

**Bituminous Pavement Stripping Research Findings
City of Ramsey**

January 16, 2020

Findings and Practices of other Cities

- Andover
 - Moving away from sealcoating streets
 - Collects funds for first crackseal of new streets from developers
- Anoka
 - Sealcoating AND fog sealing all streets
 - Cracksealing streets one year before sealcoating/fog sealing
- Brooklyn Park
 - Significant stripping issues since early 2010's
 - More input will be obtained January 17
- Coon Rapids
 - Administers Northwest Metro Pavement Management Group (JPA)
 - Planning to try faster curing fog seal emulsion offered by FHR this year (CQS-1hd50)
 - Crack filling only applied to collector streets (no sealcoats)
 - Sealcoating only applied to local streets
 - Fog sealing only applied to cul-de-sacs
- Saint Michael
 - Stripping issues experienced since mid-2010's.
 - Stopped sealcoating streets 4 years ago.
 - Applying Reclamite to streets with wear course (new and overlays) \leq 2 years old.
- Woodbury
 - Stripping issues first experienced in late 2000's.
 - Stopped sealcoating streets around 2009.
 - Replaced around 85 miles of residential street pavement since 2014
 - Adopted new mix design per MnDOT Tech Memo 17-sa-01
 - Applying Reclamite to all new pavement within 1 year

General Comments and Observations

- Stripping issues are observed more often after the second sealcoat.
- Once stripping is observed it continues to expand.
- Freeze thaw cycles accelerate stripping.
- Based on weather trends, northern climates should expect to experience increased;
 - Rain events each winter, resulting in greater saturation of pavements
 - Freeze-thaw events each winter
- Mill and infill is effective to repair stripping damage *if done before stripping progresses into pavement base course*.
- Pavement rejuvenators (Reclamite, Replay, etc.);
 - Penetrate into pavements roughly 3/8-inch
 - Replace maltenes in oxidized pavements
 - Effectively seal pavement surfaces
 - Numerous U.S. cities have used for decades, including Chicago

Local Road Research Board (LRRB) Pavement Stripping Research Conclusions and Recommendations

- 2013-08 Stripping of Hot-Mix Asphalt Pavements under Chip Seals (Wood & Cole, MnDOT)
 - Conclusions: Stripping of HMA pavement after application of chip seal caused by areas of high air voids or low density.

Bituminous Pavement Stripping Research Findings

City of Ramsey

January 16, 2020

- Recommendations: Agencies should use specified density methods to ensure proper uniform compaction of HMA paving. Three options for addressing existing streets with low density and high air voids variability include:
 1. Do nothing and allow pavement to fail prematurely.
 2. Chip seal early in pavement life, preferably within first 4 years, to keep pavement structure as dry as possible to limit moisture damage.
 3. Fog seal pavement with a CSS-1h diluted to one part water and one part emulsion.
- 2017-35 Prevention of Stripping Under Chip Seals (David L. Rettner, AET)
 - Conclusions:
 1. Study could not verify conclusions of 2013 LRRB research that high air voids is the primary cause of stripping (Wood & Cole, 2013).
 2. Study unable to identify mix designs or construction practices that correlated with incidence of stripping (e.g., bituminous mixture, contractor, geographic location, or year of construction).
 3. Primary conclusion of study is that while stripping under chip seals is a concern, it cannot be addressed with a simple mix design or paving rule of thumb.
 - Recommendations:
 1. Stripping under chip seals may be due to trapped moisture and water vapor between the chip seal and the asphalt pavement. This phenomenon would be similar to stripping behavior observed in conventional overlays of asphalt (Kandhal & Rickards, 2001).
 2. Ensure appropriate drainage in chip-sealed pavements. Utilization of subsurface drainage will reduce the probability of saturated subbase and base layers, which will reduce the amount of moisture moving through pavement.
 3. Minimize trapped water vapor between chip seal and the underlying asphalt. If first lift of pavement is damaged due to insufficient structural capacity to withstand heavy loads, the pavement may already have significant microscopic sized cracks that allow water vapor to be transmitted from subgrade soils into the pavement and be trapped. Causes of this cracking can include staggered construction of bituminous pavement layers across multiple construction seasons subjecting pavement to heavy loads while not at full strength.
 4. Explore use of thin bituminous overlays, approximately five-eighths inches in thickness, as an alternative to chip seal treatments. In Texas, these fine-mix overlays have shown promise as a surface treatment on oxidized pavement and as a surface treatment to extend the life of roadways exhibiting signs of stripping. Studies have shown these thin overlays can extend the service life by an additional three to five years before a mill-and-overlay is required.
 5. Maintain better municipal records on both the paving contractor and paving materials. While many city and county engineers were able to provide valuable detail on their chip-sealed roads for this study, the results and conclusions were limited by a lack of information (see Section 3.4). Detailed records of contractor and materials would benefit future research efforts and municipal efforts to maintain roads.
- NS462 – Is Seal Coating Counterproductive or Not?
 - Study not yet complete.