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RESEARCH UPDATE

U97-16

TERMINAL BLEND ASPHALT RUBBER HOT MIX
LOWELL-WESTFIELD, VT 100

References Work Plan 94-R-3, Report 94-9, Update U96-11

Background

This evaluation was initiated in 1994 to examine the performance of terminal blend asphalt rubber hot mix (ARHM), a pavement treatment which incorporates a minimum of 10% recycled waste tire rubber into the asphalt binder. There are currently three methods by which recycled rubber is introduced into hot mix asphaltic concrete, *terminal blend, wet blend, and dry blend.* As the name implies, terminal blend ARHM differs from wet blend and dry blend ARHM in that the recycled rubber is introduced into the asphalt cement at the asphalt cement supplier's terminal, allowing it to thoroughly dissolve into the asphalt binder. In contrast, the wet blend method introduces the rubber into the asphalt binder at the hot mix plant. In the dry blend method, the rubber is mixed directly with the aggregate.

Terminal blend ARHM was placed as an experimental feature on the Lowell-Westfield F 029-2(11) pavement rehabilitation project in the summer of 1994. The project involved the rehabilitation of 10.98 km of asphalt pavement using a 38 mm overlay of terminal blend ARHM along with a 3.293 km control section of 38 mm Type III standard overlay for purposes of comparison. Survey data is being collected from 11 test sites established on the project, 4 in the control section and 7 in the ARHM design.

Inspection

The project test sites have been inspected for signs of pavement distress over the past three years (1995 through 1997). No measurable distress was found in 1995. Comparison between the project design and control features is measured in terms of cracking (meters per 100 meters), wheel path rutting (expressed in millimeters), and ride quality based on indexes of Mays ride roughness.

Pavement Performance Data

Pavement Treatment	ARHM 1996	Standard Overlay 1996	ARHM 1997	StandardOverlay 1997
Cracking (m/100 m)	140	153	221	215
Wheel Path Rutting (mm)	0	0	3 mm	3 mm
Mays Ride Roughness (mm)	1360	1040	1480	1440

As the data presented above show, there is only minimal difference in performance between the ARHM and standard overlay test sites. After three years of service, both have similar rates of cracking and rutting, and are comparable in ride quality.

The following values are considered benchmarks for determining the end of service. Generally, when readings reach these levels a pavement is considered to be in need of rehabilitation.

- Cracking - 500 /100 m
- Rutting - 13 mm
- Mays ride roughness - 4000 mm/km

Using these indicators, and assuming that the values collected at the test sites are typical of the entire project, the pavement is currently showing the following levels of deterioration, with 100% representing a level of cracking, rutting, or roughness requiring rehabilitation.

- Cracking 45%
- Rutting 23 %
- Mays values 36%

Given these averages, the Lowell-Westfield pavement is estimated to have lost approximately 30% of its initial serviceability. From year 1996 to 1997 there was a only a slight decrease in ride quality and minimal rutting in both ARHM and standard overlay. In contrast, the rate of cracking rose sharply from 1996 to 1997. Average cracking from all test sites increased approximately 50%.

Cost Analysis

Comparative Costs of ARHM vs. Standard Overlay

ARHM Treatment

$ 3.78/m²	38 mm asphalt rubber hot mix
+2.08/m²	383 t/km leveling course
$ 5.86/m²	

Standard Overlay Treatment

$ 3.29/m²	38 mm asphalt rubber hot mix
+2.08/m²	383 t/km leveling course
$ 5.37/m²	

Costs shown above are actual construction costs for the Lowell-Westfield project. Cost comparison between the design and control treatments shows a 9% premium paid for asphalt rubber hot mix. This price is reasonable given the associated production costs of a new technology. Based on these costs, the terminal blend ARHM will have to perform at least as well as standard overlay to be considered cost effective as a rehabilitation method.

Summary and Conclusions

Based on current pavement performance data, the ARHM design treatment is performing nearly identically to the standard overlay control section. The recycled rubber introduced into the asphalt binder appears to be neither aiding nor hindering the pavement's resistance to cracking or rutting. Mays values further show that the two treatments are giving similar ride quality.

Since the terminal blend asphalt binder was priced 9% higher than standard overlay, and both are performing comparably, there is no apparent cost benefit to ARHM at this stage of the investigation.

Follow Up

Inspections of The Lowell-Westfield project will continue in order to further evaluate the performance of ARHM compared with standard overlay. Results will presented in an update report.