



# Switzerland Technical Report 2019

Comparison of the performance of asphalt containing PmB to asphalt containing standard 70/100 bitumen + MR6.

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**27/10/19**



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## Overview

In Zermatt, Switzerland a field trial was conducted to evaluate the performance of MacRebur 6% MR6 dry mixed into asphalt compiled of 70/105 binder modifier against PmB 65/105-60

The site was compiled of:

- 45 tonnes SMA 11 50/70 including 3kg of MacRebur MR6 per tonne of asphalt.
- 15 tonnes standard SMA 11 50/70 PMB

This asphalt was produced in accordance with BS EN 13108-5 at Imboden's hot mix asphalt plant near Visp.

## Testing of road

20kg samples of SMA 11 MR6 and SMA 11 PMB were taken from the site and sent to an independent UKAS accredited testing facility in the UK for comparison. A full analysis was conducted on each asphalt and their extracted binder.

## Results of Testing

A binder analysis was conducted on both samples to determine binder content and aggregate grading, and the results are outlined in figure 1.0.

Sieve Size (mm)	% Passing		Spec Limits (%)
	MR6	PmB	
11.2	100	100	90-100
10	81	83	
8	55	56	45-70
6.3	44	44	
4	33	30	25-40
2	29	28	20-30
1	23	24	
0.5	18	17	12.0-20.0
0.25	16	16	
0.125	13	12	
0.063	9.7	10.1	7.0-12.0

**Figure 1.0 Aggregate grading of samples**

	Binder Content (%)	Binder Spec	Aggregate Description
MR6	6.4	6.6 ± 0.3	Grey
PmB	6.5	6.6 ± 0.3	Grey

**Figure 1.1 Aggregate grading of samples**

The bulk and max densities of both samples were calculated, along with air void percentage and recovered penetration. The results are shown in the table in figure 1.2.

	Bulk Density (mg/m <sup>3</sup> )	Max Density (mg/m <sup>3</sup> )	Penetration (mm)	Softening Point (mm)
PmB	2.375	2.426	29	61.8
MR6	2.399	2.433	37	62.2

**Figure 1.2 Comparison of Results**

In Addition to the tests outlined in figure 1.2, marshal stability and flow tests were conducted on both the standard PMB sample and the MR6 sample and the results are outlined in figure 1.3.

	VFB	VMA	Stability	Flow	MQ	Void Content (%)
PmB	87.6	17.2	11.3	3.7	3.1	2.1
MR6	91.6	16.4	11.2	5.6	2.0	1.4

**Figure 1.3 Comparison of Results cont.**

As shown above the standard PmB sample showcased a greater void content. Therefore, it can be concluded that MacRebur MR6 sample demonstrates improved workability. In addition, MR6 binder showcased a similar stability to the regular PmB but had an increased flow.

Both samples were also subject to wheel tracking tests in accordance with BS EN 12697-22 and followed procedure B for a small; size device. The results of these tests are displayed in figures 1.4

	MR6				PmB			
Rut depth	3.4	3	3.4	3.3	4.7	3.6	3.2	3.8
Rut rate	0.03	0.029	0.027	0.028	0.0487	0.0452	0.032	0.042

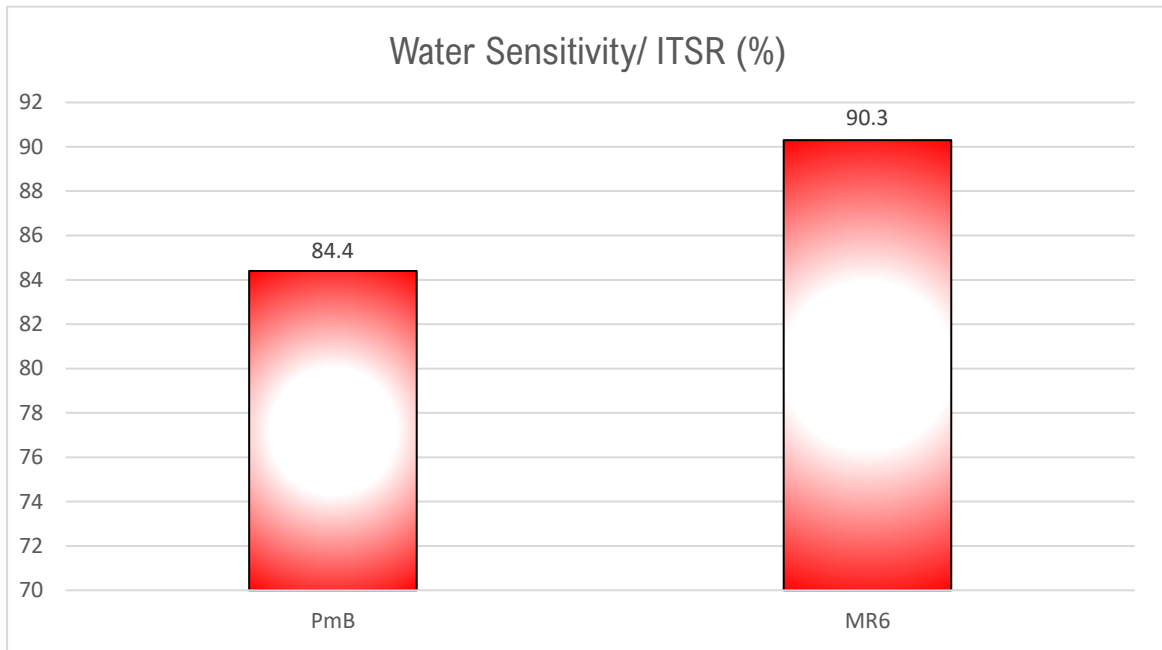
**Figure 1.4 Wheel Tracking Results**

Determination of the elastic recovery was undertaken on samples of recovered bitumen as per figure 1.5, this was in accordance to EN 13398:2010

	MR6	PmB
Test temperature	20C	20C
Stretching length	167	56
Result 1	70%	50%
Result 2	70%	46%
Mean	70%	48%

**Figure 1.5 Elastic Recovery results**

Finally, both samples were subject to a water sensitivity test, and the results are compared in the form of a bar chart shown in figure 1.6.



**Figure 1.6 Water Sensitivity**

The sample of road containing MR6 was calculated to have a higher ITSR at 90.3% compared to the regular PmB at 84.4%.

### **Conclusion**

After testing of both SMA 11 MR6 and SMA 11 PmB, the results indicate that MR6 at least matches the performance of the standard PmB, and on more than parameter shows an improvement performance.