

Experimental study of Triaxial behaviour and CBR value of plastic waste-soil mixture

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Abstract:

The bottled water is the fastest growing beverage industry in the world and recycling plastic wastes of them have become one of the major challenges worldwide. The present study provides an approach for the use waste plastic strips as reinforcement material in soil backfill. The experimental tests investigated the behaviour of soil alone and plastic waste-soil mixture using static triaxial test and CBR test. The triaxial tests were carried out on the unreinforced soil samples and plastic-soil mixture samples at three confining pressures of 50, 100, and 150 kPa. The effect of small and large sizes of waste plastic was examined by three waste plastic strips contents of 0.5%, 1% and 1.5% (by total weight of the sample). The CBR tests were performed by standard CBR apparatus with load rate of 1.27 mm/min on unreinforced and reinforced samples (i.e., waste plastic-soil mixture), with large size of waste plastic particles, at four plastic contents of 0.5, 1, 1.5, and 2%. The results of the triaxial tests show that the strength of reinforced samples increases with increase the size and percentage of plastic particles. For example, for the plastic content of 1.5% at confining pressure of 50 kPa and strain level of 6%, a maximum improvement in strength of plastic-reinforced sample was obtained as 1.25 times of the unreinforced sample. The results of CBR tests depict that the provision of waste plastic particles reduces the penetration of shaft into the sample and increases the CBR value of samples. Overall, the results of CBR and triaxial tests demonstrate that the inclusion of waste plastic strips in soil with appropriate amounts improved strength and deformation behavior of foundation beds substantially. The proposed technique can be used to advantage in bearing capacity improvement and settlement reduction in the design of shallow footings, embankment and road construction.

Keywords: waste plastic particles, triaxial test, penetration, CBR value.