DETERMINATION OF NOTABLE TOLERENCE LIMITS FOR BITUMEN AND AGGREGATE FOR ASPHALT CONCRETE MIXTURES IN SRI LANKA

V.Satheeban

158311 N

Degree of Master of Engineering

Department of Civil Engineering

University of Moratuwa
Sri Lanka

January 2020

DETERMINATION OF NOTABLE TOLERENCE LIMITS FOR BITUMEN AND AGGREGATE FOR ASPHALT CONCRETE MIXTURES IN SRI LANKA

Vaikunthanathan Satheeban

158311 N

Master of Engineering in Highway and Traffic Engineering

Department of Civil Engineering

University of Moratuwa
Sri Lanka

January 2020

DECLARATION OF THE CANDIDATE AND SUPERVISOR

I declare that this is my own work and the 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 believe it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

Also, I hereby grant University of Moratuwa the non-exclusive right to reproduce and distribute my thesis, in whole or in part in print, electronic or other medium. I retain the right to use this content in whole or part in future works (such as articles or books).

Signature: Date:

The above candidate has carried out research for the Master/MPhil/PhD thesis/ Dissertation under my supervision.

Signature of the supervisor: Date:

ABSTRACT

Determination of notable tolerance limits for bitumen and aggregate for asphalt concrete mixtures in Sri Lanka

The development of corrugation along longitudinal profile is one of the most common failures in asphalt pavement. The corrugation distresses are usually more severe in road sections with high longitudinal slope than sections with mild slope. This is because the slope decreases average speed of vehicles running upward and leads to increase in the total loading time drastically. On the other hand, vehicles tend to apply brakes when running downward.

The research aims at finding out how asphalt material (Bitumen & aggregates) properties have an impact on corrugation distress in sloped pavements. For this purpose a recently constructed and heavily trafficked road (Ambepussa Kurunegala Dambula A006) is considered.

The standard specification for construction and maintenance of roads and bridges (ICTAD) has specified requirement for bitumen content and combined aggregate grading for mix design of asphalt with tolerances. The gradation pattern of the aggregates can have an impact on permanent distress in asphalt concrete pavements. The gradients of roads are usually not considered when selecting the combined grading type for mix design of asphalt.

The specification may be adapted to suit different conditions considering various criteria. For above road project combined grading Type 1 and the bitumen content tolerance percentage by weight of total mixture was adapted as +0.3 % where standard specification states ±0.3 %. This leads the asphalt plant production crew to maintain bitumen content at higher than the design (maintain at 4.9 % in the plant though design bitumen content is 4.8 %).

More than 2000 samples (each 1500 kg batch) of different Asphalt plant bitumen batching details were analyzed to conclude the predefined tolerance limits of bitumen content and combined gradation of aggregates.

It has been concluded that standard values provided in ICTAD specification for bitumen content tolerance can be modified as ±0.2 % and bitumen content tolerance limit should also extend over ± values. Further the combined gradation tolerance of aggregates need no modification based on the sample analyzed in this study.

Key Words: Bitumen content, Combined aggregate gradation, tolerances

ACKNOWLEDGEMENTS

First and foremost, I wish to express my sincere gratitude to **University of Moratuwa, Sri Lanka,** for giving me the opportunity to follow the post graduate program M.Eng/PG Diploma in Highway and Traffic Engineering at department of civil engineering.

I must really be grateful to my supervisor **Professor W.K.Mampearachchi** for guiding me with valuable comments and numerous suggestions and words cannot express my gratitude towards him.

I would also like to convey my sincere gratitude to **Mr.D.M.Siriwardena** for allowing me to follow the course by granting leave and I also take this opportunity to thank **Maga Engineering (pvt) Ltd.** and all other supports given by colleagues with great appreciation.

Last but not the least I extend my gratitude and appreciation to my family for their support and motivation. My thanks and blessings go to everyone who supported me to complete this study successfully.

TABLE OF CONTENT

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

Abbreviation	Description
AASHTO	American Association of State Highway and Transportation Officials
BS	British Standards
FI	Flakiness Index
AIV	Aggregate Impact Value
MDD	Maximum Dry Density
LAAV	Los Angeles Abrasion Value
SSCM	Standard Specifications for Construction and Maintenance of Roads and Bridges
UK	United Kingdom
USA	United States of America