RESEARCH NOTES HIGHWAY DIVISION MATERIALS & RESEARCH SECTION
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FIVE YEAR PERFORMANCE OF ASPHALT ADDITIVE TEST SECTIONS

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The durability of hot mix asphalt concrete (HMAC) overlays is important to the Oregon State Highway Division (OSHD), as this is the most common form of surface rehabilitation on State roads. To see if several HMAC additives available in Oregon increased overlay life, test sections were built in 1985.

LAYOUT AND CROSS-SECTION - The nine test sections and one control section are located on US Route 97, 19 miles south of Bend, Oregon. The top course is a 1-1/2 to 2-inch thick lift of HMAC using the experimental additives. The combined base and leveling course is a 4 to 4-1/2 inch thick lift of HMAC, using both aggregate treated with lime, and Pave Bond, as antistripping treatments. The existing pavement was badly alligatored and had frequent thermal cracks.

MATERIALS - The aggregate is crushed river cobbles composed mainly of basalts and other extrusive igneous rocks. Section 1 has a special gradation, while Sections 2 through 10 and the base lift are OSHD Class "C" dense-graded mix with a 1/2-inch maximum stone size. The experimental mixes are:

Section 1) Plus Ride 12^{R} with Pave Bond^{R} - A mix with AC-20 asphalt, Pave Bond complex polyamine antistripping agent, coarse granulated tire rubber as an aggregate substitute, and gap-graded aggregate.

Section 2) Arm-R-Shield^{R} - A mix with AR-4000W asphalt, extender oils, and finely ground tire rubber. Most of the rubber is dissolved in the asphalt.

Section 3) Fiber Pave^{R} 3010 - A mix with AC-20 and polypropylene fibers.

Section 4) Boni Fibers^{R} B - A mix with AC-20 and polyester fibers.

Section 5) Class "C" with Pave Bond^{R} - A mix with AC-20 and Pave Bond.

Section 6) Class "C" with Pave Bond^{R} and Lime - A mix with AC-20, Pave Bond, and lime treated aggregate.

Section 7) Class "C" with Lime - A mix with AC-20 and lime treated aggregate.

Section 8) Class "C" - A mix with AC-20. The control section.

Section 9) CA(P)-1 - A mix with CA(P)-1 polymerized binder containing Elvax 150 ethylene-vinyl-acetate (EVA) polymer.

Section 10) CA(P)-1 with Lime - A mix with CA(P)-1 and lime treated aggregate.

PERFORMANCE - After five years and approximately 725,000 18-kip equivalent axle loads, all pavements have resisted rutting, maintained a smooth ride, and retained high skid resistances. The only significant distress on any sections are cracking and ravelling, as shown in the table on the following page.

In summary, the Plus Ride with Pave Bond (Southbound Lane), Arm-R-Shield, Fiber Pave, Boni Fibers, Class "C" with Pave Bond, and Class "C" with Pave Bond and Lime mixes performed better than the control.

The Class "C" with Lime mix performed similar to the control.

Over

Although the Plus Ride with Pave Bond (Northbound Lane), CA(P)-1, and CA(P)-1 with Lime mixes had overall performance equal to the control, they were worse than the control in certain performance categories.

The surface distress in the northbound lane of the Plus Ride with Pave Bond section may be due to insufficient compaction. When the southbound lane was rolled, there was shoving and tearing of the mat. This compaction difficulty could have been due to improperly graded aggregate. The compactive effort was reduced when the northbound lane was paved. Although it was not known at the time of construction, the apparent overcompaction of the southbound lane was needed to get the correct mix density, and resulting durability.

The cracking of the CA(P)-1 sections may be due to hardening of the binder. This binder aging may be due to the high mixing temperatures used in the batch plant, as recommended by the binder supplier's representitive. When this project was built, it was felt that a very hot mix was needed to get an adequate bond between the binder and the aggregate. On subsequent jobs, it was found that very hot mixes were not needed, and CA(P)-1 has been successfully placed on other projects at lower temperatures.

FIVE YEAR PERFORMANCE COMPARISON OF ASPHALT ADDITIVE SECTIONS VERSUS CONTROL SECTION
Lava Butte to Fremont Highway Junction Section of The Dalles-California Highway

Section Number	Section Name	Resistance to Transverse Thermal Cracking	Resistance to Longitudinal Fatigue Cracking in Wheeltrack	Resistance to Shrinkage Cracking	Resistance to Loss of Fines and Binder from Surface (Weathering)	Resistance to Loss of Large Aggregate From Surface (Ravelling)	Overall Performance Compared to Control
1	Plus Ride w/Pave Bond (Southbound Lane)	Much Better	Much Better	Better	Worse	Worse	Better
1	Plus Ride w/Pave Bond (Northbound Lane)	Much Better	Same	Better	Worse	Much Worse	Same
2	Arm-R-Shield	Better	Much Better	Much Better	Better	Same	Better
3	Fiber Pave	Same	Much Better	Better	Same	Same	Better
4	Boni Fibers	Better	Much Better	Much Better	Same	Same	Better
5	Class "C" w/ Pave Bond	Better	Much Better	Same	Same	Same	Better
6	Class "C" w/ Lime and Pave Bond	Same	Much Better	Better	Same	Same	Better
7	Class "C" w/Lime	Better	Same	Same	Same	Same	Same
8	Class "C"	Control	Control	Control	Control	Control	Control
9	CA(P)-1	Much Worse	Worse	Better	Same	Same	Same
10	CA(P)-1 w/Lime	Much Worse	Worse	Better	Same	Same	Same

The report "Evaluation of Asphalt Additives: Lava Butte to Fremont Highway Junction - Final Report" covering the performance of these sections during the first four years is available from the OSHD Research Unit. These sections will continue to be monitored for the next four years. For more information, contact Bo Miller, Senior Research Specialist, Oregon State Highway Division, 800 Airport Road S.E., Salem, Oregon 97310, (503) 378-2318.