
- **Invited Editorials.**
- **Reviews of Books and Standards.**

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.

The **original** manuscript and four clear copies, including original **illustrations**, should be submitted to Kathy Demoga, Manager, Acquisitions and Review, ASTM, 1916 Race St., Philadelphia, PA 19103.