

Hydraulic Conductivities for Graded Recycled Concrete and Steel Slag Blended with Two Different Fines

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Hydraulic conductivity, K_s (cm/s), of roadbed material is an important parameter to develop an effective permeable pavement system. In this study, a series of laboratory K_s tests was conducted using graded recycled concrete (RC; grain size distribution from 0.075 to 31.5 mm) and steel slag (SS; grain size distribution from 0.075 to 26.5 mm) blended with two different fines, granulated Municipal Solid Waste Slag (MSW Slag) and Autoclaved Lightweight Concrete (ALC). The grain size distributions for the fines adjusted to range from 0.106 to 2 mm. Those fines were mixed with graded recycled concrete and steel slag at mixing proportions, 0, 20, 40 % on dry-mass basis. The tested materials were packed in a mold using Proctor compaction and used for the K_s tests. For each material, two packed samples were prepared; one sample was used immediately for the K_s test after packing and the other was used for the K_s test after 28 days curing. For graded RC and SS and mixtures of ALC fine, a falling head K_s test was performed. On the other hand, a constant head K_s test was done for mixtures of MSW Slag fine.

Results showed that measured K_s values ranged from 10^{-5} to 10^{-2} cm/s. MSW Slag fine gave the highest K_s while RC 100% samples gave had the lowest values. With increasing in the mixing proportion of MSW Slag fine, the K_s values of graded RC samples increased from 10^{-5} to 10^{-3} cm/s (mixing proportion of 40%). However, the mixing of ALC fine did not contribute to increase the K_s values of graded RC irrespective of the increase in void ratio e (decrease in dry density). For graded SS samples, measured K_s values for mixtures of MSW Slag and ALC fines did not change compared to SS 100% samples, suggesting that there cannot be expected any improvement in K_s by mixing of fines. Besides, it was revealed that Kozeny-Carman model for hydraulic conductivity did not perform well for the tested mixtures in this study, implying that a useful predictive K_s model is needed to evaluate K_s values for the mixtures of graded RC and SS with fines.

Keywords: recycled concrete, steel slag, fines, hydraulic conductivity, permeable pavement system