The Issues

Stripping under the chip seal has been observed for more than twenty years; however recently, MnDOT has received increased reports of stripping of the upper ½ to 1 inch of hot mixed asphalt (HMA) pavements under chip seal surface treatments. The distress usually starts out as a small blister and develops to small potholes, at which point the chip seal delaminates from the pavement. This distress is an expensive maintenance problem. This appears to happen mainly on curb and gutter streets.

Surveys were sent to local agencies in MN. Of the respondents, 60% reported stripping within 2-4 years after placement of a chip seal. The stripping appears to be more prominent on streets older than 8 years before receiving the first chip seal.

Lab Testing

Study was completed on current test methods that help determine if asphalt will strip. These tests included the Lottman, the Asphalt Pavement Analyzer, Modified Iowa Boiling Test, and Lab Permeability. Asphalt samples were made at 7, 10, and 15% air voids. All lab tests performed determined as air voids increased, so did stripping.

Field Testing

Field testing was completed to help validate the lab testing and to help develop a process to determine suitable streets for chip seal that will not strip.

Streets were chosen and nuclear density was completed. Then cores were taken to determine air voids and to perform lab permeability on the field samples.
Results

Areas with lower density and higher air voids generally were the areas that experienced stripping. There was a lot of variability in density and air voids within the streets tested.

Conclusions and Recommendations

It was determined that stripping is caused by high air voids and low density within a street. Chip sealing does not cause the stripping.

It would be beneficial to use a nuclear density gauge on streets prior to chip seal to help determine if stripping will occur. The nuclear density gauge is the least invasive and most economical test method used in this study for determining air voids and density.

For more information

Thomas J. Wood
Office of Materials & Road Research
Phone: 651-366-5573
E-mail: thomas.wood@dot.state.mn.us

www.dot.state.mn.us/mnroad