1972

Annotated bibliography on soil plasticity, March 1972

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Soil Mechanics and Theory of Plasticity

ANNOTATED BIBLIOGRAPHY ON SOIL PLASTICITY

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Fritz Engineering Laboratory Report No. 355.12

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ABSTRACT

To date no source is available which systematically lists the literature on soil plasticity theories, and on solutions based upon the theory of plasticity for various problems in bearing capacity, slope stability, and earth pressures. The purpose of this report is, therefore, to aid in locating materials on these subjects.

The emphasis in the selection of titles has been on classical slip-line methods, limit analysis methods, yield functions and stress-strain theories considered in the context of the theory of plasticity. The conventional limit equilibrium methods are not included in this report. Full bibliographical data for all references together with short abstracts for many of the references are compiled.

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1. INTRODUCTION

The purpose of this bibliography is to tabulate, and where possible, annotate technical publications which treat soil as a plastic medium in the context of the classical theory of plasticity. These publications include solutions of various boundary value problems in soil mechanics, as well as investigations of soil stress-strain behavior and soil yield functions.

Soil was first treated as a plastic medium in the classical Coulomb earth pressure theory. In the 1920's Prandtl used a rational extension of this theory to solve the bearing capacity problem. In 1952 Drucker and Prager presented a complete stress-strain theory for soil by treating the Mohr-Coulomb failure condition as a yield function for a perfectly plastic material with the associated flow law. In recent years many writers have discussed the applicability of plasticity theory to soil stress-strain behavior. In particular, Roscoe and his co-workers at Cambridge Univesity have proposed a strain hardening model for clay.

Limit loads in soil mechanics have usually been determined using one of the following techniques, namely, limit equilibrium (e.g. Terzaghi and Meyerhof), method of slip-lines (e.g. Sokolovskii) and more recently limit analysis (e.g. Drucker and Chen). The scope of this report is

limited to slip-line and limit analysis solutions only.

It is hoped that this report will provide the researcher, engineer, or teacher with a systematically classified series of references concerned with soil plasticity. To aid the reader in locating information on various topics, bibliographical data has been alphabetically arranged under the following general categories:

1. Stress-Strain Relations
2. Bearing Capacity
3. Earth Pressure
4. Slope Stability
5. Miscellaneous

Many publications will of course appear under more than one category. Articles not specifically related to the first four categories were placed in the miscellaneous section. An alphabetical series of annotated references is provided in the last section of this report.

2. STRESS-STRAIN RELATIONS

STRESS-STRAIN RELATIONS*

Balla, A.
"Stress Conditions in the Triaxial Compression Test," Proceedings Fourth International Conference of Soil Mechanics and Foundation Engineering, Vol. 1, 1957, pp. 140-143.

Barden, L., Ismail, H., and Tong, P.
"Plane Strain Deformation of Granular Material at Low and High Pressures," Geotechnique, Vol. 19, No. 4, Dec., 1969, pp. 441-452.

Barden, L. and Khayatt, A. J.
"Incremental Strain Rate Ratios and Strength of Sand in The Triaxial Test," Geotechnique, Vol. 16, No. 4, Dec., 1966, pp. 338-357.

Belaenko, F. A.
"The Stresses Around a Circular Shaft in an Elastic-Plastic Soil," (in Russian), Izvestiya Akademia Nauk SSSR, Otdelenie Tekhnicheskikh Nauk, Mekhanika i Mashinostroenie, Leningrad, 1950, pp. 914-925.

Bhattacharya, S. K.
"The Geometry of a Slip-Line Field in Soils," Geotechnique, Vol. 1, No. 2, June 1960, pp. 75-81.

*Biarez, J., Boncherie, M., Boucraut, L. M., Haeringer, J., Martin, D., Montel, B., Negre, R., Stutz, P., and Wiendieck, K., "Equilibre Limite de Fondations en Milieu Pulverulent a deux Dimensions," Rheology and Soil Mechanics, Proceedings of the IUTAM Symposium, Grenoble, April 1964, pp. 429-446, Springer-Verlag, 1966.

Boehler, J. P. and Sawczuk, A.
"Limit Equilibrium of Anisotropic Soils," (in French), Journal de Mechanique, Vol. 9, No. 1, March 1970, pp. 5-33.

Bonneau, M.
"Equilibrium Limit and Failure of Continuous Media (Equilibre Limite Rupture des Milieux Continus)," Annales des Ponts et Chaussées, Vol. 117, Sept.-Oct., 1947, pp. 609-653, Nov.-Dec., 1947, pp. 769-801.

*Denotes those references for which no abstracts are available.

STRESS-STRAIN RELATIONS

Brown, E. H.
"A Theory for the Mechanical Behavior of Sand," Proceedings of the Eleventh International Congress of Applied Mechanics, Munich 1964, H. Gorther, ed., Springer-Verlag, Berlin, 1966, pp. 183-191.

Burland, J. B.
"The Yielding and Dilation of Clay," Correspondence, Geotechnique, Vol. 15, No. 2, June 1965, pp. 211-219.

Burland, J. B.
"Deformation of Soft Clay Beneath Loaded Areas," Proceedings of the Seventh International Conference on Soil Mechanics and Foundation Engineering, Vol. 1, 1969, pp 55-63.

Butovskaya, V. A.
"The Applicability to Clay Soils of the Hypothesis of the Invariability of the Volume in Plastic Deformation," (in Russian), Trudi N.-i. Osovanii i Podzemn Sooruzh., Akad. Str-va i Arkbitekt. SSSR, No. 33, 1958, pp. 70-76.

*Calladine, C. R.
Discussion of "A Theoretical and Experimental Study of Strains in Triaxial Compression Tests on Normally Consolidated Clays," by Roscoe and Poorooshasb, Geotechnique, Vol. 13, No. 3, Sept. 1963, pp. 250-255.

Calladine, C. R.
"A Microstructural View of the Mechanical Properties of Saturated Clay," Geotechnique, Vol. 21, No. 4, Dec., 1971, pp. 391-415.

Chaplin, T. K.
"Inner and Outer Plastic Yield Surfaces in Clays," Proceedings of the Seventh International Conference on Soil Mechanics and Foundation Engineering, Vol. 1, 1969, pp. 73-80.

Chen, W. F.
"On the Rate of Dissipation of Energy in Soils," Soils and Foundations, Vol. 8, No. 4, Dec., 1968, pp. 48-51.

STRESS-STRAIN RELATIONS

*Chen, W. F.
Discussion of "Applications of Limit Plasticity in Soil Mechanics," by W. D. L. Finn, Sept., 1967, Journal of the Soil Mechanics and Foundations Division, ASCE, Vol. 94, No. SM2, March 1968.

Chen, W. F.
"Soil Mechanics and Theorems of Limit Analysis," Journal of the Soil Mechanics and Foundations Division, ASCE, Vol. 95, No. SM2, March 1969, pp. 493-518.

Dais, J. L.
"An Isotropic Frictional Theory for a Granular Medium with or without Cohesion," International Journal of Solids and Structures, Vol. 6, No. 8, Aug., 1970, pp. 1185-1191.

Dais, J. L.
"Nonuniqueness of Collapse Load for a Frictional Material," International Journal of Solids and Structures, Vol. 6, No. 9, Sept., 1970, pp. 1315-1319.

Davis, E. H.
"A Discussion of Theories of Plasticity and Limit Analysis in Relation to the Failure of Soil Masses," Fifth Australia-New Zealand Conference on Soil Mechanics and Foundation Engineering, 1967, pp. 175-186.

Davis, E. H.
"Theories of Plasticity and the Failure of Soil Masses," Soil Mechanics - Selected Topics, I. K. Lee, ed., Chapter 6, American Elsevier, New York, 1968, pp. 341-380.

De Josselin de Jong, G.
"Graphical Method for the Determination of Slip Line Fields in Soil Mechanics," (in Dutch), de Ingenieur, Vol. 69, No. 29, July 1957, pp. 61-65.

De Josselin de Jong, G.
"The Undefiniteness in Kinematics for Friction Materials," Proceedings of Brussels Conference 58 on Earth Pressure Problems, Vol. 1, Sept., 1968, pp. 55-70.

STRESS-STEAIN RELATIONS

De Josselin de Jong, G.
"Lower Bound Collapse Theorem and Lack of Normality of Strain Rate to Yield Surface for Soils," Rheology and Soil Mechanics, Proceedings of the IUTAM Symposium, Grenoble, Springer-Verlag, April 1964, pp. 69-78.

DiMaggio, F. L. and Sandler, I. S.
"Material Model for Granular Soils," Journal of the Engineering Mechanics Division, ASCE, Vol. 97, No. EM3, June 1971, pp. 935-950.

Drescher, A. and Bojanowski, W.
"On the Influence of Stress Path Upon the Mechanical Properties of Granular Material," (in English), Archiwum Inzynierii Ladowej, Vol. 14, No. 3, 1968, pp. 351-365.

Drescher, A. and Bujak, A.
"A Study of Kinematics of a Granular Body by Indentation with a Plane Punch," (in Polish), Rozprawy Inzynierskie, Vol. 14, No. 2, 1966, pp. 313-325.

Drescher, A., Kwaszczynska, K., and Mroz, Z.
"Statics and Kinematics of a Granular Medium in the Case of Wedge Indentation," Archiwum Mechaniki Stosowanej, Vol. 19, No. 1, 1967, pp. 99-113.

Drucker, D. C., Prager, W., and Greenberg, H. J.
"Extended Limit Design Theorems for Continuous Media," Quarterly of Applied Mathematics, Vol. 9, Jan., 1952, pp. 381-389.

Drucker, D. C. and Prager, W.
"Soil Mechanics and Plastic Analysis of Limit Design," Quarterly of Applied Mechanics, Vol. 10, 1952, pp. 157-165.

Drucker, D. C.
"Coulomb Friction, Plasticity, and Limit Loads," Journal of Applied Mechanics, Vol. 21, 1954, pp. 71-74.

Drucker, D. C., Gibson, R. E., and Henkel, D. J.
"Soil Mechanics and Work-Hardening Theories of Plasticity," Proceedings, ASCE, Vol. 81, Paper 798, Sept., 1955.

STRESS-STRAIN RELATIONS

Drucker, D. C.
"On Stress-Strain Relations for Soils and Load Carrying Capacity," Proceedings of the First International Conference on the Mechanics of Soil-Vehicle System, Edizioni Minerva Tecnica, Turin, June 1961, pp. 15-23.

Drucker, D. C.
"Concepts of Path Independence and Material Stability for Soils," Rheology and Soil Mechanics, Proceedings of the IUTAM Symposium, Grenoble, Springer-Verlag, April 1964, pp. 23-43, 1966.

Drucker, D. C. and Chen, W. F.
"On the Use of Simple Discontinuous Fields to Bound Limit Loads," "Engineering Plasticity," Heyman, J. and Leckie, F. A., ed., Cambridge Universtiy Press, 1968, pp. 129-145.

Feda, J.
"The Influence of Loading Path in the Plane $\sigma_1' > \sigma_2' = \sigma_3'$ on the Shear Strength of Zbraslav Sand," (in English), Acta Technica CSAV, Vol. 14, No. 1, 1969, pp. 92-128.

Finn, W. D. Liam
"Applications of Limit Plasticity in Soil Mechanics," Journal of the Soil Mechanics and Foundations Division, ASCE, Vol. 93, No. SM5, Part 1, Sept., 1956, pp. 101-120.

Gaponov, V. V.
"On Displacements in Friable Soils in Limiting Equilibrium," (in Russian), Prikladnaya Mekhanika, Kiev, Vol. 5, No. 1, 1959, pp. 65-74.

*Geniev, G. A.
"Generalization of the Condition of Limit Equilibrium of a Cohesionless Mass," Soil Mechanics and Foundation Engineering, No. 2, March-April 1968, pp. 75-77.

Geuze, E. C. W. A.
"The Uniqueness of the Mohr-Coulomb Concept in Shear Failure," Special Technical Publication No. 361, Laboratory Shear Testing of Soils, ASTM, 1963, pp. 52-64.

STRESS-STRAIN RELATIONS

*Graham, J.
Discussion of "Applications of Limit Plasticity in Soil Mechanics," by W. D. L. Finn, Sept., 1967, Journal of the Soil Mechanics and Foundations Division, ASCE, Vol. 96, No. SM2, March 1969, pp. 630-631.

Grasshoff, H.
"Settlement Calculations for Rigid Foundations Using the Characteristic Point," (in German), Bauvingenieur, Vol. 30, No. 2, Feb., 1955, pp. 53-54.

Hambly, E. C. and Roscoe, K. H.
"Observations and Predictions of Stresses and Strains During Plane Strain of "wet" Clays," Proceedings of the Seventh International Conference on Soil Mechanics and Foundation Engineering, Vol. 1, 1969, pp. 173-181.

Hansen, Bent
"Line Ruptures Regarded as Narrow Rupture Zones, Basic Equations Based on Kinematic Considerations," Proceedings of the Brussels Conference 58 on Earth Pressure Problems, Vol. 1, Sept., 1958, pp. 39-48.

Hansen, Bent
"An Approximate Method for the Calculation of Rupture Figures in Clay," Proceedings of the Sixth International Conference on Soil Mechanics and Foundation Engineering, Vol. 2, 1965, pp. 70-73.

*Hansen, Bent
Discussion of "Settlement of Strip Load on Elastic-Plastic Soil," by K. Höeg, J. T. Christian, and R. V. Whitman, March 1968, Journal of the Soil Mechanics and Foundations Division, ASCE, Vol. 95, No. SM2, March 1969, pp. 675-676.

Hansen, J. Brinch
"A General Plasticity Theory for Clay," Geotechnique, Vol. 3, 1952-1953, pp. 154-164.

Haythornthwaite, R. M.
"Stress and Strain in Soils," Plasticity, Proceedings of the Second Symposium on Naval Structural Mechanics, April 1960; Pergamon Press, New York, 1960.

STRESS-STRAIN RELATIONS

Haythornthwaite, R. M.
"Mechanics of the Triaxial Test for Soils," Journal of the Soil Mechanics and Foundations Division, Proceedings, ASCE, Vol. 86, No. SM5, Part I, Oct., 1960, pp. 35-62.

Haythornthwaite, R. M.
"Range of Yield Condition in Ideal Plasticity," Journal of the Engineering Mechanics Division, ASCE, Vol. 87, No. EM6, Dec., 1961.

*Haythornthwaite, R. M.
"The Kinematics of Soils," Progress in Applied Mechanics, McMillan Co., London, 1963, pp. 235-250.

Höeg, K.
"Finite Element Analysis of Strain-Softening Clay," Journal of the Soil Mechanics and Foundations Division, ASCE, Vol. 98, No. SM1, Jan., 1972, pp. 43-58.

Höeg, K. and Balakrishna, H. A.
"Dynamic Strip Load on Elastic-Plastic Soil," Journal of the Soil Mechanics and Foundations Division, ASCE, Vol. 96, No. SM2, March 1970, pp. 429-438.

Höeg, K., Christian, J. T., and Whitman, R. V.
"Settlement of Strip Load on Elastic-Plastic Soil," Journal of the Soil Mechanics and Foundations Division, ASCE, Vol. 94, No. SM2, March 1968, pp. 431-445.

Hoshino, K.
"A Fundamental Theory of Plastic Deformation and Breakage of Soil," Proceedings of the Second International Conference on Soil Mechanics and Foundation Engineering, Vol. 1, June 1948, pp. 93-103.

Hoshino, K.
"A General Theory of Mechanics of Soils," Proceedings of the Fourth International Conference on Soil Mechanics and Foundation Engineering, Vol. 1, 1957.

Ivlev, D. D.
"On the General Equations of the Theory of Ideal Plasticity and of Statics of Granular Media," Applied Mathematics and Mechanics, Vol. 22, No. 1, 1958, pp. 119-128.

Ivlev, D. D.
"On Relations Defining Plastic Flow Under Tresk's Condition of Plasticity and its Generalizations," Soviet Phys - Doklady, Vol. 4, No. 1, Aug., 1959, pp. 217-220.

STRESS-STRAIN RELATIONS

Ivlev, D. D. and Martynova, T. N.
"Fundamental Relations in the Theory of Loose Anisotropic Media," (in Russian), Zh. Prikl, Mekh. Takh. Fiz. (PMTF), No. 2, March-April 1961, pp. 116-121.

James, R. G. and Bransby, P. L.
"Experimental and Theoretical Investigation of a Passive Earth Pressure Problem," Geotechnique, Vol. 20, No. 1, March 1970, pp. 17-37.

James, R. G. and Bransby, P. L.
"A Velocity Field for Some Passive Pressure Problems," Geotechnique, Vol. 21, No. 1, March 1971, pp. 61-83.

Jeske, T.
"On the Kinematics of a Granular Medium in the Case of Equilibrium State under Plane Strain Conditions, Archiwum Mechaniki Stosowanej, Vol. 20, No. 2, 1968, pp. 211-224.

Kezdi, A.
"Results of Theoretical Research," Proceedings of the Second Conference on Building of the Hungarian Academy of Sciences, (Foundation and Soil Mech. Sect., Magyar Tudomanyos Akademia Muszaki Tudomanyok, Osztalyanak Kozlemenyei, Vol. 19, No. 1/3, 1956, pp. 71-84.

Kirkpatrick, W. M.
"The Condition of Failure for Sands," Proceedings of the Fourth International Conference on Soil Mechanics and Foundation Engineering, Vol. 1, 1957, pp. 172-178.

Ko, H. Y. and Scott, R. F.
"Deformation of Sand in Shear," Journal of the Soil Mechanics and Foundations Division, ASCE, Vol. 93, No. SM5, Part 1, Sept., 1967, pp. 283-310.

*Kravtchenko, J. and Sibille, R.
"Calcul des Solutions Approaches dans les Problemes d'Equilibre Limite Plan et de Revolution des Milieu Pesants Obeissant a la Loi de Coulomb," Rheology and Soil Mechanics, Proceedings of the IUTAM Symposium, Grenoble, April 1964, pp. 203-217, Springer-Verlag, 1966.

Kwaszcynska, K., Mroz, Z., and Drescher, A.
"Analysis of Compression of Short Cylinder of Coulomb Material, International Journal of Mechanical Sciences, Vol. 11, No. 2, Feb., 1969, pp. 145-158.

STRESS-STRAIN RELATIONS

Lee, I. K. and Herington, J. R.
"The Effect of Wall Movement on Active and Passive Pressures," Uniciv Report No. R-71, University of New South Wales, Aug., 1971.

Lee, I. K. and Ingles, O. G.
"Strength and Deformation of Soils and Rocks," Soil Mechanics - Selected Topics, I. K. Lee, ed., American Elsevier Publishing Co., New York, 1968, pp. 195-294.

Lenoe, E. M.
"Deformation and Failure of Granular Media Under Three-Dimensional Stresses," Experimental Mechanics, Vol. 6, No. 2, Feb., 1966, pp. 99-104.

Lewin, P. I. and Burland, J. B.
"Stress Probe Experiments on Saturated Normally Consolidated Clay," Geotechnique, Vol. 20, No. 1, March 1970, pp. 38-56.

Livneh, M. and Shklarsky, E.
"Equations of Failure Stresses in Materials with Anisotropic Strength Parameters," Highway Research Record, No. 74, 1965, pp. 44-45.

Lomize, G. M. and Kryzhanovskii, A. L.
"Fundamental Relations of the Stress State and the Strength of Sandy Ground," Soil Mechanics and Foundation Engineering, No. 3, May-June 1966, pp. 165-169.

Lomize, G. M. and Kryzhanovskii, A. L.
"On the Strength of Sand," Proceedings of the Geotechnical Conference Oslo, Vol. 1, 1967, pp. 215-219.

Malyshev, M. V.
"Application of the Hubert-Mises-Botkin Strength Criterion to Unconsolidated Sands," Soil Mechanics and Foundations Engineering, No. 5, Sept.-Oct., 1969, pp. 302-307.

Mandel, J.
"Equation of Flow in Ideal Soils in Plain Deformation and the Concept of Double Slip," (in French), Journal of the Mechanics and Physics of Solids, Vol. 14, No. 6, Nov., 1966, pp. 303-308.

STRESS-STRAIN RELATIONS

*Mandel, J.
"Conditions de Stabilite et Postulat de Drucker," Rheology and Soil Mechanics, Proceedings of the IUTAM Symposium, Grenoble, April 1964, pp. 58-68, Springer-Verlag, 1966.

Mandel, J. and Luque, R. F.
"Fully Developed Plastic Shear Flow of Granular Materials," Geotechnique, Vol. 20, No. 3, Sept., 1970, pp. 277-307.

Marais, G. VR
"Stresses in Wedges of Cohesionless Materials Formed by Free Discharge at the Apex," Journal of Engineering for Industry, Transactions, ASME, Series B, Vol. 91, No. 2, May 1969, pp. 345-352.

Mitchell, R. J.
"On the Yielding and Mechanical Strength of Leda Clays," Canadian Geotechnical Journal, Vol. 7, No. 3, Aug., 1970, pp. 297-312.

Nikolaevskii, V. N.
"On the Formulation of the Defining Equations for a Plane Flow of a Continuous Medium with Dry Friction," Journal of Applied Mathematics and Mechanics, Vol. 32, No. 5, 1968, pp. 959-962.

Ohta, H. and Hata, S.
"A Theoretical Study of the Stress-Strain Relations for Clays," Soils and Foundations, Vol. 11, No. 3, Sept., 1971, pp. 65-90.

Palmer, A. C.
"A Limit Theorem for Materials with Non-Associated Flow Laws," Journal de Mechanique, Vol. 5, No. 2, June 1966, pp. 217-222.

Palmer, A. C.
"Stress-Strain Relations for Clay: An Energy Theory," Geotechnique, Vol. 17, No. 4, Dec., 1967, pp. 348-358.

Pariseau, W. G.
"A New View of the Ideal Plasticity of Soils and Unconsolidated Rock Materials," International Journal of Rock Mechanics and Mining Science, Vol. 3, No. 4, Nov., 1966, pp. 307-317.

STRESS-STRAIN RELATIONS

Pariseau, W. G.
"Gravity Flows of Ideally Plastic Materials Through Slots," Journal of Engineering for Industry, Transactions, ASME, Series B, Vol. 91, No. 2, May 1969, pp. 414-422.

Poorooshasb, H. B., Holubec, I., and Sherbourne, A. N.
"On Quasi-Static Yielding of a Cohesionless Granular Medium," Proceedings of the Fifth U. S. National Congress of Applied Mechanics, 1966, p. 582.

Poorooshasb, H. B., Holubec, I., and Sherbourne, A. N.
"Yielding and Flow of Sand in Triaxial Compression," (Parts I, II, and III), Part I, Canadian Geotechnical Journal, Vol. 3, No. 4, Nov., 1966, pp. 176-190, Parts II and III, Candian Geotechnical Journal, Vol. 4, No. 4, Nov., 1967, pp. 376-397.

Poorooshasb, H. B. and Roscoe, K. H.
"A Graphical Approach to the Problem of the Stress-Strain Relationship of Normally Consolidated Clays," ASTM Special Technical Publication No. 361, Laboratory Shear Testing of Soils, 1963, pp. 258-259.

Poorooshasb, H. B. and Roscoe, K. H.
"The Correlation of the Results of Shear Tests with Varying Degrees of Dilation," Proceedings of the Fifth International Conference on Soil Mechanics and Foundation Engineering, Vol. 1, 1961, pp. 297-302.

Roscoe, K. H.
Discussion of "Lower Bound Collapse Theorem and Lack of Normality of Strain Rate to Yield Surface for Soils," by De Josselin de Jong, Rheology and Soil Mechanics, Proceedings of the IUTAM Symposium, Grenoble, Springer-Verlag, 1966, pp. 75-78.

Roscoe, K. H.
Discussion on Session 1: "Shear Strength of Soft Clay," Proceedings of the Geotechnical Conference Oslo, Vol. 2, 1967, pp. 120-122.

*Roscoe, K. H.
"The Critical State Concept and the use of Short Wave Length Radiation to Study the Onset and Maintenance of Flow in Granular Materials," Proceedings T.H.T.R. Symposium on Problems of the Pebble Bed and Granular Materials, Jülich, 1968, pp. 79-115.

STRESS-STRAIN RELATIONS

Roscoe, K. H.
"The Influence of Strains in Soil Mechanics," Geotechnique, Vol. 20, No. 2, June 1970, pp. 129-170.

Roscoe, K. H., Bassett, R. H., and Cole, E. R. L.
"Principal Axes Observed During Shear of a Sand," Proceedings of the Geotechnical Conference Oslo, Vol. 1, 1967, pp. 231-237.

Roscoe, K. H. and Burland, J. B.
"On the Generalized Stress-Strain Behavior of "Wet" Clay," Engineering Plasticity, Heyman, J. and Leckie, F. A., ed., Cambridge University Press, pp. 535-609.

Roscoe, K. H. and Poorooshasb, H. B.
"A Theoretical and Experimental Study of Strains in Triaxial Compression Tests on Normally Consolidated Clays," Geotechnique, Vol. 13, No. 1, March 1963, pp. 12-38.

*Roscoe, K. H. and Schofield, A. N.
"Mechanical Behavior of an Idealized Wet Clay," Proceedings of the Second European Conference on Soil Mechanics, Wiesbaden, Vol. 1, 1963, pp. 47-54.

Roscoe, K. H. and Schofield, A. N.
Discussion on "Stress-Dilatancy, Earth Pressures, and Slopes," by P. W. Rowe, Journal of the Soil Mechanics and Foundations Division, ASCE, Vol. 90, No. SM1, Jan., 1964, pp. 136-150.

Roscoe, K. H., Schofield, A. N., and Wroth, C. P.
"On the Yielding of Soils," Geotechnique, Vol. 8, No. 1, March 1958, pp. 22-53.

Roscoe, K. H., Schofield, A. N., and Thurairajah, A.
"An Evaluation of Test Data for Selecting a Yield Criterion for Soils," ASTM Special Technical Publication No. 361, Laboratory Shear Testing of Soils, 1963, pp. 111-128.

Roscoe, K. H., Schofield, A. N., and Thurairajah, A.
"Yielding of Clays in States Wetter than Critical," Geotechnique, Vol. 13, No. 3, Sept., 1963, pp. 211-240.

Roscoe, K. H. and Thurairajah, A.
"On the Uniqueness of Yield Surfaces for Wet Clays," Rheology and Soil Mechanics, Proceedings of the ITUAM Symposium, Grenoble, Springer-Verlag, 1966, pp. 364-384.

STRESS-STRAIN RELATIONS

Sawczuk, A.
"On Yield Criteria and Incipient Plastic Motion of Soils," Acta Mechanica, Vol. 4, No. 3, 1967, pp. 308-314.

Sawczuk, A. and Stutz, P.
"On Formulation of Stress-Strain Relations for Soils at Failure," Zeitschrift fur Angewandte Mathematik und Physik, Vol. 19, No. 5, 1968, pp. 770-778.

Schlechtweg, H.
"Two-Dimensional Problem of Plastic Material Obeying Coulomb Law of Yield," (in German), Zamm, Vol. 38, No. 3/4, March-April 1958, pp 139-148.

Schofield, A. and Wroth, P.
Critical State Soil Mechanics, McGraw-Hill Book Company, New York, 1968.

Scott, R. F. and Ko, H.
"Stress-Deformation and Strength Characteristics - State-of-the-Art Report," Seventh International Conference on Soil Mechanics and Foundation Engineering, State of the Art Volume, 1969, pp. 1-47.

Shibata, T. and Karube, D.
"Influence of the Variation of the Intermediate Principal Stress on the Mechanical Properties of Normally Consolidated Clays," Proceedings of the Sixth International Conference on Soil Mechanics and Foundation Engineering, Vol. 1, 1965, pp. 359-363.

Shield, R. T.
"Mixed Boundary Value Problems in Soil Mechanics," Quarterly of Applied Mathematics, Vol. 11, No. 1, April 1953, pp. 61-75.

Shield, R. T. and Drucker, D. C.
"The Application of Limit Analysis to Punch Indentation Problems," Journal of Applied Mechanics, Vol. 20, No. 4, Dec., 1953, pp. 453-460.

Shield, R. T.
"Stress and Velocity Fields in Soil Mechanics," Journal of Mathematics and Physics, Vol. 33, No. 2, July 1954, pp. 144-156.

STRESS-STRAIN RELATIONS

Shield, R. T.
"on Coulomb's Law of Failure in Soil," Journal of Mechanics and Physics of Solids, Vol. 4, No. 1, Oct., 1955, pp. 10-16.

*Sobotka, Z.
"The Limiting Equilibrium of Non-Homogeneous Soils," Non-Homogeneity in Elasticity and Plasticity, Proceedings of the IUTAM Symposium, Warsaw, Pergamon Press, Sept., 1958.

Sobotka, Z.
"Axially Symmetrical and Three-Dimensional Limiting States of Non-Homogeneous Soils and Other Continuous Media," (in English), Archiwum Mechaniki Stosowanej, Warsaw, Vol. 13, No. 2, 1961, pp. 151-175.

Sobotka, Z.
"On a New Approach to the Analysis of Limit States in Soils and in Other Continuous Media, Bulletin of Academic Polonaise Science, Vol. 9, No. 2, 1961, pp. 85-93.

Sobotka, Z.
"The Slip Lines and Surfaces in the Theory of Plasticity and Soil Mechanics," Applied Mechanics Reviews, Vol. 14, No. 10, Oct., 1961, pp. 753-759.

*Sobotka, Z.
"Problemes de l'equilibre Limite des Sols Non-Homogenes," Rheology and Soil Mechanics, Proceedings of the IUTAM Symposium, Grenoble, April 1964, pp. 160-163, Springer-Verlag, 1966.

Sokolovskii, V. V.
"Limiting Equilibrium of Rocks in Conditions of Plane Stress," (in Russian), Bulletin of the Academy of Science of the USSR, Series of Technical Science (Izv. Akademiia Nauk SSSR Ser. Tkh. Nauk), No. 9, Sept., 1948, pp. 1361-1370.

Sokolovskii, V. V.
"Equations of Plastic Equilibrium for Plane Stress," (in Russian), Prikladnaya Matematiki i Mekhanika, Vol. 13, March-April 1949, pp. 219-221.

Sokolovskii, V. V.
"On the Limit Equilibrium of Granular Media," (in Russian), Prikladnaya Matematika i Mekhanika, Vol. 15, No. 6, Nov.-Dec., 1951, pp. 689-708.

STRESS-STRAIN RELATIONS

Sokolovskii, V. V.
"On an Approximate Method in Statics of Granular Media," (in Russian), Prikladnaya Matematika i Mekhanika, Vol. 16, No. 2, March-April 1952, pp. 246-248.

Sokolovskii, V. V.
"Limit Equilibrium of Loose Media for Small Angles of Internal Friction," (in Russian), Inzhener, Sbornik Akad. Nauk SSSR, Vol. 31, 1961, pp. 119-122.

Sokolovskii, V. V.
Statics of Granular Media, Pergamon Press, New York, 1965.

Spencer, A. J. M.
"A Theory of the Kinematics of Ideal Soils Under Plane Strain Conditions," Journal of the Mechanics and Physics of Solids, Vol. 12, 1964, pp. 337-351.

Stroganov, A. S.
"Analysis of Plane Plastic Deformation of Soils," Soviet Engineering Journal S, Vol. 4, July-Aug., 1965, pp. 573-577.

*Stutz, P.
"Stress Distribution under a Foundation Assuming Perfect Plasticity," Comptes Rendus de l'Academie des Sciences, Paris, Vol. 259, No. 4, July 1964, pp. 729-732.

*Szymanski, C.
"Some Plane Problems of the Theory of Limiting Equilibrium of Loose and Cohesive Non-Homogeneous Isotropic Media in the Case of a Non-Linear Limit Curve," Non-Homogeneity in Elasticity and Plasticity, Proceedings of the IUTAM Symposium, Warsaw, Pergamon Press, Sept., 1958.

Takagi, S.
"Plane Plastic Deformation of Soils," Journal of the Engineering Mechanics Division, ASCE, Vol. 88, No. EM3, June 1962, pp. 107-151.

Tan, E. K.
"Stability of Soil Slopes," Transactions of ASCE, Vol. 113, 1948, p. 139.

Thurairajah, A. and Roscoe, K. H.
"The Correlation of Triaxial Compression Test Data on Cohesionless Granular Material," Proceedings of the Sixth International Conference on Soil Mechanics and Foundation Engineering, Vol. 1, 1965, pp. 377-381.

STRESS-STRAIN RELATIONS

Torre, C.
"State of Stresses in a Heavy Soil Mass," Proceedings of the Second International Conference on Soil Mechanics and Foundation Engineering, Rotterdam, Vol. 3, June 1948, pp. 57-61.

Torre, C.
"The Stress State in a Heavy Soil," (in German), Österreichische Akademie der Mathematischen, Wissenschaften Naturwissenschaftliche Klasse, Sitzungsberichte, Abteilung IIa, No. 156, 1948, pp. 583-592.

*Valliapan, S.
Discussion of "Settlement of Strip Load on Elastic-Plastic Soil," by K. Höeg, J. T. Christian, and R. V. Whitman, March 1968, Journal of the Soil Mechanics and Foundations Division, ASCE, Vol. 95, No. SM2, March 1969, pp. 676-678.

van Mierlo, W. C. (Chairman)
"Earth and Rock Pressures," Proceedings of the Sixth International Conference on Soil Mechanics and Foundations Engineering, Technical Session 7 - Division 5, Vol. 3, 1965, pp. 513-539.

Wei, R.
"The Plastic Potential of Normally Consolidated Clay," (in Chinese), Journal of Hydraulic Engineering, No. 6, 1964, pp. 9-20.

Weidler, J. B. and Paslay, P. R.
"Analytical Description of Behavior of Granular Media," Journal of the Engineering Mechanics Division, ASCE, Vol. 95, No. EM2, April 1969, pp. 379-395.

Weidler, J. B., Jr. and Paslay, P. R.
"Constitutive Relations for Inelastic Granular Medium," Journal of the Engineering Mechanics Division, ASCE, Vol. 96, No. EM4, Aug., 1970, pp. 395-406.

Wroth, C. P.
"Soil Behavior during Shear," Engineering, Vol. 186, No. 4829, Sept., 1958, pp. 409-413.

STRESS-STRAIN RELATIONS

Wroth, C. P.
"The Prediction of Shear Strains in Triaxial Tests on Normally Consolidated Clays," Proceedings of the Sixth International Conference on Soil Mechanics and Foundations Engineering, Vol. 1, 1965, pp. 417-420.

Wroth, C. P. and Bassett, R. H.
"A Stress-Strain Relationship for the Shearing Behavior of a Sand," Geotechnique, Vol. 15, No. 1, March 1965, pp. 32-56.

Wroth, C. P. and Loudon, P. A.
"The Correlation of Strains within a Family of Triaxial Tests on Overconsolidated Samples of Koalin," Proceedings of the Geotechnical Conference Oslo, Vol. 1, 1967, pp. 159-163.

Wu, T. H., Loh, A. K., and Malvern, L. E.
"Study of Failure Envelopes of Soils," Journal of the Soil Mechanics and Foundations Division, ASCE, Vol. 89, No. SM1, Feb., 1963, pp. 145-181.

Yamaguchi, H.
"A Theory on the Velocity Field in the Plastic Flow of Granular Materials," (in Japanese), Transactions of the Japan Society of Civil Engineers, July 1959, pp. 8-16.

Yamaguchi, H.
"Discontinuity of Stress and Velocity in the Rigid Plastic Field in Soil Mechanics," Soils and Foundations, Vol. 7, No. 3, 1967, pp. 54-64.

Yokawa, Y., Yamagata, K., and Nagaoka, H.
"Bearing Capacity of a Continuous Footing Set in Two-Layered Ground," Soils and Foundations, Vol. 8, No. 3, 1968, pp. 1-31.

Yong, R. N. and McKyes, E.
"Yield and Failure of Clay Under Triaxial Stresses," Journal of the Soil Mechanics and Foundations Division, ASCE, Vol. 97, No. SM1, Jan., 1971, pp. 159-176.

Ziegler, H.
"On the Plastic Potential in Soil Mechanics," (in German), Zeitschrift Fur Angewandte Mathematik und Physik, Vol. 20, No. 5, 1969, pp. 659-675.

3. BEARING CAPACITY

BEARING CAPACITY*

Absi, E.
"Soil Mass in Limit Equilibrium," (in French), Publication No. 177, Ann. Inst. Tech. Bat. Travaux, Sept., 1962.

Berezantzev, V. G.
"Limit Equilibrium of a Medium Having Internal Friction and Cohesion in a Stressed State, Symmetrical to the Axis," (in Russian), Applied Mathematics and Mechanics, (Prikladnaya Matematika i Mekhanika), Vol. 12, Jan.-Feb., 1948, pp. 99-100.

Berezantsev, V. G.
"Limit Loads in Indentation of Cohesive Soils by Spherical and Conical Indenters, (in Russian), Izv. Adak Nauk SSSR Otd. Tekh Nauk, No. 7, July 1955, pp. 70-74.

Buts'ko, Z. N.
"Determination of the Bearing Capacity of Granular Media," (in Russian), Inzhener. Sbornik Akad, Nauk SSSR, No. 26, 1958, pp. 216-227.

Caquot, A. and Kerisel, J.
Tables for the Calculation of Passive Pressure, Active Pressure, and Bearing Capacity of Foundations, Gauthier Villars, Paris, 1948.

Chen, W. F.
"On Solving Plasticity Problems of Relevance to Soil Mechanics," Ph.D. Thesis, Brown University, Providence, Rhode Island, 1966.

Chen, W. F.
"The Bearing Capacity of Concrete," Ph.D. Thesis, Brown University, Providence, Rhode Island, 1966.

*Chen, W. F.
Discussion of "Applications of Limit Plasticity in Soil Mechanics," by W. D. L. Finn, Sept., 1967, Journal of the Soil Mechanics and Foundations Division, ASCE, Vol. 94, No. SM2, March 1968.

*Denotes those references for which no abstracts are available.

BEARING CAPACITY

Chen, W. F. and Drucker, D. C.
"Bearing Capacity of Concrete Blocks or Rock, Journal of the Engineering Mechanics Division, ASCE, Vol. 95, No. EM4, Aug., 1969, pp. 955-978.

Chen, W. F. and Scawthorn, C. R.
"Limit Analysis and Limit Equilibrium Solutions in Soil Mechanics," Soils and Foundations, Vol. 10, No. 3, Sept., 1970, pp. 13-49.

Chen, W. F. and Davidson, H. L.
"Bearing Capacity Determination by Limit Analysis," Fritz Lab. Report No. 355.15, Lehigh University, Bethlehem, Pennsylvania, Jan., 1972.

Cox, A. D.
"Axially Symmetric Plastic Deformation in Soils - II - Identation of Ponderable Soils," International Journal of Mechanical Sciences, Vol. 4, 1962, pp. 371-380.

Cox, A. D., Eason, G., and Hopkins, H. G.
"Axially Symmetric Plastic Deformations in Soils," Philosophical Transactions of the Royal Society of London, Vol. 254, Series A, 1961-1962, pp. 1-45.

Davis, E. H.
"A Discussion of Theories of Plasticity and Limit Analysis in Relation to the Failure of Soil Masses," Fifth Australia-New Zealand Conference on Soil Mechanics and Foundation Engineering, 1967, pp. 175-186.

De Josselin de Jong, G.
"Graphical Method for the Determination of Slip Line Fields in Soil Mechanics," (in Dutch), de Ingenieur, Vol. 69, No. 29, July 1957, pp. 61-65.

Drescher, A. and Bujak, A.
"A Study of Kinematics of a Granular Body by Indentation with a Plane Punch," (in Polish), Rozprawy Inzynierskie, Vol. 14, No. 2, 1966, pp. 313-325.

Federov, I. V.
"Certain Problems in the Elasto-Plastic Distribution of Stresses in Soil, Associated with the Analyses of Foundations," (in Russian), Inzhenernii Sbornik, Academiia Nauk SSSR, Moscow, Vol. 26, 1958, pp. 205-215.

BEARING CAPACITY

Finn, W. D. Liam
"Applications of Limit Plasticity in Soil Mechanics," Journal of the Soil Mechanics and Foundations Division, ASCE, Vol. 93, No. SM5, Part 1, Sept., 1967, pp. 101-120.

Goldshtein, L. M.
"Approximate Solution of the Problem of Three-Dimensional Limiting Equilibrium of Soils," Soil Mechanics and Foundation Engineering, No. 5, Sept.-Oct., 1969, pp. 323-329.

Gorbunov-Possadov, M. I.
"Calculations for the Stability of a Sand Bed by a Solution Combining the Theories of Elasticity and Plasticity," Proceedings of the Sixth International Conference on Soil Mechanics and Foundation Engineering, Vol. II, 1965, pp. 51-55.

Graham, J.
"Plane Plastic Failure in Cohesionless Soil," Geotechnique, Vol. 18, No. 3, Sept., 1968, pp. 301-316.

*Graham, J.
Discussion of "Application of Limit Plasticity in Soil Mechanics," by W. D. L. Finn, Sept., 1967, Journal of the Soil Mechanics and Foundations Division, ASCE, Vol. 95, No. SM2, March 1969, pp. 630-631.

Graham, J. and Stuart, J. G.
"Scale and Boundary Effects in Foundation Analysis," Journal of the Soil Mechanics and Foundations Division, ASCE, Vol. 97, No. SM11, Nov., 1971, pp. 1533-1548.

Hansen, Bent
"Bearing Capacity of Shallow Strip Footings in Clay," Proceedings of the Seventh International Conference on Soil Mechanics and Foundations Engineering, Vol. 1, 1969, pp. 107-113.

Hansen, J. Brinch
"A General Plasticity Theory for Clay," Geotechnique, Vol. 3, 1952-1953, pp. 154-164.

Harr, M. E.
"Limiting Equilibrium of Soil Structures," Foundations of Theoretical Soil Mechanics, McGraw-Hill, New York, 1966, pp. 233-339.

BEARING CAPACITY

Höeg, K.
"Finite Element Analysis of Strain-Softening Clay," Journal of the Soil Mechanics and Foundations Division, ASCE, Vol. 98, No. SM1, Jan., 1972, pp. 43-58.

Ivcovic, M. and Radenkovic, D.
"An Application of the Limit Analysis in Soil Mechanics," Ninth International Congress of Applied Mechanics, Vol. VIII, Brussels, 1957, pp. 204-205.

Jaky, J.
"Stability of Earthworks in the Plastic State, I." (Sur la Stabilite des Masses de Terre Completement Plastiques, I.). Publications of the Hungarian Technical University (Muegyeteme Közlemenyek), Budapest, No. 2, 1947, pp. 129-151.

Jaky, J.
"Stability of Earthworks in the Plastic State, Part II," (Sur la Stabilite des Masses de Terre Completement Plastiques). Publications of the Hungarian Technical University (Muegyeteme Közlemenyek), Budapest, No. 1, 1948, pp. 34-56.

Jaky, J.
"Stability of Earthworks in the Plastic State," (in French), Publications of the Hungarian Technical University (Muegyeteme Közlemenyek), Budapest, No. 3, 1948, pp. 158-172.

Karafiath, L. L.
"An Analysis of New Techniques for the Estimation of Footing Sinkage in Soils," U. S. Army Ordinance Corps, Land Locomotion Research Branch, Research and Development Division, ATC Report 18, Oct., 1957, p. 32.

Ladanyi, B. and Roy, A.
"Some Aspects of Bearing Capacity of Rock Mass," Seventh Canadian Symposium on Rock Mechanics, Edmonton, Canada, March 25-27, 1971.

Larkin, L. A.
"Theoretical Bearing Capacity of Very Shallow Footings," Journal of the Soil Mechanics and Foundations Division, ASCE, Vol. 94, No. SM6, Nov., 1968, pp. 1347-1357.

BEARING CAPACITY

Larkin, L. A.
"On Plastic Analysis and the Bearing Capacity of Circular Foundations on Granular Soils," Developments in Theoretical and Applied Mechanics, Frederick, D., ed., Vol. 4, Pergamon Press, London, 1970, pp. 503-517.

Livneh, M.
"The Theoretical Bearing Capacity of Soils on a Rock Foundation," Proceedings of the Sixth International Conference on Soil Mechanics and Foundation Engineering, Vol. 2, 1965, pp. 122-126.

Livneh, M. and Shklarsky, E.
"Equations of Failure Stresses in Materials with Anisotropic Strength Parameters," Highway Research Record, No. 74, 1965, pp. 44-45.

Lundgren, H. and Mortensen, K.
"Determination by the Theory of Plasticity of the Bearing Capacity of Continuous Footings on Sand, Proceedings of the Third International Conference on Soil Mechanics and Foundation Engineering, Vol. 1, 1953, pp. 409-412.

Lysmer, J.
"Limit Analysis of Plane Problems in Soil Mechanics," Journal of the Soil Mechanics and Foundations Division, ASCE, Vol. 96, No. SM4, July 1970, pp. 1311-1334.

Negre, M. R. and Stutz, P.
"Contribution a l'etude des Fondations de Revolution dans l'hypothese de la Plasticite Parfaite," International Journal of Solids and Structures, Vol. 6, No. 1, Jan., 1970, pp. 69-90.

*Prandtl, L.
"Uber die Härte Plastischer Körper," Nachr. Kgl. Ges. Wiss. Göttinger, Math.-Phys. Klass, 1920.

*Prandtl, L.
"Eindringungsfestigkeit und Festigkeit von Schneiden," Zeit. f. Angew. Math. u. Mech, 1, 15, 1921.

Rhines, W. J.
"Elastic-Plastic Foundation Model for Punch-Shear Failure," Journal of the Soil Mechanics and Foundations Division, ASCE, Vol. 95, No. SM3, May 1969, pp. 819-828.

BEARING CAPACITY

*Santhakumar, A. R., Kamaraj, L. K.
Discussion of "Bearing Capacity of Concrete Blocks or Rock," by W. F. Chen and D. C. Drucker, Aug., 1969, Journal of the Engineering Mechanics Division, ASCE, Vol. 96, No. EM3, June 1970, pp. 370-371.

Schultze, E.
"Resistance of Soil Foundations to Oblique Base Pressure," (in German), Bautechnik, Vol. 29, No. 12, Dec., 1952, pp. 336-342.

Schultze, E.
"Distribution of Stress Beneath a Rigid Foundation," Proceedings of the Fifth International Conference on Soil Mechanics and Foundation Engineering, Paris, Vol. 1, 1961, p. 807.

Shield, R. T.
"Mixed Boundary Value Problems in Soil Mechanics," Quarterly of Applied Mathematics, Vol. 11, No. 1, April 1953, pp. 61-75.

Shield, R. T. and Drucker, D. C.
"The Application of Limit Analysis to Punch Indentation Problems," Journal of Applied Mechanics, Vol. 20, No. 4, Dec., 1953, pp. 453-460.

Shield, R. T.
"Plastic Potential Theory and Prandtl Bearing Capacity Solution," Journal of Applied Mechanics, Vol. 21, No. 2, June 1954, p. 193.

Shield, R. T.
"On Coulomb's Law of Failure in Soil," Journal of Mechanics and Physics of Solids, Vol. 4, No. 1, Oct., 1955, pp. 10-16.

Siciliano, M. and Chen, W. F.
"The Bearing Strength of Concrete Blocks," Fritz Lab. Report No. 370.6, Lehigh University, Bethlehem, Pennsylvania, May 1971.

Sokolovskii, V. V.
"Theory of Limit Equilibrium of Soils and Its Application to the Analysis of Hydrotechnical Structures," (in Russian), Izv. Akad, Nauk SSSR Otd. Tekh. Nauk, No. 6, June 1952, pp. 809-823.

BEARING CAPACITY

*Sokolovskii, V. V.
"Stability of Foundations and of Slopes," (in Russian), Isvestiya Akademiia Nauk SSSR, Otdeleni Tekhnicheskikh Nauk, Mekhanika i Mashinostroenie, Leningrad, No. 8, Aug., 1952, pp. 1146-1159.

Sokolovskii, V. V.
"On the Stability of Foundation Beds of Laminated Cohesionless Material," (in Russian), Inzhener, Sbornik, Akad. Nauk SSSR, Vol. 22, 1955, pp. 74-82.

Sokolovskii, V. V.
"Limit Equilibrium of Loose Media for Small Angles of Internal Friction," (in Russian), Inzhener. Sbornik Akad. Nauk SSSR, Vol. 31, 1961, pp. 119-122.

Sokolovskii, V. V.
Statics of Granular Media, Pergamon Press, New York, 1965.

Spencer, A. J. M.
"Perturbation Methods in Plasticity - III Plane Strain of Ideal Soils and Plastic Solids with Body Forces," Journal of the Mechanics and Physics of Solids, Vol. 10, April-June 1962, pp. 165-177.

Spencer, A. J. M.
"A Theory of the Kinematics of Ideal Soils Under Plane Strain Conditions," Journal of the Mechanics and Physics of Solids, Vol. 12, 1964, pp. 337-351.

Steirnmann, I. Y.
"The Pressure Distribution Under a Foundation in the Presence of a Plastic Region," (in Russian), Sb. Trudi Mosk. Inzh.-Stroit In-ta, No. 14, 1956, pp. 32-56.

Stroganov, A. S.
"Analysis of Plane Plastic Deformation of Soils," Soviet Engineering Journal S, Vol. 4, July-Aug., 1965, pp. 573-577.

Vyalov, S. S.
"Limit Equilibrium of Weak Soils on a Rigid Base," (in Russian), Izvestiya Akademiia Nauk SSSR, Otdelenie Technicheskikh Nauk, Mekhanika i Mashinostroenie, Leningrad, No. 5, June 1951, pp. 813-828.

BEARING CAPACITY

Yamaguchi, H.
"Application of Kotter Equation to Theoretical Soil Mechanics," (in Japanese), Transactions of the Japan Society of Civil Engineers, Vol. 65, Nov., 1959, pp. 1-9.

Yokawa, Y., Yamagata, K., and Nagaoka, H.
"Bearing Capacity of a Continuous Footing Set in Two-Layered Ground," Soils and Foundations, Vol. 8, No. 3, 1968, pp. 1-31.

Zienkiewicz, O. C., Valliappan, S., and King, I. P.
"Elasto-Plastic Solutions of Engineering Problems - Initial Stress," Finite Element Approach, International Journal for Numerical Methods in Engineering I, No. 1, Jan.-March 1969, pp. 75-100.

4. EARTH PRESSURE

EARTH PRESSURE*

Absi, E.
"Soil Mass in Limit Equilibrium," (in French), Publication No. 177, Ann. Inst. Tech. Bat. Travaux, Sept., 1962.

Balla, A.
"The Soil Pressure on a Sustaining Wall," (in French), Acta Technica, Vol. 29, No. 1/2, 1960, pp. 99-115.

Caquot, A. and Kerisel, J.
Tables for the Calculation of Passive Pressure, Active Pressure, and Bearing Capacity of Foundations, Gauthier Villars, Paris, 1948.

*Chen, W. F.
Discussion of "Applications of Limit Plasticity in Soil Mechanics," by W. D. L. Finn, Sept., 1967, Journal of the Soil Mechanics and Foundations Division, ASCE, Vol. 94, No. SM2, March 1968.

Chen, W. F. and Scawthorn, C. R.
"Limit Analysis and Limit Equilibrium Solutions in Soil Mechanics," Soils and Foundations, Vol. 10, No. 3, Sept., 1970, pp. 13-49.

*Dembicki, E.
"Study of a Retaining Wall for an Ideal Non-Cohesive Unloaded Medium," (in French), Comptes Rendus de l'Academie des Sciences, Paris, Vol. 256, No. 12, March 1963, pp. 2537-2540.

Dembicki, E., Kravtchenko, J., and Sibille, R.
"On the Approximate Analytical Solution of Plane Limit Equilibrium Problems of Coherent Media," (in French), Journal de Mechanique, Vol. 3, No. 3, Sept., 1964, pp. 277-312.

*Dembicki, E.
"Approximate Calculation of the Stress Distribution Along a Screen Abutment Against a Coherent Solid with Weak Internal Friction," (in French), Bull. Acad. Polonaise Sci. Ser. Sci. Tech. (Polska Akad. Nauk), Warsaw, Vol. 12, No. 11, 1964, pp. 517-521.

*Denotes those references for which no abstracts are available.

EARTH PRESSURE

*Dembicki, E.
"Approximate Explicit Solution of the Problem of a Retaining Wall with an Inclined Free Surface," (in French), Bull. Acad. Polonaise Sci. Ser. Sci. Tech. (Polska Akad. Nauk), Warsaw, Vol. 12, No. 11, 1964, pp. 511-516.

Dembicki, E.
"Determining the Stress Distribution Along a Retaining Wall Structure by Method of Characteristics: Part 4, Tables of Passive Earth Pressure Coefficient Values in Cohesive Soils with Triangular Load Distribution," (in Polish), Archiwum Hydrotechniki, Vol. 12, No. 2, 1965, pp. 181-199.

Dembicki, E. and Negre, R.
"Distribution of Stress of Longitudinally Supporting Walls in a Spatial, Axisymmetric System," (in French), Bulletin de l'Academie Polonaise des Sciences, Serie des Sciences Techniques, Vol. 14, No. 8, 1966, pp. 447-452.

Federov, I. V.
"Certain Problems in the Elasto-Plastic Distribution of Stresses in Soil, Associated with the Analyses of Foundations," (in Russian), Inzhenernii Sbornik, Academiia Nauk SSSR, Moscow, Vol. 26, 1958, pp. 205-215.

Finn, W. D. Liam
"Applications of Limit Plasticity in Soil Mechanics," Journal of the Soil Mechanics and Foundations Division, ASCE, Vol. 93, No. SM5, Part 1, Sept., 1967, pp. 101-120.

Graham, J.
"Plane Plastic Failure in Cohesionless Soil," Geotechnique, Vol. 18, No. 3, Sept., 1968, pp. 301-316.

*Graham, J.
Discussion of "Applications of Limit Plasticity in Soil Mechanics," by W. D. L. Finn, Sept., 1967, Journal of the Soil Mechanics and Foundations Division, ASCE, Vol. 95, No. SM2, March 1969, pp. 630-631.

Hansen, J. Brinch
"A General Plasticity Theory for Clay," Geotechnique, Vol. 3, 1952-1953, pp. 154-164.

EARTH PRESSURE

Hansen, Brinch J.
Earth Pressure Calculation, Danish Technical Press, 1953.

Harr, M. E.
"Limiting Equilibrium of Soil Structures," Foundations of Theoretical Soil Mechanics, McGraw-Hill, New York, 1966, pp. 233-339.

Hartmann, F.
"On a New Earth Pressure Theory," (in German), Bautechnik, Vol. 45, No. 9, Sept., 1968, pp. 307-313.

Jaky, J.
"Stability of Earthworks in the Plastic State, I." (Sur la Stabilite des Masses de Terre Completement Plastiques, I.). Publications of the Hungarian Technical University (Muegyeteme Közlemenyek), Budapest, No. 2, 1947, pp. 129-151.

Jaky, J.
"Stability of Earthworks in the Plastic State, Part II," (Sur la Stabilite des Masses de Terre Completement Plastiques). Publications of the Hungarian Technical University, (Muegyeteme Közlemenyek), Budapest, No. 1, 1948, pp. 34-56.

Jaky, J.
"Stability of Earthworks in the Plastic State," (in French), Publications of the Hungarian Technical University (Muegyeteme Közlemenyek), Budapest, No. 3, 1948, pp. 158-172.

Jaky, J.
"Network of Slip Lines in Soil Stability," Acta Technica, Academiae Scientiarum Hungaricae, Budapest, Vol. 6, No. 1/2, 1953, pp. 25-38.

James, R. G. and Bransby, P. L.
"Experimental and Theoretical Investigation of a Passive Earth Pressure Problem," Geotechnique, Vol. 20, No. 1, March 1970, pp. 17-37.

James, R. G. and Bransby, P. L.
"A Velocity Field for Some Passive Pressure Problems," Geotechnique, Vol. 21, No. 1, March 1971, pp. 61-83.

EARTH PRESSURE

Kezdi, A.
"Results of Theoretical Research," Proceedings of the Second Conference on Building of the Hungarian Academy of Sciences, (Foundation and Soil Mech. Sect. Magyar Tudomanyos Akademia Muszaki Tudomanyok, Osztalyanak Kozlemenyei, Vol. 19, No. 1/3, 1956, pp. 71-84.

Lee, I. K. and Herington, J. R.
"The Effect of Wall Movement on Active and Passive Pressures," Uniciv Report No. R-71, University of New South Wales, Aug., 1971.

Lysmer, J.
"Limit Analysis of Plane Problems in Soil Mechanics," Journal of the Soil Mechanics and Foundations Division, ASCE, Vol. 96, No. SM4, July 1970, pp. 1311-1334.

Poorooshasb, H. B., Holubec, I., and Sherbourne, A. N.
"Yielding and Flow of Sand in Triaxial Compression," (Parts I, II, and III), Part I, Canadian Geotechnical Journal, Vol. 3, No. 4, Nov., 1966, pp. 176-190, Parts II and III, Canadian Geotechnical Journal, Vol. 4, No. 4, Nov., 1967, pp. 376-397.

Rochette, P. A.
"Earth Pressures on Structures and Mobilized Shear Resistance," Proceedings of the Fifteenth Canadian Soil Mechanics Conference, Technical Mem. No. 73, 1961, pp. 3-59.

Roscoe, K. H.
"The Influence of Strains in Soil Mechanics," Geotechnique, Vol. 20, No. 2, June 1970, pp. 129-170.

Rosenfarb, J. and Chen, W. F.
"Limit Analysis Solutions of Earth Pressure Problems," Fritz Lab. Report No. 355.14, Lehigh University, Bethlehem, Pennsylvania, March 1972.

Sokolovskii, V. V.
"Theory of Limit Equilibrium of Soils and Its Application to the Analysis of Hydrotechnical Structures," (in Russian), Izv. Akad, Nauk SSSR Otd. Tekh. Nauk, No. 6, June 1952, pp. 809-823.

EARTH PRESSURE

*Sokolovskii, V. V.
"Stability of Foundations and of Slopes," (in Russian), Isvestiya Akademiia Nauk SSSR, Otdelenie Tekhnicheskikh Nauk, Mekhanika i Mashinostroenie, Leningrad, No. 8, Aug., 1952, pp. 1146-1159.

Sokolovskii, V. V.
"Some Problems of Soil Pressure," Proceedings of the Fourth International Conference on Soil Mechanics and Foundation Engineering, London, Vol. 2, 1957, pp. 239-242.

Sokolovskii, V. V.
Statics of Granular Media, Pergamon Press, New York, 1965.

Yamaguchi, H.
"Application of Kotter Equation to Theoretical Soil Mechanics," (in Japanese), Transactions of the Japan Society of Civil Engineers, Vol. 65, Nov., 1959, pp. 1-9.

5. SLOPE STABILITY

SLOPE STABILITY*

Absi, E.
"Soil Mass in Limit Equilibrium," (in French), Publication No. 177, Ann. Inst. Tech. Bat. Travaux, Sept., 1962.

Chen, W. F., Giger, M. W., and Fang, H. Y.
"On the Limit Analysis of Stability of Slopes," Soils and Foundations, Vol. IX, No. 4, Dec., 1969.

Chen, W. F. and Scawthorn, C. R.
"Limit Analysis and Limit Equilibrium Solutions in Soil Mechanics," Soils and Foundations, Vol. 10, No. 3, Sept., 1970, pp. 13-49.

Chen, W. F. and Giger, M. W.
"Limit Analysis of Stability of Slopes," Journal of Soil Mechanics and Foundations Division, ASCE, Vol. 97, No. SM1, Jan., 1971.

Chen, W. F., Snitbhan, N., and Fang, H. Y.
"Limit Analysis of Stability of Slopes in Anisotropic, Non-Homogeneous Soils," Fritz Lab. Report No. 355.13, Lehigh University, Bethlehem, Pennsylvania, Feb., 1972.

Drucker, D. C. and Prager, W.
"Soil Mechanics and Plastic Analysis of Limit Design," Quarterly of Applied Mechanics, Vol. 10, 1952, pp. 157-165.

Drucker, D. C.
"Limit Analysis of Two- and Three-Dimensional Soil Mechanics Problems," Journal of the Mechanics and Physics of Solids, Vol. 1, 1953, pp. 217-226.

Fang, H. Y., Atsuta, Toshio, and Chen, W. F.
"Stability of Slopes Intercepted by a Retaining Structure," Fritz Lab. Report No. 335.11, Lehigh University, 1972.

Fang, H. Y. and Hirst, T. J.
"Application of Plasticity Theory to Slope Stability Problems," Highway Research Record, No. 323, 1970, pp. 26-38.

*Denotes those references for which no abstracts are available.

SLOPE STABILITY

Federov, I. V.
"Certain Problems in the Elasto-Plastic Distribution of Stresses in Soil, Associated with the Analyses of Foundations," (in Russian), Inzhenernii Sbornik, Academiia Nauk SSSR, Moscow, Vol. 26, 1958, pp. 205-215.

Graham, J.
"Plane Plastic Failure in Cohesionless Soil," Geotechnique, Vol. 18, No. 3, Sept., 1968, pp. 301-316.

Harr, M. E.
"Limiting Equilibrium of Soil Structures," Foundations of Theoretical Soil Mechanics, McGraw-Hill, New York, 1966, pp. 233-339.

Jaky, J.
"Stability of Earthworks in the Plastic State, I." (Sur la Stabilite des Masses de Terre Completement Plastiques, I.). Publications of the Hungarian Technical University (Muegyeteme Közlemenyek), Budapest, No. 2, 1947, pp. 129-151.

Jaky, J.
"Stability of Earthworks in the Plastic State, Part II," (Sur la Stabilite des Masses de Terre Completement Plastiques). Publications of the Hungarian Technical University (Muegyeteme Közlemenyek), Budapest, No. 1, 1948, pp. 34-56.

Jaky, J.
"Stability of Earthworks in the Plastic State," (in French), Publications of the Hungarian Technical University (Muegyeteme Közlemenyek), Budapest, No. 3, 1948, pp. 158-172.

Karafiath, L. L.
Discussion of "Application of Plasticity Theory to Slope Stability Problems," by H. Y. Fang and T. J. Hirst, Highway Research Record, No. 323, 1970, pp. 36-37.

Karafiath, L. L. and Nowatzki, E. A.
"Stability of Slopes Loaded Over a Finite Area," Highway Research Record, No. 323, 1970, pp. 14-25.

SLOPE STABILITY

Sokolovskii, V. V.
"Theory of Limit Equilibrium of Soils and Its Application to the Analysis of Hydrotechnical Structures," (in Russian), Izv. Akad, Nauk SSSR Otd. Tekh. Nauk, No. 6, June 1952, pp. 809-823.

*Sokolovskii, V. V.
"Stability of Foundations and of Slopes," (in Russian), Isvestiya Akademiia Nauk SSSR, Otdelenie Tekhnicheskikh Nauk, Mekhanika i Mashinostroenie, Leningrad, No. 8, Aug., 1952, pp. 1146-1159.

Sokolovskii, V. V.
"Some Problems of Soil Pressure," Proceedings of the Fourth International Conference on Soil Mechanics and Foundation Engineering, London, Vol. 2, 1957, pp. 239-242.

Sokolovskii, V. V.
Statics of Granular Media, Pergamon Press, New York, 1965.

Tan, E. K.
"Stability of Soil Slopes," Transactions of ASCE, Vol. 113, 1948, p. 139.

6. MISCELLANEOUS

MISCELLANEOUS*

Bleich, H. H. and Heer, E.
"Moving Step-Load on Half-Space of Granular Material," Journal of the Engineering Mechanics Division, ASCE, Vol. 89, No. EM3, June 1963, pp. 97-130.

Chadwick, P.
"The Quasi-Static Expansion of a Spherical Cavity in Metals and Ideal Soils," Quarterly Journal of Mechanics and Application of Mathematics, Vol. 12, No. 1, Feb., 1959, pp. 52-71.

Cheatham, J. B., Jr., Paslay, P. R., and Fulcher, C. W. G.
"Analysis of the Plastic Flow of Rock under a Lubricated Punch," Journal of Applied Mechanics, Vol. 35, No. 1, March 1968, pp. 87-94.

Chen, P. Y. P.
Discussion of "Flow and Pressure of Granular Materials in Soil," by G. P. Deutsch and D. H. Clyde, Dec., 1967, Journal of the Engineering Mechanics Division, ASCE, Vol. 94, No. EM4, Aug., 1968, pp. 1000-1002.

Chen, W. F.
"Extensibility of Concrete and Theorems of Limit Analysis," Journal of the Engineering Mechanics Division, ASCE, Vol. 96, No. EM3, June 1970, pp. 341-352.

Chen, W. F.
"Double-Punch Test for Tensile Strength of Concrete," Journal of the American Concrete Institute, Vol. 67, Dec., 1970, pp. 993-995.

Chen, W. F. and Covarrubias, S.
"Bearing Capacity of Concrete Blocks," Journal of the Engineering Mechanics Division, ASCE, Vol. 97, No. EM5, Oct., 1971, pp. 1413-1430.

Chen, W. F. and Trumbauer, B. E.
"Double-Punch Test and Tensile Strength of Concrete," Journal of Materials, American Society of Testing and Materials, June 1972. (In press).

*Denotes those references for which no abstracts are available.

MISCELLANEOUS

Chen, W. F. and Carson, J. L.
"Bearing Capacity of Random Wire Reinforced Concrete," Highway Research Record, 1972. (In press).

Coenen, P. A.
"Fundamental Equations in the Theory of Limit Equilibrium," Proceedings of the Second International Conference of Soil Mechanics and Foundation Engineering, Vol. VII, 1948, pp. 15-20.

Dais, J. L.
"Soil Indentation by Translating Flanged Plate," Journal of the Engineering Mechanics Division, ASCE, Vol. 97, No. EM4, Aug., 1971, pp. 1057-1070.

*De Beer, E. and Wallays, M.
"Examen Critique de Trois Théories Recentes...," (in French), Annals des trav. publ. de Belgique, Vol. 5, No. 3, June 1955.

De Josselin de Jong, G. and Geertsma, J.
"The Stress Distribution Around Vertically Drilled Holes in Sandy Terrain, Internally Supported by a Heavy Liquid," (in Dutch), de Ingenieur, The Hague, Vol. 65, No. 9, Feb., 1953.

Dembicki, E.
"A Method of Nonlinear Approximation for the Solution of Limiting Equilibrium Problems in Cohesive Media," (in French), Arch. Hydrotech, Vol. 10, No. 3, 1963, pp. 367-472.

Dembicki, E., Negre, R., and Stutz, P.
"Ecoulement Dans Un Silo Conique De Revolution Et Déformation D'un Echantillon Dans l'essai Triaxial Pour Un Materiau A Dilatation Non Standardisee," Third Budapest Conference on Soil Mechanics, 1968, pp. 35-53.

*Demin, A. M.
"Use of the Theory of Limiting Equilibrium for Calculating the Stabilities of Rock Dumps," (in Russian), Ugol. No. 9, 1957, pp. 21-23, Referativnii Zhurnal Mekhanika, Revision 8034, No. 7, 1958.

MISCELLANEOUS

Deutsch, G. P. and Clyde, D. H.
"Flow and Pressure of Granular Materials in Silos," Journal of the Engineering Mechanics Division, ASCE, Vol. 93, No. EM6, Dec., 1967, pp. 103-125.

Dismuke, T. D., Chen, W. F., and Fang, H. Y.
"Tensile Strength of Rock by the Double-Punch Method," (to be published, Journal of the International Society for Rock Mechanics, Austria).

Elsamny, M. K. and Ghobarah, A. A.
"Stress Field Under Slipping Rigid Wheel," Journal of the Soil Mechanics and Foundations Division, ASCE, Vol. 98, No. SM1, Jan., 1972, pp. 13-25.

Fang, H. Y. and Chen, W. F.
"New Method for Determination of Tensile Strength of Soils," Highway Research Record, No. 354, 1971, pp. 62-68.

Fang, H. Y. and Chen, W. F.
"Further Study of Double-Punch Test for Tensile Strength of Soils," (to be published, Third Southeast Asian Conference on Soil Engineering, Hong Kong), Nov., 1972.

Glushko, V. I.
"On the Determination of Stresses Around a Horizontal Working," (in Russian), Isv. Dnepropetr, Gorn. In-ta., Vol. 38, 1959, pp. 5-10; Referativnii Zhurnal Mekhanika Moscow, No. 8, 1960, Revision 10770.

Goguel, J.
"Distribution of Stresses Around A Cylindrical Tunnel (Repartition des Contraintes Antons d'un Tunnel Cylindrique)," Annales des Ponts et Chaussees, Vol. 117, March-April 1947, pp. 157-188.

*Hampton, D., Schimming, B. B., Skok, E. L., Jr., and Krizek, R. J., "Solutions to Boundary Value Problems of Stresses and Displacements in Earth Masses and Layered Systems," Bibliography No. 48, Highway Research Board, National Acadamy of Sciences, Washington, D. C., 1969.

Haythornthwaite, R. M.
"Methods of Plasticity in Land Locomotion Studies," Proceedings of the First International Conference on the Mechanics of Soil-Vehicle Systems, Torino-Saint Vincent Edizioni Minerva Tecnica, Turin, June 1961, pp. 3-19.

MISCELLANEOUS

*Heurtaux, J.
"On Singular Solutions of the Equations of Limit Equilibrium of Non-Cohesive Soils," (in French), Comptes Rendus Hebdomadaires des Seances de l'Academie des Sciences, Paris, Vol. 249, No. 23, Dec., 1959, pp. 2480-2491.

Il'Yushin, A. A.
"Modern Problems in the Theory of Plasticity," (in Russian), Vestnik Moscov. Univ., No. 4-5, April-May 1955, pp. 101-113.

Inoue, N.
"Application of Gas Dynamical Method to Soil Mechanics and Theory of Plasticity," Journal of Physics Society of Japan, I, II, Vol. 7, No. 6, Nov.-Dec., 1952, pp. 604-618.

Inoue, N.
"Discontinuous Solutions in Soil Mechanics," Proceedings of the Second Japan National Congress Applied Mechanics, 1952; National Committee for Theoretical Applied Mechanics, May 1953, pp. 23-27.

*Jenike, A. W. and Leser, T.
"A Flow-No-Flow Criterion on the Gravity Flow of Powders in Converging Channels," Proceedings of the Fourth International Congress on Rheology, Part 3, Brown University, 1963, pp. 125-141.

*Jurgenson, L.
"The Application of Theories of Elasticity and Plasticity to Foundation Problems," Contributions to Soil Mechanics, Boston Society of Civil Engineers, 1925-1940, pp. 148-183.

*Kravtchenko, J. and Sibille, R.
"Remarks on the Approximative Integration of the Plane Limit Equilibrium Equations of Cohesive Weightly Media," (in French), Comptes de l'Academie des Sciences, Paris, Vol. 256, No. 1, Jan., 1963, pp. 79-81.

*Kravtchenko, J. and Sibille, R.
"Some Geometric Properties of the Stress Field of Soils Obeying Coulomb Law," (in French), Comptes Rendus de l'Academie des Sciences, Series A, Vol. 262, No. 18, May 1966, pp. 1023-1026.

MISCELLANEOUS

Kuznetsov, S. V.
"Interaction of Tectonic Pressures and Gas Pressure in a Coal Seam," (in Russian), Zhurnal Prikladnoi Mekhaniki i Tekhnicheskoi Fiziki (PMFT), No. 4, July-Aug., 1961, pp. 57-77.

Lippmann, H.
"Plasticity in Rock Mechanics," International Journal of Mechanical Sciences, Vol. 13, No. 4, April 1971, pp. 291-297.

Mroz, Z. and Drescher, A.
"Limit Plasticity Approach to Some Cases of Flow of Bulk Solids," Journal of Engineering for Industry, Transactions, ASME, Series B, Vol. 91, No. 2, May 1969, pp. 357-364.

Mroz, Z. and Kwaszcynska, K.
"Axially Symmetric Plastic Flow of Soils Treated by the Graphical Method," (in English), Archiwum Inzynierii Ladowej, Vol. 14, No. 1, 1968, pp. 27-37.

Oz, A. C.
"Limit Analysis of Forces Exerted on Soil Shoving Equipment," (in German), Istanbul Teknik. Universitesi Buleteni, Vol. 22, No. 1, 1969, pp. 1-16.

Paslay, P. R., Cheatham, J. B., Jr., and Fulcher, C. W. G.
"Plastic Flow of Rock Under a Pointed Punch in Plane Strain," Journal of Applied Mechanics, Vol. 35, No. 1, March 1968, pp. 95-101.

Paslay, P. R. and Weidler, J. B.
"Analysis of Triaxial Test for Granular Soils," Journal of the Engineering Mechanics Division, ASCE, Vol. 95, No. EM3, June 1969, pp. 587-609.

Pramborg, B. O.
"Plastic Equilibrium in Soil," Proceedings of the Fifth International Conference of Soil Mechanics and Foundation Engineering, Vol. 2, 1961, pp. 459-463.

*Roscoe, K. H.
"A Brief Introduction to Soil Mechanics and an Outline of Recent Work at Cambridge," Proceedings of the Cambridge Conference of International Study Group on Soils, 1964, pp. 21-30.

MISCELLANEOUS

*Roscoe, K. H.
"Some Soil Mechanics Concepts and the Possibility of their Wider Applications," Paper 81, Proceedings International Conference on Structure, Solid Mechanics, and Engineering Design, Southampton University, 1969.

Schultze, E.
"Composition and Resolution of Slip Lines," (in German), ABH. Bodenmech. Grundbau, Berlin, Erich Schmidt Verlag, 1948, pp. 34-45.

Scott, R. F.
"Plastic Equilibrium States in Soil," Principles of Soil Mechanics, Chapter 9, Addison-Wesley, Reading, Massachusetts, 1963, pp. 398-427.

Smith, I. M.
"Incremental Numerical Solution of a Simple Deformation Problem in Soil Mechanics," Geotechnique, Vol. 20, No. 4, Dec., 1970, pp. 357-372.

Smith, I. M. and Kay, S.
"Stress Analysis of Contractive or Dilative Soils," Journal of the Soil Mechanics and Foundations Division, ASCE, Vol. 97, No. SM7, July 1971, pp. 981-997.

*Sokolovskii, V. V.
"Some Discontinuous Solutions in Soil Mechanics," Ninth International Congress of Applied Mechanics, University of Bruxelles, Vol. 8, 1957, pp. 112-118.

Westergaard, H. M.
"Plastic State of Stress Around a Deep Well," Contributions to Soil Mechanics, 1935-1940, Reported from Boston Society of Civil Engineers, Vol. 27-28, Jan., 1940, p. 1.

Wu, T. H.
"Plastic Equilibrium," Soil Mechanics, Allyn and Bacon, Inc., Boston, 1964, Chapter 8, pp. 252-264.

*Yamaguchi, H.
"Two Extremum Theorems and their Applications in Soil Mechanics," (in Japanese), Trans. Japan Soc. Civil Eng., No. 145, Sept., 1967, pp. 12-22.

7. ABSTRACTS

Absi, E.
"Soil Mass in Limit Equilibrium," (in French), Publication No. 177, Ann. Inst. Tech. Bat. Travaux, Sept., 1962.

The method of characteristics is used to obtain stress solutions to some soil strength problems including shallow foundations, retaining walls, and slopes.

Balla, A.
"Stress Conditions in the Triaxial Compression Test," Proceedings Fourth International Conference of Soil Mechanics and Foundation Engineering, Vol. 1, 1957, pp. 140-143.

Using an elastically derived stress function for a cylindrical specimen the author analyses plastification using the Huber-Mises theory of rupture. Method ignores pressure redistributions transmitted to elastic regions.

Balla, A.
"The Soil Pressure on a Sustaining Wall," (in French), Acta Technica, Vol. 29, No. 1/2, 1960, pp. 99-115.

Using Jaky's general solution of Kotter's equation for soil with $\phi = 0$, and assuming a linear variation with depth of angle of intersection of slip circles and back of rough wall, author obtains a rigorous theoretical solution for pressures from a completely plastic heavy backfill.

Barden, L., Ismail, H., and Tong, P.
"Plane Strain Deformation of Granular Material at Low and High Pressures," Geotechnique, Vol. 19, No. 4, Dec., 1969, pp. 441-452.

Results of plane strain tests on cubes of sand under range of confining pressures of 5-1000 psi. It is shown that the stress-dilatancy equation results in a simple flow rule and plastic potentials which are independent of soil density and confining pressure. The yield criterion and the plastic potential function are discussed with the subsequent conclusion that for plane strain sand does not exhibit normality.

Barden, L. and Khayatt, A. J.
"Incremental Strain Rate Ratios and Strength of Sand in The Triaxial Test," Geotechnique, Vol. 16, No. 4, Dec., 1966, pp. 338-357.

Includes discussion of stress-dilatancy relations and comparison of various plastic potentials with yield surfaces. It is also shown that some form of strain-hardening plastic behavior may be a useful idealization.

Belaenko, F. A.
"The Stresses Around a Circular Shaft in an Elastic-Plastic Soil," (in Russian), Izvestiya Akademia Nauk SSSR, Otdelenie Tekhnicheskikh Nauk, Mekhanika i Mashinostroenie, Leningrad, 1950, pp. 914-925.

Paper considers the stress around a deep vertical circular shaft in a homogeneous isotropic soil bounded by a horizontal surface and exhibiting linear hardening in the plastic range. The vertical stress is a function only of the distance from the free surface, and the radial and hoop stresses vary exponentially with radial distance from the center of the shaft.

Berezantzev, V. G.
"Limit Equilibrium of a Medium Having Internal Friction and Cohesion in a Stressed State, Symmetrical to the Axis," (in Russian), Applied Mathematics and Mechanics, (Prikladnaya Matematika i Mekhanika), Vol. 12, Jan.-Feb., 1948, pp. 99-100.

This paper treats stresses in a medium with internal friction and cohesion stressed symmetrically to the axis and without body forces. The general theory of principal stresses and lines of rupture is applied to the case of a cylindrical surface of the excavation and a continuous load on the horizontal surface of the medium. Then for uniformly distributed loading on the horizontal surface of the medium due to pressure with a cylindrical stamp, the lines of rupture and the pressure of the stamp are approximately calculated.

Berezantsev, V. G.
"Limit Loads in Indentation of Cohesive Soils by Spherical and Conical Indenters, (in Russian), Izv. Adak Nauk SSSR Otd. Tekh Nauk, No. 7, July 1955, pp. 70-74.

Study of relationship between limit loads in indentation and the friction and cohesive constants in a Mohr-Coulomb medium. Ratios of indentation load to cohesive strength computed for various ϕ, cone angles, and indentation depths.

Bhattacharya, S. K.
"The Geometry of a Slip-Line Field in Soils," Geotechnique, Vol. 1, No. 2, June 1960, pp. 75-81.

Graphical construction of slip-line fields is discussed.

Bleich, H. H. and Heer, E.
"Moving Step-Load on Half-Space of Granular Material," Journal of the Engineering Mechanics Division, ASCE, Vol. 89, No. EM3, June 1963, pp. 97-130.

Theory of plasticity used to solve the plane strain problem of a step-load moving on a half-space of Coulomb material.

Boehler, J. P. and Sawczuk, A.
"Limit Equilibrium of Anisotropic Soils," (in French), Journal de Mechanique, Vol. 9, No. 1, March 1970, pp. 5-33.

An invariant form of yield criterion is derived for anisotropic media. Generalizations of Coulomb, Tresca, and Mises yield conditions are obtained. The theory is compared to experiments on consolidated clays. Some boundary value problems are solved.

Bonneau, M.
"Equilibrium Limit and Failure of Continuous Media (Equilibre Limite Rupture des Milieux Continus)," Annales des Ponts et Chaussées, Vol. 117, Sep.-Oct., 1947, pp. 609-653, Nov.-Dec., 1947, pp. 769-801.

A complete review of the theory of plastic deformation of continuous media is presented, supplemented by problems from the authors experience, with particular emphasis on equilibrium and failure of soil configurations.

Brown, E. H.
"A Theory for the Mechanical Behavior of Sand," Proceedings of the Eleventh International Congress of Applied Mechanics, Munich 1964, H. Gorther, ed., Springer-Verlag, Berlin, 1966, pp. 183-191.

Author presents a simple frictional model which is not stable (does not satisfy Drucker's postulate). A modified version of Drucker's postulate is proposed for a frictional system, i.e., a purely deviatoric external agency must do positive work on the displacement it causes. A second hypothesis concerning isotropy following deformation is also presented.

Burland, J. B.
"The Yielding and Dilation of Clay," Correspondence, Geotechnique, Vol. 15, No. 2, June 1965, pp. 211-219.

A Cambridge soil model, "Cam-Clay," is modified by introducing a new energy dissipation equation.

Burland, J. B.
"Deformation of Soft Clay Beneath Loaded Areas," Proceedings of the Seventh International Conference on Soil Mechanics and Foundation Engineering, Vol. 1, 1969, pp. 55-63.

The paper describes a theoretical and experimental investigation of the shear and deformation behavior of normally consolidated clay. Results are compared to a stress-strain theory of Roscoe and Burland. Theory is applied to problem mentioned in paper title.

Butovskaya, V. A.
"The Applicability to Clay Soils of the Hypothesis of the Invariability of the Volume in Plastic Deformation," (in Russian), Trudi N.-i. Osovanii i Podzemn Sooruzh., Akad. Str-va i Arkbitekt. SSSR, No. 33, 1958, pp. 70-76.

The author discusses an experimental study of the volume change in clay during plastic straining. It is concluded that the volume change is small.

Buts'ko, Z. N.
"Determination of the Bearing Capacity of Granular Media," (in Russian), Inzhener. Sbornik Akad, Nauk SSSR, No. 26, 1958, pp. 216-227.

Numerical solutions of the stress characteristic equations for various parameters involved have been tabulated.

Calladine, C. R.
"A Microstructural View of the Mechanical Properties of Saturated Clay," Geotechnique, Vol. 21, No. 4, Dec., 1971, pp. 391-415.

The macroscopic behavior of clay is explained by postulating elastic-perfectly plastic behavior at the juncture of microscopic asperities. The resultant theory has similarities with the "slip" theory of metal plasticity. Some of the predictions of the theory are compared with experimental data.

Caquot, A. and Kerisel, J.
Tables for the Calculation of Passive Pressure, Active Pressure, and Bearing Capacity of Foundations, Gauthier Villars, Paris, 1948.

Presents results from the integration of the differential equations governing the conditions of limiting equilibrium. No derivations given.

Chadwick, P.
"The Quasi-Static Expansion of a Spherical Cavity in Metals and Ideal Soils," Quarterly Journal of Mechanics and Application of Mathematics, Vol. 12, No. 1, Feb., 1959, pp. 52-71.

An infinite medium of ideal soil contains a single spherical cavity within which a slowly increasing pressure is applied. The analysis of stress in the resulting plastic-elastic system, in conjunction with the flow rule associated with the Coulomb law of failure, leads to an expression for the radial displacement of the soil. Also, equations are obtained from which can be calculated the residual stresses and displacements of any state of the unloading process.

Chaplin, T. K.
"Inner and Outer Plastic Yield Surfaces in Clays," Proceedings of the Seventh International Conference on Soil Mechanics and Foundation Engineering, Vol. 1, 1969, pp. 73-80.

It is deduced that all yield surfaces for a given clay must lie between inner and outer yield surfaces corresponding to the Tresca and Mises failure criteria.

Cheatham, J. B., Jr., Paslay, P. R., and Fulcher, C. W. G. "Analysis of the Plastic Flow of Rock under a Lubricated Punch," Journal of Applied Mechanics, Vol. 35, No. 1, March 1968, pp. 87-94.

A theory for describing the flow of homogeneous isotropic rock indented by a smooth punch is presented. The theory considers the influence of the mean stress on yielding. An example is solved using an experimentally derived yield function. Work hardening is neglected.

Chen, P. Y. P.
Discussion of "Flow and Pressure of Granular Materials in Soil," by G. P. Deutsch and D. H. Clyde, Dec., 1967, Journal of the Engineering Mechanics Division, ASCE, Vol. 94, No. EM4, Aug., 1968, pp. 1000-1002.

A new slip-line field is suggested for materials of high friction angle ϕ.

Chen, W. F.
"On Solving Plasticity Problems of Relevance to Soil Mechanics," Ph.D. Thesis, Brown University, Providence, Rhode Island, 1966.

Limit analysis is applied to obtain the load carrying capacity of a soil mass. Special technique is developed, in terms more familiar to the engineer. The problems of the loaded truncated wedge and the wedge under unilateral pressure are treated as illustrative examples. Then the general strip foundation is solved.

Chen, W. F.
"The Bearing Capacity of Concrete," Ph.D. Thesis, Brown University, Providence, Rhode Island, 1966.

Limit analysis is applied to obtain the bearing capacity of concrete blocks. The small tensile strength is properly taken into account. The theoretical analysis is found to be in good agreement with previous test results. Friction effects on the bearing capacity of concrete blocks are also discussed.

Chen, W. F.
"On the Rate of Dissipation of Energy in Soils," Soils and Foundations, Vol. 8, No. 4, Dec., 1968, pp. 48-51.

The unique relationship between strain rate and energy dissipation for a c - ϕ soil of Coulomb type with the associated flow rule is derived.

Chen, W. F.
"Soil Mechanics and Theorems of Limit Analysis," Journal of the Soil Mechanics and Foundations Division, ASCE, Vol. 95, No. SM2, March 1969, pp. 493-518.

This paper discusses the basic limit analysis theorems with regard to solving soil mechanics problems. The fundamentals of constructing stress and velocity fields for the corresponding lower and upper bound solutions are discussed. The stress field of a loaded truncated wedge is illustrated in terms of truss action.

Chen, W. F. and Drucker, D. C.
"Bearing Capacity of Concrete Blocks or Rock, Journal of the Engineering Mechanics Division, ASCE, Vol. 95, No. EM4, Aug., 1969, pp. 955-978.

The load carrying capacity of concrete blocks is analyzed using the upper and lower bounding limit theorems of perfect plasticity. The yield surface chosen is the Mohr-Coulomb surface in compression with a small non-zero tension cutoff. Experimental results are compared with the theoretical solutions. Good agreement is observed.

Chen, W. F., Giger, M. W., and Fang, H. Y.
"On the Limit Analysis of Stability of Slopes," Soils and Foundations, Vol. IX, No. 4, Dec., 1969.

The upper bound theorem of the generalized theory of perfect plasticity is applied to obtain complete numerical solutions for the critical height of an embankment. A rotational discontinuity mechanism (logarithmic spiral) is assumed in the analysis. The failure plane passes through the toe.

Chen, W. F.
"Extensibility of Concrete and Theorems of Limit Analysis," Journal of the Engineering Mechanics Division, ASCE, Vol. 96, No. EM3, June 1970, pp. 341-352.

Includes experimental study of indentation of circular punch on a circular concrete block. Upper and lower bounds for bearing capacity of the standard indirect tensile test for concrete specimens are obtained.

Chen, W. F. and Scawthorn, C. R.
"Limit Analysis and Limit Equilibrium Solutions in Soil Mechanics," Soils and Foundations, Vol. 10, No. 3, Sept., 1970, pp. 13-49.

Limit equilibrium and limit analysis are compared. Upper and lower bound theorems of limit analysis for a perfectly plastic soil are discussed. Examples of upper and lower bound solutions are presented for slope stability, earth pressure, and bearing capacity problems.

Chen, W. F.
"Double-Punch Test for Tensile Strength of Concrete," Journal of the American Concrete Institute, Vol. 67, Dec., 1970, pp. 993-995.

This paper describes a new test technique (double punch test) for determining the tensile strength of concrete. The formula for computing the tensile strength of concrete is derived from the method of limit analysis.

Chen, W. F. and Giger, M. W.
"Limit Analysis of Stability of Slopes," Journal of Soil Mechanics and Foundations Division, ASCE, Vol. 97, No. SM1, Jan., 1971.

The paper is an extension of previous limit analysis solutions by the authors (1969). A log spiral failure mechanism is again assumed with a failure plane located below the embankment toe. Includes a tabulation of upper bound limit loads as well as comparisons with limit equilibrium results.

Chen, W. F. and Covarrubias, S.
"Bearing Capacity of Concrete Blocks," Journal of the Engineering Mechanics Division, ASCE, Vol. 97, No. EM5, Oct., 1971, pp. 1413-1430.

An upper bound limit analysis solution is obtained for the bearing capacity of concrete blocks with an axially or eccentrically located cable duct. Experimental results are also given.

Chen, W. F. and Davidson, H. L.
"Bearing Capacity Determination by Limit Analysis," Fritz Lab. Report No. 355.15, Lehigh University, Bethlehem, Pennsylvania, Jan., 1972.

Limit equilibrium, slip-line, and limit analysis methods are discussed and compared. Bearing capacity of foundations are obtained by the upper bound technique of limit analysis.

Chen, W. F., Snitbhan, N., and Fang, H. Y.
"Limit Analysis of Stability of Slopes in Anisotropic, Non-Homogeneous Soils," Fritz Lab. Report No. 355.13, Lehigh University, Bethlehem, Pennsylvania, Feb., 1972.

The upper bound theorem of the generalized theory of perfect plasticity is applied to obtain complete numerical solutions for the critical height of an anisotropic, non-homogeneous soil. A rotational discontinuity mechanism (logarithmic) is assumed in the analysis. The failure plane may pass through or below the toe.

Chen, W. F. and Trumbauer, B. E.
"Double-Punch Test and Tensile Strength of Concrete," Journal of Materials, American Society of Testing and Materials, June 1972. (In press).

The double punch test is examined experimentally, and the effects of several parameters are investigated. A method for performing the double punch test for obtaining the tensile strength of concrete is proposed.

Chen, W. F. and Carson, J. L.
"Bearing Capacity of Random Wire Reinforced Concrete," Highway Research Record, 1972. (In press).

This paper presents an experimental investigation of the bearing capacity of random wire reinforced concrete and plain concrete through the use of the theorems of plastic limit analysis. It is found that the more ductile random wire reinforced materials conformed better with the theoretical predictions.

Coenen, P. A.
"Fundamental Equations in the Theory of Limit Equilibrium," Proceedings of the Second International Conference of Soil Mechanics and Foundation Engineering, Vol. VII, 1948, pp. 15-20.

The author develops the fundamental equations of plastic equilibrium for a Coulomb medium with weight. He contends that Kotter's equations are wrongly considered to be the fundamental equations.

Cox, A. D.
"Axially Symmetric Plastic Deformation in Soils - II - Identation of Ponderable Soils," International Journal of Mechanical Sciences, Vol. 4, 1962, pp. 371-380.

Discusses the assumption of weightlessness in the theory of round punch indentations in a semi-infinite mass of soil. Solutions show that this assumption can only be justified if the stresses due to gravity, at depths in the soil of the order of the radius of the punch are small compared to the calculated stresses at those depths, such stresses being of the same order of magnitude as the relative cohesion stress of the soil. The author goes on to show that the yield-point pressure is strongly dependent on soil weight for frictional soils. (Axisymmetric as well as plane strain cases). The idealized soil is assumed to be rigid, perfectly plastic, and to obey Coulomb's yield criterion.

Cox, A. D., Eason, G., and Hopkins, H. G.
"Axially Symmetric Plastic Deformations in Soils," Philosophical Transactions of the Royal Society of London, Vol. 254, Series A, 1961-1962, pp. 1-45.

Axisymmetric field equations for a Coulomb soil with the associated flow rule are developed and discussed. A complete solution for both velocity and stress is developed for a smooth, rigid axisymmetric punch acting on a weightless soil. Some numerical results are presented.

Dais, J. L.
"An Isotropic Frictional Theory for a Granular Medium with or without Cohesion," International Journal of Solids and Structures, Vol. 6, No. 8, Aug., 1970, pp. 1185-1191.

For an incompressible Coulomb material the following statements are proved: (1) A surface of velocity discontinuity has at each point as its tangent a surface upon which $T = C - \sigma_n \tan\phi$, (2) A surface which separates a rigid zone from a deforming zone has at each point as its tangent either a surface upon which $T = C - \sigma_n \tan\phi$ or a surface perpendicular to surfaces upon which $T = C - \sigma_n \tan\phi$.

Dais, J. L.
"Nonuniqueness of Collapse Load for a Frictional Material," International Journal of Solids and Structures, Vol. 6, No. 9, Sept., 1970, pp. 1315-1319.

For a simple problem with both stress and displacement boundary conditions, the author presents two different collapse loads. For an incompressible Coulomb material, a lower bound theorem is presented for a class of stress boundary value problems.

Dais, J. L.
"Soil Indentation by Translating Flanged Plate," Journal of the Engineering Mechanics Division, ASCE, Vol. 97, No. EM4, Aug., 1971, pp. 1057-1070.

Slip-line solutions for the grouser plate problem are presented. Coulomb failure criterion is used and soil is assumed to be weightless.

Davis, E. H.
"A Discussion of Theories of Plasticity and Limit Analysis in Relation to the Failure of Soil Masses," Fifth Australia-New Zealand Conference on Soil Mechanics and Foundation Engineering, 1967, pp. 175-186.

Discussion of dilatancy behavior of ideal cohesive frictional materials with regard to validity of limit theorems. Bearing capacity example is given.

Davis, E. H.
"Theories of Plasticity and the Failure of Soil Masses," Soil Mechanics - Selected Topics, I. K. Lee, ed., Chapter 6, American Elsevier, New York, 1968, pp. 341-380.

Author discusses the theory of perfectly plastic solids as applied to soil strength problems. Limit theorems for a c - ϕ soil with the associated flow rule are presented and bounds for a simple problem are developed. Stress and velocity characteristics for a perfectly plastic soil are also discussed.

De Josselin de Jong, G.
"Graphical Method for the Determination of Slip Line Fields in Soil Mechanics," (in Dutch), de Ingenieur, Vol. 69, No. 29, July 1957, pp. 61-65.

The graphical analysis of the slip-line field in the plane plastic flow of a Mises material is extended to problems of plain strain in a soil that obeys Coulomb's yield condition. An example is given of the stress field under a footing.

De Josselin de Jong, G.
"The Undefiniteness in Kinematics for Friction Materials," Proceedings of Brussels Conference 58 on Earth Pressure Problems, Vol. 1, Sept., 1968, pp. 55-70.

The kinematics of a friction material in which flow is assumed to be associated with sliding along stress characteristics is considered. It is shown that principal axes of stress and deformation may not be coincident. The deformation state is shown to be unique only for special boundary conditions.

De Josselin de Jong, G.
"Lower Bound Collapse Theorem and Lack of Normality of Strain Rate to Yield Surface for Soils," Rheology and Soil Mechanics, Proceedings of the IUTAM Symposium, Grenoble, Springer-Verlag, April 1964, pp. 69-78.

A lower bound theorem for an incompressible c - ϕ soil is presented. The theorem reads the same as the lower bound theorem for a stable material. However, the definition of a "statically admissible and safe" stress field has been modified.

De Josselin de Jong, G. and Geertsma, J.
"The Stress Distribution Around Vertically Drilled Holes in Sandy Terrain, Internally Supported by a Heavy Liquid," (in Dutch), de Ingenieur, The Hague, Vol. 65, No. 9, Feb., 1953.

Determination of stresses in the various regions of stress; e.g., elastic and plastic. Formulas are elaborated describing the stresses in the various regions and the demarcation lined between them.

Dembicki, E.
"A Method of Nonlinear Approximation for the Solution of Limiting Equilibrium Problems in Cohesive Media," (in French), Arch. Hydrotech, Vol. 10, No. 3, 1963, pp. 367-472.

An approximate solution technique for the characteristic equations of a cohesive ponderable soil with internal friction is presented.

Dembicki, E., Kravtchenko, J., and Sibille, R.
"On the Approximate Analytical Solution of Plane Limit Equilibrium Problems of Coherent Media," (in French), Journal de Mechanique, Vol. 3, No. 3, Sept., 1964, pp. 277-312.

The problem of a horizontal wall retaining cohesive media with weight is considered. The governing equations are solved using an approximate method. Comparison is made with a rigorous method. An axisymmetric problem is treated similiarly.

Dembicki, E.
"Determining the Stress Distribution Along a Retaining Wall Structure by Method of Characteristics: Part 4, Tables of Passive Earth Pressure Coefficient Values in Cohesive Soils with Triangular Load Distribution," (in Polish), Archiwum Hydrotechniki, Vol. 12, No. 2, 1965, pp. 181-199.

Author presents tabular values for coefficients of passive earth pressure.

Dembicki, E. and Negre, R.
"Distribution of Stress of Longitudinally Supporting Walls in a Spatial, Axisymmetric System," (in French), Bulletin de l'Academie Polonaise des Sciences, Serie des Sciences Techniques, Vol. 14, No. 8, 1966, pp. 447-452.

Numerical results are obtained by integrating a pair of partial differential equations.

Dembicki, E., Negre, R., and Stutz, P.
"Ecoulement Dans Un Silo Conique De Revolution Et Deformation D'un Echantillon Dans l'essai Triaxial Pour Un Materiau A Dilatation Non Standardisee," Third Budapest Conference on Soil Mechanics, 1968, pp. 35-53.

Method for analyzing the initial flow in an axisymmetrical conical silo and the deformation of a sample in a triaxial test. Coulomb failure criterion used with associated potential type flow law.

Deutsch, G. P. and Clyde, D. H.
"Flow and Pressure of Granular Materials in Silos," Journal of the Engineering Mechanics Division, ASCE, Vol. 93, No. EM6, Dec., 1967, pp. 103-125.

An approximate upper bound plasticity solution for the wall pressures on the silo is presented. The material is assumed to obey the Mohr-Coulomb failure criterion with associated flow rule. A system of logarithmic spiral slip lines is chosen for the assumed stress field.

DiMaggio, F. L. and Sandler, I. S.
"Material Model for Granular Soils," Journal of the Engineering Mechanics Division, ASCE, Vol. 97, No. EM3, June 1971, pp. 935-950.

A stress-strain model based upon the classical theory of plasticity is proposed for granular soils. The yield surface combines a Coulomb-Mohr failure envelope with a moving cap whose position depends on the plastic volume strain. Authors show how model can fit a particular sand.

Dismuke, T. D., Chen, W. F., and Fang, H. Y.
"Tensile Strength of Rock by the Double-Punch Method," (to be published, Journal of the International Society for Rock Mechanics, Austria).

This paper presents an experimental study of the newly developed double-punch test method for determination of the tensile strength of rocks. The method for preparation of test specimens and test procedure is reported and discussed. The comparisons of tensile strength determined from double-punch and split-cylinder tests are also presented.

Drescher, A. and Bojanowski, W.
"On the Influence of Stress Path Upon the Mechanical Properties of Granular Material," (in English), Archiwum Inzynierii Ladowej, Vol. 14, No. 3, 1968, pp. 351-365.

Constant strain triaxial test results show that certain stress paths affect the Mohr-Coulomb yield condition with a subsequently varying angle of internal friction.

Drescher, A. and Bujak, A.
"A Study of Kinematics of a Granular Body by Indentation with a Plane Punch," (in Polish), Rozprawy Inzynierskie, Vol. 14, No. 2, 1966, pp. 313-325.

Experimental study of punch indentation of sand in plane state of strain. Results show that the kinematically and statically admissible theoretical velocity fields compare poorly with experiment as computed by the assumption of the associated flow law.

Drescher, A., Kwaszczynska, K., and Mroz, Z.
"Statics and Kinematics of a Granular Medium in the Case of Wedge Indentation," Archiwum Mechaniki Stosowanej, Vol. 19, No. 1, 1967, pp. 99-113.

Experimental and theoretical study of the plane motion of a granular medium during the indentation of a rigid wedge. Material assumed rigid, perfectly plastic and incompressible. Experimental data concerned with penetration force and velocity fields in the deforming region is presented.

Drucker, D. C., Prager, W., and Greenberg, H. J.
"Extended Limit Design Theorems for Continuous Media," Quarterly of Applied Mathematics, Vol. 9, Jan., 1952, pp. 381-389.

Earlier results on safe loads for Prandtl-Reuss material subjected to surface tractions or displacements which increase in ratio are extended to any perfectly plastic material and any history of loading.

Drucker, D. C. and Prager, W.
"Soil Mechanics and Plastic Analysis of Limit Design," Quarterly of Applied Mechanics, Vol. 10, 1952, pp. 157-165.

The implication of plasticity theory and limit design for soil mechanics are discussed. Volume expansion is seen to be a necessary accompaniment to shearing deformation. Low critical heights are found for slopes when the soil is assumed to be unable to take tension.

Drucker, D. C.
"Limit Analysis of Two- and Three-Dimensional Soil Mechanics Problems," Journal of the Mechanics and Physics of Solids, Vol. 1, 1953, pp. 217-226.

Previous work on the implications of assuming soil to be a perfectly plastic body is extended. The stability of unbraced vertical-walled cuts is then treated. The application of the general limit theorems to inhomogeneous soil is also included to demonstrate their power.

Drucker, D. C.
"Coulomb Friction, Plasticity, and Limit Loads," Journal of Applied Mechanics, Vol. 21, 1954, pp. 71-74.

It is shown that the limit theorems do not always apply when there is finite sliding friction. Theorems are developed which relate the limit loads with finite Coulomb friction to the extreme cases of zero friction and complete attachment and also to the case where the frictional interfaces are "cemented" together with a cohesionless soil.

Drucker, D. C., Gibson, R. E., and Henkel, D. J.
"Soil Mechanics and Work-Hardening Theories of Plasticity," Proceedings, ASCE, Vol. 81, Paper 798, Sept., 1955.

Discusses the approach of considering soil to be work-hardening material which may reach the perfectly plastic state. This is in contrast to the idealization of soil as perfectly plastic, which results in discrepancies between the theoretical and experimental dilation values.

Drucker, D. C.
"On Stress-Strain Relations for Soils and Load Carrying Capacity," Proceedings of the First International Conference on the Mechanics of Soil-Vehicle System, Edizioni Minerva Tecnica, Turin, June 1961, pp. 15-23.

The paper is to explore the stress-strain relations for plastic and frictional soil along with the associated means of determination of loads which will cause failure of a soil mass. Needed directions of study are indicated.

Drucker, D. C.
"Concepts of Path Independance and Material Stability for Soils," Rheology and Soil Mechanics, Proceedings of the IUTAM Symposium, Grenoble, Springer-Verlag, April 1964, pp. 23-43, 1966.

The development is traced of the description of soil behavior in terms of the stress-strain relations of the mathematical theory of plasticity. A perfectly plastic idealization is seen to be unsuitable for soils. The analysis of the stable and the unstable behavior of soil is also discussed.

Drucker, D. C. and Chen, W. F.
"On the Use of Simple Discontinuous Fields to Bound Limit Loads," "Engineering Plasticity," Heyman, J. and Leckie, F. A., ed., Cambridge University Press, 1968, pp. 129-145.

An attempt is made to exhibit some of the connections between the formal approach of the classical theory of perfect plasticity and the intuitive approach of the design engineer. The appropriate choice of a pin-connected truss to support loads is shown to provide an excellent technique for obtaining lower bounds on plastic limit loads. A result of some interest is obtained for the strip squeezed between two wide or narrow punches.

Elsamny, M. K. and Ghobarah, A. A.
"Stress Field Under Slipping Rigid Wheel," Journal of the Soil Mechanics and Foundations Division, ASCE, Vol. 98, No. SM1, Jan., 1972, pp. 13-25.

The slip-line field approach is used to predict the state of stress in a soil mass underneath a slipping rigid wheel. The Mohr-Coulomb yield criterion is used. Numerical examples are given.

Fang, H. Y., Atsuta, Toshio, and Chen, W. F.
"Stability of Slopes Intercepted by a Retaining Structure," Fritz Lab. Report No. 335.11, Lehigh University, 1972.

Upper bound theorem of limit analysis is employed to obtain a closed-form solution to the stability of a slope intercepted by a retaining structure. The tabulated results and design charts are presented and discussed.

Fang, H. Y. and Chen, W. F.
"New Method for Determination of Tensile Strength of Soils," Highway Research Record No. 354, 1971, pp. 62-68.

Based on the perfect plasticity theory, a simple formula for computing the tensile strength of soils is developed. The fundamental relationship between tensile strength and environmental variables is examined. The comparisons of tensile strength determined from double punch tests and split tensile tests for various materials including concrete, mortar, and bituminous concrete are presented.

Fang, H. Y. and Chen, W. F.
"Further Study of Double-Punch Test for Tensile Strength of Soils," (to be published, Third Southeast Asian Conference on Soil Engineering, Hong Kong), Nov., 1972.

Correlation study of double-punch tensile strength with compressive strength, activity, moisture content, and plasticity index is presented and discussed. Other factors including sample-punch sizes and rate of loading are also reported.

Fang, H. Y. and Hirst, T. J.
"Application of Plasticity Theory to Slope Stability Problems," Highway Research Record No. 323, 1970, pp. 26-38.

Review of Drucker's work on straight-line failure plane, including upper and lower bound solutions. Logarithmic spiral failure plane upper bound solutions are presented. Comparison between limit equilbrium and plasticity solutions are shown in graphical forms. Design charts included also.

Feda, J.
"The Influence of Loading Path in the Plane $\sigma_1' > \sigma_2' = \sigma_3'$ on the Shear Strength of Zbraslav Sand," (in English), Acta Technica CSAV, Vol. 14, No. 1, 1969, pp. 92-128.

The author presents an experimental investigation of the influence of loading path on shear strength. It is concluded that the yield surface is path dependent.

Federov, I. V.
"Certain Problems in the Elasto-Plastic Distribution of Stresses in Soil, Associated with the Analyses of Foundations," (in Russian), Inzhenernii Sbornik, Academiia Nauk SSSR, Moscow, Vol. 26, 1958, pp. 205-215.

Paper deals with the two-dimensional problem of the stress distribution in a cohesive weightless soil mass, limited by a slope and a horizontal plane, subjected to uniform distributed loads, on the horizontal plane and on the slope. The elasto-plastic solution is presented in equation form.

Finn, W. D. Liam
"Applications of Limit Plasticity in Soil Mechanics," Journal of the Soil Mechanics and Foundations Division, ASCE, Vol. 93, No. SM5, Part 1, Sept., 1967, pp. 101-120.

Stress-strain relationship for a Coulomb material with the associated flow rule is discussed. Upper and lower bounds for some earth pressure and bearing capacity problems are determined.

Gaponov, V. V.
"On Displacements in Friable Soils in Limiting Equilibrium," (in Russian), Prikladnaya Mekhanika, Kiev, Vol. 5, No. 1, 1959, pp. 65-74.

An elasto-plastic analysis is used to derive a solution to the title problem.

Geuze, E. C. W. A.
"The Uniqueness of the Mohr-Coulomb Concept in Shear Failure," Special Technical Publication No. 361, Laboratory Shear Testing of Soils, ASTM, 1963, pp. 52-64.

Experimental evidence is presented to show the Mohr-Coulomb failure concept is valid for granular materials and for clays failing in an undrained condition.

Glushko, V. I.
"On the Determination of Stresses Around a Horizontal Working," (in Russian), Isv. Dnepropetr, Gorn. In-ta., Vol. 38, 1959, pp. 5-10; Referativnii Zhurnal Mekhanika Moscow, No. 8, 1960, Revision 10770.

The radial stress is determined in a homogeneous isotropic mass if weakened by a circular horizontal working, assuming that the rock is incompressible. Solution is obtained on the basis of the theory of ideal plasticity.

Goguel, J.
"Distribution of Stresses Around A Cylindrical Tunnel (Repartition des Contraintes Antons d'un Tunnel Cylindrique)," Annales des Ponts et Chaussees, Vol. 117, March-April 1947, pp. 157-188.

Assuming the ground surface to be horizontal, G of the rock to be constant, and the original stress condition hydrostatic, the author first derives the condition of stress inside the rock for an unconstrained circular tunnel section. Next he considers the non-hydrostatic case. The author then turns to the Huber-Mises condition of plastic deformation. After making certain assumptions, he finds the problem to be determinate, but the computations are excessive. The relaxation caused by slow deformation is considered next. The basic assumptions are (1) constant volume, (2) coincidence of the principal directions of stress and strain, and (3) the principal strains are proportional to the principal stress deviations.

Goldshtein, L. M.
"Approximate Solution of the Problem of Three-Dimensional Limiting Equilibrium of Soils," Soil Mechanics and Foundation Engineering, No. 5, Sept.-Oct., 1969, pp. 323-329.

Bearing capacity of a soil indented by a rectangular punch is approximated as the product of two independent two-dimensional problems. Solutions obtained with proposed technique is compared with experimental data.

Gorbunov-Possadov, M. I.
"Calculations for the Stability of a Sand Bed by a Solution Combining the Theories of Elasticity and Plasticity," Proceedings of the Sixth International Conference on Soil Mechanics and Foundation Engineering, Vol. II, 1965, pp. 51-55.

The author considers the problem of the bearing capacity of sand loaded by a rough punch. It is assumed that a portion of the sand beneath the punch remains elastic. The boundary of this elastic portion is determined analytically. The method of characteristics is used to calculate the stress field outside of the elastic core. Some numerical results are given.

Graham, J.
"Plane Plastic Failure in Cohesionless Soil," Geotechnique, Vol. 18, No. 3, Sept., 1968, pp. 301-316.

A computer program for the numerical integration of the characteristic equations of a cohesionless soil is described. Solutions of bearing capacity, earth pressure and slope stability problems are presented.

Graham, J. and Stuart, J. G.
"Scale and Boundary Effects in Foundation Analysis, Journal of the Soil Mechanics and Foundations Division, ASCE, Vol. 97, No. SM11, Nov., 1971, pp. 1533-1548.

The authors present slip-line solutions for rough footings. Variation of friction angle with mean principal stress is considered.

Grasshoff, H.
"Settlement Calculations for Rigid Foundations Using the Characteristic Point," (in German), Bauvingenieur, Vol. 30, No. 2, Feb., 1955, pp. 53-54.

Author uses "characteristic point" concept (due to Van Hamme) for comparing by plastic theory the relative settlements of rigid and flexible surface footings. At the

"characteristic point" on two footings, one rigid, one flexible, there would be the same settlement under equal (uniform) loading.

Hambly, E. C. and Roscoe, K. H.
"Observations and Predictions of Stresses and Strains During Plane Strain of "wet" clays," Proceedings of the Seventh International Conference on Soil Mechanics and Foundation Engineering, Vol. 1, 1969, pp. 173-181.

A new plane-strain apparatus is described. Experimental results are compared with some of the Cambridge stress-strain theories.

Hansen, Bent
"Line Ruptures Regarded as Narrow Rupture Zones, Basic Equations Based on Kinematic Considerations," Proceedings of the Brussels Conference 58 on Earth Pressure Problems, Vol. 1, Sept., 1958, pp. 39-48.

A theory of soil kinematics is presented in which velocity discontinuity lines are not coincident with stress characteristics.

Hansen, Bent
"An Approximate Method for the Calculation of Rupture Figures in Clay," Proceedings of the Sixth International Conference on Soil Mechanics and Foundation Engineering, Vol. 2, 1965, pp. 70-73.

Kinematically admissible velocity fields are presented for a purely cohesive soil.

Hansen, Bent
"Bearing Capacity of Shallow Strip Footings in Clay," Proceedings of the Seventh International Conference on Soil Mechanics and Foundation Engineering, Vol. 1, 1969, pp. 107-113.

The author considers the problem of a strip subsurface footing bearing on a purely cohesive weightless soil. Both upper and lower bound solutions are presented.

Hansen, J. Brinch
"A General Plasticity Theory for Clay," Geotechnique, Vol. 3, 1952-1953, pp. 154-164.

The equations of plasticity are developed for a ponderable cohesive soil with internal friction. Cohesion is assumed to vary linearly with depth and to vary sinusoidally with angular orientation. A simple earth pressure problem is solved. For a homogeneous, isotropic ponderable soil, a bearing capacity problem is solved.

Hansen, Brinch J.
Earth Pressure Calculation, Danish Technical Press, 1953.

Includes discussion of methods of the theory of plasticity.

Harr, M. E.
"Limiting Equilibrium of Soil Structures," Foundations of Theoretical Soil Mechanics, McGraw-Hill, New York, 1966, pp. 233-339.

Includes discussion of the Sokolovskii method of characteristics.

Hartmann, F.
"On a New Earth Pressure Theory," (in German), Bautechnik, Vol. 45, No. 9, Sept., 1968, pp. 307-313.

Cohesionless soil is assumed to yield without volume change. Axes of principal stress and principal strain are not assumed to be coincident.

Haythornthwaite, R. M.
"Stress and Strain in Soils," Plasticity, Proceedings of the Second Symposium on Naval Structural Mechanics, April 1960; Pergamon Press, New York 1960.

Hollow cylindrical soil specimens were subjected to hydrostatic pressure, an axial force and a torque. It was the purpose of the experiments to check the validity of the Coulomb yield law and associated flow rule for complex stress states.

Haythornthwaite, R. M.
"Mechanics of the Triaxial Test for Soils," Journal of the Soil Mechanics and Foundations Division, Proceedings, ASCE, Vol. 86, No. SM5, Part I, Oct., 1960, pp. 35-62.

A unique solution to the triaxial test problem by assuming soil to be a perfectly plastic (Coulomb yield law) medium with associated flow rule is presented. The results are used to discuss significance of test data for sands. An alternate yield criterion is suggested.

Haythornthwaite, R. M.
"Methods of Plasticity in Land Locomotion Studies," Proceedings of the First International Conference on the Mechanics of Soil-Vehicle Systems, Torino-Saint Vincent Edizioni Minerva Tecnica, Turin, June 1961, pp. 3-19.

Construction of upper and lower bounds is discussed. Upper and lower bounds for the grouser plate problem are developed.

Haythornthwaite, R. M.
"Range of Yield Condition in Ideal Plasticity," Journal of the Engineering Mechanics Division, ASCE, Vol. 87, No. EM6, Dec., 1961.

Investigation of problem of finding upper and lower bounds to the yield load of a body when yield strength known exactly for only one or two stress states. The analysis is extended to Coulomb yield condition with discussion of applicability.

Höeg, K.
"Finite Element Analysis of Strain-Softening Clay," Journal of the Soil Mechanics and Foundations Division, ASCE, Vol. 98, No. SM1, Jan., 1972, pp. 43-58.

Author develops undrained load-deformation behavior of an axially symmetric punch bearing on clay. Both linear elastic-perfectly plastic and linear elastic-linear strain softening models are used. von Mises yield criterion with associated flow rule is employed.

Höeg, K. and Balakrishna, H. A.
"Dynamic Strip Load on Elastic-Plastic Soil," Journal of the Soil Mechanics and Foundations Division, ASCE, Vol. 96, No. SM2, March 1970, pp. 429-438.

Authors present a lumped parameter analysis of the response of an elastic-perfectly plastic soil to a transient load. Tresca yield condition and the associated flow rule are used.

Höeg, K., Christian, J. T., and Whitman, R. V.
"Settlement of Strip Load on Elastic-Plastic Soil," Journal of the Soil Mechanics and Foundations Division, ASCE, Vol. 94, No. SM2, March 1968, pp. 431-445.

Presents a lumped-parameter numerical analysis assuming elastic-perfectly plastic behavior and Tresca yielding. The soil was assumed weightless, isotropic, and homogeneous. Although there is excellent agreement with the Prandtl solution it is shown that the plastic zone is more extensive than that assumed in the Prandtl and Terzaghi Analyses.

Hoshino, K.
"A Fundamental Theory of Plastic Deformation and Breakage of Soil," Proceedings of the Second International Conference on Soil Mechanics and Foundation Engineering, Vol. 1, June 1948, pp. 93-103.

The author presents a theory of plastic deformation and soil failure based on the assumption that the two coefficients existing between stress and strain (one expressing the form change due to shearing stresses, and the other the volume change due to normal stresses) are both proportional to the strain energy stored in the soil. Expressions are derived for these coefficients for the cases of normal stress with no shear and pure shear, in both two and three dimensions.

Hoshino, K.
"A General Theory of Mechanics of Soils," Proceedings of the Fourth International Conference on Soil Mechanics and Foundation Engineering, Vol. 1, 1957.

A general theory is developed based on conservation of energy through plastic deformation to plastic failure. Equations for stress-strain relationships and failure criterion are established by assuming simple direct correlations of the coefficients of deformation with the amount of energy. Results are given with equations and plots. The theory is checked with some triaxial test results.

Il'Yushin, A. A.
"Modern Problems in the Theory of Plasticity," (in Russian), Vestnik Moscov. Univ., No. 4-5, April-May 1955, pp. 101-113.

Review of contributions to plasticity theory from research workers at Moscow state. Includes soil mechanics.

Inoue, N.
"Application of Gas Dynamical Method to Soil Mechanics and Theory of Plasticity," Journal of Physics Society of Japan, I, II, Vol. 7, No. 6, Nov.-Dec., 1952, pp. 604-618.

Analogy between supersonic flow of gasses and plastic equilibrium problems is discussed.

Inoue, N.
"Discontinuous Solutions in Soil Mechanics," Proceedings of the Second Japan National Congress Applied Mechanics, 1952; National Committee for Theoretical Applied Mechanics, May 1953, pp. 23-27.

The two equilibrium equations and the yield condition for two-dimensional plastic flow are interpreted as a problem in the ultrasonic flow of a hypothetical gas. The analogy is extended so that the study of shock waves can be used to study discontinuities in plastic flow.

Ivcovic, M. and Radenkovic, D.
"An Application of the Limit Analysis in Soil Mechanics," Ninth International Congress of Applied Mechanics, Vol. VIII, Brussels, 1957, pp. 204-205.

Upper and lower bounds for a Coulomb medium indented by smooth flat die are gotten by using extremum principles of plasticity. Weight of material considered. Only an abstract of the paper is included in the above reference.

Ivlev, D. D.
"On the General Equations of the Theory of Ideal Plasticity and of Statics of Granular Media," Applied Mathematics and Mechanics, Vol. 22, No. 1, 1958, pp. 119-128.

Analysis based on Tresca-Saint Venant condition of plasticity, isotropy, and condition of incompressibility is presented. Discusses the conditions of stress for which the equilibrium equations show statical determinancy or indeterminacy.

Ivlev, D. D.
"On Relations Defining Plastic Flow Under Tresk's Condition of Plasticity and its Generalizations," Soviet Phys - Doklady, Vol. 4, No. 1, Aug., 1959, pp. 217-220.

Investigation of relations defining plastic flow for special case of two principal stresses equal with Tresca yield condition is presented. Also studied are relations governing loose medium under limit state conditions.

Ivlev, D. D. and Martynova, T. N.
"Fundamental Relations in the Theory of Loose Anisotropic Media," (in Russian), Zh. Prikl, Mekh. Takh. Fiz. (PMTF), No. 2, March-April 1961, pp. 116-121.

Equations of limit equilibrium are first formulated for the general three-dimensional case. The limit equilibrium equations and the flow relations for the plane strain case are considered in detail.

Jaky, J.
"Stability of Earthworks in the Plastic State, I." (Sur la Stabilite des Masses de Terre Completement Plastiques, I.). Publications of the Hungarian Technical University (Muegyeteme Közlemenyek), Budapest, No. 2, 1947, pp. 129-151.

For the proper knowledge of slip lines and stresses, the author gives a solution for the compressive problems of highly plastic clay soil; active and passive earth pressure values, the stability of earth slopes, and the maximum bearing values for mild clayey subsoils.

Jaky, J.
"Stability of Earthworks in the Plastic State, Part II," (Sur la Stabilite des Masses de Terre Completement Plastiques). Publications of the Hungarian Technical University (Muegyeteme Közlemenyek), Budapest, No. 1, 1948, pp. 34-56.

This paper is the continuation of the author's previous study of the stability of earthworks in the plastic state. Here he deals with the special stress conditions of the plastic state.

Jaky, J.
"Stability of Earthworks in the Plastic State," (in French), Publications of the Hungarian Technical University (Muegyeteme Közlemenyek), Budapest, No. 3, 1948, pp. 158-172.

Considers the various stress conditions prevailing in a heavy earth mass, with the help of polar coordinates.

Jaky, J.
"Network of Slip Lines in Soil Stability," Acta Technica, Academiae Scientiarum Hungaricae, Budapest, Vol. 6, No. 1/2, 1953, pp. 25-38.

Paper examines some simple solutions of equilibrium equations with Coulomb's failure condition to determine active pressure on retaining wall. On the assumption that there is only one surface of failure passing through the heel of the wall, the conditions under which slip surfaces are plane or logarithmic spiral are obtained.

James, R. G. and Bransby, P. L.
"Experimental and Theoretical Investigation of a Passive Earth Pressure Problem," Geotechnique, Vol. 20, No. 1, March 1970, pp. 17-37.

Experimentally determined strains are converted to stresses using a stress-dilatency theory. These stresses are compared to analytically determined stresses obtained from a Sokolovskii type stress solution.

James, R. G. and Bransby, P. L.
"A Velocity Field for Some Passive Pressure Problems," Geotechnique, Vol. 21, No. 1, March 1971, pp. 61-83.

This paper includes a comparison of predicted and measured strains for various wall displacement modes. Velocity fields are discussed in terms of the wall boundary conditions. Paper also discusses material idealizations in terms of real volumetric changes.

Jeske, T.
"On the Kinematics of a Granular Medium in the Case of Equilibrium State Under Plane Strain Conditions,"

Archiwum Mechaniki Stosowanej, Vol. 20, No. 2, 1968, pp. 211-224.

Some kinematic models for a granular medium are discussed in light of the following postulates: (1) perfect plasticity (Coulomb), (2) isotropy, and (3) incompressibility. It is noted that sliding along stress characteristics in inconsistent with the above postulates. A reinterpretation of the direct shear test is presented.

Karafiath, L. L.
"An Analysis of New Techniques for the Estimation of Footing Sinkage in Soils," U. S. Army Ordinance Corps, Land Locomotion Research Branch, Research and Development Division, ATC Report 18, Oct., 1957, p.32.

Equations for sinkage of vehicles in sand are developed based on the theory of plastic flow, but modified by empirical constants. The Terzaghi equation for bearing capcity is used. Equations are developed for the axially symmetrical case of loaded plates and checked by experimentation.

Karafiath, L. L.
Discussion of "Application of Plasticity Theory to Slope Stability Problems," by H. Y. Fang and T. J. Hirst, Highway Research Record, No. 323, 1970, pp. 36-37.

Discussion of the validity of application of plasticity theory to slope stability problems.

Karafiath, L. L. and Nowatzki, E. A.
"Stability of Slopes Loaded Over a Finite Area," Highway Research Record, No. 323, 1970, pp. 14-25.

Two methods of analysis are presented: an approximate method, based on the assumption that a slip-line field analogous to the Prandtl solution for horizontal ground applies, and a numerical method, based on the numerical integration of the governing differential equations of plastic equilibrium. A formula for the N_q value is given for slope angle, friction angle, and the angle of the inclination of load and surcharge as principal variables.

Kezdi, A.
"Results of Theoretical Research," Proceedings of the Second Conference on Building of the Hungarian Academy of Sciences, (Foundation and Soil Mech. Sect., Magyar Tudomanyos Akademia Muszaki Tudomanyok, Osztalyanak Kozlemenyei, Vol. 19, No. 1/3, 1956, pp. 71-84.

Review of the work of Jaky in the field of earth pressure, strut loads, and state of stress in perfectly plastic soils. Also surveys Hungarian results in slip surfaces in the plastic state of earth masses (Kopácsy), and plastic deformations in cohesionless soils (Kezdi).

Kirkpatrick, W. M.
"The Condition of Failure for Sands," Proceedings of the Fourth International Conference on Soil Mechanics and Foundation Engineering, Vol. 1, 1957, pp. 172-178.

Discussion and comparison of the various yield conditions for drained sands. Includes experimental data derived from "thick cylinder" tests. Mohr-Coulomb theory found to be adequate.

Ko, H. Y. and Scott, R. F.
"Deformation of Sand in Shear," Journal of the Soil Mechanics and Foundations Division, ASCE, Vol. 93, No. SM5, Part 1, Sept., 1967, pp. 283-310.

Experimental investigation of dilatational behavior of sand in constant hydrostatic stress. Includes discussion of normality of plastic strain increment vector.

Kuznetsov, S. V.
"Interaction of Tectonic Pressures and Gas Pressure in a Coal Seam," (in Russian), Zhurnal Prikladnoi Mekhaniki i Tekhnicheskoi Fiziki (PMFT), No. 4, July/Aug., 1961, pp. 57-77.

Title problem is treated analytically. The equations used are those of plasticity theory. Solutions of the resulting set of equations are given for various sets of boundary conditions.

Kwaszcynska, K., Mroz, Z., and Drescher, A.
"Analysis of Compression of Short Cylinder of Coulomb Material, International Journal of Mechanical Sciences, Vol. 11, No. 2, Feb., 1969, pp. 145-158.

Static solution assuming perfectly plastic material with Coulomb yield condition and associated flow law. Stress state calculated for corners of Coulomb hexagon for which Haar-Kármán hypothesis is satisfied. Theoretical solutions compared with available experimental data.

Ladanyi, B. and Roy, A.
"Some Aspects of Bearing Capacity of Rock Mass," Seventh Canadian Symposium on Rock Mechanics, Edmonton, Canada, March 25-27, 1971.

Possible solutions for the effect of depth of embedment on the failure of rock beneath a circular indenter and the effect of stratification and jointing on the breaking capacity are discussed in terms of the limit analysis of perfect plasticity. Solutions are compared with test results and good agreement is observed.

Larkin, L. A.
"Theoretical Bearing Capacity of Very Shallow Footings," Journal of the Soil Mechanics and Foundations Division, ASCE, Vol. 94, No. SM6, Nov., 1968, pp. 1347-1357.

The problems of a smooth circular footing and a smooth strip footing acting on a cohesionless ponderable soil are considered. Finite difference methods are used to integrate the characteristic stress equations. Numerical results are presented for friction angles of thirty and forty degrees and for depth to breadth ratios of .005 to .5.

Larkin, L. A.
"On Plastic Analysis and the Bearing Capacity of Circular Foundations on Granular Soils," Developments in Theoretical and Applied Mechanics, Frederick, D., ed., Vol. 4, Pergamon Press, London, 1970, pp. 503-517.

Plastic limit analysis of rigid, smooth, flat-ended, circular indenter. Limit loads with smallest incipient velocity fields obtained for c = o soils using Coulomb yield criterion. Comparisons with small scale footing tests.

Lee, I. K. and Herington, J. R.
"The Effect of Wall Movement on Active and Passive Pressures," Uniciv Report No. R-71, University of New South Wales, Aug., 1971.

Includes a discussion of soil idealization in terms of associated and non-associated flow rule materials. Comparisons of results obtained by using both idealizations are made with existing solutions.

Lee, I. K. and Ingles, O. G.
"Strength and Deformation of Soils and Rocks," Soil Mechanics - Selected Topics, I. K. Lee, ed., American Elsevier Publishing Co., New York, 1968, pp. 195-294.

Includes discussion of elastic, elastic-plastic, and plastic theories for soil and rock deformation. Also discusses experimental results; in particular that of Roscoe et al. Numerous references.

Lenoe, E. M.
"Deformation and Failure of Granular Media Under Three-Dimensional Stresses," Experimental Mechanics, Vol. 6, No. 2, Feb., 1966, pp. 99-104.

With the use of a special three-dimensional stress testing apparatus, results show that for such three-dimensional stressing the ordinary Mohr-Coulomb yield condition may not be adequate. Results show linear relations between the stress invariants.

Lewin, P. I. and Burland, J. B.
"Stress Probe Experiments on Saturated Normally Consolidated Clay," Geotechnique, Vol. 20, No. 1, March 1970, pp. 38-56.

The authors describe stress-controlled triaxial tests on remolded, saturated, powdered slate dust. It is shown that the normality condition of plasticity provides a reasonable basis for the prediction of stress-strain behavior. Volume changes are in general agreement with those predicted by Roscoe and Schofield.

Lippmann, H.
"Plasticity in Rock Mechanics," International Journal of Mechanical Sciences, Vol. 13, No. 4, April 1971, pp. 291-297.

Upper and lower bounds are determined for the support required in coal-mining tunnels. The Coulomb yield condition and the associated flow rule are used.

Livneh, M.
"The Theoretical Bearing Capacity of Soils on a Rock Foundation," Proceedings of the Sixth International Conference on Soil Mechanics and Foundation Engineering, Vol. 2, 1965, pp. 122-126.

Slip-line solutions are presented for the bearing capacity of footings resting on a soil stratum bounded by rock.

Livneh, M. and Shklarsky, E.
"Equations of Failure Stresses in Materials with Anisotropic Strength Parameters," Highway Research Record, No. 74, 1965, pp. 44-45.

The Mohr-Coulomb equations of the failure stress and Prandtl's equation of the bearing capacity are extended to include the case of a medium with both anisotropic cohesion and angle of internal friction.

Lomize, G. M. and Kryzhanovskii, A. L.
"Fundamental Relations of the Stress State and the Strength of Sandy Ground," Soil Mechanics and Foundation Engineering, No. 3, May-June 1966, pp. 165-169.

The equations of the stress state of a sandy ground are obtained as relations between invariants defined by the strain in the soil and some invariants characterizing the stress state. Soil considered homogeneous and isotropic.

Lomize, G. M. and Kryzhanovskii, A. L.
"On the Strength of Sand," Proceedings of the Geotechnical Conference Oslo, Vol. 1, 1967, pp. 215-219.

A new strength theory for soils is proposed which takes into account the role of the intermediate principal stress. The theory is compared to experiments in which the three principal stresses were varied independently.

Lundgren, H. and Mortensen, K.
"Determination by the Theory of Plasticity of the Bearing Capacity of Continuous Footings on Sand, Proceedings of the Third International Conference on Soil Mechanics and Foundation Engineering, Vol. 1, 1953, pp. 409-412.

The characteristic equations are numerically integrated to obtain stress solutions for cohesionless soils with and without weight. Both rough and smooth footings are considered. Some numerical results are presented.

Lysmer, J.
"Limit Analysis of Plane Problems in Soil Mechanics," Journal of the Soil Mechanics and Foundations Division, ASCE, Vol. 96, No. SM4, July 1970, pp. 1311-1334.

A numerical method is presented for obtaining lower bound solutions to soil strength problems. Example solutions for earth pressure and bearing capacity are presented.

Malyshev, M. V.
"Application of the Hubert-Mises-Botkin Strength Criterion to Unconsolidated Sands," Soil Mechanics and Foundations Engineering, No. 5, Sept.-Oct., 1969, pp. 302-307.

The author discusses the merits of the Hubert-Mises-Botkin yield function (incorporates intermediate principal stress). It is concluded that this yield function leads to an absurdity.

Mandel, J.
"Equation of Flow in Ideal Soils in Plain Deformation and the Concept of Double Slip," (in French), Journal of the Mechanics and Physics of Solids, Vol. 14, No. 6, Nov., 1966, pp. 303-308.

Author indicates that deformation in soil is the result of slip on surface portions corresponding to the contact points of Mohr circles with Mohr envelopes.

Mandel, J. and Luque, R. F.
"Fully Developed Plastic Shear Flow of Granular Materials," Geotechnique, Vol. 20, No. 3, Sept., 1970, pp. 277-307.

Authors criticize Drucker/Prager theory for soils (Coulomb yield function with associated flow rule). A theory is

proposed in which the principal axes of stress and strain are no longer coincident. The proposed theory incorporates a modified version of Drucker's postulate.

Marais, G. VR
"Stresses in Wedges of Cohesionless Materials Formed by Free Discharge at the Apex," Journal of Engineering for Industry, Transactions, ASME, Series B, Vol. 91, No. 2, May 1969, pp. 345-352.

Includes discussion of Sokolovskii method applied to a wedge of cohesionless material stressed by self-weight only. Experiments show that assumptions of perfect plasticity and a Mohr yield condition are acceptable.

Mitchell, R. J.
"On the Yielding and Mechanical Strength of Leda Clays," Canadian Geotechnical Journal, Vol. 7, No. 3, Aug., 1970, pp. 297-312.

Author shows that a yield curve can be established for Leda clay. The shape of such a curve indicated strength anisotropy.

Mroz, Z. and Drescher, A.
"Limit Plasticity Approach to Some Cases of Flow of Bulk Solids," Journal of Engineering for Industry, Transactions, ASME, Series B, Vol. 91, No. 2, May 1969, pp. 357-364.

Upper bound solutions for a c - ϕ soil with weight for some problems concerning flow of bulk solids are presented.

Mroz, Z. and Kwaszcynska, K.
"Axially Symmetric Plastic Flow of Soils Treated by the Graphical Method, (in English), Archiwum Inzynierii Ladowej, Vol. 14, No. 1, 1968, pp. 27-37.

The authors present a graphical method considering the Haar-von Karman regimes represented by the corners of Coulomb's hexagon. An example is given of the compression of a cylindrical specimen with $\phi = 30°$, $c = 0$. Calculated deformation patterns are also given.

Negre, M. R. and Stutz, P.
"Contribution a l'etude des Fondations de Revolution dans l'hypothese de la Plasticite Parfaite," International Journal of Solids and Structures, Vol. 6, No. 1, Jan., 1970, pp. 69-90.

Authors consider initial flow of an axially symmetric foundation and give coefficients of limit bearing capacity. A generalized Coulomb criterion is used without the associated flow rule.

Nikolaevskii, V. N.
"On the Formulation of the Defining Equations for a Plane Flow of a Continuous Medium with Dry Friction," Journal of Applied Mathematics and Mechanics, Vol. 32, No. 5, 1968, pp. 959-962.

A yield condition and a flow law for a cohesive, incompressible medium with internal friction is discussed. The total force acting on a critical equilibrium plane is assumed to be colinear with the direction of maximum shear.

Ohta, H. and Hata, S.
"A Theoretical Study of the Stress-Strain Relations for Clays," Soils and Foundations, Vol. 11, No. 3, Sept., 1971, pp. 65-90.

Using concepts from the classical theory of plasticity, the authors derive incremental stress-strain relations for clay. Behavior of normally consolidated and over consolidated clays is discussed. The results support the Cambridge Cam-Clay model.

Oz, A. C.
"Limit Analysis of Forces Exerted on Soil Shoving Equipment," (in German), Istanbul Teknik. Universitesi Buleteni, Vol. 22, No. 1, 1969, pp. 1-16.

The Coulomb-Rankine theory of earth pressure is employed in order to estimate forces required when scraping soils. An upper bound limit analysis solution is obtained by considering sliding of pushed earth along a system of planes.

Palmer, A. C.
"A Limit Theorem for Materials with Non-Associated Flow Laws," Journal de Mechanique, Vol. 5, No. 2, June 1966, pp. 217-222.

A simple frictional model is presented for which the plastic strain rate vector is not normal to the yield surface. A "yield like" function is hypothesized which is everywhere normal to the strain rate vector (except at corners). A lower bound theorem associated with this function is then proved. Author suggests that the Coulomb yield conditions may represent a lower bound yield condition.

Palmer, A. C.
"Stress-Strain Relations for Clay: An Energy Theory," Geotechnique, Vol. 17, No. 4, Dec., 1967, pp. 348-358.

The author develops an energy theory for the inelastic deformation of clays. The paper briefly discusses the stress-strain relation obtained with the normality concept of plasticity theory.

Pariseau, W. G.
"A New View of the Ideal Plasticity of Soils and Unconsolidated Rock Materials," International Journal of Rock Mechanics and Mining Science, Vol. 3, No. 4, Nov., 1966, pp. 307-317.

Various forms of yield functions and flow rules for a $c - \phi$ soil are discussed. It is emphasized that in general, velocity characteristics and stress characteristics are not coincident. A new interpretation of the direct shear test is also presented.

Pariseau, W. G.
"Gravity Flows of Ideally Plastic Materials Through Slots," Journal of Engineering for Industry, Transactions, ASME, Series B, Vol. 91, No. 2, May 1969, pp. 414-422.

A yield condition defined by the intersection of a function of the stress deviator invariants (J_2) and a function of volumetric strain (I_1) is proposed. The normality condition for strain rates leads to a description of flow allowing for compressible or incompressible plastic strain. Some experimental and theoretical velocity fields are compared.

Paslay, P. R., Cheatham, J. B., Jr., and Fulcher, C. W. G. "Plastic Flow of Rock Under a Pointed Punch in Plane Strain," Journal of Applied Mechanics, Vol. 35, No. 1, March 1968, pp. 95-101.

Extension of previous formulation for indentation by a smooth flat punch. Numerical results given.

Paslay, P. R. and Weidler, J. B. "Analysis of Triaxial Test for Granular Soils," Journal of the Engineering Mechanics Division, ASCE, Vol. 95, No. EM3, June 1969, pp. 587-609.

An analytical solution for the triaxial test is compared to experimental results.

Poorooshasb, H. B., Holubec, I., and Sherbourne, A. N. "On Quasi-Static Yielding of a Cohesionless Granular Medium," Proceedings of the Fifth U. S. National Congress of Applied Mechanics, 1966, p. 582.

Experimental study on yielding of granular particles. It is demonstrated that the plastic potential curve does not coincide with the yield curve, hence normality does not hold. Various flow rule expressions are given.

Poorooshasb, H. B., Holubec, I., and Sherbourne, A. N. "Yielding and Flow of Sand in Triaxial Compression," (Parts I, II, and III), Part I, Canadian Geotechnical Journal, Vol. 3, No. 4, Nov., 1966, pp. 176-190, Parts II and III, Canadian Geotechnical Journal, Vol. 4, No. 4, Nov., 1967, pp. 376-397.

It is experimentally demonstrated that a plastic potential function exists for incremental plastic strain vectors. It is further shown experimentally, that the potential functions and the yield function do not coincide. The yield function is found to be a function of stress ratios only. In addition, stress and velocity fields for a passive earth pressure problem are presented. A discussion of the stress and velocity characteristics is also included.

Poorooshasb, H. B. and Roscoe, K. H. "A Graphical Approach to the Problem of the Stress-Strain Relationship of Normally Consolidated Clays,"

ASTM Special Technical Publication No. 361, Laboratory Shear Testing of Soils, 1963, pp. 258-259.

The authors present a graphical method of predicting strains in a normally consolidated specimen of remolded clay subjected to triaxial compression. The method is based on previous theoretical work of the authors.

Poorooshasb, H. B. and Roscoe, K. H.
"The Correlation of the Results of Shear Tests with Varying Degrees of Dilation," Proceedings of the Fifth International Conference on Soil Mechanics and Foundation Engineering, Vol. 1, 1961, pp. 297-302.

Some test results are correlated with the stress-strain postulates of Roscoe, Schofield, and Wroth (1958). The analysis of the experimental data incorporates a boundary energy correction.

Pramborg, B. O.
"Plastic Equilibrium in Soil," Proceedings of the Fifth International Conference of Soil Mechanics and Foundation Engineering, Vol. 2, 1961, pp. 459-463.

The author uses a stress function to satisfy identically the equations of equilibrium. In the plastic equilibrium field the yield function is then the governing equation for the stress function. Some approximate solutions for the plastic stress field are presented.

Rhines, W. J.
"Elastic-Plastic Foundation Model for Punch-Shear Failure," Journal of the Soil Mechanics and Foundations Division, ASCE, Vol. 95, No. SM3, May 1969, pp. 819-828.

Pasternak model is extended by including plastic yielding in the shear layer. Two dimensional problem of infinitely long rigid strip resting on subgrade surface is treated as elastic-perfectly plastic. Model is seen to be appropriate for highly compressible soil.

Rochette, P. A.
"Earth Pressures on Structures and Mobilized Shear Resistance," Proceedings of the Fifteenth Canadian Soil Mechanics Conference, Technical Mem. No. 73, 1961, pp. 3-59.

This paper is particularly concerned with the effects of wall movement on soil deformation and wall friction angle. Includes discussion of plasticity methods and some test results.

Roscoe, K. H.
Discussion of "Lower Bound Collapse Theorem and Lack of Normality of Strain Rate to Yield Surface for Soils," by De Josselin De Jong, Rheology and Soil Mechanics, Proceedings of the IUTAM Symposium, Grenoble, Springer-Verlag, 1966, 75-78.

It is proposed that the normality condition is applicable to soils considered as strain hardening materials.

Roscoe, K. H.
Discussion on Session 1: "Shear Strength of Soft Clay," Proceedings of the Geotechnical Conference Oslo, Vol. 2, 1967, pp. 120-122.

The author discusses the correlation of data from various types of tests using the Cambridge stress-strain theories.

Roscoe, K. H.
"The Influence of Strains in Soil Mechanics," Geotechnique, Vol. 20, No. 2, June 1970, pp. 129-170.

The author reviews the past twenty years of research into the stress-strain behavior of soils and the attempt to model soil as an elasto-plastic material. Experimental techniques and results are discussed. The earth pressure problem is reviewed.

Roscoe, K. H., Bassett, R. H., and Cole, E. R. L.
"Principal Axes Observed During Shear of a Sand," Proceedings of the Geotechnical Conference Oslo, Vol. 1, 1967, pp. 231-237.

A simple shear apparatus in which the principal axes of stress and strain can be determined independently is described. The significance of the directions of principal axes of stress and strain with respect to the Cambridge stress-strain theories is discussed. It is concluded that up to peak stress the axes of stress and strain coincide.

Roscoe, K. H. and Burland, J. B.
"On the Generalized Stress-Strain Behavior of "Wet" Clay," Engineering Plasticity, Heyman, J. and Leckie, F. A., ed., Cambridge University Press, pp. 535-609.

The Cambridge theory for triaxial stress-strain behavior of wet clay is extended to the general three-dimensional case. A new yield locus is proposed to account for shear distortion without plastic volume change for state paths beneath the state boundary surface. It is found to be possible to correlate the results of triaxial tests and the results from a simple shear apparatus.

Roscoe, K. H. and Poorooshasb, H. B.
"A Theoretical and Experimental Study of Strains in Triaxial Compression Tests on Normally Consolidated Clays," Geotechnique, Vol. 13, No. 1, March 1963, pp. 12-38.

A stress-strain theory for normally consolidated clays subjected to triaxial compression is developed. Experimental and theoretical work is considered in light of the yield surface proposed by Roscoe, Schofield, and Wroth (1958). The plastic potential concept is briefly considered.

Roscoe, K. H. and Schofield, A. N.
Discussion on "Stress-Dilatancy, Earth Pressures, and Slopes," by P. W. Rowe, Journal of the Soil Mechanics and Foundations Division, ASCE, Vol. 90, No. SM1, Jan., 1964, pp. 136-150.

The stress-dilatancy theory of Rowe is compared to the Cambridge continuum model for soil deformation.

Roscoe, K. H., Schofield, A. N., and Wroth, C. P.
"On the Yielding of Soils," Geotechnique, Vol. 8, No. 1, March 1958, pp. 22-53.

The authors make the following hypotheses: (1) A yield surface exists in a space of stresses and void ratio, and (2) A critical voids ratio line exists on this surface at which unrestricted flow may occur. Comparison with some experimental work shows that the two hypotheses are applicable to clays and granular materials.

Roscoe, K. H., Schofield, A. N., and Thurairajah, A. "An Evaluation of Test Data for Selecting a Yield Criterion for Soils," ASTM Special Technical Publication No. 361, Laboratory Shear Testing of Soils, 1963, pp. 111-128.

The Mohr-Coulomb, extended von Mises and extended Tresca failure criteria are used to predict the results of triaxial extension and compression tests.

Roscoe, K. H., Schofield, A. N., and Thurairajah, A. "Yielding of Clays in States Wetter than Critical," Geotechnique, Vol. 13, No. 3, Sept., 1963, pp. 211-240.

Soil is modeled as an elasto-plastic continuous medium. This paper describes a continuation of the work presented by Roscoe, Schofield, and Wroth (1958). It is assumed by the authors that soil behaves as a rigid-plastic medium in distortion. Theoritical work is compared with experimental data.

Roscoe, K. H. and Thurairajah, A. "On the Uniqueness of Yield Surfaces for Wet Clays," Rheology and Soil Mechanics, Proceedings of the IUTAM Symposium, Grenoble, Springer-Verlag, 1966, pp. 364-384.

Authors discuss the apparently different yield surfaces for Koalin obtained in drained and undrained triaxial tests. It is suggested that the discrepancy is due to an erroneous assumption concerning uniformity of dilation in the triaxial test. The authors conclude that there is probably one yield surface for a clay in a plane strain or axisymmetric condition.

Rosenfarb, J. and Chen, W. F. "Limit Analysis Solutions of Earth Pressure Problems," Fritz Lab. Report No. 355.14, Lehigh University, Bethlehem, Pennsylvania, March 1972.

Limit analysis method is applied to obtain upper bound solutions to active and passive earth pressure problems. A rigid, frictional wall retaining a cohesionless and homogeneous earth backfill is considered in the analysis.

Sawczuk, A.
"On Yield Criteria and Incipient Plastic Motion of Soils," Acta Mechanica, Vol. 4, No. 3, 1967, pp. 308-314.

Discusses the controversy existing with regard to the flow law for incipient flow for a Coulomb failure criteria. The general tensorially linear relation between stress and strain rate tensors is studied in order to specify the independent material functions describing the kinematics and the bearing capacity of isotropic soils.

Sawczuk, A. and Stutz, P.
"On Formulation of Stress-Strain Relations for Soils at Failure," Zeitschrift fur Angewandte Mathematik und Physik, Vol. 19, No. 5, 1968, pp 770-778.

Authors study the form of functions entering constitutive equations. The principal of maximum dissipation coupled with the tensorially linear stress-strain law leads to a flow law relating the strain rate tensor to the deviatoric stress tensor for a cohesionless soil.

Schlechtweg, H.
"Two-Dimensional Problem of a Plastic Material Obeying Coulomb Law of Yield," (in German), Zamm, Vol. 38, No. 3/4, March/April 1958, pp. 139-148.

The author discusses the equations of plane strain for a material with the Coulomb yield law. Proof is given that the slip lines and stress characteristics coincide.

Schofield, A. and Wroth, P.
Critical State Soil Mechanics, McGraw-Hill Book Company, New York, 1968.

The authors discuss the Cambridge critical state concept. The stress-strain behavior of soil in the triaxial test is compared with the predictions of two idealized soils, Granta-gravel and Cam-clay. The relationship between the critical state concept and limiting equilibrium concept is discussed.

Schultze, E.
"Composition and Resolution of Slip Lines," (in German), ABH. Bodenmech. Grundbau, Berlin, Erich Schmidt Verlag, 1948, pp. 34-45.

An approximate method for the determination of slip lines is obtained using kinematic considerations. Experimental results included.

Schultze, E.
"Resistance of Soil Foundations to Oblique Base Pressure," (in German), Bautechnik, Vol. 29, No. 12, Dec., 1952, pp. 336-342.

The theory of Buisman-Caquot is used to compute the ultimate bearing load. Influence of soil weight is included. Results for an example problem are given.

Schultze, E.
"Distribution of Stress Beneath a Rigid Foundation," Proceedings of the Fifth International Conference on Soil Mechanics and Foundation Engineering, Paris, Vol. 1, 1961, p. 807.

Boussinesq's theory is improved to account for plastic flow at the edges. The contact pressure distribution is obtained for different types of footings. Results are verified by field observations.

Scott, R. F.
"Plastic Equilibrium States in Soil, "Principles of Soil Mechanics, Chapter 9, Addison-Wesley, Reading, Massachusetts, 1963, pp. 398-427.

Includes discussion and comparison of various plasticity solutions.

Scott, R. F. and Ko, H.
"Stress-Deformation and Strength Characteristics - State-of-the-Art Report," Seventh International Conference on Soil Mechanics and Foundation Engineering, State of the Art Volume, 1969, pp. 1-47.

Includes discussion on plasticity and failure theories for soils. Numerous references.

Shibata, T. and Karube, D.
"Influence of the Variation of the Intermediate Principal Stress on the Mechanical Properties of Normally Consolidated Clays," Proceedings of the Sixth International Con-

ference on Soil Mechanics and Foundation Engineering, Vol. 1, 1965, pp. 359-363.

The effect of the intermediate principal stress is experimentally studied.

Shield, R. T.
"Mixed Boundary Value Problems in Soil Mechanics," Quarterly of Applied Mathematics, Vol. 11, No. 1, April 1953, pp. 61-75.

The stress-strain law for an ideal soil is used to obtain the velocity equations referred to the stress characteristic lines in plane stress problems. The results are used to obtain the incipient velocity field for the indentation of a semi-finite mass of material by a flat punch or footing, and to solve the problem of indentation by a lubricated wedge.

Shield, R. T. and Drucker, D. C.
"The Application of Limit Analysis to Punch Indentation Problems," Journal of Applied Mechanics, Vol. 20, No. 4, Dec., 1953, pp. 453-460.

Limit analysis approach is used to obtain upper and lower bound punch pressures for indentation into a plane surface of elastic-perfectly plastic material.

Shield, R. T.
"Plastic Potential Theory and Prandtl Bearing Capacity Solution," Journal of Applied Mechanics, Vol. 21, No. 2, June 1954, p. 193.

Author shows that not only is the Prandtl bearing capacity of an infinite strip load on a c, ϕ soil an upper bound for the collapse value of the average pressure, but it is also a lower bound, and therefore the true value of the average pressure.

Shield, R. T.
"Stress and Velocity Fields in Soil Mechanics," Journal of Mathematics and Physics, Vol. 33, No. 2, July 1954, pp. 144-156.

Analysis assumes perfectly plastic idealization with Mohr-Coulomb failure criterion and associated flow rule. Emphasizes discontinuities in stress fields for cohesive soils. Detailed solutions of stress distributions are given for various shaped wedges.

Shield, R. T.
"On Coulomb's Law of Failure in Soil," Journal of Mechanics and Physics of Solids, Vol. 4, No. 1, Oct., 1955, pp. 10-16.

The Coulomb law of failure for an ideal cohesive soil is interpreted to obtain the yield surface for three-dimensional stress fields. The associated flow rule is derived under the assumption of perfect plasticity. As an application, limit analysis is used to obtain a lower bound for the bearing capacity of a rectangular footing on a soil.

Siciliano, M. and Chen, W. F.
"The Bearing Strength of Concrete Blocks," Fritz Lab. Report No. 370.6, Lehigh University, Bethlehem, Pennsylvania, May 1971.

An experimental investigation is made to ascertain the validity of the linear elastic and perfectly plastic solutions of the bearing capacity of concrete blocks. It is found that when the concrete in bearing is confined, the plastic theory controlled; while in the case where there is little confinement, the results are bounded by the plastic and the elastic solutions.

Smith, I. M.
"Incremental Numerical Solution of a Simple Deformation Problem in Soil Mechanics," Geotechnique, Vol. 20, No. 4, Dec., 1970, pp. 357-372.

The author solves a thick-walled cylinder problem using the finite element method. Both the stress-strain theories developed at Cambridge, and Rowe's stress dilatancy theory are utilized in the analysis. The results from the various stress-strain theories are compared with experimental data.

Smith, I. M. and Kay, S.
"Stress Analysis of Contractive or Dilative Soils," Journal of the Soil Mechanics and Foundations Division, ASCE, Vol. 97, No. SM7, July 1971, pp. 981-997.

Cam-clay model for clay and Rowe's stress-dilatancy model for sand are used to analyze pressurized thick-walled cylinders. Clay analysis is compared with experimental data.

Sobotka, Z.
"Axially Symmetrical and Three-Dimensional Limiting States of Non-Homogeneous Soils and Other Continuous Media," (in English), Archiwum Mechaniki Stosowanej, Warsaw, Vol. 13, No. 2, 1961, pp. 151-175.

For the axially symmetrical problem, with linear form Mohr envelope, author establishes a system of partial differential equations of the hyperbolic type, similar to those valid for homogeneous materials. The three-dimensional case is treated for a linear-form limiting curve.

Sobotka, Z.
"On a New Approach to the Analysis of Limit States in Soils and in Other Continuous Media, Bulletin of Academic Polonaise Science, Vol. 9, No. 2, 1961, pp. 85-93.

Investigates plain strain problems of soil plasticity with non-homogeneous strength characteristics and Mohr failure criteria. The axisymmetric problem using the Haar-von Karman assumption is also discussed. Hyperbolic equations are derived for the equilibrium solution.

Sobotka, Z.
"The Slip Lines and Surfaces in the Theory of Plasticity and Soil Mechanics," Applied Mechanics Reviews, Vol. 14, No. 10, Oct., 1961, pp. 753-759.

Author reviews slip line theory and methods of integrating the characteristic equations for both metals and soils. Plane, axisymmetric, and general three-dimensional problems are considered.

Sokolovskii, V. V.
"Limiting Equilibrium of Rocks in Conditions of Plane Stress," (in Russian), Bulletin of the Academy of Science of the USSR, Series of Technical Science (Izv. Akademiia Nauk SSSR Ser. T kh. Nauk), No. 9, Sept., 1948, pp. 1361-1370.

This paper presents a derivation of equations referring to an infinite solid body in a condition of plane stress. The body is at all points in a state of limiting equilibrium characterized by the tangency of the Mohr's stress circle to a given slope.

Sokolovskii, V. V.
"Equations of Plastic Equilibrium for Plane Stress," (in Russian), Prikladnaya Matematiki i Mekhanika, Vol. 13, March-April 1949, pp. 219-221.

The differential equations of the plastic field for plane stress can be either hyperbolic or elliptic. The author discusses the solution of the plasticity condition for plane stress.

Sokolovskii, V. V.
"On the Limit Equilibrium of Granular Media," (in Russian) Prikladnaya Matematika i Mekhanika, Vol. 15, No. 6, Nov.,-Dec., 1951, pp. 689-708.

Paper considers only conditions of a purely cohesionless soil. By employing the theory of limit equilibrium, solutions of such problems are obtained in a simpler manner as compared with the application of the general theory. Problems in which zones of the limit and elastic states exist simultaneously can be treated by this method. Solutions of these problems can be treated by this method. Solutions of these problems are either in a closed form or they lead to an integration of ordinary nonlinear equations. Author derives equations of the limit equilibrium in polar coordinates.

Sokolovskii, V. V.
"On an Approximate Method in Statics of Granular Media," (in Russian), Prikladnaya Matematika i Mekhanika, Vol. 16, No. 2, March-April 1952, pp. 246-248.

It is shown that the solution of problems concerning the limit equilibrium of granular media can be replaced - as an approximation - by the sum of (1) the solution of the

same problem for granular media with internal friction and with cohesion, but without any weight of its own, and (2) the solution of the problem for granular media with internal friction and with weight of its own, but without any cohesion. Equations are derived and an example is given to illustrate the application of this method.

Sokolovskii, V. V.
"Theory of Limit Equilibrium of Soils and Its Application to the Analysis of Hydrotechnical Structures," (in Russian), Izv. Akad, Nauk SSSR Otd. Tekh. Nauk, No. 6, June 1952, pp. 809-823.

The method of stress characteristics is applied to foundation, retaining wall, and slope stability problems.

Sokolovskii, V. V.
"On the Stability of Foundation Beds of Laminated Cohesionless Material," (in Russian), Inzhener, Sbornik, Akad. Nauk SSSR, Vol. 22, 1955, pp. 74-82.

The angle of internal friction is assumed to be the same on all planes excepting the horizontal plane, where it takes on a small value. The author distinguishes two kinds of equilibrium zones; a conventional zone where sliding occurs on inclined planes, and a zone where sliding occurs on a horizontal plane.

Sokolovskii, V. V.
"Some Problems of Soil Pressure," Proceedings of the Fourth International Conference on Soil Mechanics and Foundation Engineering, London, Vol. 2, 1957, pp. 239-242.

This paper deals with two problems: (1) the construction of the free curvilinear contour for a stable semi-arch, the lower part of which is a slope, and (2) the determination of contact stresses acting on the curvilinear contour of a rigid wall. Solutions are obtained assuming the soil is elastic, isotropic, and homogeneous, and using Coulomb's parameters ϕ and c. Solutions are presented in chart and tabular form.

Sokolovskii, V. V.
"Limit Equilibrium of Loose Media for Small Angles of Internal Friction," (in Russian), Inzhener. Sbornik Akad. Nauk SSSR, Vol. 31, 1961, pp. 119-122.

Characteristic equations are developed for a ponderable cohesive medium with internal friction. An approximation is then made that the friction angle is small. The technique is applied to a bearing capacity problem.

Sokolovskii, V. V.
Statics of Granular Media, Pergamon Press, New York, 1965.

Includes the derivation of the non-linear differential equations of limiting equilibrium for bearing capacity, slope stability, and earth pressure. Limited numerical results are given.

Spencer, A. J. M.
"Perturbation Methods in Plasticity - III Plane Strain of Ideal Soils and Plastic Solids with Body Forces," Journal of the Mechanics and Physics of Solids, Vol. 10, April-June 1962, pp. 165-177.

A perturbation method is presented for the construction of slip-line fields for a ponderable c - ϕ soil. Stresses caused by gravity forces are assumed to be "small." Some numerical results for a smooth punch are tabulated.

Spencer, A. J. M.
"A Theory of the Kinematics of Ideal Soils Under Plane Strain Conditions," Journal of the Mechanics and Physics of Solids, Vol. 12, 1964, pp. 337-351.

Equations of flow for a Coulomb soil are developed considering the following assumptions: (1) isotropy, (2) incompressibility, and (3) deformation in plane strain occurs by shearing along stress characteristics. A kinematically admissible velocity field associated with the slip line solution for a smooth punch acting on a cohesive weightless soil is presented.

Steirnmann, I. Y.
"The Pressure Distribution Under A Foundation in the Presence of a Plastic Region," (in Russian), Sb. Trudi Mosk. Inzh.-Stroit In-ta, No. 14, 1956, pp. 32-56.

Solution presented for the distribution under a rigid foundation at ground level on the hypothesis that the foundation soil can be represented by an elastic semi-space, but that the stresses near the edges of the foundation slab cannot exceed a particular limit.

Stroganov, A. S.
"Analysis of Plane Plastic Deformation of Soils," Soviet Engineering Journal S, Vol. 4, July-Aug., 1965, pp. 573-577.

Experimental study of the load carrying capacity of foundations and embankments, and of the plastic properties of soils in complex stress states. Results suggest that the soils obey the Huber-Schleicher plasticity condition and possess a new type of plastic potential.

Takagi, S.
"Plane Plastic Deformation of Soils," Journal of the Engineering Mechanics Division, ASCE, Vol. 88, No. EM3, June 1962, pp. 107-151.

Attempts to present a mathematically consistent deformation theory for the plane plastic flow of ideal soils. After a review of the existing theories, two examples are discussed: that of vibration under the Rankine state, and one-dimensional secondary consolidation. The author discusses five major problems with the theory: existence, uniqueness, three-dimensional plastic motion, pre-plastic deformation, and yield criteria.

Tan, E. K.
"Stability of Soil Slopes," Transactions of ASCE, Vol. 113, 1948, p. 139.

Development of approximate mathematical theory for plastic failure of a slope due to its own mass. Slip-line determinations are made. Discussion included.

Thurairajah, A. and Roscoe, K. H.
"The Correlation of Triaxial Compression Test Data on Cohesionless Granular Material," Proceedings of the Sixth International Conference on Soil Mechanics and Foundation Engineering, Vol. 1, 1965, pp. 377-381.

It is demonstrated that there exists a unique surface in space of hydrostatic stress, deviator stress, and void ratio for both drained and undrained tests if a boundary energy and elastic energy correction is made.

Torre, C.
"State of Stresses in a Heavy Soil Mass," Proceedings of the Second International Conference on Soil Mechanics and Foundation Engineering, Rotterdam, Vol. 3, June 1948, pp. 57-61.

The paper discusses the state of stress in a semi-infinite mass consisting of heavy cohesionless grains of approximately equal size. The involute parabola set-up around the Mohr circles is used as a yield condition.

Torre, C.
"The Stress State in a Heavy Soil," (in German), Österreichische Akademie der Mathematischen, Wissenschaften Naturwissenschaftliche Klasse, Sitzungsberichte, Abteilung IIa, No. 156, 1948, pp. 583-592.

A half space is assumed to be filled with uniform grains of approximately uniform size subject to gravity but without cohesive forces. The plane boundary may form any angle with the direction of gravity. The method of envelopes, assuming a parabolic form, is used to determine the stress distribution and the families of slip surfaces under "plastic" flow.

van Mierlo, W. C. (Chairman)
"Earth and Rock Pressures," Proceedings of the Sixth International Conference on Soil Mechanics and Foundation Engineering, Technical Session 7 - Division 5, Vol. 3, 1965, pp. 513-539.

Contains a discussion of the applicability of the theory of plasticity to the shear failure of earth bodies.

Vyalov, S. S.
"Limit Equilibrium of Weak Soils on a Rigid Base," (in Russian), Izvestiya Akademiia Nauk SSSR, Otdelenie Technicheskikh Nauk, Mekhanika i Mashinostroenie, Leningrad, No. 5, June 1951, pp. 813-828.

Considers the solution to the problem of limit equilibrium of a half-plane under the influence of a long strip on a rigid base loaded with a uniformly distriubted load. Solution is obtained with the aid of plastic theory using Prandtl's condition of plasticity.

Wei, R.
"The Plastic Potential of Normally Consolidated Clay," (Chinese), Journal of Hydraulic Engineering, No. 6, 1964, pp. 9-20.

Includes a discussion of the concept of a plastic potential in the study of stress-strain relationship of normally consolidated clays. Calladine's method is proved to be valid in finding the yield surface, and tests show such a surface is elliptical.

Weidler, J. B. and Paslay, P. R.
"Analytical Description of Behavior of Granular Media," Journal of the Engineering Mechanics Division, ASCE, Vol. 95, No. EM2, April 1969, pp. 379-395.

Various postulates for a work hardening (and softening) yield function, and for the kinematics of plastic flow are examined in light of the second law of thermodynamics. The components of stress and the specific volume are selected as state variables.

Weidler J. B. and Paslay, P. R.
"Constitutive Relations for Inelastic Granular Medium," Journal of the Engineering Mechanics Division, ASCE, Vol. 96, No. EM4, Aug., 1970, pp. 395-406.

An alternative to the Coulomb yield function is presented in which the shear stress required to initiate flow is a function of the mean normal stress and the specific volume. The equations governing the kinematics of flow include the possibility of either an increase or decrease of volumetric strain. Predictions of the theory are compared to some experimental results.

Westergaard, H. M.
"Plastic State of Stress Around a Deep Well," Contributions to Soil Mechanics, 1935-1940, Reported from Boston Society of Civil Engineers, Vol. 27-28, Jan., 1940, p. 1.

The author derives from the laws of elasticity and plasticity a set of equations for the stress distribution around a deep well.

Wroth, C. P.
"Soil Behavior During Shear," Engineering, Vol. 186, No. 4829, Sept., 1958, pp. 409-413.

Author discusses the yield surface and critical voids ratio curve proposed by Roscoe, Schofield, and Wroth (1958). It is noted that once the yield surface has been established, it is possible to predict the complete path, provided the initial conditions and degree of drainage are known.

Wroth, C. P.
"The Prediction of Shear Strains in Triaxial Tests on Normally Consolidated Clays," Proceedings of the Sixth International Conference on Soil Mechanics and Foundation Engineering, Vol. 1, 1965, pp. 417-420.

Exponential functions are used to describe the shearing behavior of normally consolidated clays. The theoretical behavior is compared with experimental results.

Wroth, C. P. and Bassett, R. H.
"A Stress-Strain Relationship for the Shearing Behavior of a Sand," Geotechnique, Vol. 15, No. 1, March 1965, pp. 32-56.

The authors propose simple functions for describing the stress-strain behavior of sand. As in the work of Roscoe, Schofield, and Wroth (1958), sand is treated as an elasto-plastic medium (strain hardening and softening) with a unique critical voids ratio line. The theory is compared with experimental work on steel balls and sand.

Wroth, C. P. and Loudon, P. A.
"The Correlation of Strains within a Family of Triaxial Tests on Overconsolidated Samples of Koalin," Proceedings

of the Geotechnical Conference Oslo, Vol. 1, 1967, pp. 159-163.

The results of a series of undrained tests reveal a family of distinct contours of equal increment of strain. The pattern of contours also applies to the results of drained tests. It is shown how the complete test path of a conventional drained test may be estimated from undrained results.

Wu, T. H.
"Plastic Equilibrium," Soil Mechanics, Allyn and Bacon, Inc., Boston, 1964, Chapter 8, pp. 252-264.

Brief discussion on upper and lower bound solutions and limitations on use of plasticity theory.

Wu, T. H., Loh, A. K., and Malvern, L. E.
"Study of Failure Envelopes of Soils," Journal of the Soil Mechanics and Foundations Division, ASCE, Vol. 89, No. SM1, Feb., 1963, pp. 145-181.

The results of an experimental study of the Mohr-Coulomb failure criterion in three-dimensional stress space are presented. The effect of the intermediate principal stress on the strength of both sands and clays is considered.

Yamaguchi, H.
"A Theory on the Velocity Field in the Plastic Flow of Granular Materials," (in Japanese), Transactions of the Japan Society of Civil Engineers, July 1959, pp. 8-16.

By using the concept of plastic potential, relations between two and three-dimensional stresses, and the yield condition are derived. For small ϕ results are in agreement with Hoshino analysis. Dilatancy formulas in the shearing flow are derived from the present theory, and proved valid experimentally.

Yamaguchi, H.
"Application of Kotter Equation to Theoretical Soil Mechanics," (in Japanese), Transactions of the Japan Society of Civil Engineers, Vol. 65, Nov., 1959, pp. 1-9.

A method of analysis for earth pressure computation and bearing capacity estimation is presented by solving different forms of the generalized Kotter equations. Developing Ohde's method, an approximate method of analysis for earth pressure on a wall rotating around its upper end is discussed.

Yamaguchi, H.
"Discontinuity of Stress and Velocity in the Rigid Plastic Field in Soil Mechanics," Soils and Foundations, Vol. 7, No. 3, 1967, pp. 54-64.

Velocity and stress discontinuities for a c - ϕ soil with the associated flow rule are discussed.

Yokawa, Y., Yamagata, K., and Nagaoka, H.
"Bearing Capacity of a Continuous Footing Set in Two-Layered Ground," Soils and Foundations, Vol. 8, No. 3, 1968, pp. 1-31.

Slip line fields and the associated velocity fields are developed for a weightless c - ϕ soil with the associated flow rule. The solutions are modified to incorporate soil weight. Numerical results are presented.

Yong, R. N. and McKyes, E.
"Yield and Failure of Clay Under Triaxial Stresses," Journal of the Soil Mechanics and Foundations Division, ASCE, Vol. 97, No. SM1, Jan., 1971, pp. 159-176.

The authors present an experimental study of clay in which the three principal stresses were varied independently. It is shown that over a certain range of applied stresses, the classical isotropic theory of plasticity is capable of predicting the behavior of clay. Beyond this limit the theory is not suitable.

Ziegler, H.
"On the Plastic Potential in Soil Mechanics," (in German), Zeitschrift Fur Angewandte Mathematik und Physik, Vol. 20, No. 5, 1969, pp. 659-675.

Based on the principle of maximal specific rate of dissipational work, which yields the theory of the plastic potential including the convexity of the yield surface. The author shows that in isotropic bodies the stress and strain rate always have a common system of principal axes.

Zienkiewicz, O. C., Valliappan, S., and King, I. P. "Elasto-Plastic Solutions of Engineering Problems - Initial Stress," Finite Element Approach, International Journal for Numerical Methods in Engineering I, No. 1, Jan.-March 1969, pp. 75-100.

Elastic-plastic solutions are presented for both the von Mises and Coulomb (Drucker) yield surfaces with the associated flow rule. A solution is presented for the strip footing problem.

8. AUTHOR INDEX

9. ACKNOWLEDGMENTS

ACKNOWLEDGMENTS

The work described in this report was conducted in the Geotechnical Engineering Division, Fritz Engineering Laboratory, Lehigh University, as part of the research program on soil plasticity. This particular study is sponsored by the Envirotronics Corporation.

Thanks are due to Miss Phyllis Raudenbush for typing the manuscript and mastering the difficult setting of the foreign-language references.