A Study on the Stability of Underground Pipes with Backfill Materials

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ABSTRACT

Underground pipes are dominantly used in urban areas for various purposes, such as electrical power lines and sewer. This study examined the relative density obtained from field compaction with water of a typical electrical power line pipe. A pilot site was constructed and extensive sets of field and laboratory tests were performed. The results of the tests showed that a high level of relative density can be obtained through field compaction with water. In addition, the subsurface settlement was estimated through a numerical analysis. Numerical analyses showed that the settlement is not sensitive to the relative density compared to the type of fill soil.

KEY WORDS: Field pilot test, Numerical analysis, Electrical power line, Relative density, Compaction by watering

INTRODUCTION

Underground pipes are frequently used for various purposes, including electric power transmission lines and sewer lines. The pipes are filled with sand to protect the pipes from overburden pressure. Possible damage of a pipe should be carefully predicted and avoided (Korean Society of Civil Engineers, 2006), since it is very difficult to determine the location of damage and fix it after filling.

In this study, field tests were performed at a pilot test to determine the relative density obtainable with sand compaction by watering. Extensive field and laboratory tests were performed. In addition, numerical analyses were performed to simulate the condition and to examine the amount of settlements of pipe lines as well as the foundation soils. Detailed background of the design and construction of the electrical transmission pipes is well explained in Korea Electric Power Corporation (1996) and Korean Society Civil Engineers (2006).

SITE DESCRIPTION

The pilot site prepared for field test was 103m in length. Borings were performed at ten locations (BX (core diameter: 41.3mm): 8 places, NX (core diameter: 54mm): 2 places), as listed in Table 1. The site is composed of sandy gravel, weathered soil, weathered rock overlying soft rock. The list of field and laboratory tests performed are given in Table 1 and the results of the laboratory tests are listed in Table 2.