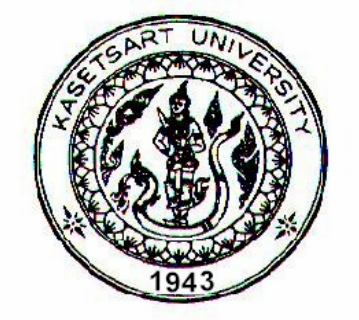

THESIS

STABILIZATION OF DREDGED SLUDGE
AS CONSTRUCTION MATERIALS

AUKSORNPET SUKSIRITAWONKUL

GRAUDATE SCHOOL, KASETSART UNIVERSITY
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THESIS

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AUKSORNPET SUKSIRITAWONKUL

A Thesis Submitted in Partial Fulfillment of
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Auksornpet Suksiritawonkul 2007: Stabilization of Dredged Sludge as Construction Materials. Master of Engineering (Civil Engineering), Major Field: Civil Engineering, Department of Civil Engineering.
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This research attempts to improve the properties of dredged sludge having high water content at about 200-300%. Dredged sludge was taken from the second navigation channel for access to Bangkok Port Project, Samut Prakarn Province. Technical concept of improvement using combination techniques of physical modification via simple preloading and chemical stabilization via cement mixing method has been proposed. Based on the preloading using relatively low pressure (0.05 – 0.30 kg/cm^2), surplus water was squeezed out of the dredged sludge. It was found that the most suitable ranges of water content are 140 – 180 % prior to chemical stabilization and in preliminary test on stabilization of the dredged sludge with various cement contents and initial water content, it was found that the ratio of water content after mixing and percentage of weight of cement to dry weight of soil (C_w/A_w) within the range of 2.75 – 3.02 provides homogeneous mixtures with good workability.

Samples of soil cement were prepared based on the standard of JSF T821-2000 ASTM D1883 for California Bearing Ratio (CBR) test. Unconfined compressive strength tests were performed after curing time of 3, 7, 14 and 28 days and CBR test was performed after curing time of 7, 14 and 28 days for both unsoaked and soaked conditions. In addition, elucidation on strength development and correlation of reaction products to strength of the stabilization soils were investigated by XRD analysis and changes on microstructures of the stabilized soils observations by the Scanning Electron Microscope (SEM).

Experimental results showed that strengths of soil cement was significantly increased when mixed with cement and fine sand. The successful approach was to partially mix dredged sludge with some amount of fine sand (approximately 20 - 40 % by dry weight). Strength could be improved 10 – 30 % when compared with dredged sludge having no sand replacement and the slight reduction on strength and CBR due to soaking condition, approximately 8 -10 %, could be observed. For a successful mix proportion of initial water content of 160 % and 200 kg/m^3 cement, a 7-days soaked strength of 7.94 ksc and a 14-days soaked CBR of 30.86 % were obtained. The improved properties agreed with technical requirements as recommended by the Department of Highway, Thailand and therefore showed potential for use as subbase materials for road.

Based on XRD analysis investigated, strength was directly proportional to amounts of the major hydration products such CSH and Ettringite. Moreover, based on observations by SEM, Ettringite plays important role in stabilizing soil having high moisture content since growth of their crystals reduced pore spaces between soil particles, contributing to higher strength.

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Student's signature Thesis Advisor's signature

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