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Field Load Tests of Geogrid Encased Stone Columns in Soft Ground

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ABSTRACT.

The geogrid encased stone column (GESC) system, which increases the confinement effect, has been developed to improve the load carrying capacity of stone columns. This paper investigates improvement in load-carrying capacity and reduction in bulging of a geogrid cncasedstone column using field load tests. Also, to examine the effect of the geogrid encasement depth, GESC were for changing geogrid encasement depths from the upper part of 2D and 3D. It is found from load tests that geogrid encased stone columns have much higher load carrying capacity and less laterial bulging compared to conventional stone columns.

KEY WORDS: geogrid encased stone column; field load tests; load carrying capacity; bulging failure.

INTRODUCTION

Recent research on the technology of reinforcing gravel piles or stone columns using geosynthetics has been active. This method is known to have the advantage of lessening the horizontal deformation and increasing the bearing capacity of sand compaction piles, gravel piles or stone columns (Al-Joulani, 1995; Wood et al, 2000; Kempfert, et al, 2002). Since the research on the geotextile encased column (GEC) method , which is the method of increasing the carrying capacity by encasing the sand in the soft ground with geotextile, was started in Germany in early 1994, extensive research on using geotextiles has continued (Kempfert, et al, 1999; Raithel, et al, 2001; Alexiew et al. 2003). The GEC method has been applied mainly to soft ground such as marine areas. It has the disadvantage of increasing construction cost because it uses sand as the filler, causing insufficiency of natural aggregate. By contrast, the geogrid-encased stone column method, which uses stones, waste concrete and recycled aggregates as the filler with a high strength geogrid, is more economical because it reinforces the weak part of the stone column unlike the GEC method which reinforces the entire sand column with geotextile. The previous research on the geogrid reinforced stone column method has been conducted as laboratory model tests or numerical analyses (Paul et al., 2004; Trunk et al., 2004; Murugesan et al., 2006; Lee et al. 2006), and there has been no research on the application of the geogrid-encased stone column method to actual construction or design.

In this research, as a pilot research for the on-site application of the GESC(Geogrid Encased Stone Column) method, we applied the GESC method to actual construction on the soft ground in Korea and analyzed the load bearing capacity achieved by the GESC method and the deformation characteristics of the stone columns and adjacent ground by carrying out a field load test

GEOGRID ENCASED STONE COLUMN

The geogrid encased stone column is the result of the application of the method which reduces the horizontal deformation of a stone column with the carrying capacity of the geogrid by encasing the stone column with high strength geogrid to prevent bulging failure and decrease settlement. The GESC method can be partly applied to the weak part of the stone column by using a high strength geogrid. The GEC method, which is similar to the GESC and has been applied to construction, is mainly applied to the seabed soft ground. It consists of the following procedure: installation of the case for the installation of the geotextile, sand filling, case removal and then sand column installation. The GESC method consists of the following procedure: installation of columns by using a casing to install the geogrid to prevent the outer wall from collapsing during drilling with consideration of the features of soft ground. The GESC method can reinforce only the upper part of the stone column. There have been no cases of the GESC method being