PIERO SEMBENELLI MILANO

VOL.104 NO.GT4. APRIL 1978

PROCEEDINGS OF THE AMERICAN SOCIETY OF CIVIL ENGINEERS



AMERICAN SOCIETY OF CIVIL ENGINEERS

ROARD OF DIRECTION

President William R. Gibbs

Past President Leland J. Walker

President Elect Walter E. Blessey

Vice Presidents Frederick R. Brown

Austin Milhollin Directors

Richard O. Albright Donald S. Austin George D. Barnes John A. Bonell, Jr Edward A. Bryant Jose L. Capacete

William J. Carroll Francis J. Connell John J. Cusack Ronald J. Drnevich

William W. Moore Cranston R. Rogers

R. Gene Ellis D. Allan Firmage James W. Gillespie James N. Glenn Robert T. Lawson Eugene R. McMaster Virgil G. Meedel Franklin D. Meyers David A. Novick Richard G. Vaughan

John H. Wiedeman

EXECUTIVE OFFICERS

Eugene Zwoyer, Executive Director Louis L. Meier, Washington Counsel/Assistant Secretary William N. Carey, Secretary Emeritus

William H. Wisely, Executive Director Emeritus Michael N. Salgo, Treasurer

Elmer B. Isaak, Assistant Treasurer

STAFF DIRECTORS

Gail Bays, Managing Director for Administrative Services Donald A. Buzzell, Managing Director for Education and Professional Affairs Robert A. Crist, Jr., Managing Director for Publications and Technical Affairs Richard A. Jeffers, Controller Joseph McCabe, Director, Education Services Carl E. Nelson, Director, Field Services Paul A. Parisi, Director, Publication Services Don P. Reynolds, Director, Policy, Research

and Standards Services James M. Shea, Director, Public Communications

Albert W. Turchick, Director, Technical Services

R. Lawrence Whipple, Director, Engineering Management Services

COMMITTEE ON PUBLICATIONS

John H. Wiedeman, Chairman James W. Gillespie, Vice Chairman John J. Cusack Ronald J. Drnevich

James N. Glenn Virgil G. Meedel

Poul Lade

L. J. Langfelder

Roberto Lastrico

William F. Marcuson

Gholamreza Mesri

Donald J. Murphy

Irai Noorany

Ed Nowatzki

Adrian Richards

Glen S. Tarbox

Dave Thompson

G. R. Thiers

Kuei-Wu Tsai

Walter C. Sherman M. L. Silver

Ted Park

E. T. Selia

David A. Novick

GEOTECHNICAL ENGINEERING DIVISION

Executive Committee John Lysmer, Chairman

William F. Swiger, Vice Chairman Richard E. Gray Er John A. Focht, Secretary

Ernest T. Selig Woodland G. Shockley, Management Group E

Contact Member

Publications Committee

Raymond J. Krizek, Chairman O. B. Andersland

Warren J. Baker Don C. Banks James M. Bell Joseph E. Bowles Raiph Brown T. Christian G. W. Clough C. S. Desai Tuncer B. Edil Herbert H. Einstein L. R. Gebhart D. H. Gray Bobby Hardin Robert D. Holtz I. M. Idriss H. Irwin H. Y. Ko

William D. Kovacs L. M. Kraft Fred H. Kulhawy C. C. Ladd

Charles R. Ullrich C. V. G. Vallabhan V. N. Vijayvergiya J. Lawrence Von Thun S. G. Wright R. N. Yong

John Lysmer, Exec. Comm. Contact Member

PUBLICATION SERVICES DEPARTMENT

Paul A. Parisi, Director

Technical Publications

Richard R. Torrens, Editor Geraldine Fahey, Assistant Editor Antoinette Cimino, Editorial Assistant John DeGaspari, Editorial Assistant James T. Halston, Editorial Assistant Matthew A. Lederman, Editorial Assistant Shiela Menaker, Production Editor Richard C. Scheblein, Draftsman

Information Services

Irving Amron, Editor

CONTENTS

| Field Study of Moisture Effects on Slab Movements by Richard L. Tucker and Arthur R. Poor | 403 |
|---|------|
| Consolidation Theory for Cyclic Loading by Mohsen M. Baligh and Jacques N. Levadoux | 415 |
| Mapping Liquefaction-Induced Ground Failure Potential by T. Leslie Youd and David M. Perkins | .433 |
| Liquefaction Criteria for Trans-Alaska Pipeline by Neville C. Donovan and Sukhmander Singh | .447 |
| Effects of System Compliance on Liquefaction Tests by Geoffrey R. Martin, W. D. Liam Finn, and H. Bolton Seed | .463 |
| Seismic Ground Motion Parameter Relations by Robin K. McGuire | .481 |
| | |

TECHNICAL NOTES

| The training training to the training training to the training tra | |
|--|---|
| Proc. Paper 13650 | |
| ad Letters M. A. off, in Co., city | |
| Unsheathed Excavation in Cohesive Soils by Wen L. Wang and Khorin Salmassian | 3 |
| Critical State Parameters by Yudhbir, Surendra K. Mathur, and V. Kuganathan | 7 |
| | |

This Journal is published monthly by the American Society of Civil Engineers. Publications office is at 345 East 47th Street, New York, N.Y. 10017. Address all ASCE correspondence to the Editorial and General Offices at 345 East 47th Street, New York, N.Y. 10017. Allow six weeks for change of address to become effective. Subscription price to members is \$12.00. Nonmember subscriptions available; prices obtainable on request. Second-class postage paid at New York, N.Y. and at additional mailing offices. GT, HY.

The Society is not responsible for any statement made or opinion expressed in its

publications.

DISCUSSION

Proc. Paper 13645

| Kulhawy and Thomas M. Gurtowski (Sept., 1976. Prior Discusons: May, June, July, Aug., Sept., Oct., 1977). | 505 |
|--|-----|
| Time- and Stress-Compressibility Interrelationship, by Gholamreza Mesri and Paul M. Godlewski (May, 1977. Prior Discussion: Jan., 1978). | |
| by Philip Keene by Edward Kavazanjian, Jr. and James K. Mitchell by Carl B. Crawford, Michael Bozozuk, and K. Tim Law | 508 |
| Time-Dependent Behavior of Undisturbed Clay, by Yoginder P. Vaid and Richard G. Campanella (July, 1977. Prior Discussions: Jan., Mar., 1977). by Urs Rieder | 512 |
| Probabilistic One-Dimensional Consolidation, by R. Allen Freeze (July, 1977). by Dirk J. A. van Zyl | 514 |
| Stabilization of Potentially Liquefiable Sand Deposits Using Gravel Drains, by H. Bolton Seed and John R. Booker (July, 1977). by Dennison J. Pickering | 516 |
| Progress in Marine Geotechnical Engineering, by John A. Focht and Leland M. Kraft, Jr. (Oct., 1977). | 517 |
| by Vukoslav E. Aguirre | 21/ |

^{*}Discussion period closed for this paper. Any other discussion received during this discussion period will be published in subsequent Journals.