



شبكة المعلومات الجامعية

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ





شبكة المعلومات الجامعية



شبكة المعلومات الجامعية

التوثيق الالكتروني والميكرو فيلم

جامعة عين شمس

التوثيق الالكتروني والميكرو فيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأفلام قد اعدت دون أية تغيرات



يجب أن

تحفظ هذه الأفلام بعيداً عن الغبار

في درجة حرارة من 15 – 20 مئوية ورطوبة نسبية من 20-40 %

To be kept away from dust in dry cool place of
15 – 25c and relative humidity 20-40 %



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بعض الوثائق الأصلية تالفة



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بالرسالة صفحات
لم ترد بالأصل

Analysis and Prediction of Heave Behaviour for Treated and Non Treated Expansive Soils

By
Eng. Azza Anwar Ismail
B.Sc. in Civil Engineering
M.Sc. in Civil Engineering

A Thesis Submitted to the Faculty of Engineering, Cairo University in
Partial Fulfillment of the Requirement for the Degree of

DOCTOR OF PHILOSOPHY

In
CIVIL ENGINEERING

Under the supervision of

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FACULTY OF ENGINEERING, CAIRO UNIVERSITY

GIZA, EGYPT

1999

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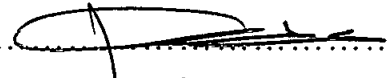
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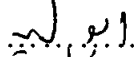
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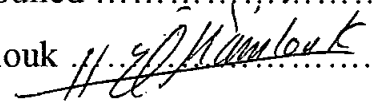
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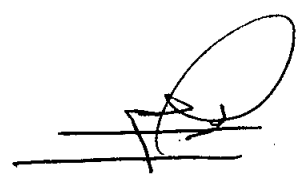
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FACULTY OF ENGINEERING, CAIRO UNIVERSITY
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To

**My husband and children who
suffered a lot during this work**

**To my father and my sister who
are backing me all the time**

Acknowledgment

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Abstract

Expansive soil is considered a worldwide problem that causes extensive damage to civil engineering structures. The problems with foundations on expansive soils have included heaving, cracking and breakup of pavements, building foundations, slab on grade members, channel and reservoir linings.

This research work aims at studying the effect of soil treatment on heave reduction of expansive silty clay soil at three different cases of initial water contents and dry densities. Two treatment methods of expansive soil were studied by adding sand homogeneously or as a separate top cushion.

Laboratory tests in the form of Atterberg limits, grain size analysis, specific gravity, Free swell, swelling pressure and heave measurements were carried out for natural soil and for three mixtures of soil with sand. Each of the natural compacted soil and the three soil-sand mixtures were prepared at three different water contents. Model experiments were done for only natural compacted soil. The model was designed and constructed for measuring the value of maximum heave. At different percentages of loading area ratios, water content percentages and sand cushion thicknesses, model specimens were prepared. The specimens were also statically compacted by 200 ton Newton compression machine.

Results revealed that treatment the silty clay expansive soil by adding sand homogeneously or using it as a top cushion were resulted in decrease in heave values. However, adding the sand in a homogeneous manner, though more effective, is definitely more expensive and time consuming. The other treatment method of using top sand cushion, is definitely easier and more economic. An equation is formulated to predict the most suitable thickness of top sand cushion to minimize the heave of the expansive soil at different loading area ratios and different initial water contents.

