SYNOPSIS

Although the concept of reinforcing soil exists from the Biblical times the first commercial use of Reinforced Earth was developed by Vidal, a French Engineer about seventeen years ago. The concept gained so much popularity that in less than two decades several thousands of reinforced earth structures have been built throughout the world. While the majority of these structures are retaining structures, use of this technique has been gaining momentum for use in other areas too.

Many investigators have reported improvement in bearing capacity and settlement characteristics of sand subgrades under footing foundations when horizontal reinforcing elements/members are placed in the subgrade. Metallic and non-metallic, rectangular and circular reinforcing elements have been used for the improvement. However, the greatest disadvantage with horizontal reinforcement is that it cannot be used in in-situ conditions. The subgrade under the footing has to be relaid and compaction of the layer becomes essential after placing the reinforcing elements.

If inclined or vertical reinforcements are effective, they can be installed more easily in new constructions and used for strengthening existing foundations as well. The present investigation has, therefore, been directed towards evaluating the efficiency of vertical reinforcing elements in improving sand

subgrades. Load tests on footings of different sizes have been conducted on sand subgrades reinforced with vertical reinforcing rods. Length, extent, spacing, surface characteristics and flexibility of the reinforcing elements have been selected as the variables in this investigation.

Evaluation of ultimate loads from test data has been carried out according to the method suggested by De Beer (20) and used by Vesic (91) since it has been found to be most suitable as a definite point of failure is obtained. The study shows the beneficial effect of using vertical reinforcing rods for sand subgrades. The improvement in bearing capacity compares favourably with the results obtained by investigators using a horizontal form of reinforcement. However, the greatest advantage of this method is that relaying of the subgrade is not required and the method can be utilised for improving the existing foundations, too.

The investigation has shown that for a given spacing of reinforcements (density), the bearing capacity is a function of the diameter and roughness of the reinforcements. It is observed that flexible reinforcements with a length of one and a half times the width of the footing for an extent of twice the width of the footing on either side with a spacing of six diameters can be used to derive a substantial improvement.

Introduction of the subject of investigation is given in Chapter-I. A general review of literature pertaining to Bearing Capacity and settlement behaviour of footing foundations

and detailed review of earlier investigations on footings on reinforced sand subgrades are included in Chapter-II. Chapter-III contains scope of the present investigation and details of tests carried out and the results obtained have been presented in Chapter-IV. Proposed stability analysis and procedure for settlement computation are given in Chapter-V. Chapter-VI presents analysis and discussion of results and evaluation of different models. A set of conclusions from the present investigation are given in Chapter-VII. Soil properties, instrumentation details and references cited in the thesis are given in Appendices at the end.