

POLYMER MODIFIED EMULSIONS FOR CHIP SEALS

DECEMBER 1991

RSN 91-10

The Research Unit is conducting a study of chip seal emulsions using asphalts containing polymers on test sections that were built in 1987 on Oregon Route 22 near Stayton in Marion County. A commonly used emulsion in the 1987 OSHD Specifications for Asphalt Materials was used as a standard for comparison. It was:

- CRS-2 cationic emulsion with a conventional asphalt.

Two other emulsions in the 1987 OSHD Specifications were also tried. They were:

- HFE-90 anionic high-float emulsion with a conventional asphalt.
- HFE-100S anionic emulsion with Styrelf polymerized asphalt by ELF Aquitane.

Several emulsions that were rarely or never used in Oregon were also tested. They were:

- CRS-2P cationic emulsion with latex rubber by Polysar.
- CRS-2R cationic emulsion with AC-20R polymerized asphalt by Asphalt Supply and Service.
- CRS-2D cationic emulsion with Ductilad polymerized asphalt by LBD.
- LMCRS-2H cationic "hard residue" emulsion with polymerized asphalt containing Neoprene by DuPont.
- CRS-2(P1) cationic emulsion with Chevron's CA(P)-1 polymerized asphalt containing Elvax EVA by DuPont.
- CRS-2K cationic emulsion with Chevron's CA(P)-2 polymerized asphalt containing Kraton by Shell.

All seals were constructed in the conventional manner with an emulsion coat followed by a cover stone application of 3/8-inch to 1/4-inch aggregate and rolling. On one group of seals (the CRS-2 control sections and the CRS-2P, CRS-2R, HFE-100S and HFE-90 test sections) traffic was released onto the newly constructed seals. On all sections except the HFE-100S, the tires stripped most of this cover aggregate out of the wheeltracks. 1/4-inch to #10 sand was applied to these seals and they were rerolled. The exact cause of this rock loss is unknown. It is suspected that the steel wheel rollers used on this project did not properly align and embed the chips in the wheeltracks of this slightly rutted road.

In contrast to the sections mentioned above, a second group of seals (the CRS-2 calibration section and the CRS-2D, LMCRS-2H, CRS-2(P1), and CRS-2K test sections) were covered with sand and rolled before traffic was allowed on the seals. All of these seals retained their cover aggregate.

Polymers helped the emulsion's chip retention. The polymer modified emulsions in the CRS-P, CRS-2R, and HFE-100S seals had better retention of original chips than the conventional emulsions in the CRS-2 control sections and the HFE-90 test section.

After four years of use, the following can be concluded about each emulsion:

CRS-2

This emulsion can perform well if care is used during construction. When sand was rolled into it before traffic was allowed on it, a CRS-2 seal had better than average retention of cover stone and resistance to bleeding, as shown by the performance of the calibration section. It also has slightly better than average crack sealing ability, as shown by the control sections.

CRS-2P, CRS-2R, and LMCRS-2H

These emulsions are not performing well. They had better retention of original chips than the conventional emulsions. However, their resistance to ravelling and cracking is poor. Due to its poor crack sealing ability, the CRS-2P seal is the only seal that has reached the end of its useful life. This occurred in Fall 1990. The problems with the CRS-2P and CRS-2R seals may not have happened if these emulsions were blended by methods different than the ones used on this project.

HFE-90

This emulsion is not performing well. It did not retain many of its original chips and it is a poorer than average crack sealer.

HFE-100S, CRS-2D, CRS-2(P1), and CRS-2K

These emulsions are performing well. They have retained their cover aggregate and are better than average crack sealers.

The report, "Polymer Modified Chip Seal Test: Oregon Route 22," has just been published by the Research Unit. It covers the construction and performance of these chip seals during the first two years. The results from this study will be used by the Materials and Research Section to revise the 1992 Specifications for Asphalt Materials.

These seals will be monitored by the Research Unit throughout their service life or until the reconstruction of the roadway which is scheduled for 1994. For more information, contact:

**Keith Martin or Bo Miller
Research Unit
Oregon State Highway Division
Highway Materials Laboratory
800 Airport Road S.E.
Salem Oregon 97310
(503) 378-2318**