

## ABSTRACT

Cement Treated Recycled Base (CTRB) is a compacted pavement base layer material that was developed to reuse recycled materials for the purpose of conservation of natural resources, minimizing construction cost, and to be more environmentally friendly construction compared to the conventional pavement base layer materials.

The objective of this research is to explore the influences of the allowable proportions of Natural Pozzolan (trass) in CTRB mixes as partial replacement amounts of Portland cement in improving the physical properties of the CTRB mixtures to improve the in-place field performance of the pavement.

The research efforts consist of various laboratory experimental methods including physical properties of materials, mixture compaction parameters, and stiffness/strength evaluations in relation to the performance parameters of the mixture using Natural pozzolan (trass) as a cement replacement. The compositions of the mixtures were 40% RAP and 60% RAM, and 60% RAP and 40% RAM with cement contents of 2%, 4% and 6% substituted by 0%, 15% and 30% Natural Pozzolan respectively. The total number of samples tested for the physical properties and stiffness/strength testing were 378.

The results of this study indicate that the amount of Natural pozzolan on CTRB mixture can improve the physical properties of the mixtures by improving the mechanical properties of the samples. The results show that the increase in density ( $\gamma_d$ ) or the decrease in porosity ( $\eta$ ) in the samples as positive impacts to the stiffness/strength parameters that exceed the parameters of the control mixtures stabilized with cement only. The optimal CTRB mixture performances are from 15% natural pozzolan substitution to 6% cement for 40% RAP and from 15% and 30% Natural pozzolan substitution to 6% cement for 60% RAP mixtures.

In this study, an equation was developed to show the relationship between strength ( $q_u$ ) and the ratio between the porosity  $\eta$  to the cementitious material content ( $C_{IV}^*$ ) based on the Natural pozzolan efficiency factor. This equation can be used to determine a proportion of cementitious material needed for a CTRB mixture design to achieve a designated strength.

Key words: CTRB, Natural pozzolan, UCS, ITS and CBR