

Pavement Demonstration Program Status Report

January 2016

Background

Public Act 51 of 1951 allows the Michigan Department of Transportation (MDOT) to construct up to four demonstration projects per year that are not subject to a Life-Cycle Cost Analysis (LCCA). The LCCA process is a tool to select the lowest cost pavement design over the expected service life of the pavement. The LCCA process must include, by law, historical information for initial construction and maintenance costs and performance (service life). This information is not available for new pavement designs, precluding them from being chosen as alternatives. Also, new pavement designs and new technologies may be more expensive than the standard methodologies, which could reduce their chance of being selected as the lowest cost alternative. The pavement demonstration legislation provides an avenue for trying new and innovative ideas.

Potential advantages of pavement demonstration projects include increased service life, improved customer benefits, and lower maintenance costs. Future LCCAs may utilize cost, performance, and maintenance information from the demonstration projects.

Project Selection

Selection of candidate projects is a collaborative effort among MDOT central office pavement personnel, region personnel, and industry groups. Once these partners reach a consensus that a project would make a good candidate, the project goes to MDOT's Engineering Operations Committee for formal approval. Once approved, the project becomes part of the Pavement Demonstration Program.

All costs for the demonstration project are funded by the region's rehabilitation and reconstruction budget.

Project List

The following table contains a list of demonstration projects to date.

Table 1. Pavement Demonstration Project List							
FY Let	Route	Region	County	Location	Description	Pavement Costs	
						HMA	Concrete
2003	I-75 NB	North	Ogemaw	Ski Park Road to Roscommon County Line	Low volume unbonded overlay		\$1,980,000
2003	M-84 SB	Bay	Bay/Saginaw	Pierce Road to Delta Road	Perpetual pavement	\$700,000	
2004	M-3	Metro	Wayne	St. Aubin to McClellan	Thin unbonded overlay		\$2,200,000
2005	M-13	Bay	Bay	Mary Drive to North Street	Low volume concrete		\$1,200,000
2005	I-96 WB	Metro	Wayne	M-39 to Schaeffer Road	Perpetual pavement	\$4,800,000	
2006	M-99	Univ.	Jackson	Village of Springport	Low volume concrete		\$100,000
2008	I-75 NB	North	Cheboygan	Topinabee Mail Road north for 2.37 miles	Perpetual pavement	\$781,000	

Pavement Demonstration Program Status Report January 2016

Table 1. Pavement Demonstration Project List

FY Let	Route	Region	County	Location	Description	Pavement Costs	
						HMA	Concrete
					over rubblized concrete		
2009	M-1	Metro	Wayne	Tuxedo to Chandler	Thin unbonded overlay		\$931,000

NB = northbound; SB = southbound; WB = westbound

Below is a brief description of the status or condition of each project based on recent field visits.

I-75 Northbound (Ogemaw County): This project, constructed in 2003, is a six-inch unbonded concrete overlay on the northbound direction only. It includes the following test sections:

- Section 1: 10 foot transverse joint spacing, unsealed joints, no load transfer bars, 0.25 miles
- Section 2: 10 foot transverse joint spacing, sealed joints, no load transfer bars, 0.25 miles
- Section 3: 12 foot transverse joint spacing, unsealed joints, no load transfer bars, 1.5 miles
- Section 4: 12 foot transverse joint spacing, sealed joints, no load transfer bars, 1.5 miles
- Section 5: 12 foot transverse joint spacing, sealed joints, load transfer bars, 0.5 miles

The southbound direction, constructed at the same time, was rubblized (broken into smaller pieces) and overlaid with 6.5 inches of Hot Mix Asphalt (HMA).

Latest Survey: Section 3 continues to show the most amount of distress with 72 of the concrete panels having a crack. This is an increase of 17 panels over 2015 and represents approximately 3.6 percent of the total panels in this section. Section 4 had five newly cracked panels, bringing the total to 16. The number of cracked panels increased from 1 to 4 in Section 1, and from 0 to 3 in Section 5. Section 2 continues to be distress free. Section 2 is short in length and entirely on a hill, which allows moisture to drain away from the section very quickly. These counts do not include the small number of cracked panels that were repaired in 2011. Overall, the number of distressed concrete panels for the entire project is less than 2 percent. The rubblized project in the southbound direction had a slight increase in longitudinal and transverse cracking. The centerline joint continues to open up, which indicates potential poor joint construction.

M-84 Southbound: This project is a 6.5-inch HMA perpetual pavement completed in the fall of 2005. This was a two-lane road that was upgraded to a four-lane boulevard section and was built over a two-year period. The northbound direction contained a standard 6.5-inch HMA cross section and was built in 2004. The southbound contains the perpetual pavement, which is designed for a 40-year life. Polymerization of the HMA and a thicker base are expected to increase the service life over the standard cross section.

Latest Survey: For the fourth straight year, transverse cracking increased significantly for both directions. This year, the transverse cracking in the northbound direction (standard cross section) increased by 3,054 feet - an increase of 71 percent. For the southbound direction (perpetual pavement design), transverse cracking increased by 6,336 feet, an increase of 336 percent.

Pavement Demonstration Program Status Report January 2016

Extreme cold temperatures are typically the cause of transverse cracking on full-depth asphalt pavements. The amount of longitudinal cracking in both directions continues to be very minimal at 75 and 24 feet, respectively, for the northbound and southbound directions.

M-3: This project is a 4-inch unbonded concrete overlay constructed in the fall of 2005. Normal unbonded overlays are 6 inches or thicker. This project contains four test sections involving a combination of sealed and unsealed joints, with two different HMA bond breaking interlayer mixes. The HMA interlayer mixes are a normal dense-graded HMA and a more open-graded (drainable) HMA. The test sections are as follows:

- Section 1: Open-graded HMA interlayer, unsealed joints
- Section 2: Open-graded HMA interlayer, sealed joints
- Section 3: Dense-graded HMA interlayer, sealed joints
- Section 4: Dense-graded HMA interlayer, unsealed joints

Latest Survey: Overall, 779 of the 6 x 5.5 foot concrete panels have a crack (2.4 percent of the total in the survey area). This is an increase of 162 panels over 2012, which represents a 35 percent increase over last year. These counts do not include panels that were previously repaired, which is a total of 275. Including these panels brings the total to 3.2 percent of the panels in the survey area that are, or were, distressed. Of the 779 total panels, 349 are on northbound and 430 on southbound. The sealed sections are exhibiting fewer cracks than the unsealed (275 vs. 504), while the dense-graded HMA interlayer is exhibiting fewer cracks than the open-graded HMA (296 vs. 483). The unsealed category saw the largest increase in cracking (135 of the 162 panel increase).

A 2004 mill and resurface on the composite section directly to the north of this project (north of I-94) is being used as a comparison section. A new mill and resurface project was conducted in 2014, ending the life of the 2004 project at 10 years.

M-13: This project is a low-volume concrete design constructed in the summer of 2005. The concrete is 6 inches thick compared to a minimum concrete thickness of 8 inches on non-freeway routes. Joints are spaced 5.5 feet in both directions and are unsealed. A dense-graded base was used instead of the normal open-graded base material.

Latest Survey: 26 of the 5.5 by 5.5 foot panels were noted as having a crack this year. This is higher than last year (14) but matches the total from the 2014 report (27). The cracked panels represent less than 0.4 percent of the total panels for this pavement. These counts do not include the 32 panels that are cracked at the south side of the bridge over the Pinconning River. They are attributed to heavy equipment (large crane, etc.) that was parked there during a 2009 repair project on the bridge. There is a significant amount of scaling and spalling at the joints, particularly at the south end of the project. This condition was severe enough in some areas that they have been filled with a spray on patching material commonly referred to as AMZ. This joint deterioration is likely due to the timing of the sawing operation.

I-96 Westbound: This project is a 14-inch HMA perpetual pavement constructed in the fall of 2005. The eastbound direction was reconstructed with concrete. The concrete is a 20-year design, while the perpetual pavement is a 40-year design; this is not a side-by-side comparison.

Pavement Demonstration Program Status Report January 2016

Latest Survey: The longitudinal joints continue to be a problem on this pavement. The joint between the right lane and the right shoulder, for both the express and local lanes, continuously shows the most distress. The joint between the left and middle express lanes has a few intermittent locations that are very bad. As noted in previous reports, the longitudinal joint problems are typically a construction-related issue and therefore, are not considered a problem of the perpetual pavement design. New this year are two longitudinal cracks in the left (passing) lane of the express roadway totaling approximately 165 lineal feet. These cracks, as well as deteriorated sections of the longitudinal joint, have been sealed with overband crack fill.

M-99: This is the second low-volume concrete design project and is the same as the M-13 project, except the joints are spaced at 6 feet in both directions. It was constructed in summer/fall of 2006 and is approximately 800 feet in length.

Latest Survey: Two new cracked concrete panels were noted this year. One of these cracks is very small and is at the curb line in the intersection on the western end of the project. This brings the total number of distresses to 36. However, the distress progression on this very short section has been stable for several years.

I-75 Northbound (Cheboygan County): This is another 40-year HMA perpetual pavement design constructed in the fall of 2008. For this project, the existing concrete pavement was rubblized prior to the paving of the HMA. Rubblization is a standard fix; however, the HMA resurfacing is normally a 20-year design.

Latest Survey: Three transverse cracks across both lanes were noted this year. The longitudinal joint between lanes and between the right lane and right shoulder are both separating. This is typically a construction-related issue.

M-1 (Woodward Avenue): This project is a 4-inch unbonded concrete overlay similar to the M-3 project. It was constructed in 2010 and does not contain test sections. All joints were sealed and the same HMA interlayer (drainable open-graded HMA) was used throughout. Transverse joints are spaced at 6 feet, while the longitudinal joints are spaced at 5 feet.

Latest Survey: A total of 205 of the 6 x 5 feet panels are cracked, which is 82 more than last year (an increase of 67 percent). This, however, represents approximately 2 percent of the total survey area. Also noted this year is intermittent black staining on either side of some longitudinal and transverse joints. It is not immediately known what is causing the staining—further investigation will be needed.

Prepared by: Michael Eacker, P.E.
Pavement Management Engineer
Pavement Management Section
Construction Field Services Division
Michigan Department of Transportation