

Montana Department of Transportation
Research Program
August 2005

EXPERIMENTAL EVALUATION REPORT

Thin-Whitetopping Bonded Composite

Location: Glendive, Montana – Dawson County

Project No.: STPP 20-1(6)0 P-20, Highway 16, Milepost 0-0.6

FHWA No. MT 00-04

Description: Fourth 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: August, 2005

Date Constructed: May 2001

Report Origin: Craig Abernathy
Experimental Project Manager

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. This project will be formally evaluated for five years to 2006 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. Note that the crack map is strictly an interpretation of progressive cracking during the analysis 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. No additional transverse cracking has occurred

since construction.

The rest of the project displayed some additional panel cracking. A total of sixteen panels have cracked since construction. 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.

Fifteen 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 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, overloading of the composite panel or sympathy cracking. In addition, some panels that have 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). 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 east edge of the southbound pavement. The east edge 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 current, progressive cracking of panels that was first documented in the first annual evaluation (north-end, south bound), the image was the condition of the area 2004. Truck tire imprints were seen in the gravel. Figure 3 is the condition of the panel as seen in 2005. This area is continuing to deteriorate in each annual inspection. No panel deflection was seen as heavy trucks passed over. However, 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. On the south end of the southbound lane, westside, panels are continuing to

deteriorate as first documented in the 2002 report. This began as sympathy cracking from the full-depth portion and has progressed towards the truck stop approach. Load transfer from the gravel curb onto the whitetopping may be the major factor for panel cracking at this site. Figure 4 shows the area of



deterioration, a white line has been sprayed on the area where tire treads are seen in the gravel. A black line has been superimposed on the image to better see the cracks.



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 continued cracking at the site-specific areas, this project is performing well. The next evaluation will be held in the fall of 2006.