

Pavement Demonstration Program Status Report January 2015

Background

Public Act 51 of 1951 allows the Michigan Department of Transportation (MDOT) to construct 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 may not be available for new pavement designs, precluding them from being chosen as alternatives. Also, new pavement designs and new technologies are generally more expensive than the standard methodologies, which may 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 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.

Additional 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 over rubblized concrete | \$781,000 | |

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|-----------|-------|--------|--------|-----------------------|-----------------------------|----------------|-----------|
| | | | | | | HMA | 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 resembling gravel) and overlaid with 6.5 inches of Hot Mix Asphalt (HMA).

Latest Survey: Section 3, which has shown the most distress, had four new panels with cracks this year. Section 4 had two newly cracked panels, while Sections 1, 2, and 5 are in the same condition as last year. Four of the six newly cracked panels are due to a transverse crack, one is a corner crack, and one is a longitudinal crack. The total number of cracked panels represents about one percent of the total number in the entire project. These counts do not include the small number of cracked panels that were repaired in 2011.

The rubblize project in the southbound direction has some longitudinal cracking in both lanes and at the centerline joint. It appears there is a significant increase in transverse cracking over last year. This is most likely due to last winter when there was a long stretch of days with temperatures below freezing.

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 third straight year, transverse cracking increased significantly for both directions. This year, there were 2,710 feet of unsealed transverse cracks in the northbound direction (standard cross section), while there were 1,318 feet in the southbound direction (perpetual pavement design). In the previous year, there was a total of eight feet of unsealed transverse cracking for both directions. The unsealed cracks are discussed because they represent new cracks. The increase in transverse cracking this year is most likely due to last winter when there was a long stretch of days with temperatures below freezing.

Pavement Demonstration Program Status Report January 2015

M-3: This project is a four-inch unbonded concrete overlay constructed in the fall of 2005. Normal unbonded overlays are six 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, 627 of the 6 x 5.5 feet concrete panels have a crack (1.9 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. Of the 627 total, 287 are on northbound and 340 on southbound. The sealed sections are exhibiting fewer cracks than the unsealed (258 vs. 369), while the dense-graded HMA interlayer is exhibiting fewer cracks than the open-graded HMA (237 vs. 390). The southbound direction experienced the majority of the increase in cracking (106 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 ten years.

M-13: This project is a low-volume concrete design constructed in the summer of 2005. The concrete is six inches thick compared to a minimum concrete thickness of eight 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: The number of cracked panels noted on this project this year was lower than last year (14 vs. 27). It is not known why the number is lower than last year. The cracked panels represent less than 0.2 percent of the overall surface area of the project. These counts do not include the 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.

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.

Latest Survey: The longitudinal joints continue to worsen. 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. The middle and right lanes were paved at the same time with a technique called echelon paving (two paving trains very close to one another). The longitudinal joint between these two lanes is doing very well. As noted in previous reports, the longitudinal joint problems are typically a construction-related issue and are therefore not considered a problem of the perpetual pavement design.

Pavement Demonstration Program Status Report January 2015

Two angled transverse joints over a utility trench do not appear to be any worse than last year. However, the area between the two cracks (approximately six feet) may have settled a little bit.

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 six feet in both directions. It was constructed in summer/fall of 2006 and is approximately 800 feet in length. However, the number of distresses for such a small section of roadway is high. In general, the distresses that are present do appear to be in the same condition as in previous years' surveys. The exception to this would be a couple of transverse cracks that have widened slightly over several years and have a little bit of secondary spalling.

Latest Survey: No new distresses were noted this year. 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: This pavement continues to exhibit no distresses other than some raveling in spot locations along the longitudinal joints between lanes and between the right lane and the right shoulder. This longitudinal joint problem is typically a construction-related problem and not a problem with the perpetual pavement design.

M-1 (Woodward Avenue): This project is a four-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 six feet, while the longitudinal joints are spaced at five feet.

Latest Survey: A total of 123 of the 6 x 5 feet panels are cracked after four years of service (an increase of 62 percent over the 76 from last year). This, however, represents only 1.2 percent of the total survey area.

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