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STUDY OF THE BEHAVIOUR OF FOOTINGS IN EXTENDED SWELLING SOILS.

M.Sc. THESIS

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ABSTRACT

Foundations in swelling clays are frequently subjected to severe movements as a result of moisture changes within the clay formations, these movements cause destruction of structures.

Numerous remedies for foundations and soils have been developed, but till now, they do not provide the complete success. The treatment of this problem by using a sand cushion beneath the footing is one of these remedies, which, may control and overcome the problem.

This investigation aims at studying the behaviour of isolated footings when they are directly placed on such soils, and when using a sand cushion beneath the isolated footing. The goal isto provide the engineer ability to deal with the swelling soils with suitable dimensions for the isolated footing and the cushion for minimizing the upheaval resulting from the swelling soil.

Some experimental work was carried out on the swelling clay samples for measuring their swelling pressure and understanding the nature of the problem.

The finite element technique was used for simulating the problem, the concrete is used for simulating the isolated footing, a sandy soil was used as a cushion beneath the footing, and spring support is used as a boundary element for simulating the swelling soil. A computer software program (SAP90) is used for three-dimensional analysis of the problem.

Some factors affecting the upheaval resulting from swelling are studied, these factors are the dimensions of the footing and the sand cushion, and the loads acting on the footing. In some cases of study, the clay surface around the footing is absolutely free from any surcharge, while in other cases it is loaded by uniformly distributed surcharge pressure around the footing. The study extends to study the heaving of the clay soil around the footing and comparing between both the heaving of soil and the cushion.

The results of these investigation showed that a great benefit when using the sand cushion beneath the footing, however such arrangement reduces the harmful effect of the swelling clay.

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