Interstate 494 from Mile Post 2.143 to Mile Post 7.461 in both directions a three to four lane divided urban freeway. The Average Daily Traffic (ADT) is between 140,000 to 150,000. The underlying pavement is concrete, which has received numerous hot mix asphalt (HMA) overlays. The last overlay was placed in 1998 the mixed used was SPWEA540E Superpave with a PG binder of 64-28. The total thickness of the last HMA overlay was 40 mm (1 ½ “).

The longitudinal construction joints on this segment of roadway had deteriorated to the point that they were a possible safety issue, especially for motorcyclist.

The Metro District maintenance forces had tried different methods of patching the longitudinal joint failure. The methods tried are either very expensive or leave poor driving surface. The decision was made to try using the Micro Surfacing technology to see if this would fill the joints and leave a smooth durable driving surface. The intent of the project was to repair the right fog line and the two skip lines that where exhibiting failures. The total...
length of the project was 28,079 feet each direction with three passes made in each direction for a total of 166,848 feet of construction joint repaired. The plan was to use MN/DOT type II micro surfacing aggregate (same as ISSA Type II) for the gradation. The Contractor was ASTECH of St. Cloud, MN. They chose to use Martin Marietta granite out of the St. Cloud, MN quarry. The emulsion was supplied by Sem-Materials and was their Ralumac® micro surfacing emulsion. The mix design called for 13 percent emulsion and 1 percent cement.

The estimated quantity of micro surfacing to fix the failing joints was 2.5 pounds per linear foot. The application was placed two feet wide centered over the joint. Due to the joints being in poorer condition then what was observed at the time of the developing plan. The final yield of material used was 3.6 pounds per linear foot. The actual cost of the micro surfacing was $0.498 per linear foot.¹

One other long-term option was to mill one foot wide by four inches deep and refill with HMA. Using the following prices the cost varied from $4.83 per linear foot (patching mix $200/t) to $9.66² per foot (patching mix $400/t).

Due to the high ADT the Contractor was not allowed to have two lanes closed in one direction until after 11:00 PM. This allowed the Contractor only six hours of working time. Even with the time limits the project was completed in 6 working days (nights).

The Contractor modified a standard micro surfacing rut-fill box by removing the augers and placed a smaller box inside the v box. The smaller box was two feet wide and approximately four feet long. It was fitted with flexible seals on the sides to control the mixture. The rear was equipped with an adjustable strike-off plate. This allowed the operator to place a smooth surface with little to no lip.

¹ All costs given do not include traffic control or pavement markings cost.
² All costs given do not include traffic control or pavement markings cost.
Augers which where removed

Picture 3 - Normal Rut Filling Box

Picture 4 - Front of Micro Surfacing Machine
Picture 5 - Newly placed micro surfacing.

Picture 6 - I-494 Eastbound micro surface with temporary pavement markings.
Conclusion and Recommendation

The early performance of this project has been very encouraging. Mn/DOT has received many positive comments about the improved ride, increased visibility of the pavement markings. The final test will be to see how well the micro surfacing treatment withstands the effects of winter. If the project withstands the winter effects similarly to other micro surfacing then Mn/DOT will have a very cost effective fast method to repair failing construction joints. Recommend would be to increase the amount of emulsion used in the mix design from 13 percent to 16 percent and also consider using a softer base emulsion. This increase should make the micro surfacing flow better into the small cracks and enhance the long-term durability.

The problem with longitudinal construction joints is well documented. The use of this modified micro surfacing process can result in a cost-effective technique for repairing failed longitudinal construction joints.

Based on the successful performance of this project over the first winter, Metro Maintenance partnered with District 3B maintenance forces to use the Mini Mac to continue to repair longitudinal joints on other roadways during the summer of 2008. The Mini Mac is a smaller micro surfacing machine made to do special work such as leveling transverse cracks.

February 2009, Observations

The vast majority of the joint repair material is still performing well. There are some potholes and hair line cracks forming primarily at the intersection of transverse cracks and longitudinal joints. Away from transverse joints the micro surfacing is showing good success in filling the joint. Metro Maintenance plans to continue to repair longitudinal joints this coming summer.
NEED MORE INFORMATION ON THE STUDY OR THE MINNESOTA ROAD RESEARCH PROJECT (MnROAD)?

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