Proceedings of the

SYMPOSIUM ON RECENT ADVANCES IN GEOTECHNICAL CENTRIFUGE MODELING

A symposium on Recent Advances in Geotechnical Centrifuge Modeling was held on July 18-20, 1984 at the University of California at Davis. The symposium was sponsored by the National Science Foundation's Geotechnical Engineering Program and the Center for Geotechnical Modeling at the University of California at Davis.

The symposium offered an opportunity for a meeting of the International Committee on Centrifuges of the International Society for Soil Mechanics and Foundation Engineering. The U.S. participants also met to discuss the advancement of the centrifuge modeling technique in the U.S. A request is being transmitted to the American Society of Civil Engineers to establish a subcommittee on centrifuges within the Geotechnical Engineering Division.

Abstract:

Unexpected Scaling Effects in Flow Through
Centrifugal Models of Permeable Soils

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Experimental verification of modelling laws governing flow of water through centrifuge models of permeable soils is not common in research literature. This article examines three studies of flow through centrifuge models of embankment dams in which the shapes of the observed phreatic surfaces were not as expected, and may be indicating scaling effects. In one instance, a change in phreatic surface was associated with a change in flow regime from laminar to transitional at high accelerations. In the other two cases, migration of fines and their accumulation downstream in the embankment appeared to have been responsible for distortion in the laminar flow phreatic surfaces; there is speculation that this also may be a result of a scaling effect.

For both behaviours, the scaling effects will be functions of particle size distribution, hydraulic gradient and centrifugal acceleration. These may offer the reduced scale modeller opportunities to observe flow behaviour which normally is very difficult to model at 1g. Alternatively, they may be important scaling effects to avoid, and may cause restrictions on the smallest model scale that may be selected while still ensuring hydraulic similitude in model and prototype. Verification of the absence or presence of these effects is an important preliminary step in models with high rates of through flow.