

Basic Properties of Soil-Cement Slurry Mixed with Elastic Material

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ABSTRACT: Elastic geo-materials, such as rubber chips and EPS beads, are seldom used in soil structures by mixing with sandy soils to improve the dynamic properties. For the usages in a narrow space or underwater, slurry-type mixtures are more favorable; however, the properties of the mixtures have not been investigated. A series of lab-tests was conducted for soil-cement slurry containing fine elastic particles for their application as aseismic material. Effects on their workability and strength of cement and tire-chips content were checked to determine the appropriate composition of the slurry. High potentials for elastic geo-materials are confirmed on slurry workability and strength development, and the feasible components of the slurry are proposed based on this investigation.

1 INTRODUCTION

For increasing the dynamic durability of the structure, introducing elastic properties into the geo-material could be effective. Elastic geo-materials, such as rubber and EPS, are seldom used as insulators for structures. For example, elastic particle and soil mixtures have been applied in actual construction projects, in which elastic materials were added and mixed with soils and compacted at the construction sites. For this usage, the following precautions are important for the performance: (1) the materials should be accurately placed between ground and structure; and (2) a given homogeneity and density of the mixture should be kept. Slurries containing the elastic particles might be beneficial for the placement and are suitable for placement into narrow spaces or underwater spaces. Properties of the slurry-type mixtures, however, have not been investigated. From the point of the material recycling, waste tire-chips are the best choice for the elastic particles. A series of lab tests was conducted on soil-cement slurry and waste tire-chips mixtures. Effectiveness of the waste tire addition for aseismic usages is concluded on the test results.

2 LAB TESTS

2.1 *Material*

The physical properties of the materials used in this study are presented in Table 1. Cement and tire-chips were added to the basic soil slurry, collected from soil recycling plants. Tire-chips are made from old waste tires, and the diameter is from 1 to 5 millimeters. Slag cement*⁴ was chosen for the cement because of its long-term stability and our experience.