

Development of a Guideline to Determine Structural Capacity of Demolition Waste as a Road Construction Material

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Abstract

The use of demolition waste as pavement base material is a promising but unproven technique for road rehabilitation and construction. The scarcity of natural resources for construction industry-related activities was rising over the past few years. However, demolition waste is not frequently being used in pavement construction, primarily due to a lack of knowledge about the engineering properties of the material used. This research study focuses on evaluating the strength and durability characteristics of such waste in Sri Lanka and determining the applicability of crushed concrete material (CCM) in pavement base construction. Laboratory testing component in the study includes preliminary material tests including flakiness index, elongation index, Los Angeles abrasion value (LAAB), aggregate impact value (AIV), and unconfined compressive strength (UCS). In addition, a laboratory-scale prototype model testing was carried out to compare the characteristics of CCM with respect to conventional base materials. This setup was subjected to a plate load test and a dynamic cone penetration test to determine its properties. The results of the prototype model testing demonstrated that the CCM base layer was susceptible to stiffness changes due to the changes in moisture levels. The layer coefficient of CCM was calculated using deflection data and it was equal to 0.134. However, the variability of material properties was significant in the case of CCM compared to conventional dense graded aggregate bases (DGAB). Therefore, the authors recommend using CCM as a base material for the pavements where light wheel loads operating, preferably 20kN or less. The present practice of flexible pavement design in Sri Lanka is based on the Transport Research Laboratory method (RN31-1993) but modified to suit local conditions. Even though RN31 provides different aggregate base layer types, DGAB is the common practice of base construction. Therefore, a guideline and a design chart have been developed for the process of replacing DGAB with CCM. The equivalent thickness of CCM required for DGAB thicknesses varying from 4-10 inches could be obtained from the developed design chart.

Keywords: *concrete crushed material, aggregate bases, pavement design, layer coefficients*

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