



Registration No. 1996/009045/07
 45 Alexander Road, Westmead, Pinetown
 P O Box 15324, Westmead, 3608, Republic of South Africa
 Tel: + 27 (0) 31 700 4510, Fax: + 27 (0) 31 700 3165, E-mail: srtdbn@mweb.co.za

TEST REPORT

REPORT NO: E 8721

2009-06-12

Much Asphalt (Pty) Ltd
 P.O.Box 15287
 Bellair 4006

Attention: Mr. Timothy Gradwell

Dear Sir,

Warm Asphalt Trials Leicester Road

With reference to the samples submitted for testing.

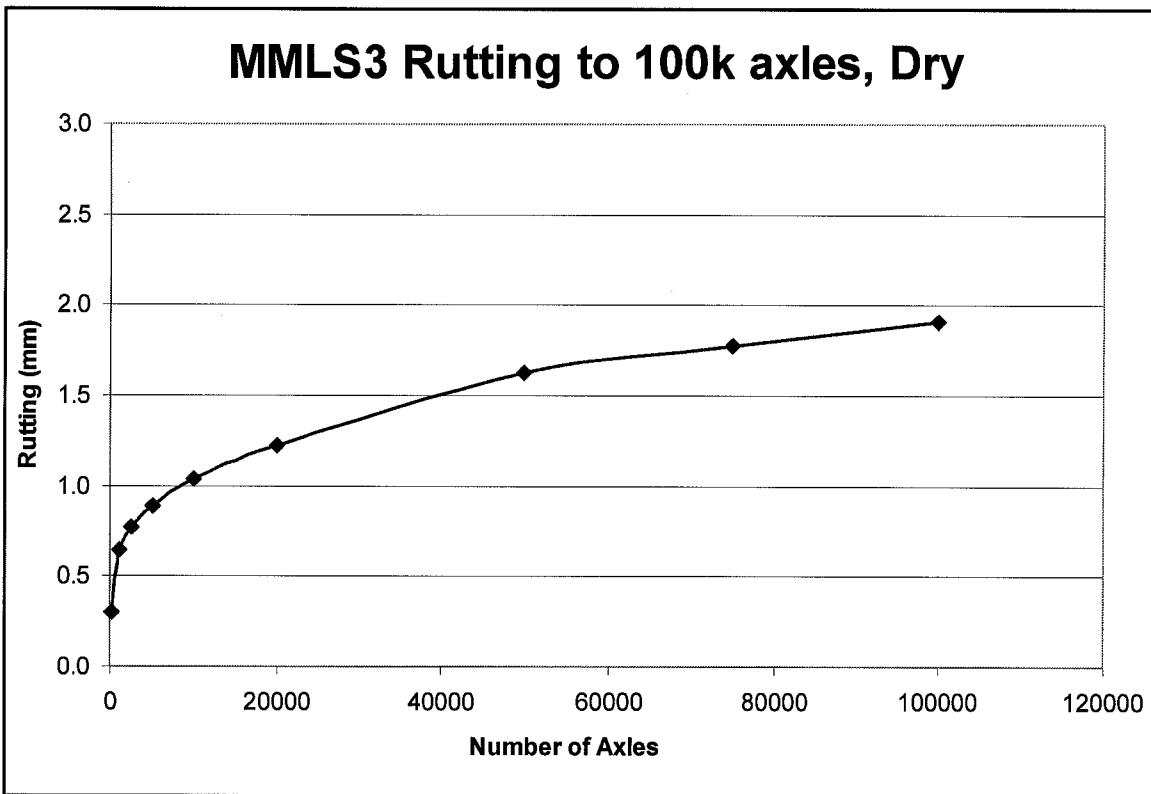
Date Received :	2009-05-26
Date Tested :	2009-05-28 to 2009-06-06
Material Description :	1 x ± 68kg asphalt sample 15 x ± 100 mm dia asphalt briquettes 1 x 5liter 40/50 pen Bitumen
Order Number	-
Deviation/Irregularity from test method:	N/A
Subcontracted to (*) as indicated :	N/A
Total number of pages :	6
Tests carried out :	Test Methods:
MMLS3 Wheel tracking	MMLS3 @ 50 ± 2°C, 7200 load repetitions per hour, wheel pressure 700 kPa, 2.7 kN wheel load, with no lateral wander. Briquettes were cut to a width of 105 mm. Transverse rut measurement were taken at 3 mm intervals. The tests were done dry. Briquettes were compacted at 150 mm diameter on a Troxler SGC to 7 ± 1% void content.
Air Permeability	TRH8 Appendix C
Modified Lottmann Test	ASTM D4687
Dynamic Creep Modulus	40°C, 100 kPa, 0.5Hz, Square wave, 1 s loading 1s rest, 30 – 3600 pulses
Resilient Modulus	NAT, 25°C, 0.4 Poisson's Ratio, 120ms risetime, 5µm horizontal deformation.
Modified Lottmann Test	ASTM D4867
Gyratory Compaction	Troxler Superpave Gyratory Compactor, 145°C, 1.25° Angle of gyration, 600 kPa loading, 30 gyr/min
Extraction, Bitumen Recovery and Penetration	TMH1 C7b, Din 1996, ASTM D5
Softening Point (R&B) (Recovered)	TMH1 C7b, Din 1996, ASTM D36
SANS 307	ASTM D5, D36, D2872, D4402 SRT TMA 1.

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The results of the MMLS testing are as follows:

Laboratory Number	B5919
Sample Number	P2611
Mix Identification	R
Mix Type/Layer	Type D, 10% RA, 1% Lime
Binder Type	40/50
MMLS3 Data	
Average Voids of Briquettes (%)	7.0
Average Rut depth after 100 k repetitions (μ) (mm)	1.91
Standard Deviation (σ) (mm)	0.276
COV (%)	14.5
$\mu + 2\sigma$ (95% Probability level) (mm)	2.5

A graphical representation of the rut resistance of the mix is as follows:



The above graph was drawn from the following data:

Number of Axles	100	1000	2500	5000	10000	20000	50000	75000	100000
Rut Depth (mm)	0.30	0.65	0.77	0.89	1.04	1.23	1.63	1.78	1.91



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The individual briquette data are as follows:

Test Position	0200	0300	0400	0500	0600	0700	0800	Average
Briquette Number	12	10	2	5	1	3	4	
Briquette Height (mm)	60							
BRD	2.301	2.298	2.306	2.306	2.301	2.475	2.305	
TMRD	2.475							
Void Content (%)	7.0	7.2	6.8	6.8	7.0	7.1	6.9	7.0
Rut Depth (mm)	1.99	2.07	1.46	1.64	2.23	2.11	1.87	1.91

We can refer you to the interim protocol presented by Professor Hugo at the November 2008 RPF held in Pretoria for an interpretation of the results. A copy can be forwarded to you if required.

The results of the rest of the tests on asphalt, performed by SRT are as follows:

Laboratory Number	B5919		
Sample Number	P2611		
Date Sampled	2009-05-26		
Mix Type	Type D, 1% Hydrated Lime, 10% RA		
Binder Grade	40/50		
Modified Lottmann Test (TSR)	0.83		
Air Permeability @ 7% Voids ($\times 10^{-8} \text{cm}^2$)	1.48		
Dynamic Creep Modulus (MPa)	27.0	25.0	20.6
Average	24.2		
Voids after 300 Gyration @ 145°C (%)	4.7		
Resilient Modulus (MPa)	3777	3945	4313
Average	4012		
Recovered Penetration (d.mm)	35		
Recovered Softening Point (R&B) (°C)	53.6		

The results of the tests on the bitumen sample are as follows:

Laboratory Number	B5921	Specification
Sample Number	Bit 61 (P2611)	SANS 307
Date Sampled	2009-05-26	
Binder Grade	40/50	40/50
Tests Before RTFOT		
Penetration (d.mm)	52	40 - 50
Softening Point (R&B) (°C)	48.1	49 - 59
Dynamic Viscosity @ 60°C (Pa.s)	276	220 - 400
Dynamic Viscosity @ 135°C (Pa.s)	0.419	0.27 - 0.65
Spot Test	15	30 Max
Tests After RTFOT		
Mass Loss (%)	0.087	Max 0.3 Max
Retained Penetration (%)	67.3	60 Min
Softening Point (R&B) (°C)	52.7	52 Min
Difference in Softening Point (R&B) (°C)	4.6	7 Max
Dynamic Viscosity @ 60°C (% of Original)	235.3	300 Max

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Attached, please find an "Air Permeability at 7% Voids Report", as well as a "Gyratory Compaction Graph"

We wish to thank you for your valued support and if you require any further information please feel free to contact us.

Yours faithfully



C.H. Loots
Branch Manager

Everything possible is done to ensure that tests are representative and are performed accurately, and that reports and conclusions are quoted correctly. SRT or its officials can in no way be held liable for consequential damage or loss due to any error made in carrying out the tests, nor for any erroneous statement or opinion contained in a report based on such tests. If a test report is published or reproduced by the client, it will be done in full, without any omission. This report relates only to the samples received. If the report is referred to as an INTERIM REPORT it is not fit for publication.

SPECIALISED ROAD TECHNOLOGIES

GYRATORY COMPACTION GRAPH

Client : Much Asphalt (Pty) Ltd.

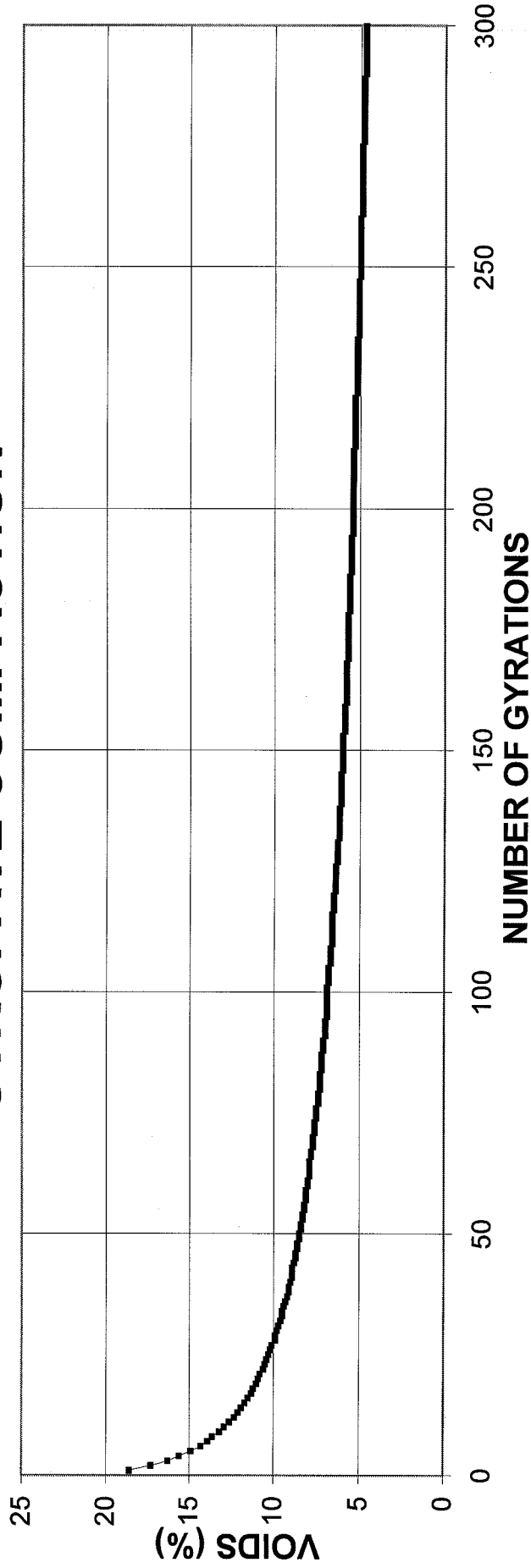
Report Number : E8721

Project : Warm Mix Trials - Leicester Road

Date : 2009-06-12

Laboratory Number	B5919	Voids after 300 gyrations (%)	4.7
Sample Number	P2611	Compaction after 300 gyrations (%)	95.3
Mix Type / Content (%)	Type D + 10% RA	Compaction Temp. (°C)	145
Blinder Type	40/50	BRD after 300 Gyrations	2.359
Gyratory Number	G144	TMRD	2.475

GYROPAVE COMPACTION



For SRT:


 Branch Manager

SPECIALISED ROAD TECHNOLOGIES

Air Permeability @ 7% Voids Report

Client : Much Asphalt (Pty) Ltd.

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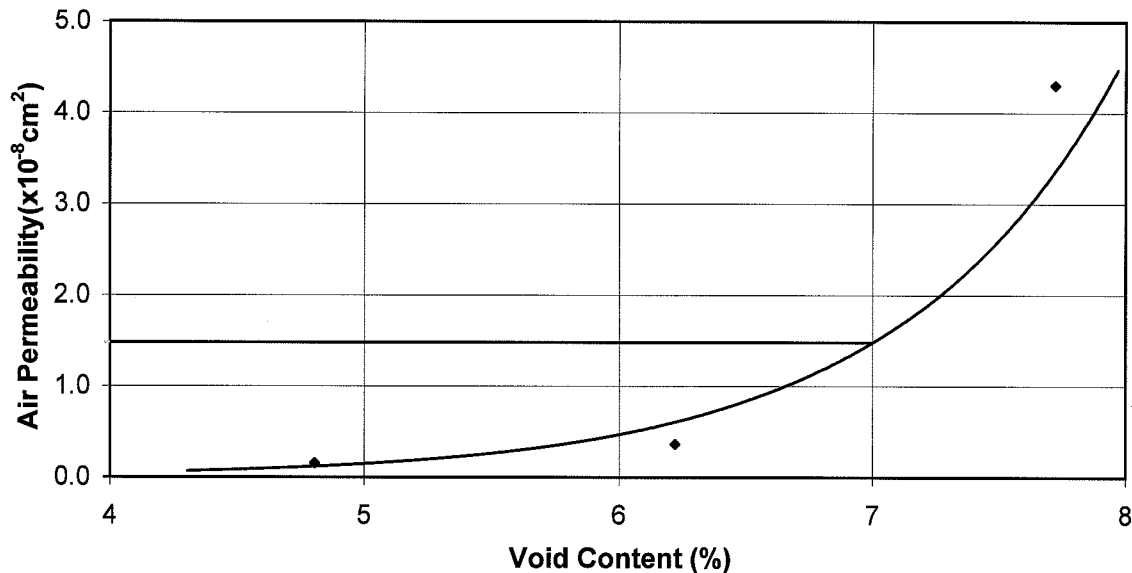
Project : Warm Mix Trials-Leicester Road

Date : 2009-06-12

Lab. Number	Sample Number	Mix Type	Specimen Number	BRD	TMRD (Rice's)	Voids (%)	Air Permeability ($\times 10^{-8} \text{ cm}^2$)
B5919	P2611	Type "D"	25	2.284	2.475	7.7	4.304
		40/50	35	2.321		6.2	0.365
			75	2.356		4.8	0.157

Result @ 7% Voids : 1.480

Air Permeability vs Voids



Comment: An exponential fit was used.

For SRT:


Branch Manager