DEVELOPMENT OF A GUIDELINE TO DETERMINE STRUCTURAL CAPACITY OF DEMOLITION WASTE AS A ROAD CONSTRUCTION MATERIAL

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DECLARATION BY CANDIDATE

"I declare that this is my own work and this thesis/dissertation does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any University or other institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text"

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DEDICATION

To My Dear

Father, Mother and to my wife Imesha

For their continuous dedication and encouragement for my advancement

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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. A survey was conducted by Building Economics Department of university of Moratuwa found that demolition waste is infrequently used in this application due primarily to a lack of practical knowledge about the engineering properties of the material. Therefore, this research was aimed at evaluating the physical properties, strength parameters, and durability characteristics of demolition waste to use as pavement base material.

The study included extensive laboratory and prototype model testing. Laboratory tests included flakiness index value, elongation index, aggregate impact value, Los Angeles abrasion value test, California bearing ratio, unconfined compressive strength and durability evaluations. Prototype modeling was utilized to compare demolition waste with respect to general base materials. It included a plate load _test and dynamic cone penetrometer. The prototype model demonstrated that the demolition waste base layer was susceptible to stiffness changes due primarily to changes in moisture.

Prototype model results have been verified using 'Everstress' back-calculation software and it can be shown that the layer coefficient of CCM is equivalent to 0.134. And also this material shows a very high variability with respect to conventional base materials i.e. DGAB. Therefore it is recommended to use this material as a base material for a traffic load of 20kN or less. And it will perform a strong correlation as given in design charts & tables.

Finally it was possible to evaluate a structural capacity of demolition waste and develop a design chart to replace dense graded aggregate base course from demolition waste base layer for construction of roads. Therefore it is recommended to introduce demolition waste material instead of conventional base material based on the developed design guidelines.

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LIST OF ACRONYMS

AASHTO	American Association of State Highway and
DGAB	Aggregate Base Course
AIV	Aggregate Impact Value
ASTM	American Society for Testing and Materials
BS	British Standard
C & D	Construction & Demolition
CBR	California Bearing Ratio
CCM	Crushed Concrete Material
CNSA	Cumulative Number of Standard Axles
C-S-H	Calcium Silicate Hydrate
DCP	Dynamic Cone Penetrometer
DGAB	Dense Graded Aggregate Base
ESAL	Estimated Standard Axle Load
FEM	Finite Element Model
LAAV	Los Angeles Abrasion Value test
MC	Moisture Content
MDD	Maximum Dry Density
NA	Natural Aggregate
OMC	Optimum Moisture Content
PCC	Portland Cement Concrete
RCA	Recycled Concrete Aggregate
RDA	Road Development Authority

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SSCM Standard Specification for Construction Material of Roads and Bridges

UCS Unconfined Compressive Strength