WIFEO SEMBENEELD

VOL.94 NO.SM2. MAR. 1968

BITCOLD

AS CE 1968 PROCEEDINGS OF THE AMERICAN SOCIETY OF CIVIL ENGINEERS



AMERICAN SOCIETY OF CIVIL ENGINEERS BOARD OF DIRECTION

President

Richard H. Tatlow III

President-Elect

Frank H. Newnam, Jr.

Part President

Earle T. Andrews

Vice Presidents

John F. Rinne Robert P. Vreeland Clifford D. Williams

Charles W. Yoder Austin B. Milhollin

Directors

Daniel B. Barge, Jr. John W. Frazier Richard Hazen Ralph W. Hutchinson

William W. Moore Malcolm Pirnie, Jr. Gardner M. Reynolds A I R Sonders

Carl B. Jansen Emory E. Johnson Daniel Kennedy James L. Konski

Robert E. Shaver James R. Sims Eugene W. Weber

Longino A. Woodman I Harold Zoller

Jack E. McKee Executive Officers

William H. Wisely, Executive Secretary

Don P. Reynolds, Assistant Secretary William P. Kimball, Assistant Secretary—Education

William N. Carey, Secretary Emeritus

William S. LaLonde, Jr., Treasurer Elmer K. Timby, Assistant Treasurer

COMMITTEE ON PUBLICATIONS

Carl B. Jansen, Chairman

Daniel B. Barge, Jr., Vice Chairman

Daniel Kennedy

A. L. R. Sanders J. Harold Zaller

James L. Konski SOIL MECHANICS AND FOUNDATIONS DIVISION

Executive Committee

F. E. Richart, Jr., Chairman

Richard T. Woodward, Vice Chairman Jack W. Hilf T. W. Lambe

James K. Mitchell, Secretory Ralph W. Hutchinson, Board Contact Member

Publications Committee

H. Bolton Seed, Chairman

Richard G. Ahlvin E. D'Appolonia James M. Duncan W. D. Liam Finn

Bernard B. Gordon Harry M. Horn J. H. Schmertmann

I. H. Wu

David J. Henkel Robert L. McNeill W. G. Shockley Aleksander S. Vesic

J. K. Mitchell, Exec. Comm. Contact Member TECHNICAL PUBLICATIONS

Paul A. Parisi, Manager

William D. French, Editor

Robert D. Walker, Associate Editor

Richard R. Torrens, Assistant Editor Janet B. Davis, Seniar Editorial Assistant

Joon E. Blum, Editorial Assistant Sandra Matis, Editorial Assistant

Antonia M. Powell, Editorial Assistant Michele D. Raffalow, Editorial Assistant

Susan E. Sauer, Editorial Assistant Frank J. Loeffler, Draftsman

CONTENTS

Papers	Page
GUIDE SPECIFICATIONS FOR CHEMICAL GROUTS by The Committee on Grouting	345
VIBRATION MODULUS OF NORMALLY CONSOLIDATED CLAY by Bobby O. Hardin and William L. Black	353
STRESS HISTORY EFFECTS ON DYNAMIC MODULUS OF CLAY by W. Kenneth Humphries and Harvey E. Wahls	371
CONTRIBUTION TO THE ANALYSIS OF RESTRAINT IN SOIL by Zvi Getzler	391
EFFECTS OF LOADING ON TRIAXIAL TEST RESULTS by Raymond Lundgren, James K. Mitchell, and James H. Wilson	407
END BEARING AND SKIN FRICTION RESISTANCE OF PILES by Bengt B. Broms and Lars Hellman	421
SETTLEMENT OF STRIP LOAD ON ELASTIC-PLASTIC SOIL by Kaare Hoeg, John T. Christian, and Robert V. Whitman	431
ELECTRICAL DISPERSION IN RELATION TO SOIL STRUCTURE by James K. Mitchell and Kandiah Arulanandan	447
FINITE-ELEMENT METHOD FOR PROBLEMS IN SOIL MECHANICS	
by Chiyyarath V. Girijavallabhan and Lymon C. Reese	473
GRAPHICAL STABILITY ANALYSIS OF SLOPES IN JOINTED ROCK	
by Klaus W. John	497
(over)	

This Journal is published bimonthly by the American Society of Civil Engineers. Publications office is at 2500 South State Street, Ann Arbor, Michigan 48104. Editorial and General Offices are at 345 East 47th Street, New York, N. Y. 10017. Subscription price is \$8.00 per year with discounts to members and libraries. Second-class postage paid at Ann Arbor, Michigan. EM, HY, SA, SM.

	Page
EMBANKMENT PORE PRESSURES DURING CONSTRUCTION by Walter C. Sherman and Gerald W. Clough	527
CYCLIC STRESS-STRAIN CHARACTERISTICS OF CLAY by Gerald R. Thiers and H. Bolton Seed	555
DISCUSSION	
Proc. Paper 5827	
PLANE STRAIN TESTS ON A SATURATED REMOLDED CLAY, by David J. Henkel and Neil H. Wade (Nov., 1966. Prior Discussion: Sept., 1967). closure	573
BEARING CAPACITY OF FOOTINGS ON LAYERED CLAYS ^a , by A. Siva Reddy and R. J. Srinivasan (Mar., 1967. Prior Discussion: Sept., Nov., 1967). by Moshe Livneh and Elisha Shklarsky	574
INFLUENCES ON SELECTION OF THE TYPE OF DAMa, by Francis B. Slichter (May, 1967). by Asit K. Biswas	576
FOUNDATION CUTOFF WALL FOR ALLEGHENY RESERVOIR DAM ^a , by Garth A. Fuquay (May, 1966. Prior Discussion: Sept., 1967).	
by Edward Bush and Fioravante Bares	578
ANALYSIS OF SOIL LIQUEFACTION: NIIGATA EARTHQUAKE ^a , by H. Bolton Seed and I. M. Idriss (May, 1967. Prior Discussion: Sept., 1967).	
by Neville C. Donovan	582
PROBLEMS IN DESIGN AND CONSTRUCTION OF EARTH AND ROCKFILL DAMS ^a , Report of the Committee on Earth and Rockfill Dams, George E. Bertram, Chairman (May, 1967. Prior Discussion: Jan, 1968).	
by Guido Oberti	583 584
STABILITY ANALYSIS OF EMBANKMENTS ^a , by John Lowe, III (July, 1967).	200
by B. Satyanarayana	587
WACO DAM SLIDE ^a , by Ralph R. W. Beene (July, 1967). by A. L. Little	588

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

	Page
ELECTRO-OSMOTIC STABILIZATION OF WEST BRANCH DAM ^a , by Claude A. Fetzer (July, 1967). by Leo Casagrande	590 592
INVESTIGATION OF EMBANKMENT PERFORMANCE ^a , by Stanley D. Wilson (June, 1967). by R. L. Brown	596
SLOPE STABILITY DURING EARTHQUAKES ^a , by H. Bolton Seed (July, 1967). by Richard C. Harlan	598
EARTHQUAKE CONSIDERATIONS IN EARTH DAM DESIGN ^a , by James L. Sherard (July, 1967). by R. L. Brown	600
BEHAVIOR OF A COLLUVIAL SLOPE ^a , by Elio D'Appolonia, Robert Alperstein, and David J. D'Appolonia (July, 1967). by Parthasarathy Banerjee	603
SPECIAL PROBLEMS IN SLOPE STABILITY ^a , by Willard J. Turnbull and Mikael J. Hvorslev (July, 1967). by B. Satyanarayana	604
ANALYSIS OF EMBANKMENT STRESSES AND DEFORMA- TIONS ^a , by Ray W. Clough and Richard J. Woodward, III (July, 1967). by Richard H. Gates	605
EFFECTS OF PILE DRIVING ON SOIL PROPERTIES ^a , by Olle Orrje and Bengt Broms (Sept., 1967). by Kwan Yee Lo	606
APPLICATIONS OF LIMIT PLASTICITY IN SOIL MECHANICS ^a , by W. D. Liam Finn (Sept., 1967). by W. F. Chen	608
FOUNDATION REBOUND AT DOS AMIGOS PUMPING PLANT ^a , by John P. Bara and Ronald R. Hill (Sept., 1967). by Ulrich W. Stoll	614
FOOTING VIBRATION WITH NONLINEAR SUBGRADE SUP- PORT ^a , by Nelson E. Funston and William J. Hall (Sept., 1967). by Peter J. Moore	615

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