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DEVELOPMENT OF A FRICTION PREDICTION MODEL OF ASPHALT CONCRETE AT THE CONSTRUCTION STAGE BASED ON SRI LANKAN AGGREGATES

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Thesis/Dissertation submitted in partial fulfillment of the requirements for the degree Master of Science (Major Component of Research)

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DECLARATION

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 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. I retain the right to use this content in whole or part in future works (such as articles or books).

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The above candidate has carried out research for the Master's thesis/dissertation under my supervision. I confirm that the declaration made above by the student is true and correct.

Name of Supervisor: Prof. H.R. Pasindu

Signature of the Supervisor: Date: 19/05/2026

DEDICATION

I dedicate my work to the Transportation Engineering Division of the Department of Civil Engineering of Faculty of Engineering of University of Moratuwa, Sri Lanka

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ABSTRACT

The skid resistance at the tire-pavement interface ensures adequate braking force for road user safety. Insufficient friction at the wearing course emerges as the primary pavement-related factor of highway crashes. Governing factors of pavement friction include pavement properties, vehicle/tire/driver conditions, and environmental conditions, with pavement characteristics, particularly the mineralogical and textural attributes of surfacing coarse aggregates exerting dominant control. Coarse aggregate polishing resistance critically determines the available skid resistance of an asphalt concrete road, prompting extensive research on aggregate's friction retention capacity under traffic loading. Hence, globally a number of pivotal studies have been conducted to explore polishing behaviour of roadstones and to develop prediction models to forecast skid resistance capacity of flexible pavements. In Sri Lanka, road safety garners increased emphasis amid expressway network integration, yet studies on local aggregate friction properties remain limited, with fewer user-safety guidelines incorporated in the national Standard Specifications for Construction and Maintenance of Roads and Bridges (SSCM-RB). This study thus evaluates friction characteristics of indigenous Sri Lankan road surfacing aggregates via the Polished Stone Value (PSV) test (employing Accelerated Polishing and British Pendulum) alongside petrographic and microscopic analysis of polishing behavior in order to develop a friction prediction model for national asphalt concrete pavements.

Keywords: Coarse aggregates, pavement friction, pavement texture, polishing resistance, skid number, friction prediction model

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LIST OF ABBREVIATIONS

Abbreviation	Description
AAPM	Aachen Polishing Machine
AIMS	Aggregate Imaging System
AIV	Aggregate Impact Value
APM	Accelerated Paving Machine
ASTM	American Society for Testing and Materials
BPN	British Pendulum Number
BPT	British Pendulum Tester
CIDA	Construction Industry Development Authority
CTM	Circular Texture Meter
CVD	Commercial Vehicles per lane per Day
DFT	Dynamic Friction Tester
DoT	Department of Transportation
DTA	Differential Thermal Analysis
EDX	Energy Dispersive X-ray
FHWA	Federal Highway Administration
FI	Flakiness Index
FN	Friction Number
HC	Highland Complex
HMA	Hot Mix Asphalt
ICTAD	Institute of Construction Training and Development
IFI	International Friction Index
IML	Industrial Mining License
KC	Kadugannawa Complex
LAAV	Los Angeles Abrasion Value
MD	Micro-Deval
MPD	Mean Profile Depth
MSSC	Mean Summer SCRIM Coefficient
MTD	Mean Texture Depth

OD	Oven-Dried
OMT	Outflow Meter Test
PFM	Pavement Friction Management
PIARC	Permanent International Association of Road Congresses
PMS	Pavement Management Systems
PSV	Polished Stone Value
RDA	Road Development Authority
RMS	Root Mean Square
RPV	Residual Polish Value
RTM	Road Test Machine
SCRIM	Sideway Force Coefficient Routine Investigation Machine
SEM	Scanning Electron Microscope
SN	Skid Number
SPM	Sand Patch Method
SSCM-RB	Standard Specifications for Construction and Maintenance of Roads and Bridges
SSD	Saturated Surface Dry
SSS	Sodium Sulphate Soundness
TRRL	Transport and Road Research Laboratory
VC	Vijayan Complex
WC	Wanni Complex
WFT	Water Film Thickness
W/S	Wehner/Schulze
XRD	X-ray Diffraction