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RESEARCH UPDATE

U 1999-10

PERFORMANCE GRADE ASPHALT CEMENT WATERFORD, VT ROUTE 18

REFERENCES:

Report WP 94-R-4, Research Report 95-4, U96-22,U97-17

INTRODUCTION:

This report describes the performance of PG (performance grade) asphalt cement which was placed on VT Route 18 in the Town of Waterford. This study was initiated by the nationwide effort to switch to SHRP (Strategic Highway Research Program) PG asphalt cements. The focus of the study is to determine whether PG asphalt cement improves the pavement's performance.

The asphalt selected for this project was PG 52-40. This classification indicates that the material can perform satisfactorily at a high pavement temperature of 52° C (at 20 mm below the pavement surface) and a low pavement surface temperature of -40° C. As certified by the manufacturer, Bitumar of Montreal, Canada, the binder provided for this project was Ecoflex PG 58-40, which exceeded the specified design requirement.

PROJECT DESCRIPTION:

Waterford project CM-RS 0225(3) began on VT Route 18 at mile marker 0.034 and continued north, 4.46 km to mile marker 2.868. Constructed in 1994, the project included drainage improvements, full depth reclamation and resurfacing. No chemical stabilization was used in the reclaimed base, but optimum compaction was assured through a test section and a moisture-density evaluation. Preconstruction and construction observations are available in Research Report 95-4.

For comparison, two full width control areas, using an AC-20 asphalt cement, were incorporated in the project at the north and south ends. The experimental area, using PG 58-40 (PG 52-40 was specified), was located between the two control areas. A total of 13 test sites were established, each 30 m in length, and are examined yearly for cracking, rutting and ride roughness.

Metric All units in metric. Exceptions: mile markers/mileage reference for project location and supplier costs.

PERFORMANCE:

The following table compares five years of performance between standard and performance grade asphalt cements.

AVERAGE PAVEMENT PERFORMANCE (1995-1999)				
		Control Section "A"	**Experimental Section**	**Control Section "B"**
1995	**Cracking**	0	0	0
	Rutting (NB)	0	0	0
	Rutting (SB)	0	0	0
	IRI	1.1	1.0	0.8
1996	**Cracking**	0	0	23
	Rutting (NB)	0	1	0
	Rutting (SB)	0	2	2
	IRI	1.2	1.1	0.8
1997	**Cracking**	0	0	53
	Rutting (NB)	1	1	1
	Rutting (SB)	1	2	4
	IRI	1.1	1.1	1.2
1998	**Cracking**	0	2	93
	Rutting (NB)	3	2	2
	Rutting (SB)	2	3.5	5.5
	IRI	1.2	1.2	1.3
1999	**Cracking**	0	2	133
	Rutting (NB)	3	5	4
	Rutting (SB)	2	5	7
	IRI	N/A	N/A	N/A

Units: Cracking .... m/100m (average of longitudinal and transverse cracks, excluding center line cracks)
Rutting .... mm (average of inner and outer wheel paths)
IRI (roughness) ..... m/km (average for both travel lanes)

NB .... northbound lane
SB .... southbound lane
N/A .... not available

Control Section "A" - standard (AC-20) asphalt cement, test sites at MM 0.15, MM 0.31 and MM 0.40.

Experimental Section - performance grade (PG 58-40) asphalt cement, test sites at MM 0.65, MM 0.90, MM 1.11, MM 1.60, MM 1.73 and MM 2.05.

Control Section "B" - standard (AC-20) asphalt cement, test sites at MM 2.20, MM 2.40, MM 2.60 and MM 2.80

COSTS:

The control sections, with AC-20 asphalt cement, were placed at a cost of $\$7.89/m^2$. The experimental section, with PG 58-40 (PG 52-40 specified) asphalt cement, was placed at a cost of $\$8.90/m^2$. A detailed cost analysis is available in Research Report 95-4.

SUMMARY:

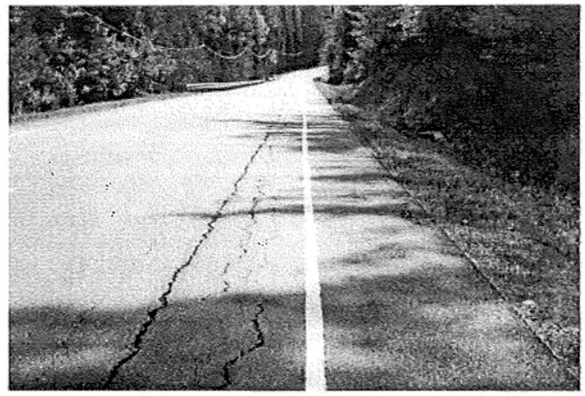
In 1999, after five years of service, the performance of control section "A" and the experimental section is very good. Control section "A" has yet to develop any cracks within the test sites and no additional rutting has occurred in the past year. The experimental test sites have also shown no increase in cracking but have developed more pronounced rutting, with the total amount doubling this past year.

Control section "B", consisting of four test sites, has developed cracking and rutting at all sites. The two northern sites exhibit minimal cracking, while the other two are more significant. At MM 2.40, cracking has increased 43m/100m in the past year to a total of 100m/100m and MM 2.20, showing the most distress, increased 100m/100m to a total of 383m/100m. These two sites also exhibit more rutting, predominantly in the outer wheel paths. Since the majority of cracks, predominantly longitudinal, and rutting occur in the same location, a correlation can be made that one failure mechanism helped to introduce another.

The longitudinal cracks may be associated with the quality of the subbase material. The existing subbase involved an old roadbed, which during this project, was reclaimed and widened. During this construction practice, fine materials, such as clays and silts, can become incorporated into the subbase which aid in holding water. During cold weather months, moisture in the subbase can freeze, causing movement of the pavement, and cracking. Once cracking begins, additional cracks may be generated by moisture penetrating through established cracks, to the subbase, resulting in general distress and loss of support in the subbase.

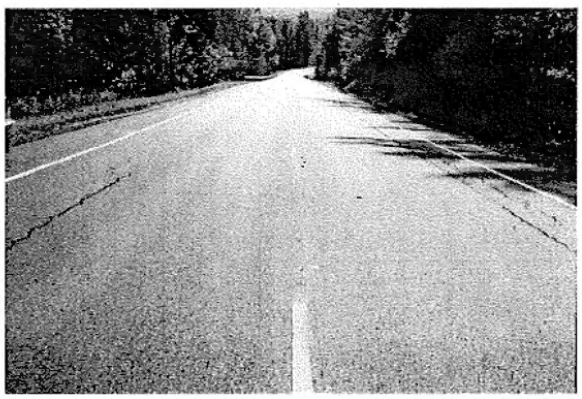
In 1999, ride roughness data was not collected for the project area due to the unavailability of equipment. Past data indicates that the three test sections have performed nearly equal to each other each year. It is important to note that because the Mays meter, a device that measures the road roughness, is calibrated each year, data may not be consistent from year to year, but are nonetheless relative within a given year.

Overall, after five years, this project is performing very well. Due to the fact that the majority of the control test sites are performing similar to the experimental test sites, it can be concluded that there does not appear to be any obvious advantage in the use of the PG asphalt cement at this time.



General Performance of VT Route 18

Southbound Lane @ MM 2.20



Northbound / Southbound Lane @ MM 2.20

FOLLOW-UP:

The project will continue to be monitored annually, with emphasis on identifying differences between the sections with standard and PG asphalt cements.