

REVIEW OF PENETRATION GRADING SYSTEM AND SUITABILITY OF THE VISCOSITY GRADING SYSTEM FOR ASPHALT BINDERS IN SRI LANKAN HIGHWAYS

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Degree of Master of Science

Department of Civil Engineering

University of Moratuwa
Sri Lanka

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Thesis submitted in partial fulfillment of the requirements for the degree Master of
Science

Department of Civil Engineering

University of Moratuwa

Sri Lanka

April 2014

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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The above candidate has carried out this research for the dissertation under my supervision.

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ABSTRACT

Review of penetration grading system and suitability of the viscosity grading system for asphalt binders in Sri Lankan highways

Road development has become a dominant component in modern Sri Lanka. As a developing nation durability and long term performance of roads are very much important to the country. In Sri Lanka flexible pavements are the frequently used for road construction. In flexible pavement bitumen and aggregate are the main ingredients for surface layer. The quality of bitumen for roads is assessed using penetration grading system which was initiated in early 19th century. The quality of bitumen and the method of grading bitumen in Sri Lanka have made several discussions among the professionals because of the premature failures on some major roads. In this research twenty three bitumen samples were collected from various construction sites and tests were carried out to assess their quality. A sample of test reports issued by the bitumen suppliers were also taken in to consideration. Penetration test, Softening point test and Viscosity test were carried out using the collected samples. Penetration and Softening Point were assessed using the local bitumen specifications and viscosity was assessed based on the requirements of viscosity grading system. The Quality of bitumen was further analysed using the temperature susceptible measures such as Penetration Index, Viscosity Temperature Susceptibility and Pen-Vis Number. Relationship of temperature susceptibility measures were carried out using statistical means. Behaviour of bitumen at operation level was analysed using equi-viscous method of Asphalt Institute MS-2. Indirect methods were used to obtain the stiffness of bitumen and asphalt concrete. Stiffness measures were analysed with climatic considerations and traffic loading. Based on the test results and analysis, modifications for the standard of bitumen selection are recommended. Testing of bitumen properties at construction temperature range is essential. So, addition of kinematic viscosity at 135 C to the current specification in selecting bitumen for road construction in Sri Lanka and the importance of viscosity based grading system in bitumen selection was emphasized in this study.

Key words: Bitumen, Penetration, Viscosity, Grading

TABLE OF CONTENTS

Declaration	i
Acknowledgements	ii
Abstract	iii
Table of contents	iv
List of figures	vii
List of tables	vii
List of abbreviations	xi
List of appendices	xii
1. Introduction	1
1.1 General	1
1.2 Problem statement	2
1.3 Objectives	3
1.4 Scope of the Report	3
2. Literature review	5
2.1 Introduction	5
2.2 Asphalt Material	5
2.2.1 History	6
2.2.2 Bitumen	8
2.3 Asphalt Refining	10
2.3.1 Crude oil	10
2.3.2 Distillation	11
2.4 Refining of Asphalt Cement	11
2.5 Tests on Bitumen	12
2.6 Bitumen Grading	14



2.6.1	History of Bitumen Grading	14
2.6.2	Penetration Grading System	15
2.6.3	Viscosity Grading System	19
2.6.4	Super pave Grading System	26
2.7	Temperature susceptibility	28
2.7.1	Comparison of Temperature susceptibility parameters	29
2.8	Stiffness of bitumen and asphalt concrete	36
2.8.1	Determination of Mix stiffness	39
2.9	Mixing and Compaction temperatures	47
2.9.1	General	47
2.9.2	History and development	47
2.9.3	Equi-viscous method	48
2.9.4	Pavement temperature	52
2.10	Pavement distresses	53
2.10.1	Fatigue cracking	53
2.10.2	Rutting	54
3.	Current condition in sri lanka	57
3.1	Introduction	57
3.2	Bitumen Specification	57
4.	Methodology	59
4.1	Introduction	59
4.2	Laboratory test procedure	59
4.3	Temperature susceptibility of Sri Lankan bitumen	61
4.4	Effect of bitumen in HMA	62
4.5.1	Determination of Mixing and Compaction Temperatures	62
4.5.2	Stiffness of bitumen and asphalt concrete	62
4.5	Modifications for grading bitumen in Sri Lanka	63
5.	Laboratory testing and results	64

5.1	Introduction	64
5.2	Laboratory testing	64
5.2.1	Penetration Test	64
5.2.2	Softening point test	66
5.2.3	Absolute viscosity test	67
5.2.4	Kinematic Viscosity test	70
5.3	Test results	72
5.4	Test report data	75
6.	Analysis and discussion	77
6.1	Introduction	77
6.2	Test results analysis	77
6.2.1	Analysis of penetration at 25 ⁰ C	77
6.2.2	Softening point analysis	82
6.2.3	Kinematic viscosity	85
6.2.4	Absolute viscosity	87
6.3	Temperature susceptibility	91
6.3.1	Penetration Index (PI)	91
6.3.2	Viscosity Temperature Susceptibility (VTS)	102
6.3.3	Pen-Vis Number (PVN)	106
6.4	Test report analysis	110
6.5	Mixing and Compaction temperatures	114
6.6	Mixing and Compaction Viscosity	120
6.7	Stiffness of bitumen and asphalt concrete	122
6.8	Pavement Temperatures	128
7.	Conclusion and recommendations	131
	Reference list	133
	Appendix	136

LIST OF FIGURES

	Page
Figure 2.1: Trinidad Lake Asphalt	7
Figure 2.2: Arrangement of components in asphalt cement	10
Figure 2.3: Change in stiffness of asphalt cement with temperature	18
Figure 2.4: Stiffness for AC-30 bitumen at various temperatures	24
Figure 2.5 shows an overview of the Super pave PG system	27
Figure 2.6: Nomograph for the PI of bitumen (Whiteoak, 1990)	32
Figure 2.7: Shell nomograph to find Penetration Index (Shell Hand Book)	33
Figure 2.8: Graph to get L and M for PVN chart (McLeod, 1976)	35
Figure 2.9: Vander Poel Nomograph (Van der Poel, 1954)	40
Figure 2.11: McLeod Nomograph (McLeod, 1976)	43
Figure 2.12: Vander poel chart for mix stiffness (Heukelom & Klomp, 1964)	44
Figure 2.13: Stiffness of Bitumen in PSI (Heukelom & Klomp, 1954)	45
Figure 2.14: Shell Nomograph (Shell hand Book)	46
Figure 2.15: Viscosity Temperature chart for bitumen as Asphalt Institute	50
Figure 2.16: Longitudinal depressions in the wheel paths	55
Figure 4.1: Operational Framework for the study	60
Figure 5.1: Penetration apparatus-automatic (left) and manual (Right)	65
Figure 5.2: Softening point apparatus	66
Figure 5.3: Pressure control system developed for absolute viscosity test	68
Figure 5.4: Suggested vacuum system by ASTM D 2171	68
Figure 5.5: Asphalt Institute vacuum capillary viscometer	69
Figure 5.6: Kinematic viscometer and bath	70
Figure 5.7: Zeitfuchs Cross-Arm Viscometer	71
Figure 6.1: Penetration values of the tested samples at 25C	79
Figure 6.2: Softening values for the test samples	83
Figure 6.3: Comparison of penetration and softening points for test samples	84
Figure 6.4: Viscosity values at 135C with mixing and compaction requirements	86
Figure 6.6: Relationship of absolute viscosity vs. softening point	90
Figure 6.7: PI index (with penetration and softening point) of the tested samples	93
Figure 6.8: comparison of penetration and PI values	94

Figure 6.9: Comparison of softening point and PI	94
Figure 6.10: Relationship of penetration and temperature	96
Figure 6.11: Penetration Index by two temperature method	97
Figure 6.12: PI (by two temperature method) vs. penetration	98
Figure 6.13: Comparison of PI with two methods	100
Figure 6.14 Comparison of PI(SP) and PI(T1/T2)	101
Figure 6.15: Relationship between viscosity and temperature for test samples	103
Figure 6.16: VTS for tested bitumen samples	105
Figure 6.17: PVN of the tested samples	107
Figure 6.18: Penetration values from collected test reports	111
Figure 6.19: softening point values from collected test reports	111
Figure 6.20: softening point vs. penetration for test report data	112
Figure 6.21: PI of bitumen samples from test report data	113
Figure 6.22: Calculating mixing and compaction viscosity for test samples	116
Figure 6.23: Mixing temperatures for tested bitumen samples	118
Figure 6.24: Compaction temperatures for tested bitumen samples	119
Figure 6.25: Comparison of Mixing temperature and penetration of test samples	120
Figure 6.26: Comparison of Mixing temperature and penetration of test samples	122
Figure 6.27: Mix Stiffness comparison for two methods	126

LIST OF TABLES

	Page
Table 2.1: Details of various crude oil sources	11
Table 2.2: Requirements for penetration grading system	17
Table 2.3: Advantages and disadvantages of the penetration grading	18
Table 2.4: Viscosity grade Bitumen specification table 1	21
Table 2.5: Viscosity grade Bitumen specification table 2	22
Table 2.6: Viscosity grade Bitumen specification table 3	23
Table 2.7: Advantage and disadvantages of viscosity grading system	25
Table 2.8: PG binders for low and high temperatures	28
Table 3.1: ICTAD table 1702-1 a-Requirement of penetration grade bitumen 60/70	58
Table 5.1: Penetration and softening point values for tested bitumen samples	73
Table 5.2: Kinetic viscosity for tested bitumen samples	74
Table 5.3: Kinetic viscosity for tested bitumen samples	75
Table 5.4: Test Report data from construction sites and bitumen suppliers	76
Table 6.1: Penetration values of the tested samples at 25C	78
Table 6.2: Maximum difference for penetration readings in ASTM 05	80
Table 6.3: Penetration readings for test samples in penetration test	81
Table 6.4: Softening values for the test samples	82
Table 6.5: Kinematic viscosity of test samples at 135C	85
Table 6.6: Absolute viscosity of tested samples at 60C	87
Table 6.7: Viscosity grades and properties ASTM D 3381 table 2	88
Table 6.8: comparison of other test properties with absolute viscosity	90
Table 6.9: PI values related to penetration and softening point data	92
Table 6.10: Penetration test results for test sample at various temperatures	95
Table 6.11: Penetration Index by two temperature method	96
Table 6.12: Comparison of PI with two methods	99
Table 6.13: Viscosity test results for test samples at various temperatures	103
Table 6.14: Viscosity temperature susceptibility	104
Table 6.15: PVN values for tested bitumen samples	106
Table 6.16: Comparison of Temperature susceptibility measures	108
Table 6.17: Collected Test Report data	110

Table 6.18: Kinematic viscosity values at different temperatures	115
Table 6.19: Kinematic viscosity of test sample 2 at different temperatures	116
Table 6.20: Mixing and Compaction temperatures for tested bitumen samples	117
Table 6.21: Mixing (160C) and Compaction (135C) viscosities of tested bitumen	121
Table 6.22: Stiffness of tested bitumen at various temperatures for 0.1S loading	124
Table 6.23: Stiffness of mixture related to bitumen stiffness	125
Table 6.24: Stiffness of bitumen at various loading times	127
Table 6.25: Max and min air temperatures and latitudes of major districts	128
Table 6.26: Max and min pavement temperatures calculated for major districts	129



LIST OF ABBREVIATIONS

Abbreviation		Description
AI	-	Asphalt Institute
PI	-	Penetration Index
VTS	-	Viscosity Temperature Susceptibility
PVN	-	Penetration Viscosity number
HMA	-	Hot Mix Asphalt
ICTAD	-	Institute of Construction Training And Development



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LIST OF APPENDICES

Appendix	Description	page
Appendix A:	Sample Test Report	136
Appendix B:	Penetration Results for test samples	137
Appendix C:	Kinematic Viscosity of the test samples	141



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