DISSERTATION INFORMATION

INTRODUCTION

Ph.D. candidate:	**LUONG THI BICH**
Dissertation title:	**INVESTIGATION OF PERMEABILITY OF SOILCRETE IN THE LABORATORY**
Major:	**Transportation Construction Engineering**
Major code:	**9580205**
Advisor:	**Assoc. Prof. Dr. Tran Nguyen Hoang Hung**
University:	**Ho Chi Minh City University of Technology, VNU-HCM**

ABSTRACT

The in-situ soils mixed with cement (soilcrete) technology (SCM) has been applied for seepage cutoff purposes such as impermeable cores for embankments, dams, containment walls, or leakage prevention for contamination. The hydraulic conductivity of soilcrete (k_s) is an important property to evaluate the effect of the soilcrete in these applications. However, some researches of authors in the world on the soilcrete permeability remains inconsistent. In Vietnam, the soilcrete hydraulic conductivity remains difficult to determine. It has not been studied thoroughly and full aspects yet. This study aims a better understanding of the soilcrete permeability behaviors made from some typical soils in the Mekong delta mixing with cement in the laboratory. The flexible wall permeameters were manufactured according to the ASTM D5084 standard to conduct the permeability tests of the soilcrete. Several typical soil types in the Mekong delta such as soft clay, medium clay, medium stiff clay, and dredging sand were taken in Dong Thap and Hau Giang provinces for this study. About 100 soilcrete specimens were created from the soil types mixing with three types of cement including the Ordinary portland cement (OPC40), Portland cement blended (PCB40), and Portland cement slag (PCS) at various contents of 200, 250, 300, 350, 400 kg/m^3, respectively. For dredging sand mixed with the PCB40 at a content of 300 kg/m^3 was additional mixed with bentonite at some contents of 15, 25, 50, 75, and 100 kg/m^3, respectively. The soilcrete specimens were tested the unconfined compressive strength (UCS), the permeability, and the microstructure. The UCS tests were carried out according to the ASTM D2166 standard. The permeability tests were performed by the falling head -

constant tailwater method or falling head - rising tailwater method. The soilcrete microstructure was investigated by a combination of scanning electron microscope (SEM), X-ray powder diffractometer (XRD), and energy-dispersive X-ray spectroscopy (EDS) methods. The results show that: (1) the k_s of the soilcrete made from cement - mixed soft clay was lower 100 times than that of the unmixed soft clay; (2) the k_s of the sand soilcrete decreased 1000 times in comparison with the compacted sand sample; (3) the k_s of soilcrete reduced with increasing in cement contents and in curing time; (6) bentonite reduced the k_s of sand soilcrete. However, when bentonite content exceeded an optimum value, the k_s of bentonite soilcrete increased slightly with bentonite content; (7) the k_s of soilcrete made from the PCS cement was lower than those made from the OPC and PCB cement; (8) the k_s of soilcrete was independent on hydraulic gradient; (9) the more soilcrete strength increases, the more hydraulic conductivity decreases; (10) the k_s of soilcrete was lower than 10^{-9} m/s; (11) the surface structure of the cement treated dredging sand was denser than that of the untreated sand; (12) the soilcrete structure was gradually dense with the increase in curing time and cement contents. The microstructural examination of the soilcrete by XRD, SEM-EDS interpreted for the strength enhancement and the hydraulic conductivity reduction of the soilcrete. The results of the SEM examination agreed well with the results from the strength and permeability tests. The results of strength and permeability of the soilcrete demonstrated that the soil cement mixing technology can be used to reinforce earth levees against floods in the Mekong delta. Cement contents to create seepage cutoff soilcrete wall for the earth levees were proposed following: for clay soilcrete, A_c = 300 kg/m^3; for sand soilcrete made from the OPC40 or the PCS, A_c = 250 -300 kg/m^3; for sand soilcrete made from the PCB40, A_c = 300 kg/m^3, A_b = 25 kg/m^3. The effectiveness of soilcrete to reinforce the earth levees under rapid drawdown of floodwater was analysed by the SEEP/W and SLOPE/W softwares. The results indicate that the soilcrete walls were highly effective in cutting seepage off and increasing stability significantly. A 0.4-m single row soilcrete wall can reinforce successfully for earth levees with less slide situation. A 0.8-m double row soilcrete wall can reinforce earth levees sustainably.

Advisor **Ph.D. candidate**

Assoc. Prof. Dr. Tran Nguyen Hoang Hung **Luong Thi Bich**