ABSTRACT

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Thesis title: Impact of Replacement of Aggregate Fines with RAP Fines in CTSB Mixes

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The present study provides an experimental investigation into the performance of Cement-Treated Sub-Base (CTSB) materials, with emphasis on the utilization of Reclaimed Asphalt Pavement (RAP) fines as a replacement for natural aggregate fines in flexible pavement layers. The principal objective of this study is to examine the mechanical behaviour, durability, and flexural fatigue characteristics of CTSB mixes containing varying proportions of RAP fines, addressing the dual concerns of sustainable material utilization and structural performance in pavement construction.

Three distinct CTSB mixes were prepared: a control mix (0% RAP fines) and two replacement mixes with 50% and 100% RAP fines substituting natural fines. Each fines replacement level was combined with varying cement contents and compacted to simulate heavy field compaction. Laboratory evaluations included comprehensive characterization of compaction characteristics, assessment of unconfined compressive strength (UCS) at 7-day and 28-day curing durations, and durability assessment through wet–dry cycles in accordance with IRC:SP:89

standards.

For each RAP fines replacement level (0%, 50%, and 100%), flexural rigidity was evaluated using CTSB beam specimens prepared with selected cement contents. These tests enabled the assessment of stiffness characteristics and tensile performance of the mixes under flexural loading.

The experimental data were analysed to evaluate the effect of varying RAP fines content and cement dosage on the engineering performance of CTSB materials and their compliance with Indian pavement design standards. The results demonstrate the technical feasibility of incorporating RAP fines into CTSB layers as a sustainable alternative to natural aggregate fines, provided that optimal cement content and gradation are maintained.

The findings of this study are relevant for highway agencies and pavement engineers seeking to promote sustainable construction practices by reducing dependence on virgin materials and minimizing construction waste, while ensuring structural integrity and compliance with established pavement design criteria.