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Research

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Centrifuge Model Tests for Investigation of Fiber Reinforced Soil Walls

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ABSTRACT

The centrifuge model tests were used to evaluate the geotechnical properties of fiber reinforced soil walls. The reduced-scale centrifuge models were built and the clay barrier was prepared using kaoline amended silty soil. The unreinforced soil barrier was found to lose their water-tightness and integrity at lower distortion levels compared to fiber reinforced soil barrier. The silty soil used in the centrifuge models, frequently considered as having negligible creep, did not ultimately found to prevent the development of time-dependent deformations. Thus, the significant time-dependent deformations could be occurred in geotechnical structure of fiber reinforced soil walls wall systems. The long-term behavior of reinforced soil walls structures was investigated under stress levels using centrifuge model.

Key words: Fiber, Centrifuge Model, Silty Soil, Geotechnical Properties.

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1. INTRODUCTION

In recent decade, researchers have been studied the structure of reinforced soil walls in earth retention projects (1-3). However, the main challenge of projects is the time-dependent behavior under sustained load. Therefore, development of time-dependent deformations in the geotechnical properties of reinforced soil walls under constant loading is necessary. The time-dependent behavior reinforced soil walls is a key factor for the design of reinforced soil structures with respect to the high deformations and even creep failure of reinforced soil (4, 5). Furthermore, the creep tests conducted on geotechnical specimens are identified to investigate the long-term behavior of a reinforced soil structure (6). The creep tests have been almost used to accelerate the preparation of time-dependent behavior. But, there are a little study about the interaction between the reinforcement and the confining soil affected on the long term deformation of reinforced soil walls (7-10). The reduced scale model used for reinforced soil walls in the centrifuge model is an alternative approach for investigation of interactions between soil and reinforcements (11). To investigate the long-term behavior of reinforced soil walls, the design of full-scale instrumented walls plays an important role.

However, in most of reported studies, the full scale of walls did not consider for long-term behavior of reinforced soil walls. The full scaled walls provide the sufficient information about the significant deformations of reinforced soil walls over time (12-14). The strain rate in these walls, during a special time intervals can be predicted by conventional creep tests. But a little information is available on the time-dependent deformations of reinforced soil walls. Costa et al. (6) in geotextile-reinforced walls, a centrifuge test was used to evaluate time-dependent deformation changes. They detected that this going practice of penalizing the reinforcement ultimate tensile strength using considerable creep decrease factors may not be as overly stuffy as sometimes speculated. Allen and Bathurst (7) measured creep rates in full-scale walls and compared them to creep rates measured in-isolation. They found that reinforcement was initially exhibited the creep, with minor stress relaxation. However, in the long-term, there is a trend toward reinforcement stress relaxation. Furthermore, the long-term behavior observed in the full-scale walls indicates that the reinforcement loads are well below values required to cause creep rupture over the design life of the structures (15). In the present study, the centrifuge model tests were used to investigate time-dependent interaction between silty soil and fibers in