Mongkol Katapant : Application of Fracture Mechanics Theory and the Finite Element Method to Study Crack Propagation in the Material. Thesis Advisors : Dr.Siripong Hungspreug, Assist. Prof.Dr.Thanu Chouychai, 1989.

This study is aimed to apply the fracture mechanics theory to investigate crack propagation through the use of the finite element method. The direction of crack propagation and the factor of safety of the material are,thus,determined. ⌐ The study assumes that the stress and strain behaviour of the material is linear. The typical case study adopted in this study is to study the behaviour of crack propagation in the earthfilled dam.

The study methodology consists of the modelling of the earthfilled dam, the modification of the finite element programme to accomodate the application of fracture mechanics theory. The material data was input in order to analyze for the coefficient of fracture(K_1) which was later compared with the critical value(K_{1c}) obtained from the test results in the laboratory. The crack was, then, considered for opening. The result of the study revealed that cracks occurred immediately after the completion of construction at the downstream toe of the dam body. These cracks became closed after the impounding of the reservoir. Additional new cracks reappeared at the upstream toe of the dam at about one-third of the dam height. These cracks are likely to result in the sliding of the dam body and lead to failure. Also, the study indicated that the factor of safety of dam against cracking is 0.60 which is not safe. This may be remedied by the improvement of the soil characteristics or the modification of the shape of the dam body.

The results of the study can lead to further investigation of crack propagation in other areas particularly for brittle materials. This may help the engineer to improve the design accordingly.