

Thesis Title

Consolidation of Layered Soils Under Cyclic Loading

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Abstract

The purpose of this research is to study methods of analyzing rate of consolidation of layered soils under cyclic loadings. Consolidation problems of two-layered elastic soils having stratum thickness ratios 0.1, 0.2, 0.5 and 1.0, coefficient of consolidation ratios 0.1, 1.0 and 10.0, and coefficient of permeability ratios 0.01, 1.00 and 100.00, two-way drainage, under square cyclic loading which has equal loading and unloading periods equivalent to time factor $TL = 0.00125, 0.06250, 0.25000, 1.0000$ and ∞ respectively, were analyzed by closed form solution, Lee, I.K. explicit finite difference method, Schiffman, R.L. and Arya, S.K. implicit finite difference method and Abbott, M.B. implicit finite difference method.

Comparison of the results from the three numerical methods used indicate that Schiffman, R.L. and Arya, S.K. implicit finite difference method is the most accurate method and can be applied to elastic overconsolidated soils under very slow ($TL = 1.00000$), slow ($TL = 0.25000$) and rapid ($TL = 0.06250$) cyclic loadings except very rapid ($TL = 0.00125$) cyclic loading when using 80 finite difference mesh along the depth axis with maximum ratio of time factor increment to square of depth increment not exceed $\frac{1}{6}$. The average steady state percent consolidation under cyclic loading during loading period is not less than 50% and the average steady state percent consolidation under cyclic loading during unloading period is not greater than 50%.