UNIVERSITI PUTRA MALAYSIA

ASSESSMENT OF AN ACRYLIC POLYMER ON THE PROPERTIES OF SOIL-CEMENT

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ASSESSMENT OF AN ACRYLIC POLYMER ON THE PROPERTIES OF SOIL - CEMENT

By

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Faculty: Engineering

The aim of this study is to compare the performance of Soil Cement with a manufactured polymer in order to examine the physical properties of the stabilized material. The study determine strength, durability, chemical analysis, mineralogical study, microstructural investigation and, computer modeling, CHEVPC.

The laterite soil named Serdang series was used as a fundamental control material for this study. Normal Portland cement and polymer were used as stabilizing agents. Analysis of Variance (ANOVA) design and Tukey test were used for the unconfined compression strength data between the curing periods and between cement and polymer content. The study showed significant difference ($p < 0.05$) in the amount for 8% cement with 10% polymer (SCP810) between the curing periods, between cement content; and between polymer content .

Unconfined compressive strength of SCP810 achieved more than 2.9 MN/m^2 (JKR, 1985) and the durability of wet-dry test shows that the weight loss of SCP810 is 12.9% against 14% of the ACI (1990) as the requirement for the road base material.

Mineralogical study in X-Ray Diffraction (XRD) showed an increase in relative intensity of the coarse grain mineral, Quartz mineral, with addition of the polymer. This findings were confirmed by the micrographs Scanning Electron Microscopy (SEM).

Finally, Layered Elastic computer programme, CHEVPC was used to identify the strain criteria of pavement upon the imposed traffic loading. Then, the strain criteria were used to model the Fatigue Models. The following two models were formulated:

- one in terms of unpaved road for the low and light traffic volume and,
- the other in terms of paved road with different thicknesses of asphalt layer and the upper bound and lower bound of soil cement materials.

The study indicates that the unpaved road is suitable for low and light traffic and the paved road can be constructed as the common road especially in tropical country for example, in Malaysia.

Abstrak tesis dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk Ijazah Master Sains

PENILAIAN POLIMER AKRILIK TERHADAP SIFAT-SIFAT SIMEN-TANAH

Oleh

WONG KHIEN NGIE

OGOS 2003

Pengerusi: **Azlan Bin Abdul Aziz.**

Fakulti: **Kejuruteraan**

Kajian ini bertujuan untuk menilai keberkesanan simen tanah dengan polimer pembuatan bagi menguji sifat-sifat fizikal untuk kestabilan bahan tersebut. Kajian ini termasuk kekuatan, ketahanlasakan, analisis kimia, kajian mineralogi, kajian mikro struktur dan, pemodelan komputer, CHEVPC

Tanah laterit yang bernama Siri Serdang digunakan sebagai bahan kawalan asas untuk kajian ini. Simen Portland biasa dan polimer pembuatan digunakan sebagai agen penstabilan. Rekabentuk Varians (ANOVA) dan ujian Tukey digunakan untuk memproses kekuatan mampatan tak terkurung data dari segi tempoh awetan dan kandungan simen dan polimer pembuatan. Kajian menunjukkan bahawa terdapat kesan yang berbeza bagi komposisi 8% simen dengan 10% polimer (SCP810) samada dari segi tempoh awetan, kandungan simen, kandungan polimer ($p < 0.05$).

Kekuatan mampatan tak terkurung bagi SCP810 telah mencapai keputusan melebihi 2.9 MN/m^2 (JKR, 1985) dan ketahanlasakan (ujian basah-kering) bagi SCP810 telah mencapai 12.9% kehilangan berat kurang daripada 14% (ACI, 1990) yang merupakan syarat keperluan bagi bahan asas jalan.

Kajian mineralogi melalui Belauan Sinar-X (XRD) menunjukkan penambahan dalam keamatan relatif bagi mineral saiz besar, mineral Quartz dengan lebihan polimer. Keputusan ini disokong oleh mikrograf mikroskop elektron imbasan (SEM).

Akhirnya, program komputer CHEVPC pula digunakan untuk mengenalpastikan kriteria tegasan bagi turapan semasa dikenakan beban trafik. Kriteria tersebut digunakan pula untuk mengaplikasikan model-model lesu. Terdapat 2 model yang diformulakan seperti berikut:

- satu dalam keadaan tanpa turapan jalan untuk kegunaan isipadu trafik yang rendah dan ringan dan,
- satu lagi berkeadaan turapan jalan dengan ketebalan lapisan asphalt yang berlainan dengan kekuatan bahan tanah simen di bahagian atas and bahagian bawah.

Kajian ini mendapati jalan tanpa turapan lebih sesuai untuk keadaan trafik yang rendah dan ringan. Manakala, jalan turapan boleh dibina sebagai jalan biasa, terutamanya di negara tropikal seperti Malaysia.

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I certify that an Examination Committee met on 26th June 2003 to conduct the final examination of Wong Khien Ngie on his Master of Science thesis entitled "Assessment of an Acrylic Polymer on the Properties of Soil-Cement" in accordance with Universiti Pertanian Malaysia (Higher Degree) Act 1980 and Universiti Pertanian Malaysia (Higher Degree) Regulations 1981. The Committee recommends that the candidate be awarded the relevant degree. Members of the Examination Committee are as follows:

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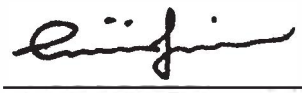

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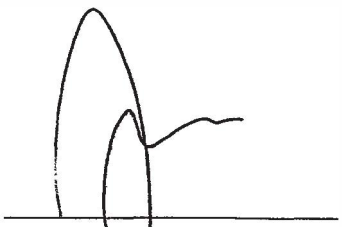
DECLARATION

I hearby declare that the thesis is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at UPM or other institutions.



(WONG KHIEN NGIE)

Date: 25.8.2003

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