IMPROVEMENT OF AGGREGATE PACKING MODEL OF INTERLOCKING CONCRETE BLOCK PAVEMENT (ICBP) MIXTURE USING FLY ASH

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Thesis submitted in partial fulfilment of the requirements for the degree Master of Engineering

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DECLARATION

"I declare that this is my own work and this thesis does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any other University or 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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Name of the supervisor: Prof.W.K.Mampearachchi

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Abstract

Use of concrete paver blocks is becoming increasingly popular. They are used for the paving of approaches, paths and parking areas including their application in pre-engineered buildings and pavements. Interlocking Concrete Block Pavements (ICBP) have been extensively used in a number of countries for quite some time as a specialized problem-solving technique for providing pavements in areas where conventional types of construction are prove to be less durable due to many operational and environmental constraints. As it was observed that “Sri Lanka, Lak Vijaya Coal Power Station at Norocholai, Puttalam generates large amount of fly ash per day as a byproduct” which was considered as a waste & an environmental hazard ,leading to the limitation of its usage, this research focuses on utilizing the fly ash to improve the aggregate packing model of ICBP. Fly ash is used as a filler material in the paving block mixture to optimize the packing of the aggregate. Fly ash includes samples and control samples were tested for compressive strength, water absorption and were made to go through a Scanning Electron Microscope Analysis. Experimental results showed that 23 and 21 percent of cement can be replaced by Fly Ash in Grade 15 & 20 for OPC mixtures while 26 and 21 percent of cement can be replaced in Grade 15 & 20 for PLC mixtures. Optimization of the packing of aggregates is the process of determining the most suitable aggregate particle size and distribution to minimize the void content of an aggregate mix. An optimized aggregate mix will have a lesser amount of voids which needs to be filled with cement paste. Further, fly ash has improved the workability of the mixture due to the special nature of the particle. Better economy and durability also have been achieved as its utilization leads to the reduction of needed cement content and heat of hydration. To elaborate further, it will also help in safe-guarding the environment from ill effects of CO2 emissions from cement industry and contribute towards providing a solution for the disposal of fly ash produced by thermal power plants.

Keywords: Fly Ash, Interlocking Concrete Block Pavement, packing of aggregate, Optimization, Compressive Strength, Scanning Electron Microscope ,Portland lime cement(PLC),Ordinary Portland cement(OPC).

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LIST OF ABBREVIATIONS

Abbreviation	Description
ICBP	Interlocking concrete block pavers
OPC	Ordinary Portland cement
PLC	Portland Lime cement
SEM	Scanning Electron Microscope
TCLP	Toxicity Characteristics Leaching Procedure
HVFA	High volume Fly Ash
BS	British Standard
EN	European Standards
SLS	Sri Lanka Standard
ICTAD	Institute for Construction Training and Development
W/C	Water/Cement
ITI	Industrial Technology Institute
AIV	Aggregate Impact Value

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