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DISCUSSION

Proc. Paper 9002

INFORMATION RETRIEVAL

The key words, abstract, and reference "cards" for each article in this Journal represent part of the ASCE participation in the EJC information retrieval plan. The retrieval data are placed herein so that each can be cut out, placed on a 3 x 5 card and given an accession number for the user's file. The accession number is then entered on key word cards so that the user can subsequently match key words to choose the articles he wishes. Details of this program were given in an August, 1962 article in CIVIL ENGINEERING, reprints of which are available on request to ASCE headquarters.

9016 STRESSES AND MOVEMENTS IN OROVILLE DAM

KEY WORDS: **Cracking (fracturing); Dams; Dams (earth);** Displacement; **Embankments; Finite element method; Instrumentation;** Loading; **Soil mechanics;** Stress strain diagrams

ABSTRACT: Oroville Dam, presently the world's highest embankment dam, was well-instrumented with several types of instrumentation to monitor its construction behavior. The results obtained from the instrumentation clearly indicated that the embankment performed very well with only small amounts of movement. However, the embankment core block did not perform satisfactorily and cracked during construction. The results of a finite element analysis, modeling the construction sequence and the nonlinear, stress-dependent material properties of the embankment soils, are presented and compared with the instrumentation results. The results of this analysis agreed well with the instrumentation results and showed that: (1) The small movements are attributable to the excellent stress-strain characteristics of the embankment soils; (2) significant load transfer occurred from the core to the adjacent coarse zones; and (3) the core block cracking could have been anticipated if these results had been available during the early design stages.

REFERENCE: Kulhawy, Fred H., and Duncan, James M., "Stresses and Movements in Oroville Dam," *Journal of the Soil Mechanics and Foundations Division*, ASCE, Vol. 98, No. SM7, **Proc. Paper 9016**, July, 1972, pp. 653-665

9006 SHEAR MODULUS AND DAMPING: EQUATIONS AND CURVES

KEY WORDS: **Analysis;** Clays; **Damping; Design data; Earthquakes;** Laboratory equipment; **Repeated loading;** Sands; **Shear modulus;** Shear tests; Silts; **Soils; Stress-strain curves;** Torsion shear tests; Undisturbed samples; **Vibration**

ABSTRACT: Equations and graphs for the determination of shear modulus and damping of soils, for use in design problems involving repeated loading or vibration of soils, are presented. These equations and graphs are based on numerous laboratory tests on both remolded and undisturbed cohesive soils and on clean sands. Comparison of the measured and computed values shows good agreement. An example problem showing how these equations and curves are used is given.

REFERENCE: Hardin, Bobby O., and Drnevich, Vincent P., "Shear Modulus and Damping in Soils: Design Equations and Curves," *Journal of the Soil Mechanics and Foundations Division*, ASCE, Vol. 98, No. SM7, **Proc. Paper 9006**, July, 1972, pp. 667-692

9030 CONSOLIDATION OF LAYER UNDER STRIP LOAD

KEY WORDS: **Anisotropy; Consolidation;** Drainage; Finite element method; Footings; **Settlement (structural); Soil mechanics; Time**

ABSTRACT: A previously described finite element program is used to solve for the consolidation behavior of an elastic soil under strip loading. A parametric study is made of the effects of loading geometry, drainage, and material constants. The results indicate that the ratio of half width of load to depth of soil for drainage at the top (a/H) has little effect when a/H is greater than 1 and that there is some acceleration of settlement when a/H is smaller. Poisson's ratio of the soil has very little effect. The anisotropic permeability has the largest effect, and its influence is described in two charts. With these provisions, one-dimensional theory can be used in many cases.

REFERENCE: Christian, John T., Boehmer, Jan Willem, and Martin, Philippe P., "Consolidation of a Layer Under a Strip Load," *Journal of the Soil Mechanics and Foundations Division*, ASCE, Vol. 98, No. SM7, **Proc. Paper 9030**, July, 1972, pp. 693-707