Evaluation of Permeability for Reinforced Ground with Geogrid

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ABSTRACT

To evaluate the permeability of the ground reinforced geogrid, the two types of equipments; a triaxial cell and a large scale-pit were conducted. The former is an element test without moving soil particles to compare the permeability of specimens prepared with various compacted energy and maximum grain size. The latter is a model test with moving soil particles to compare the change of permeability in zones with geogrid and without geogrid to compare the change of permeability in parts of model ground with and without geogrid. As a result, it was concluded in the former test that the permeability of specimens are almost same when their compaction degrees were enough. In the latter test, it was concluded that geogrid restricts the movement of soil particles.

KEY WORDS: Coefficient of permeability; Geosynthetic; Irrigation embankment

INTRODUCTION

Many of small embankments with irrigation reservoir (av. irrigation embankment) in Japan were constructed many years ago. Now, they are suffered from problems of functional decline, which are causes of the risk of collapse caused by disasters such as intense rainfall and earthquakes. Thus, they must be reconstructed to have greater resistance against these disasters than the current design. The damage of old irrigation embankments have been increasing in natural disaster. In the typhoon No.23 in 2004, many of irrigation embankments were reported to be broken. Causes of damages of old irrigation embankments were studied by Aoyama et al. (2002) and Hori et al (2002). They specified that the causes of collapses were piping and hydraulic fracturing. Many other researchers studied the causes of hydraulic fracturing to propose the repairing methods. Fukushima et al (2002) proposed an improved soil which was constituted of cement and dredged clay deposited the base of irrigation reservoir considering the effect on environment. It is well known that geotextiles reinforce embankments. The effectiveness was confirmed in the 1995 Hyogo-ken Nambu Earthquake by Tatsuoka et al. (1998). However, as there are few cases where geotextile have been used in seepage control facility, the effect of using geotextile on the permeability of the facility has not yet be clarified. In this research, we focus on the two respects: First, we compare the permeability of specimens prepared with various compacted energy and maximum grain size. Second, we compare the change of permeability in parts of the model ground with and without geogrid.

PHYSICAL PROPERTIES OF MATERIAL

Specimens were prepared with dredged clay improved with cement (av. improved soil) for the permeability test using a triaxial cell, and with a silica sand for the one using the large-scale pit. Fig.1 shows grain size distributions of these materials used. Table 1 shows physical properties of the improved soil. Three kinds of maximum grain sizes were used for the improved soil; 2.00mm, 4.76mm and 9.52mm. Table 2 shows physical properties of the silica sand.