CHAPTER V.

CONCLUSIONS AND RECOMMENDATIONS

Herein have been developed a nonlinear finite element program and the associated computational methods for an analysis of pile-group settlements. The formulation of this program is based on the work of Monkar (10), using the isoparametric finite element discretization, element matrices for three dimensional isoparametric hexahedral analysis are obtained.

Two representative examples, namely, large deflection of a cantiliver beam under uniformly distributed static load and the settlement of uniform soil mass under strip loading, were carried out to perform program verification and to investigate the convergence and accuracy of the developed program. It has been confirmed by both problems that the proposed program is utmostly reliable.

In the application of the proposed method to practical problem, the settlement behavior of square-configuration pile groups has been investigated and it is shown that the pile-group settlements predicted by this method are in reasonable agreement with the results obtained by Poulos's method. To verify the efficiency of the proposed method, the settlements of a highrise building in Bangkok have been analysed. It is obvious that the predicted settlements are in good agreement with the field measurements and the results obtained by

Poulos's method. However, it should be noted that the accuracy of the proposed method depends mainly on three features, first, the mesh of the model should be sufficiently refined, second, the parameters used should be accurate and suitable. Third, the safety factor of loading capacity of considered pile-group should be more than two, otherwise, the soil failure may occur and the slip will be developed. For general pile foundation, the first and the second feature can be determined approximately by analysing the single-pile problem. If the single-pile settlement is in agreement with the settlement measured from pile load test or that predicted by Poulos's method, then the model and parameters used for analysing single-pile problem will be sufficiently accurate for analysing pile-group problem as well.

Although the developed program, with three dimensional analysis, involves the least amount of simplification, it also the most expensive one to run and the most complex one to set up. For axially loaded pile groups with small settlements ,i.e., less than ten centimeters, the solutions performed by nonliner analysis are very close to those performed by linear analysis. Therefore, it should be concluded that linear analysis is sufficiently accurate for this case.

The proposed method has been proved to be effective for the settlement analysis of driven pile groups in which the pile tip does not pass through the first sand layer. Thus, it is necessary to further investigate the settlements of bored pile groups embedded within the first and the second sand layer. It is also necessary to obtain further experience with the load capacity and load distribution of pile groups.