Performance of Ultra Thin Bonded Wear Course
Case Study: Interstate 35 Southbound, Mile Post 18 to 12

Introduction
This review was part of ongoing research to determine how Bituminous over Concrete (BOC) pavement cracks, and how to reduce or eliminate cracking of the Hot Mix Asphalt (HMA) overlay. View the complete field report from 2008 at: [www.mrr.dot.state.mn.us/research/pdf/2008MR RDOC036.pdf](http://www.mrr.dot.state.mn.us/research/pdf/2008MR RDOC036.pdf)

Construction
The original 9-in. pavement was constructed in 1970 with dowel reinforced skewed joints placed 27 feet apart. The HMA shoulders were three feet wide inside and ten feet outside.

By 2001 the concrete had deteriorated to the point that an HMA overlay was recommended. The overlay was placed with two 1½-in. layers of HVNW37540E below 1½ in. of HVWE37540E wearing course. The binder was a PG 64-28. The length of the project was approximately six miles, with the Northern two and Southern two miles receiving 4.5 in. of HMA. The Center two miles received 4.5 in. of HMA followed by ⅝ to ¾ in. of Ultra Thin Bonded Wearing Course (UTBWC).

Cracking Evaluations
The project was evaluated in 2004, 2005, and 2008. Evaluation used a combination of crack counts, coring, and photography.

Observations from 2004 showed that both sections not receiving UTBWC were cracking at a much greater rate than the section with the UTBWC.

Condition ratings ranging from 1 to 3 were used to rate the performance of each crack.

Examples of #2 and #3 Performance.

Most of the damage was located along the center line of the roadway at the junction of the cold paving joint. The following figure shows that during 2008 more cracks received a rating of (1), but the occurrence of condition (2) was high in the HMA-only sections.

Coring Evaluations
The project was cored in 2005. Observations were:
- HMA coring just past end of partial width cracking showed no sign of cracking.
- HMA coring over the same partial width demonstrated that formation was from the top down, with migration thorough the top two lifts of the HMA overlay.
- HMA coring over a more mature crack showed it had migrated thorough the HMA. In both cases cracking was offset approximately four inches downstream from the PCC joint.

UTBWC coring over an apparent crack showed no migration through the core.
- UTBWC coring over a visible crack showed no migration through the core. In both cases the joint in the PCC was offset approximately four inches from the surface crack.

Conclusions
The three main observations were:
1. Sections that only received the HMA overlay cracked at a much greater rate. The 2004 crack data showed that HMA had cracked at a rate five times great then the section utilizing UTBWC.
2. All the joints in PCC were offset by approximately four inches as compare to the location of the surface cracks.
3. Some of the cracks in the UTBWC seemed only to be on the surface.

For More Information:
Thomas J. Wood
(651) 366-5573 thomas.wood@state.mn.us
Office of Materials & Road Research
1400 Gervais Avenue
Maplewood, MN 55109
www.dot.state.mn.us/materials/research

Acknowledgment
This summary is based on research performed by Thomas Wood and Jerry Geib of MnDOT.