

A Comparative Study Between High and Low Infiltration Soils as Filter Media in Low Impact Development Structures

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Abstract

The increasing effect of urbanization has been more apparent through flooding and downstream water quality especially from heavy rainfalls. In response, stormwater runoff management solutions have focused on runoff volume reduction and treatment through infiltration. However, there are areas with low infiltration soils or are experiencing more dry days and even drought. In this study, a lab-scale infiltration system was used to compare the applicability of two types of soil as base layer in gravel-filled infiltration systems with emphasis on runoff capture and suspended solids removal. The two types of soils used were sandy soil representing a high infiltration system and clayey soil representing a low infiltration system. Findings showed that infiltration rates increased with the water depth above the gravel-soil interface indicating that the available depth for water storage affects this parameter. Runoff capture in the high infiltration system is more affected by rainfall depth and inflow rates as compared to that in the low infiltration system. Based on runoff capture and pollutant removal analysis, a media depth of at least 0.4 m for high infiltration systems and 1 m for low infiltration systems is required to capture and treat a 10-mm rainfall in Korea. A maximum infiltration rate of 200 mm/h was also found to be ideal to provide enough retention time for pollutant removal. Moreover, it was revealed that low infiltration systems are more susceptible to horizontal flows and that the length of the structure may be more critical than the depth in this condition.

Keywords : design, infiltration, low impact development, reuse, stormwater runoff

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