REVIEWS

The following reviews have been prepared by the Soil Mechanics Information Analysis Center for the U.S. Army Corps of Engineers Waterways Experiment Station in Vicksburg, Miss.

Vane Shear Test

REFERENCE: Poplin, J. K., et al, *Evaluation of the Vane Shear Test in Louisiana,* Engineering Research Bulletin 118, Louisiana State University, Division of Engineering Research, Baton Rouge, December 1978, 213 pages.

An extensive review of literature on field testing indicated that the vane shear test had the greatest potential for measuring in-situ properties of the soft to medium clays prevalent in Louisiana. A Swedish vane borer was used at selected sites throughout the state. In-situ shear strengths measured by the vane shear test were compared with undrained shear strengths determined by laboratory unconfined and triaxial compression tests on samples taken by conventional tube sampling and on a few hand-carved samples. In-situ shear strengths as determined by the vane shear test were from 2.0 to 2.5 times the shear strengths from laboratory tests on tube samples and were more comparable to the shear strengths of hand-carved samples. Miniature vane shear tests on tube samples indicated shear strengths more comparable to laboratory strengths. Sensitivity indicated by in-situ remolding with the vane was greater than sensitivity as determined by triaxial compression tests.

Centrifugal Modeling of Soil Structures

REFERENCE: Morris, D. V., *Centrifugal Modeling of Soil Structures, Part II: The Centrifugal Modeling of Dynamic Soil-Structure Interaction and Earthquake Behavior,* DAERO-76-G-040, U.S. Army European Research Office, London, England, June 1979, 205 pages.

This report shows that dynamic modeling of problems in soil mechanics is possible, and uses that technique for some initial studies of soil-structure dynamic interaction and earthquake motion. The tests that are discussed investigated the rocking behavior of rigid towers instrumented with accelerometers on bases of varying sizes and geometries, resting on a foundation of dry sand. It was possible to measure the natural frequency and damping of the soil-structure system by perturbing such a tower by detonating a small explosive charge on the tower and recording its wind-induced motion. The natural frequency of circular foundations appeared to be satisfactorily predicted by a simple one-degree-of-freedom analysis that used equivalent elastic theory for the rotational foundation stiffness. However, agreement depended on the precise assumptions that were made about the magnitude and distribution of the soil stress (and thus soil modulus) under the foundation.

Erosion of Dispersive Clay

REFERENCE: Perry, E. B., "Susceptibility of Dispersive Clay at Granada Dam, Mississippi, to Piping and Rainfall Erosion," Technical Report GL-79-14, U.S. Army Corps of Engineers, Waterways Experiment Station, Vicksburg, Miss., September 1979, 165 pages.

The past performance of Granada Dam has indicated the occurrence of piping of the embankment and foundation soils through joints of the collector pipe for the toe drainage system (before its replacement with an open paved ditch in 1961). Also, rainfall erosion tunnels developed on the downstream slope of the dam, primarily in the valley section between Sta 105+00 and 145+00, soon after completion of the main embankment in 1949 and have continued to develop at a decreasing rate to the present. Judging from laboratory tests conducted on undisturbed soil samples and reservoir water samples obtained in 1973 and 1976, the embankment soil is nondispersive at the surface and dispersive below a depth of about 2 m (6 ft.). Limited data obtained below the embankment indicate the foundation soil is dispersive at the surface and nondispersive to dispersive with depth.

Cemented Rockfill Testing

REFERENCE: Gouano, L. F., Kirkby, R. W., and Dight, P. M., "Triaxial Testing of Cemented Rockfill," Technical Report 72, Division of Applied Geomechanics, Commonwealth Scientific and Industrial Research Organization, Syndal, Australia, 1978, 60 pages.

A series of triaxial tests was carried out on laboratory samples formed from the basic raw materials that are used to produce cemented rockfill for the 1100 orebody at Mount Isa Mine, Queensland. The modeling approach, testing techniques, and test results are presented. The test results are related to the various fill structures found in situ and possible remedies for improving the mechanical properties of the fill are indicated. Results indicate that cemented rockfill is a complex material that has creep-dependent properties.

Foundation Design for Expansive Soils

REFERENCE: Johnson, L. D., "Overview for Design of Foundations on Expansive Soils," Miscellaneous Paper GL-79-21, U.S. Army Corps of Engineers, Waterways Experiment Station, Vicksburg, Miss., September 1979, 108 pages.

This paper provides background information for establishing the preliminary design of structures in swelling soil areas, based on field studies conducted by the Waterways Experiment Station and the experiences of numerous investigators. It includes analyses of site and soil investigations; topography and landscaping, including drainage and soil stabilization techniques; and selection of the foundation and superstructure. General suggestions for remedial repair of existing structures are also provided. Analyses of the movement of cast-in-place concrete piers in swelling soil are included to provide a basis for design of these foundations.

REVIEWS

Levee Restoration

REFERENCE: Townsend, F. C., "Use of Lime in Levee Restoration," Technical Report GL-79-12, U.S. Army Corps of Engineers, Waterways Experiment Station, Vicksburg, Miss., September 1979, 102 pages.

This report evaluates the feasibility of lime treatment as an alternative design and remedial method for restoration of shallow surface slides, and furnishes criteria for mix design, design parameters, and construction procedures. The lime treatment susceptibility of four typical levee slide clays in the lower Mississippi Valley Division was evaluated by mix design procedures that included the use of pH tests and evaluation of the effects of normal and accelerated (105°F) curing times, immersion, variations in density and water content, and compaction delay on unconfined compression test strengths. Test results showed that all the soils were beneficially modified by the addition of 4% lime (pH percentage); three of the four soils achieved sufficient strength to be judged reactive to lime stabilization.

Expansive Soils in Highway Subgrades

REFERENCE: Snethen, D. R., "Technical Guidelines for Expansive Soils in Highway Subgrades," FHWA-RD-79-51, prepared for the U.S. Dept. of Transportation, Office of Research and Development, Federal Highway Administration, by the U.S. Army Corps of Engineers, Waterways Experiment Station, Vicksburg, Miss., June 1979, 168 pages.

These guidelines describe research on minimization of damage to pavements on expansive soils and present results that should be implemented. Technical guidelines are presented for the location of potentially expansive soil areas using occurrence and distribution maps, as well as alternative sources of information; field exploration and sampling of expansive soils; identification and classification of potentially expansive soils by using index and soil suction properties; testing of expansive soils and prediction of anticipated volume change; selection of appropriate treatment alternatives; and presentation of design, construction, and maintenance recommendations for new and existing highways.