

REVIEWS

These reviews have been prepared by the Soil Mechanics Information Analysis Center of the U.S. Army Corps of Engineers' Waterways Experiment Station in Vicksburg, Miss. The evaluators are named in parentheses at the end of their comments.

Accelerated Weathering of Tough Shales

REFERENCE: Noble, D. F., "Accelerated Weathering of Tough Shales," VHTRC 78-R20, Virginia Highway and Transportation Research Council, Charlottesville, Va., Oct. 1977, 37 pp.

The purpose of this study was to find or develop a test that would identify a very tough but relatively rapid weathering type of shale that has caused problems when used in embankments as rock. Eight shales, including the problem shale, were collected and tested by the slake, slake durability, and modified sulfate soundness tests, and a new sulfuric acid test that was thought to simulate the type of weathering that takes place in the field. Quantitatively, the slake and slake durability tests did not differentiate between the shales very well. The modified sulfate soundness test and the new sulfuric acid test did differentiate between the shales, and the orders of responsiveness of the shales to the tests compared quite favorably. It was found that if both iron sulfide and chlorite occur in the same shale, that shale should be considered to have the potential for relatively rapid weathering. 18 references.

Evaluation

The report by Noble presents a test with possible potential for evaluating shale durability, but falls short of the purpose stated above. The test supplements a previous scheme (Purdue University) for classifying types by concentrating on subdivision at the rock-line end of the shale spectrum. The principle value of this report is that it addresses the chemical and mineralogical changes that may be occurring in nature. (R. J. Lutton)

Clay Fabric and Geotechnical Properties of Selected Submarine Sediment Cores from the Mississippi Delta

REFERENCE: Bennett, R. H., "Clay Fabric and Geotechnical Properties of Selected Submarine Sediment Cores from the Mississippi Delta," NOAA Professional Paper 9, National Oceanic and Atmospheric Administration, Rockville, Md., July 1977, 86 pp.

Gives results of research on clay fabrics and selected geotechnical properties of submarine sediment samples from the Mississippi prodelta depositional environment. The clay fabric of a Deep Sea Drilling Project sample is compared with the Delta samples because of its highly complex nature in the undisturbed versus the remolded states. Techniques of transmission electron microscopy, unique sample preparation, and quality control were used in the analyses. Three general areas of this investigation include: (1) comprehensive literature review tracing the develop-

ment of concepts about clay fabrics; (2) detailed study of analytical techniques, instrumentation, and sample quality as applied to clay fabrics; and (3) study relating clay fabrics to selected geotechnical properties, depth of burial, and laboratory consolidation loads. Characteristics of clay fabrics in natural versus laboratory consolidated samples were evaluated. 191 references.

Evaluation

The publication by Bennett et al would be of interest to persons working in the area of marine geotechnology. Quantitative determination of the degree of underconsolidation from consolidation test data is difficult due to sample disturbance, particularly the degassing of entrapped methane as subsurface samples are raised to the surface. The publication uses a method proposed by Silva ("Marine Geomechanics: Overview and Projects," in *Deep-Sea Sediments, Physical and Mechanical Properties*, Plenum Press, 1974, pp. 45-76) for determining the relative degree of sample disturbance in terms of an index parameter. The primary contribution of the publication is a proposed clay fabric model for submarine sediments for different void ratios given in Fig. 94. (E. B. Perry)

Automatic Soil Classification Using Quantitative Terrain Factors

REFERENCE: Wong, K. W., "Automatic Soil Classification Using Quantitative Terrain Factors," UILU-ENG-77-2014, University of Illinois at Urbana-Champaign, Urbana, Ill., July 1977, 28 pp.

A success rate of 60 to 80% was achieved in identifying the soil parent materials of sample areas from among several highly similar parent materials. Only quantitative terrain factors, which were computed from digital elevation and drainage data, were used for discriminating among the soil parent materials. The results clearly demonstrated that a reliable method of automatic soil mapping is now technically feasible. Nine soil associations from the state of Illinois and one each from the states of Indiana, Nebraska, and Kentucky were used in the study. Eleven commonly used terrain factors were modified for efficient computation using electronic computer, and standard univariate and multivariate analysis techniques were used for testing and classification. Drainage density and surface variance, which is a statistical measure of surface relief, were found to be the most efficient factors for discriminating the soil parent materials. 18 references.

Contribution to the Engineering Soil Classification of Cohesionless Soils

REFERENCE: Al-Hussaini, M. M., "Contribution to the Engineering Soil Classification of Cohesionless Soils," Miscellaneous Paper S-77-21, U.S. Army Corps of Engineers Waterways Experiment Station, Vicksburg, Miss., Nov. 1977, 61 pp.

This report is a state-of-the-art examination of existing soil classification systems with emphasis on classification of cohesionless soils. The purpose of the report is to note and suggest possible improvements to the Unified Soil Classification System currently used by the Corps of Engineers. Characteristics of soil types pertaining to roads and airfields and soil stabilization are also considered. Criteria for differentiating coarse-grained soil groups which have diverse engineering properties, but which are not fully described in other classification systems, are also proposed.

The Effects of Conventional Soil Sampling Methods on the Engineering Properties of Cohesive Soils in Louisiana

REFERENCE: Arman, Ara and McManis, K. L., "The Effects of Conventional Soil Sampling Methods on the Engineering Properties of Cohesive Soils in Louisiana," Engineering Research Bulletin 117, Louisiana State University, Baton Rouge, La., July 1977, 294 pp.

A comprehensive literature study was performed. 1800 samples from six sampling sites representing several typical geologic formations of Louisiana were obtained. About 1700 field and 6500 laboratory tests were performed. Engineering properties of soils studied exhibited inherent variations. Both samples provided specimens with least amount of disturbance. Sampling with small diameter thin wall tests caused serious disturbances. Stress-strain relationship of soils was affected by sample size. Long-term (15 days or longer) storage of samples caused measurable changes in their properties. X-ray analysis of samples showed internal discontinuities and disturbances caused by sampling and handling. 85 references.

In-Situ Stress Measurements, Park River Project, Hartford Connecticut

REFERENCE: Nataraja, Mysore, "In-Situ Stress Measurements, Park River Project, Hartford, Connecticut," Miscellaneous Paper S-77-22, U.S. Army Corps of Engineers Waterways Experiment Station, Vicksburg, Miss., Nov. 1977, 69 pp.

This report presents the test procedure and results of in-situ stress tests performed along the proposed route of the Park River Tunnel, Hartford, Connecticut. The borehole deformation gage overcoring technique was successfully used to depths of 150 ft below ground surface. Modifications of the test procedure and equipment are discussed. The results of these tests are compared with the stresses determined at several other sites in the north-eastern United States. 14 references.

Strength and Deformation Properties of Rock Fill

REFERENCE: Donaghe, R. T. and Cohen, M. W., "Strength and Deformation Properties of Rock Fill," Technical Report S-78-1, U.S. Army Corps of Engineers Waterways Experiment Station, Vicksburg, Miss., Jan. 1978, 98 pp.

During the past 25 years there has been a large increase in the use of rock fill materials for the construction of high dams and embankments. The South Pacific (SPD) Laboratory of the U.S. Army Corps of Engineers has been engaged in developing equipment and methods to determine the strength and deformation properties of such materials since 1953. This report presents summaries of previously published but not generally available reports prepared by the SPD Laboratory dealing with the influence of gradation, confining pressure, relative density, and engineering properties of individual aggregate particles on the consolidated-drained strength and deformation properties of gravelly materials. Also presented in the report are results of additional unpublished laboratory investigations performed on rock fill materials by the SPD Laboratory dealing with the influence of end restraint and particle shape on consolidated-drained characteristics and with the influence of particle size on one-dimensional consolidation characteristics.

Subsurface Exploration in Alluvial Terrain by Surface Geophysical Methods

REFERENCES: Murphy, W. L., "Subsurface Exploration in Alluvial Terrain by Surface Geophysical Methods," Miscellaneous Paper S-77-24, U.S. Army Corps of Engineers Waterways Experiment Station, Vicksburg, Miss., Dec. 1977, 79 pp.

Field tests were conducted at several sites in Louisiana to determine the effectiveness of two geophysical tools for detecting and locating subsurface geological features in alluvial terrain. The hammer seismic refraction technique, using a hammer source and portable seismograph, and the surface electrical resistivity method, using a DC-powered resistivity meter and current source, were investigated. Seismic refraction lines and resistivity soundings and profiles were run concurrently at each site. Boring control was used where available to aid in interpretation of the geophysical data. The resistivity profiling (fixed electrode spacing) technique was the most successful of the three methods, detecting or locating the targeted geologic feature at three of the four sites tested.

Frost Heaving Rate of Silty Soils as a Function of Pore Size Distribution

REFERENCES: Reed, M. A., "Frost Heaving Rate of Silty Soils as a Function of Pore Size Distribution," JHRP-77-15, Joint Highway Research Project, Purdue University, W. Lafayette, Ind., Sept. 1977, 116 pp.

Examines the relation of frost heave to pore size distribution of compacted silty soils, and proposes that frost susceptibility

criteria based upon the distribution of porosity are more logical and versatile than those based upon texture and grain size. Rapid freezing laboratory tests were conducted to evaluate the heaving rate. The soils were compacted at different energy levels and

water contents, and consisted of three different combinations of silt and kaolin. The relation of frost heave to pore size was obtained using the method of linear regression. The prediction equation ultimately selected had an R^2 value of 82%. 54 references.