Montana Department of Transportation
Research Program
November 2003

EXPERIMENTAL EVALUATION REPORT

Thin-Whitetopping Bonded Composite

Location:	Glendive, Montana – Dawson County
Project No.:	STPP 20-1(6)0 P-20, Highway 16, Milepost 0-.6
FHWA No.	MT 00-04
Description:	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 (.6 mile)
Date of Evaluation:	October 28, 2003
Date Constructed:	May 2001
Report Origin:	Craig Abernathy Experimental Project Coordinator

Purpose


North View of Project

Highway 16 (P-20) suffered from rutting, plastic deformation and transverse cracking with the previous AC pavement. 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. This project will be formally evaluated for five years and may be evaluated informally thereafter.

Documentation

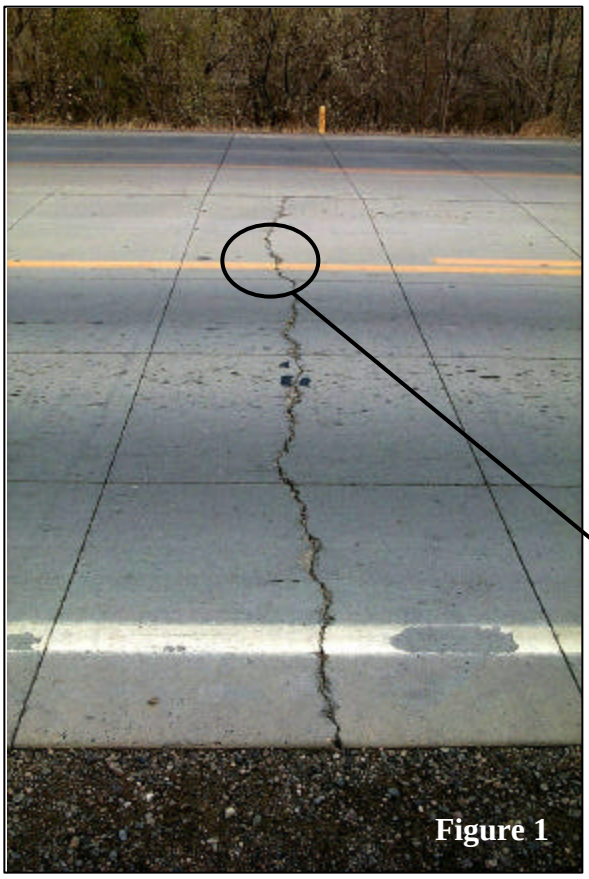
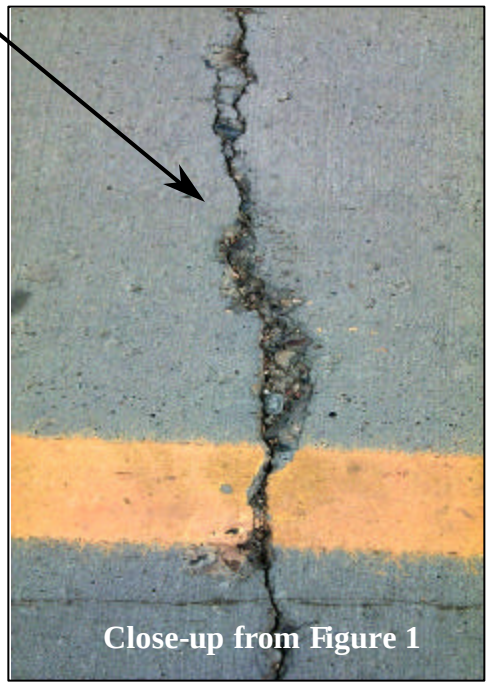


Figure 1

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 as well as a representative crack map is included in this report. 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). Note that these cracks developed soon after placement during construction. These cracks are widening rapidly since construction and are rated as severe in nature (example of crack in figure 1). Incompressible debris (rocks, friables etc,) are entering the cracks and will accelerate the deterioration of the fracture with freeze thaw events. It is suggested that these cracks be sealed in some manner to delay further damage.


Close-up from Figure 1

The rest of the project displayed minimal additional panel cracking. A total of ten panels have cracked which represents an additional three panels cracked since the last evaluation. A cracked panel does not necessarily mean a failure of the bond with the AC and PCCP layers. No panel movement or deflection was noticed on any of the panels as traffic moved over them.

Nine panels are affected at the north and south end of the project and one panel midway in the southbound lane. 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


Figure 2


Figure 3

various causes of cracking; which could entail debonding of the PCCP from the asphalt concrete, structural failure of the underlying AC layer, overloading of the composite panel or sympathy cracking. In addition, some panels that have cracked are at the curb edge. This lack of support, may have allowed cracking at these locations (refer to the crack map at the end of this document). The mid-way crack in the southbound lane located at about 1322' (0' starting at the south-end of the lane) has the same characteristics as the other cracked panels; save the fact, it is located at the southbound, east edge of the pavement. The east edge of the southbound pavement supported the paver for the northbound placement of the PCCP. This may have acerbated the cracking of the panel.

Additional panel cracking was located on the north end of the southbound lane on the west side of the road. It was originally observed that large truck traffic exiting off the interstate (due to the angle of turn) would roll over this section half on the pavement and partially on the gravel shoulder. The main reason for cracking at this location may be due to the lack of supporting shoulder and heavy loadings. The cracking pattern also reflects lack of support. Figure 2 shows the most recent area of cracked panel that was first documented in the 2002 evaluation. Truck tire imprints can be seen in the gravel. Figure 3 is the condition of the panel in 2002. This area has expanded into two additional damaged panels (figure 4). The cracks have been superimposed with a dark line for better visibility. Due to the nature and location of the cracking, this area will most likely deteriorate to the point in which it will require repair of the pavement.

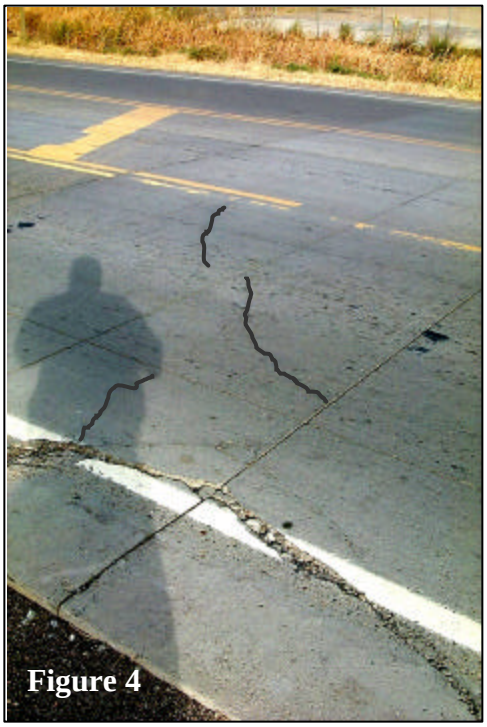


Figure 4

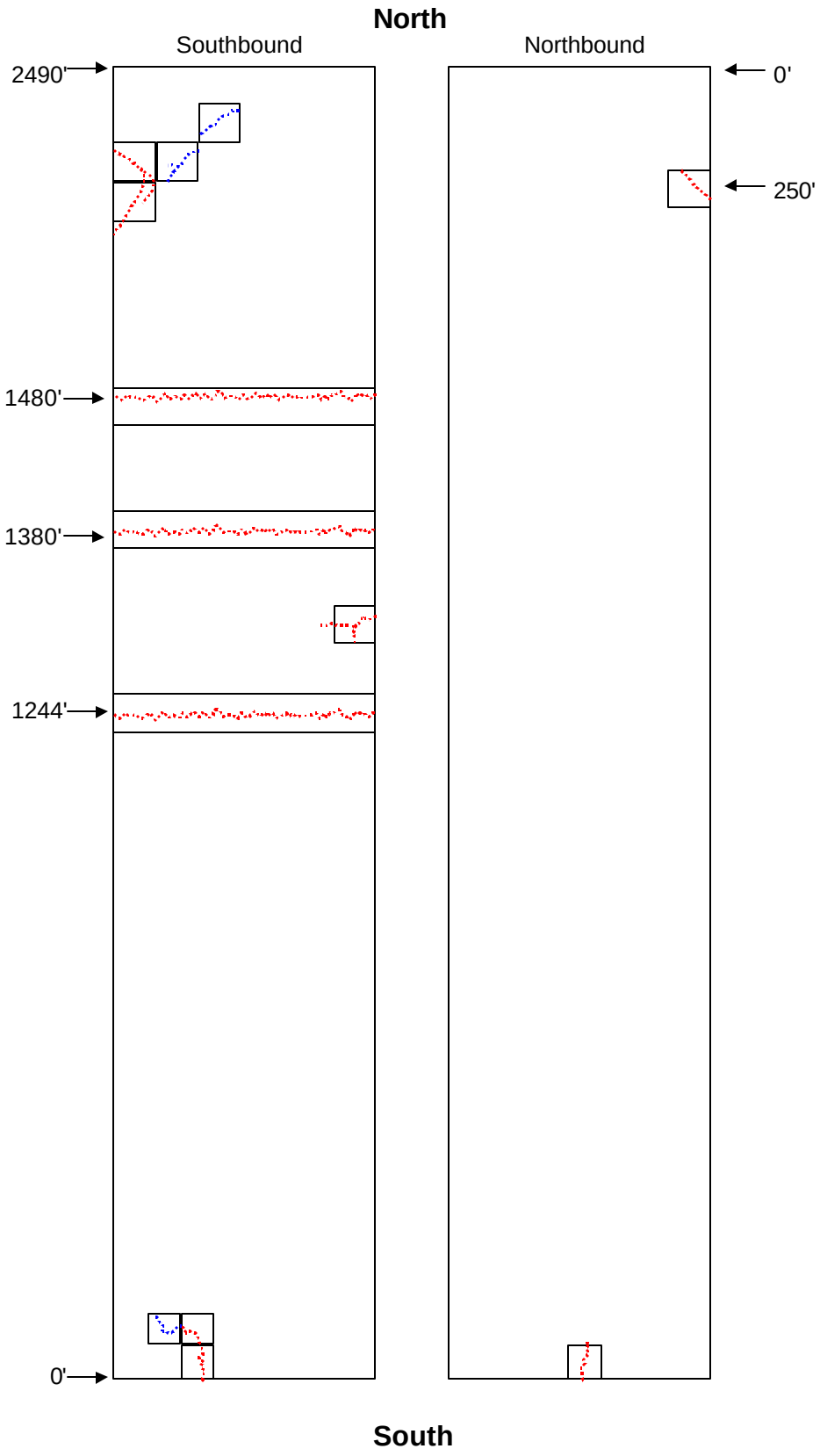
Cracking appeared at the south end of the project on both southbound and northbound lanes. This cracking was located adjacent to the full-depth PCCP at the Towne St. intersection (P-57), the cracks within these panels line up directly with the saw cuts on the full-depth PCCP (as seen in figure 5). This cracking is sympathy stress from

the full depth pavement. Installing a bond breaker between the full depth and whitetop sections may have alleviated this condition or (if possible) matching up saw cuts with the whitetopping and full-depth pavements.

Figure 5

The current Ride Index for the northbound lane is rated at 45 and for the southbound lane at 50, 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. Regardless of the ride analysis and the transverse cracking, which can be attributed to constructability issues, this project is performing well. The next evaluation will be held in the fall of 2004.

Glendive Whitetopping Representative Crack Map



Legend

Crack 2002

Crack 2003

Saw-cut Representation

All values and symbols are approximate

Highway 16 (P-20), .Milepost 0-.6 mile - Glendive, Montana