Montana Department of Transportation
Research Program
August 2008

EXPERIMENTAL EVALUATION FINAL REPORT

Thin-Whitetopping Bonded Composite

Location:	Glendive, Montana – Dawson County
Project No.:	STPP 20-1(6)0, P-20, C000020; Highway 16, Milepost 0-0.6
FHWA No.	MT 00-04
Description:	Seventh year analysis of experimental thin-whitetopping (TW) construction project consisting of milling approximately 38mm of Asphalt Cement (AC) and placement of 100mm Portland Cement (PCCP) onto the milled surface to create a bonded, composite pavement. Project length-0.9 kilometer (0.6 mile).
Date of Evaluation:	June 2008
Date Constructed:	May 2001
Report Origin:	Craig Abernathy Experimental Project Manager Research Programs

Purpose

Highway 16 (P-20) suffered from rutting, plastic deformation and transverse cracking. The Montana Department of Transportation decided to construct a thin-whitetopping project based on minor rehabilitation criteria. Whitetopping is an alternative to the regular program of mill & fill. This procedure bonds a flexible layer to a rigid layer to form a bonded composite pavement, which eliminates rutting and plastic deformation. Currently, the Department considers this type of pavement treatment experimental.

Documentation

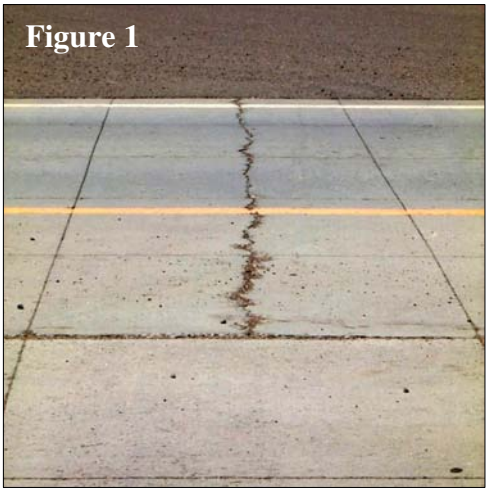


Figure 1

A visual inspection of the entire project was performed to document all types of surface cracking and distress. Photographic documentation of some of the cracks, recent repairs, as well as a representative crack map is included in this report. Note that the crack map is strictly an interpretation of progressive distress during the evaluation phase of the project, it is not to scale. Currently three transverse cracks are present on this project, all in the southbound lane. Location as follows (footage counted from the south end of the project going north), #1 at 1244' (541m), #2 at 1380' (420m), and #3 at 1480' (451m), see crack map at end of report. Note that these cracks developed soon after placement during construction. These cracks have widened since construction and are rated as severe in nature (example of crack in figure 1). Incompressible debris (rocks, friables etc,) is entering the cracks and will accelerate the deterioration of the fracture with freeze thaw events, however no debonding of the asphalt and PCCP layer was observed with any of the existing transverse cracks in this evaluation. No additional transverse cracking has occurred since construction.


Figure 2

A total of approximately twenty panels have cracked since construction, (the three areas of transverse cracking is not part of the performance analysis since that damage is related to the construction effort) which overall is a small percentage of the total number of sawed panels on the project. A cracked panel does not necessarily mean a failure of the bond between the AC and PCCP layers. To date, no panel movement or deflection was noticed on any of the panels as traffic moved over them.

Figure 3

Figure 4

Fifteen panels were affected at the north and south end of the project on the southbound lane. In fall of 2005 both these areas were repaired due to the extent of the panel cracking. The repair involved removal of the existing PCCP and asphalt layers and replaced with full-depth PCCP.

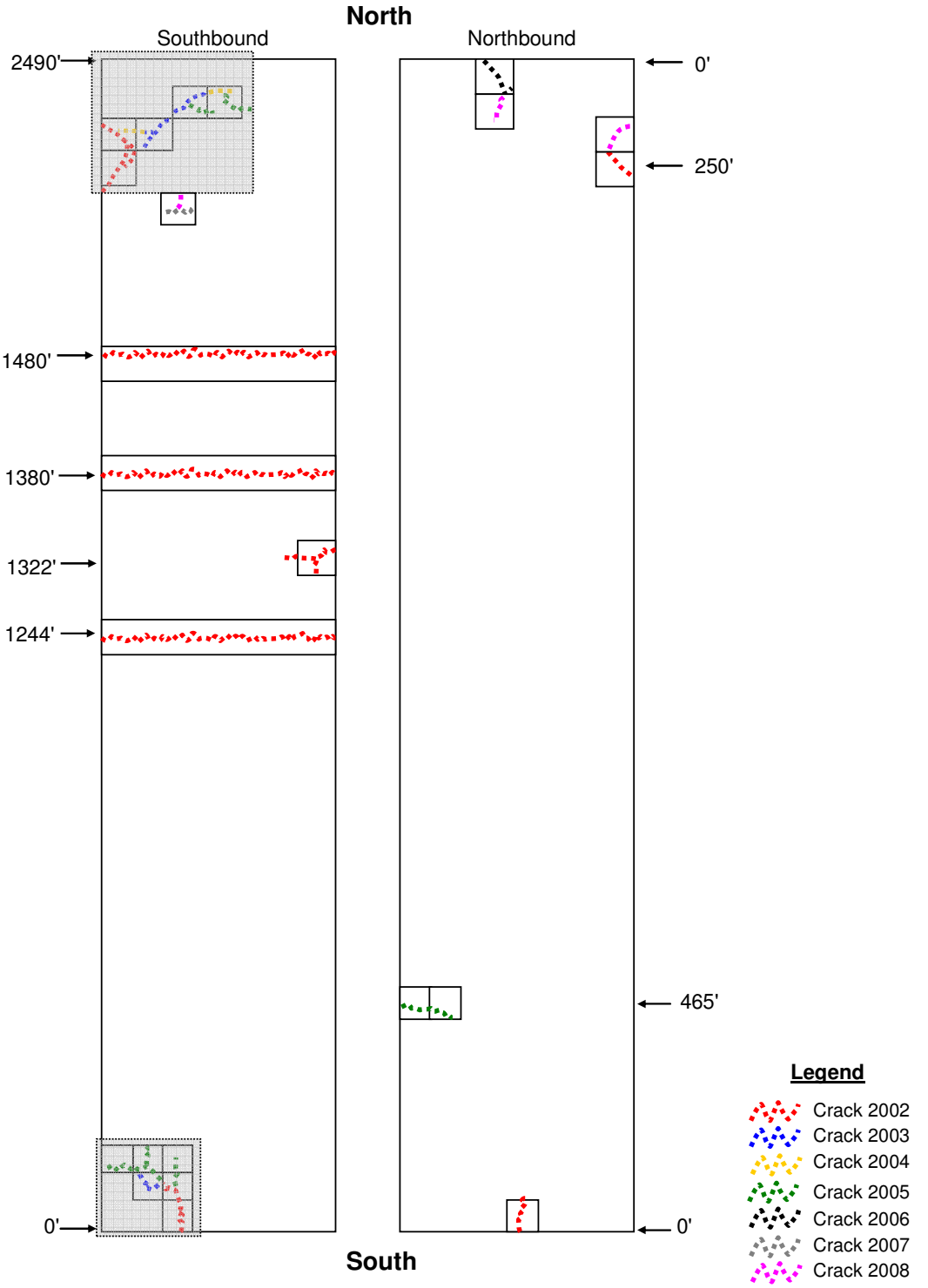
During this analysis several more panels have cracked, located at the north edge of the southbound lane of the project; adjacent to the recent full-depth repair (figure 2, crack panel shown as black line in image). In this type of cracking which is indicative of this kind of pavement treatment, without an autopsy of the panel, it is difficult to determine the various causes of cracking. It could entail debonding of the PCCP from the asphalt concrete, structural failure of the underlying AC layer, which visually, has not been seen, or possibly overloading of the composite panel or sympathy cracking. In addition, panels that have previously cracked are at or near the curb edge adjacent to areas where turning movements of heavy trucks are traveling onto the gravel curb and onto the edge of the PCCP pavement. The lack of support may have allowed cracking at these locations (refer to the crack map at the end of this document). Figure 3 (located midway on southbound side) shows how the lack of curb supports can allow panels to crack and shift from heavy loadings. Figure 4 shows the extent of cracking in 2008.

The current Ride Index for the northbound lane is rated at 200 and for the southbound lane at 178, both grouped as being in the ‘poor’ ride category. The northbound lane is rougher than the southbound. This may have been caused by the type of paver that was used during construction. The contractor used an old style, Alan three-tube paver; which could have inadvertently (due to the back and forth action of the unit) created the undulation or ‘rough ride’ as indicated. In addition, since the paver rested on the east edge of the previously placed southbound lane during construction, it most likely accelerated the roughness aspect of the ride for the northbound lane.

Several areas on the project are showing signs of wear and tear with slight spalling at panel saw cuts, to date minimum occurrences but gradually appearing. Figure 5 is an example of the spalling.

Regardless of the documentation of poor performance by the contractor during construction, the ride index analysis also as poor, and accumulative cracking to date; the majority of the project has performed well. This report and other project related information can be found at:
http://www.mdt.mt.gov/research/projects/gld_whitetopping.shtml

Glendive Whitetopping Representative Crack Map



All values and symbols are approximate - not to scale

Highway 16 (P-20), .Milepost 0-0.6 mile - Glendive, Montana

Full-depth Repair

Saw-cut Representation