연직배수재의 통수능 해석

김홍관, 안영화*, 전한용**
FITI 시험연구원, *인하대학교대학원 섬유공학과, **인하대학교 나노시스템공학부

Drainage Performance Analysis of Vertical Drain Board

Hong Kwan Kim, Yinghua An*, and Han-Yong Jeon**
FITI Testing & Research Institute, Seoul, Korea
**Department of Textile Engineering, Inha University Graduate School, Incheon, Korea*
***Division of Nano-Systems Engineering, Inha University, Incheon, Korea*

1. Introduction

Cylindrical drain is usually used when the demand of water to be drained must be dissipated in a large amount and rapidly such as being used for liquefaction mitigation to prevent the excess pore pressure develops beyond the confinement pressure of the soil. In this study, clogging effect has been evaluated by comparing the drainage capacity (discharge and accumulated volume of water drained) of cylindrical drain with two different shapes of plastic cores (round and angular types)

2. Experimental

The main materials of the current column tests are clayey silt soil and cylindrical drain samples. Clayey silt soil had been taken from west coast of South Korea and remade until more than 60% of water content could be obtained. The cylindrical drain samples are composed of PE-core geometries (round and angular types) and the same filter jacket (non-woven geotextile). The cylindrical drain samples were placed into four 70-cm-high acrylic chambers and surrounded by different thickness of clayey silt with 64.56% water content. The column tests have been conducted for 13 days.

3. Results and Discussion

At the initial stage before a significant development of clogging (*Figure 1*), the maximum increase of discharge of cylindrical drain samples with angular-type-plastic-core is about twice greater than that of cylindrical drain samples with round-type-plastic-core. However, the discharges become smaller and smaller after their peak values are transcended. At elapsed time 210 hours, the cylindrical drain samples with angular-type-plastic-core can produce discharge only 30% higher (maximum) than those with round-type one and 20% higher (maximum) after 312 hours. *Figure 2* gives the overall increase of drainage capacities (trended by polynomial equation) in using angular-type-plastic-core normalized with round-type one during the tests. Moreover, at the end of the tests, there is an indication for the normalized drainage capacity (discharge and accumulated volume) to become unity after some more hours. That means that the later discharges of all cylindrical drain samples are more or less equal independent on the type of plastic core.

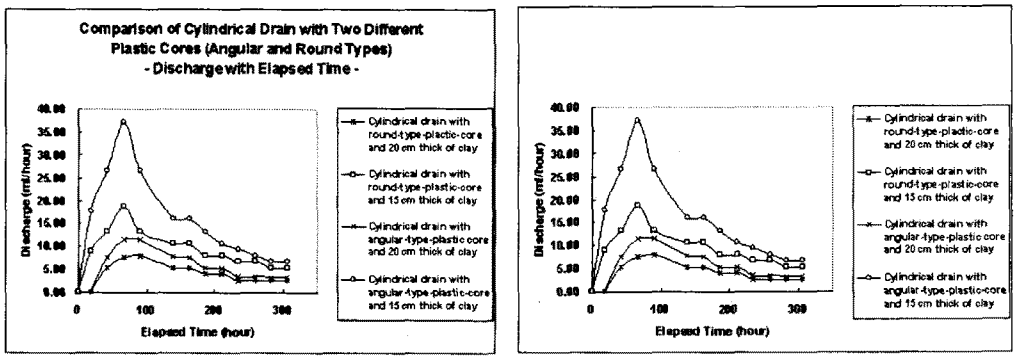

Figure 1. Discharge of with time for vertical drain board

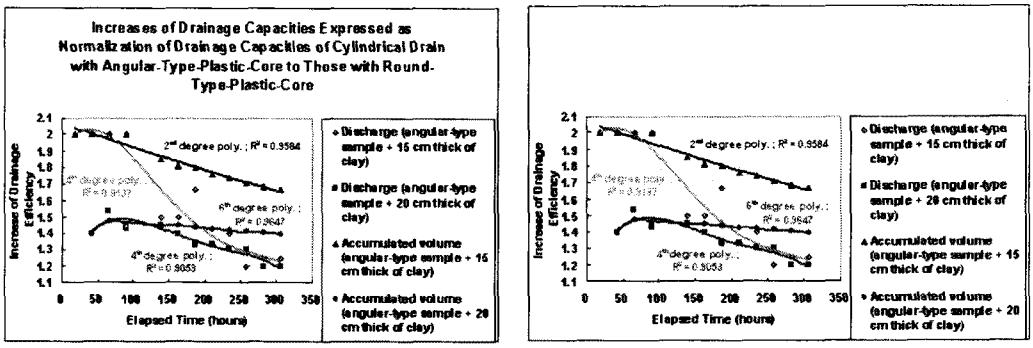

Figure 2. Increases of drainage capacities expressed in normalization

4. Conclusion

Cylindrical drain with angular-type-plastic-core could produce higher flow rate (discharge) for some hours before the development of clogging gave reduction, although the thickness of clay used gave significant reduce of discharge at the initial stage due to different length of flow in the clayey silt soil. As the clogging develops with time, the cylindrical drain samples with angular-type-plastic-core produce less discharges and seem to get close to the ones with round-type-plastic-core.

This work was supported by grant No. RTI04-01-04 from the Regional Technology Innovation Program of the Ministry of Commerce, Industry, and Energy (MOCIE).

References

E. M. Rathje, W. J. Chang, B. R. Cox, K. H. Stokoe II, "Effect of Prefabricated Vertical Drains on Pore Pressure Generation in Liquefiable Sand," 11 th International Conference on Soil Dynamics and Eartquake Engineering and 3rd International Conference on Earthquake Geotechnical Engineering, Berkeley, CA, January, Vol. 2, pp.529-536(2004).