

Laboratory and field studies of response of structures to heave of expansive clay

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Abstract: Laboratory and field studies are presented concerning the interaction that takes place between expansive soils and structures. A model floating slab and fixed slab were constructed on a highly expansive soil contained in a stainless steel box, which was also used to obtain large, undisturbed soil samples and used as a part of the laboratory experiment. A controlled heave test was conducted to investigate the effect of heave rate on swelling pressure. In the field, an instrumented, reinforced concrete structure and an in situ test were carried out to investigate heave movement, structure - expansive soil interaction and structural damage, while the ground was artificially wetted through vertical sand drains. The field and laboratory tests were compared with the results of the conventional oedometer test. The swelling pressure obtained from the constant volume test, in which the volume of the specimen was kept constant throughout the test, almost coincides with the average pressure predicted from the braced fixed slab test. A major reduction in swelling pressure takes place if the expansion is not completely restrained, as revealed from both the unbraced fixed slab and the instrumented field tests. The presence of non-uniform fissures in clay could lead to a differential heave and a reduction in swelling pressures.