Billian UK Ltd Type Testing

Laboratory Report

4076

PTS1419-B-04

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1.0 Introduction

Billian UK Limited approached PTS to investigate the feasibility of producing an asphalt mix compliant with BS EN 13108-5: 2006 Stone Mastic Asphalt from a source of recycled asphalt planning with the addition of Billians GTR Paving Pellets

2.0 Laboratory Work

2.1 Evaluation of feed stock

The composition and binder content of the feed stock was determinate in accordance with BS EN 12697-1 &2. A sample of the binder was recovered in accordance with BS EN 12697-3 and the penetration and softening point determined. The results of which can be seen in table 1. The results were compared against the target grading limits specified in PD 6691:2010 Guidance on the use of BS EN 13108

Table 1: Feed stock composition and binder properties

BS EN sieve (mm)	% Passing	PD 6691:2010 Table D.1
14	100	100
10	98	93 – 100
6.3	85	28 – 52
2	75	20 – 32
0.063	16.3	8.0 – 13.0
Binder Content	8.5	6.2 min
Needle Penetration (dmm @25°C)	34	
Ring & Ball softening point (deg C)	59.0	

2.2 Design of declared target composition

In order to produce a target grading compliant with PD 6691:2010 the feed stock was screened to remove the excess fines found to be present in the feed stock. The resultant product was them blended with 1% pellets to adjust the binder properties to within the 40/60 paving grade. The target composition and binder properties can be seen in table 2

Table 2: Target Composition & Binder properties

	% Passing	
BS EN sieve (mm)	Target composition	Compliance Specification
14	100	**100**
10	95	**90 – 100**
6.3	50	**43 – 57**
2	32	**26 – 38**
0.063	10.0	**8.0 – 12.0**
Binder content (Bact)	6.2	**5.7 – 6.7**
Needle Penetration (dmm @25°C)	40	**40 – 60**
Ring & Ball softening point (deg C)	61.8	

2.3 Product Evaluation

The mix was then tested for a series of properties to evaluate the mixes compliance with BS EN 13108-5:2006. The properties determined are listed below along with the relevant clause number

Clause 5.4 Void content.
Clause 5.5 Voids filled with bitumen
Clause 5.6 Binder Drainage
Clause 5.7 Water Sensitivity
Clause 5.9 Resistance to permanent deformation

2.4 Void Content

Samples were compacted in accordance with BS EN 13108-20 Tb3.1 ref C.1.1 & C.1.2 to determine the void content of the material at minimum compaction V_{max} and maximum compaction V_{min}.
The V_{min} void content was found to be 1.4% and the V_{max} 3.5%

2.5 Voids filled with bitumen
The voids filled with bitumen were determined at minimum compaction VFB_{min} and maximum compaction VFB_{max}. The VFB_{min} was found to be 80.1% and the VFB_{max} was found to be 91.5%.

2.6 Binder drainage
At target composition the binder drainage was determined in accordance with BS en 12697-18:2004, Clause 5 Schellenburg method. The average binder drainage *D* was found to be 0.1%

2.7 Water Sensitivity
At target composition the water sensitivity was determined in accordance with BS EN 12697-12:2008 tested at 25°C the *ITSR* value was found to be 97%

2.8 Resistance to permanent deformation (Wheeltracking)
Slabs were produced in accordance with BS EN 12697-33:2003 to an average void content of 3.5% and tested in accordance with BS EN 12697-22:2003 Small device procedure B @ 60°C. The mean results were found to be: Mean Wheel-tracking slope in air WTS_{AIR} 0.222mm/10^3 and Mean proportional rut depth PR_{DAIR} 11.2%.

2.9 Additional testing
In addition to the tests specified in BS EN 13108-5:2006 at target composition the stiffness (IT-CY) in accordance with BS EN 12697-26:2004 was also determined. The mean stiffness was found to be 6727Mpa

3.0 Summary of results
The results of the product evaluation were then placed into the appropriate categories specified in BS EN 13108-5:2006 along with the requirements specified in PD 6691:2010. The results can be seen in table 3

Table 3 Summary of results

Property tested	Result found	Selected category	PD 6691	
Void content				
maximum	V_{max} 3.5%	V_{max4}	V_{max5}	
minimum	V_{min} 1.4%	$V_{min1.5}$	$V_{min1.5}$	
Voids Filled with bitumen				
maximum	VFB_{max} 91.5%	VFB_{max92}	NR	
minimum	VFB_{min} 80.1%	VFB_{min80}	NR	
Binder Drainage	*D* 0.1%	$D_{0.3}$	$D_{0.3}$	
Water Sensitivity (25°C)	*ITSR* 97	$ITSR_{90}$	NR	
Wheeltracking (small device) procedure B				
Wheel tracking slope (60°C)	WTS_{AIR} 0.22mm/10^3	$WTS_{AIR0.3}$	$WTS_{AIR1.0}$	
Proportional rut depth (60°C)	PR_{DAIR} 11.2%	$PR_{DAIR\ NR}$	NR	
Stiffness (IT-CY)	6727 Mpa	NR	NR	

4.0 Conclusions
The product at target composition was found to comply with all the requirements of PD 6691:2010.

Signed:	**Darren Foster** **Laboratory Manager**

Date: 19/05/14