Kerkes, D. J., **"Analysis and Prediction of Stresses and Pore Pressures Associated with Wet Core Construction for Embankment Dams,"** a thesis submitted to the faculty of the Graduate School of the University of Colorado in partial fulfillment of the requirements for the degree of Doctor of Philosophy, May 1990

Thesis directed by Professor Robert L. Schiffman

ABSTRACT

The wet core construction method has been successfully applied to embankment dams in parts of the world that experience high annual rainfall, where the natural moisture content of core zone construction material is so far above optimum as to render fill placement to conventionally accepted standards infeasible. While the method has definite advantages in terms of construction cost and schedule, a significant disadvantage is associated with the high pore pressures that develop during construction. This study examines the factors governing pore pressure generation, as well as those affecting the distribution of stresses within the embankment. The primary purpose of the investigation was to develop a simple analytical model that could be used for routine design purposes to estimate the pore pressures that develop during construction in the core of a zoned embankment. Field data from a 394 feet (120 meter) high wet core dam constructed in Indonesia was used to validate the model. The secondary objective was to study the instrumentation data obtained from total stress cells, piezometers and settlement devices, in an effort to better understand the internal stress distribution, pore pressures and consolidation that occur in a zoned embankment with a wet core.

The investigation yielded a relatively straightforward analytical model for estimating pore pressures in the core of a zoned embankment that can be executed using a desk top personal computer and commercially available spreadsheet software. The primary components of the model consist of (1) an approximate method for estimating the stresses within the core, (2) an algorithm for computing the pore pressures generated in the core, which considers the effect of partial saturation, and (3) a two-dimensional finite difference solution for the uncoupled multi-dimensional consolidation theory of Terzaghi-Rendulic to account for pore pressure dissipation during construction. The model can be adapted to virtually any core zone geometry, simulates the advancing fill by providing for a moving upper boundary that can be controlled to approximate the actual construction sequence, and permits pore pressures along the upstream boundary to be varied to model reservoir impoundment. The solution algorithms for the model are presented in detail.

CONTENTS

APPENDIX

TABLES

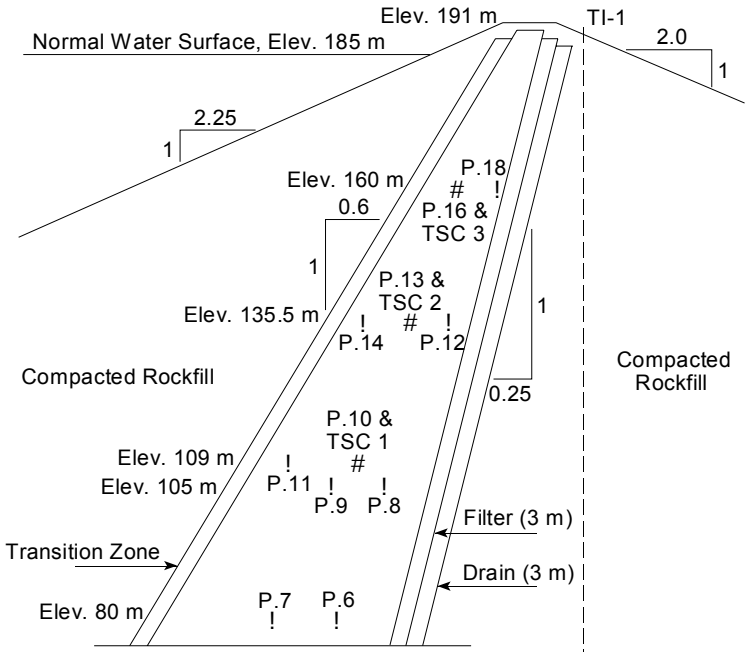
Table

FIGURES

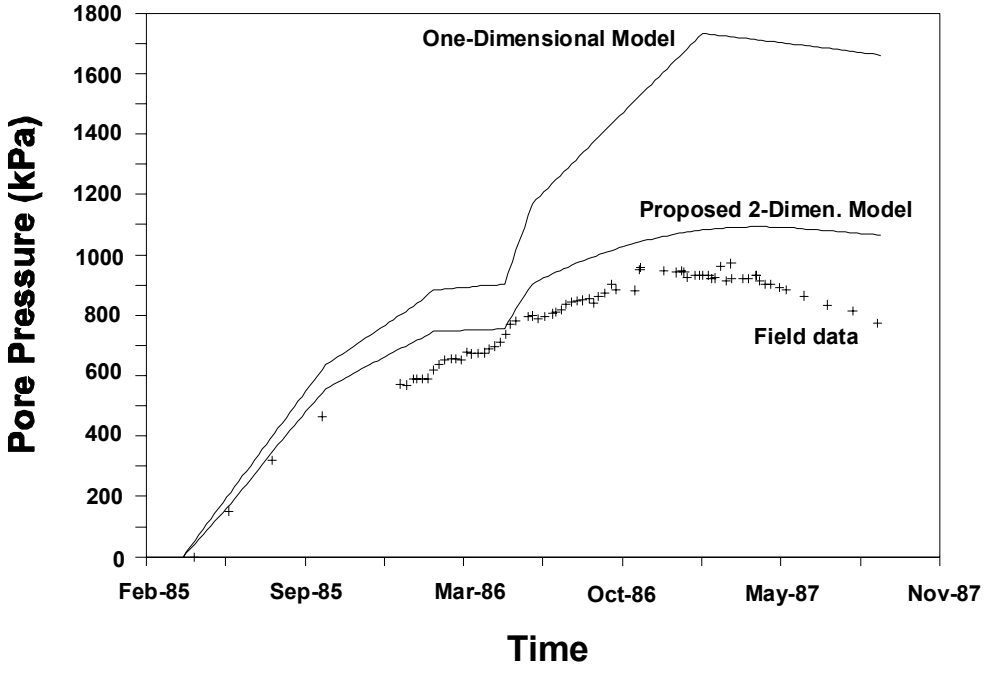
Figure

Figure

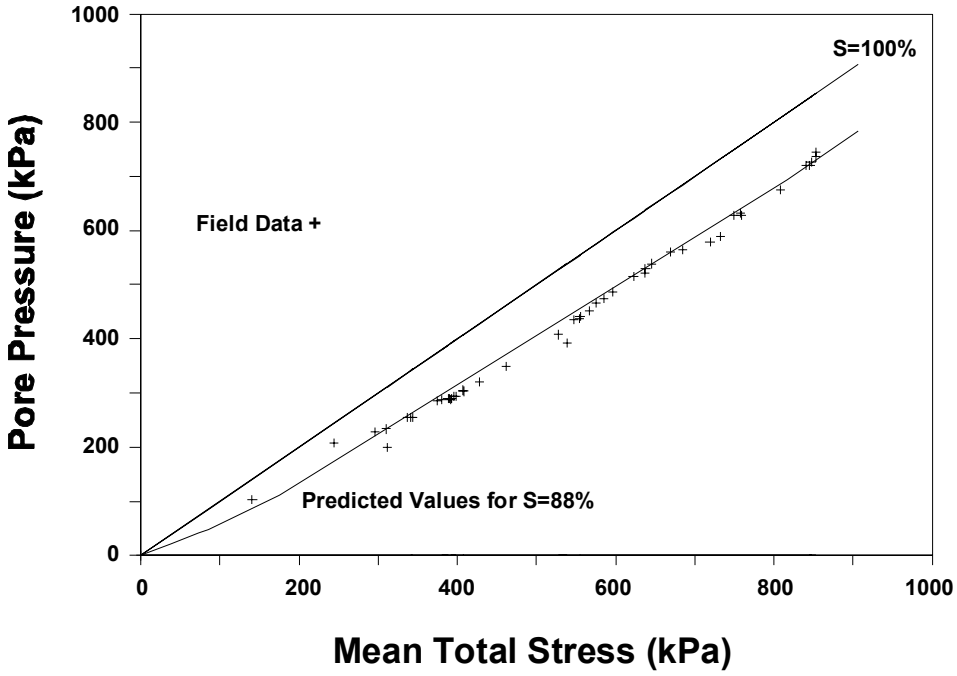
Figure



Location of piezometers (P) and total stress cells (TSC) at the maximum section of Wadaslintang Dam. [*Fig. 4.2*]



Comparison between observed and predicted pore pressures at P.6 [*Fig. 9.1*]



Pore pressure response vs mean total stress at TSC 1 & P.10 [*Fig 10.2 - corrected*]
Predicted values for S=88% developed using Hilf's Method.