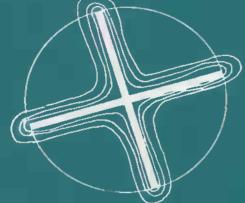
Vane Shear



Strength Testing in Soils

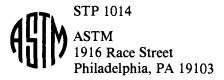
Field and Laboralory Studies

EDITOR



Vane Shear Strength Testing in Soils: Field and Laboratory Studies

Adrian F. Richards, Editor



Library of Congress Cataloging-in-Publication Data

Vane shear strength testing in soils: field and laboratory studies/ Adrian F. Richards, ed.

p. cm. — (STP: 1014)

Papers from the International Symposium on Laboratory and Field Vane Shear Strength Testing, held at Tampa, Fla., 22-23 January 1987, sponsored by ASTM Committee D-18 on Soil and Rock.

"ASTM publication code number (PCN) 04-010140-38." Includes bibliographies and index.

ISBN 0-8031-1188-6

1. Shear strength of soils—Testing—Congresses. 2. Vane shear tests-Congresses. I. Richards, Adrian F. II. International Symposium on Laboratory and Field Vane Shear Strength Testing (1987: Tampa, Fla.) III. ASTM Committee D-18 on Soil and Rock. IV. Series: ASTM special technical publication; 1014. TA710.5.V36 1988 624.1′5136—dc19 88-7684

CIP

Copyright © by American Society for Testing and Materials 1988

NOTE

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

Peer Review Policy

Each paper published in this volume was evaluated by three peer reviewers. The authors addressed all of the reviewers' comments to the satisfaction of both the technical editor(s) and the ASTM Committee on Publications.

The quality of the papers in this publication reflects not only the obvious efforts of the authors and the technical editor(s), but also the work of these peer reviewers. The ASTM Committee on Publications acknowledges with appreciation their dedication and contribution of time and effort on behalf of ASTM.

> Printed in Baltimore, MD December 1988

Foreword

The International Symposium on Laboratory and Field Vane Shear Strength Testing was held at Tampa, FL, on 22-23 January 1987. ASTM Committee D-18 on Soil and Rock sponsored the symposium. Adrian F. Richards, Adrian Richards Company, and Michael Perlow, Jr., Valley Foundation Consultants, Inc., served as chairmen of the symposium. Adrian F. Richards is also editor of the resulting publication.

Contents

Overview	1
PART I: STATE-OF-THE-ART REVIEWS	
The In-Situ Measurement of the Undrained Shear Strength of Clays Using the Field Vane—RICHARD J. CHANDLER	13
Discussion	45
In-Situ Vane Shear Testing at Sea—ALAN G. YOUNG, BRAMLETTE McCLELLAND, AND GERARDO W. QUIROS	46
PART II: FIELD VANE THEORY AND INTERPRETATION	
Interpretation of the Field Vane Test in Terms of In-Situ and Yield Stresses— DENNIS E. BECKER, J. H. A. CROOKS, AND KEN BEEN	71
Anisotropy and In-Situ Vane Tests—v. SILVESTRI AND M. AUBERTIN	88
Errors Caused by Friction in Field Vane Tests—J. A. R. ORTIGÃO AND HAROLDO B. COLLET	104
Factors Affecting the Measurements and Interpretation of the Vane Strength in Soft Sensitive Clays—MARIUS ROY AND ANDRÉ LEBLANC	117
PART III: LABORATORY VANE THEORY AND INTERPRETATION	
Analysis of a Vane Test Based on Effective Stress—daizo karube, satoru shibuya, takao baba, and yasuhiro kotera	131
Progressive Failure in the Vane Test—Julio A. De Alencar, Dave H. Chan, and Norbert R. Morgenstern	150
Measurement of Residual/Remolded Vane Shear Strength of Marine Sediments—RONALD C. CHANEY AND GREGORY N. RICHARDSON	166
Micromorphological Aspects of the Vane Shear Test—PETRUS L. M. VENEMAN AND TUNCER B. EDIL	182

PART IV: LABORATORY	VANE NEW	Test Methods
---------------------	----------	--------------

Miniature Vane and Cone Penetration Tests During Centrifuge Flight— MARCIO S. S. ALMEIDA AND RICHARD H. G. PARRY 209 Initial Stage Hardening Characteristics of Marine Clay Improved Cement— TETSURO TSUTSUMI, YOSHIO TANAKA, AND TOSHIAKI TANAKA PART V: FIELD VANE COMPARISONS TO LABORATORY AND IN-SITU TEST METHODS Comparison of Field Vane and Laboratory Undrained Shear Strength on Soft Sensitive Clays—GUY LEFEBVRE, CHARLES C. LADD, AND JEAN-JACQUES PARÉ 233 Comparison of Field Vane Results with Other In-Situ Test Results— JAMES W. GREIG, RICHARD G. CAMPANELLA, AND PETER K. ROBERTSON PART VI: FIELD VANE TESTING ON LAND Experience with Field Vane Testing at Sepetiba Test Fills—vinod K. GARGA Vane Shear Test Apparatus: A Reliable Tool for the Soft Soil Exploration— PANDURANG K. NAGARKAR, SUDHAKAR V. RODE, TRIMBAK W. SHURPAL, AND GOPAL L. DIXIT PART VII—FIELD VANE TESTING OFFSHORE Comparison of In-Situ Vane, Cone Penetrometer, and Laboratory Test Results for Gulf of Mexico Deepwater Clays—GARY W. JOHNSON, THOMAS K. HAMILTON, RONALD J. EBELHAR, JEFFREY L. MUELLER, AND JOHN H. PELLETIER 293
PART V: FIELD VANE COMPARISONS TO LABORATORY AND IN-SITU TEST METHODS Comparison of Field Vane and Laboratory Undrained Shear Strength on Soft Sensitive Clays—Guy Lefebvre, Charles C. Ladd, and Jean-Jacques Paré Comparison of Field Vane Results with Other In-Situ Test Results— James W. Greig, Richard G. Campanella, and Peter K. Robertson Part VI: Field Vane Testing on Land Experience with Field Vane Testing at Sepetiba Test Fills—vinod K. Garga Vane Shear Test Apparatus: A Reliable Tool for the Soft Soil Exploration— Pandurang K. Nagarkar, Sudhakar V. Rode, Trimbak W. Shurpal, and Gopal L. Dixit Part VII—Field Vane Testing Offshore Comparison of In-Situ Vane, Cone Penetrometer, and Laboratory Test Results for Gulf of Mexico Deepwater Clays—Gary W. Johnson, Thomas K. Hamilton,
Comparison of Field Vane and Laboratory Undrained Shear Strength on Soft Sensitive Clays—Guy Lefebvre, Charles C. Ladd, and Jean-Jacques Paré Comparison of Field Vane Results with Other In-Situ Test Results— James W. Greig, Richard G. Campanella, and Peter K. Robertson Part VI: Field Vane Testing on Land Experience with Field Vane Testing at Sepetiba Test Fills—vinod K. Garga Vane Shear Test Apparatus: A Reliable Tool for the Soft Soil Exploration— Pandurang K. Nagarkar, Sudhakar V. Rode, Trimbak W. Shurpal, and Gopal L. Dixit Part VII—Field Vane Testing Offshore Comparison of In-Situ Vane, Cone Penetrometer, and Laboratory Test Results for Gulf of Mexico Deepwater Clays—Gary W. Johnson, Thomas K. Hamilton,
Sensitive Clays—GUY LEFEBVRE, CHARLES C. LADD, AND JEAN-JACQUES PARÉ Comparison of Field Vane Results with Other In-Situ Test Results— JAMES W. GREIG, RICHARD G. CAMPANELLA, AND PETER K. ROBERTSON PART VI: FIELD VANE TESTING ON LAND Experience with Field Vane Testing at Sepetiba Test Fills—vinod K. Garga Vane Shear Test Apparatus: A Reliable Tool for the Soft Soil Exploration— PANDURANG K. NAGARKAR, SUDHAKAR V. RODE, TRIMBAK W. SHURPAL, AND GOPAL L. DIXIT PART VII—FIELD VANE TESTING OFFSHORE Comparison of In-Situ Vane, Cone Penetrometer, and Laboratory Test Results for Gulf of Mexico Deepwater Clays—GARY W. JOHNSON, THOMAS K. HAMILTON,
PART VI: FIELD VANE TESTING ON LAND Experience with Field Vane Testing at Sepetiba Test Fills—vinod K. Garga Vane Shear Test Apparatus: A Reliable Tool for the Soft Soil Exploration— PANDURANG K. NAGARKAR, SUDHAKAR V. RODE, TRIMBAK W. SHURPAL, AND GOPAL L. DIXIT PART VII—FIELD VANE TESTING OFFSHORE Comparison of In-Situ Vane, Cone Penetrometer, and Laboratory Test Results for Gulf of Mexico Deepwater Clays—Gary W. JOHNSON, THOMAS K. HAMILTON,
Experience with Field Vane Testing at Sepetiba Test Fills—vinod K. Garga 267 Vane Shear Test Apparatus: A Reliable Tool for the Soft Soil Exploration— PANDURANG K. NAGARKAR, SUDHAKAR V. RODE, TRIMBAK W. SHURPAL, AND GOPAL L. DIXIT 277 PART VII—FIELD VANE TESTING OFFSHORE Comparison of In-Situ Vane, Cone Penetrometer, and Laboratory Test Results for Gulf of Mexico Deepwater Clays—Gary W. JOHNSON, THOMAS K. HAMILTON,
Vane Shear Test Apparatus: A Reliable Tool for the Soft Soil Exploration— PANDURANG K. NAGARKAR, SUDHAKAR V. RODE, TRIMBAK W. SHURPAL, AND GOPAL L. DIXIT PART VII—FIELD VANE TESTING OFFSHORE Comparison of In-Situ Vane, Cone Penetrometer, and Laboratory Test Results for Gulf of Mexico Deepwater Clays—GARY W. JOHNSON, THOMAS K. HAMILTON,
PANDURANG K. NAGARKAR, SUDHAKAR V. RODE, TRIMBAK W. SHURPAL, AND GOPAL L. DIXIT PART VII—FIELD VANE TESTING OFFSHORE Comparison of In-Situ Vane, Cone Penetrometer, and Laboratory Test Results for Gulf of Mexico Deepwater Clays—GARY W. JOHNSON, THOMAS K. HAMILTON,
Comparison of In-Situ Vane, Cone Penetrometer, and Laboratory Test Results for Gulf of Mexico Deepwater Clays—GARY W. JOHNSON, THOMAS K. HAMILTON,
Gulf of Mexico Deepwater Clays—GARY W. JOHNSON, THOMAS K. HAMILTON,
Comparison of Field Vane, CPT, and Laboratory Strength Data at Santa Barbara—GERARDO W. QUIROS AND ALAN G. YOUNG 306
Design and Offshore Experience with an In-Situ Vane—JOOST M. GEISE, JOHN TEN HOOPE, AND ROBERT E. MAY 318
Discussion 33°
Evaluation of Offshore In-Situ Vane Test Results—HARRY J. KOLK, JOHN TEN HOOPE, AND BRIAN W. IMS
Autonomous Seafloor Strength Profiler: Comparison of In-Situ and Core Results— ARMAND J. SILVA AND ROBERT M. WYLAND 354

IZBN 0-9037-7799-P