A Study on Evaluation of the Period of Stepped Suction Pressure in Suction Drain Method

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ABSTRACT

Suction Drain Method is soft ground improvement technique, in which a vacuum pressure can be directly applied to the Vertical Drain Board to promote consolidation and strengthening the soft ground. This method does not require surcharge loads, different to embankment or preloading method. In this study, ground improvement efficiency of suction drain method was estimated when suction pressure increase step by step (-0.2, -0.4, -0.6, -0.8 kgf/cm²) with different period. During suction drain method process, surface settlement and pore pressure were monitored, and cone resistance test as well as water content were also measured after the completion of Suction Drain Method treatment.

KEY WORDS: Suction Drain Method; vacuum pressure; vertical drain method

INTRODUCTION

The suction drain method is used to promote consolidation with increased effective stress under regular total stress by directly adding vacuum pressure to the vertical drain of the placed soil base. The embankment load method, which is generally used to improve the stability of soft ground, has the advantage of securing the embankment material and preventing the local shear failure of the soil base since it is not needed for various embankment loads. In addition, the embankment load method is the vacuum consolidation method in which the vacuum pressure is applied directly to the drain filter to solve the existing problems of the vacuum consolidation method, such as decreased pump efficiency, the high cost of the airtight sheet, frequent breakage of the airtight sheet, etc. However, the suction drain method considerably decreases the efficiency of soil improvement due to the clogging of filter material and the hardened hardening zone brought about by the decreased percolation coefficient around the drain filter, which is a result of applying high vacuum pressure directly to the drain filter (Kim, et al, 2007). Therefore, to improve this method without rapid generation of a hardened zone, the vacuum pressure should be increased gradually rather than applying a single dose of high vacuum pressure (Lee, 2007).

THEORETICAL BACKGROUND

The difference between the vertical drain method and the vacuum consolidation method may be confirmed from the comparison of stresses, as seen in the Figure 1.

In this study, to determine the application period that assures a high soil improvement effect, the vacuum pressure was variably applied by phase (-0.2, -0.4, -0.6, -0.8 kgf/cm²). During the test, the degree of soil settlement by improvement duration was examined, the final settlement, function, and cone resistance were examined, and the vacuum pressure application period by stage was determined by comparing/analyzing the derived data.