RESEARCH NOTES
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CONSTRUCTION AND FIRST YEAR'S PERFORMANCE OF POLYMER MODIFIED OPEN-GRADED ASPHALT CONCRETE TEST SECTIONS

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In recent years, open-graded friction courses (OGFC) of hot mix asphalt concrete have been widely used by the Oregon State Highway Division (OSHD). Typically, conventional asphalt cement is used as an OGFC binder. However, in Oregon, several binders are available that use asphalt modified by the addition of polymers. To see if these binders increase OGFC life, several test sections were built in 1989.

LAYOUT AND CROSS SECTION - The five test and two control sections are on US Route 97, 2-1/2 miles south of Bend, Oregon. The 2 to 2-1/2 inch thick OGFC is over a 2 to 3 inch thick combined base and leveling course. In widened areas, these top courses are over new cement treated aggregate. Otherwise, the top courses overlay the old roadway. The existing pavement was badly alligatored and had frequent thermal cracks.

MATERIALS - The OGFC mix uses OSHD Class "F" gradation with either conventional asphalt or polymerized binders. The combined base and leveling course uses OSHD Class "B" dense-graded mix with a conventional asphalt binder. Both mixes have a 3/4-inch maximum stone size, and they use lime coated aggregate as an antistripping treatment. The sections contain these binders:

Sections 1 and 3) Styrelf^{R} - An asphalt modified with thermoplastic styrene-butadiene chemical cross-link diblock copolymer (SB).

Sections 2 and 5) AC-20 - A conventional asphalt. The control sections.

Sections 4 and 7) AC-20R - An asphalt modified with thermosetting styrene-butadiene rubber latex random copolymer (SBR).

Section 6) CA(P)-1 - An asphalt modified with thermoplastic ethylene-vinyl-acetate random copolymer (EVA).

CONSTRUCTION - No major construction problems occurred with any of the mixes, and all pavements were in good condition immediately after laydown. The need for special techniques and equipment was minimal. During construction, the following was observed:

1) The Styrelf was hard to pump at temperatures below 300°F. It is not known if this problem would occur with the other binders, as they were hotter upon delivery.

2) In comparison to the other binders, the fumes of the CA(P)-1 were very noxious.

3) Both the Styrelf and AC-20R mixes left thick coatings on equipment. In some cases, the deposits made the doors of the trailers used to haul the mix hard to open. Diesel fuel was used as a release agent on the inside of the trailers. However, it was not very effective.

4) The binders in both the Styrelf and AC-20R mixes had excessive downward migration during transport and placement. None of the mix or binder tests used in this study predicted this migration.

Over

5) Mix sampling and binder extraction techniques that work well on mixes with conventional asphalt performed poorly with these polymerized binders. Special sampling equipment and extraction techniques were developed to overcome these problems.

6) The OGFG had much higher void contents and lower stabilities than either the OSHD mix design criteria or the mix design samples. Although the mix design procedure was useful for determining mix proportions, the procedure may need modification to produce realistic void and stability values.

PERFORMANCE - After one year and approximately 340,000 18-kip equivalent single axle loads, all sections resisted rutting, maintained a smooth ride, and retained adequate skid resistance. The only significant distress on any sections were abrasion damage and weathering.

All sections suffered abrasion distress. Typical damage was a series of pockets 3 inches wide, 6 inches long, and 1/4 inch deep. They were spaced a foot apart along the entire section. It appeared that this scraping was due to abrasion from snow removal equipment. The CA(P)-1 pavement was the best at resisting this damage, and the AC-20 pavements were the worst. The Styrelf and AC-20R pavements were equal in performance, and their abrasion resistance was midway between the CA(P)-1 and AC-20 pavements.

Weathering caused the loss of fines, binder, and in some cases, large aggregate from the surface of the travel and passing lanes on all sections. Traffic may accelerate or induce this weathering, as there was no loss from the shoulders. In all cases it appeared that the binder and fines were lost first, and the large aggregate was lost due to lack of support. The comparative performance of these pavements at resisting weathering was similar to their resistance to abrasion damage. The CA(P)-1 pavement was the best, the AC-20 pavements were the worst, and the Styrelf and AC-20R pavements performance was midway between the CA(P)-1 section and the AC-20 section.

MAINTENANCE - In order to prevent further loss of surface aggregate and to toughen the surface against abrasion damage, a fog seal was applied to all sections in the Summer of 1990. The seal consisted of SS-1 emulsion diluted 50-50 with water, and the application rate varied between .12 to .15 gallons per square yard. The emulsion contained Styrelf polymer modified asphalt.

The report, "Field Test of Polymer Modified Asphalt Concrete: Murphy Road to Lava Butte Section - Construction Report," covering the construction of these sections, is available from the OSHD Research Unit. These sections will be studied through 1992. For more information, contact Bo Miller, Senior Research Specialist, Oregon State Highway Division, 800 Airport Road S.E., Salem, Oregon 97310, (503) 378-2318.