

Weighted Plasticity Index (WPI) as a Screening Tool for Quality Control Measures

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Abstract

Expansive soils are one of the most problematic materials in road construction. Soil expansiveness is generally assessed by the Plasticity Index (PI) test. But PI test discards the fraction coarser than the 425 μ m test sieve as part of the test procedure. Therefore PI test does not well represent the whole sample. In Sri Lanka, residual soils are very common, with a high granular content in “clayey” soils. Therefore PI value often provides error in classification of residual clays.

Weighted Plasticity Index (WPI) is another parameter which can be used to assess the expansiveness of the soil. WPI is defined as the product of the PI and the percentage passing in the 425 μ m test sieve. Therefore WPI accounts for both PI and percentage used in the test.

The objectives of the study are to find out correlations to WPI with soil CBR and CBR swell and then establish the WPI boundaries for soil materials such as embankment soil, shoulder soil & sub-base soil.

Soil data on different soil samples were collected and analyzed to find out above mentioned correlations. A soil classification method is developed for the subgrade soil based on the correlations obtained from the data analysis carried out and is given in the table 1 below.

Table 1: WPI Classification for subgrade soil

Soil Class	WPI	CBR Swell	Potential for Volume change
A	<1100	$<1\%$	Low
B	$1100 \leq \text{WPI} < 2250$	$1\% \leq \text{CBR swell} < 2\%$	Medium
C	≥ 2250	$\geq 2\%$	High

Further a case study was done using the soil data collected from the Outer Circular Highway (OCH) phase III project in order to validate the above mentioned WPI boundaries for subgrade soil.

Soil classification based on WPI provides meaningful solution to overcome the misclassification arises in PI test due to the usage of percentage passing in the 425 μ m test

sieve. Also WPI classification leads to significant savings while qualifying significant quantities of marginal material for road construction.

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