Pavement Demonstration Program Status Report
Public Act 457 of 2016
June 2018

Background
Public Act 457 of 2016, Section 1i allows the Michigan Department of Transportation (MDOT) to construct demonstration projects 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 and new pavement technologies and thus they cannot be used in the pavement selection process until the information has been obtained. The pavement demonstration legislation provides an avenue for trying new and innovative ideas.

Potential outcomes 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 Construction Field Services pavement personnel, region personnel and industry groups. Once these partners reach a consensus that a project would be 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 respective region’s rehabilitation and reconstruction budget.

Project List
The table below contains a list of demonstration projects to date.

<table>
<thead>
<tr>
<th>FY Let/Built</th>
<th>Route/Road</th>
<th>Region</th>
<th>County</th>
<th>Location</th>
<th>Description</th>
<th>Pavement Costs* HMA</th>
<th>Concrete</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003/2003</td>
<td>I-75 NB</td>
<td>North</td>
<td>Ogemaw</td>
<td>Ski Park Road to Roscommon County Line</td>
<td>Low volume unbonded overlay</td>
<td>$1,980,000</td>
<td></td>
</tr>
<tr>
<td>2003/2005</td>
<td>M-84/Bay Road SB</td>
<td>Bay</td>
<td>Bay/Saginaw</td>
<td>Pierce Road to Delta Road</td>
<td>Perpetual pavement</td>
<td>$700,000</td>
<td></td>
</tr>
<tr>
<td>2004/2005</td>
<td>M-3/Gratiot Avenue</td>
<td>Metro</td>
<td>Wayne</td>
<td>St. Aubin to McClellan</td>
<td>Thin unbonded overlay</td>
<td>$2,200,000</td>
<td></td>
</tr>
<tr>
<td>2005/2005</td>
<td>M-13/Euclid Avenue</td>
<td>Bay</td>
<td>Bay</td>
<td>Mary Drive to North Street</td>
<td>Low volume concrete</td>
<td>$1,200,000</td>
<td></td>
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<tr>
<td>2005/2005</td>
<td>I-96 WB</td>
<td>Metro</td>
<td>Wayne</td>
<td>M-39 to Schaeffer Road</td>
<td>Perpetual pavement</td>
<td>$4,800,000</td>
<td></td>
</tr>
<tr>
<td>2006/2006</td>
<td>M-99/Eaton Rapids Road</td>
<td>Univ.</td>
<td>Jackson</td>
<td>Village of Springport</td>
<td>Low volume concrete</td>
<td>$100,000</td>
<td></td>
</tr>
</tbody>
</table>
Table 1. Pavement Demonstration Project List

<table>
<thead>
<tr>
<th>FY Let/Built</th>
<th>Route/Road</th>
<th>Region</th>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>HMA</td>
<td>Concrete</td>
</tr>
<tr>
<td>2008/2008</td>
<td>I-75 NB</td>
<td>North</td>
<td>Cheboygan</td>
<td>Topinabee Mail Route Road north for 2.37 miles</td>
<td>Perpetual pavement over rubblized concrete</td>
<td>$781,000</td>
</tr>
<tr>
<td>2009/2010</td>
<td>M1 Woodward Ave</td>
<td>Metro</td>
<td>Wayne</td>
<td>Tuxedo to Chandler</td>
<td>Thin unbonded overlay</td>
<td>$931,000</td>
</tr>
<tr>
<td>2018/</td>
<td>I-94</td>
<td>University</td>
<td>Jackson</td>
<td>M-60 to Elm</td>
<td>Continuously Reinforced Concrete Pavement</td>
<td>$3,488,000</td>
</tr>
</tbody>
</table>

* = estimated costs during design phase; NB = northbound; SB = southbound; WB = westbound; FY = Fiscal year

Below is a brief description of the status or condition of each project based on field visits in April and May of 2018. Condition ratings for good/fair/poor have been assigned to each project based on a subjective evaluation of the condition at the time of the latest field visit. These are intended to provide the reader with a general sense of the performance of each project and may not reflect any future decisions about each project once enough information is obtained to make a final determination.

**I-75 Northbound (Ski Park Road to Roscommon County Line, Ogemaw County, North Region):**

This project, constructed in 2003, is a 6-inch unbonded concrete overlay on the northbound direction only, with a 20-year design life. 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 continues to show the most amount of distress in the form of corner breaks, transverse and longitudinal cracks, and joint spalling. Most of the increase in distresses was due to corner breaks and joint spalling. Corner breaks increased from a count of 26 last year to 67 this year. Most of the joints in this section showed joint spalling of varying severity levels. The number of cracks, however, remained stable compared to last year at around 50. For Section 4, the number of distressed slabs increased by 10, bringing the total to 28. Most of this increase (7 out of 10 new distresses) came from corner breaks. For Section 1, the number of distressed slabs remained stable at 12. For Section 5, the number of cracked slabs remained the same as last year, at 3. Section 2, which was distress-free until 2016, had developed 3 corner breaks with no new cracks observed. All sections showed low-to-medium severity joint spalling and some low-levels
of faulting intermittently along the transverse joints. The number of distressed concrete slabs for
the entire project is still less than 2 percent. Overall, the performance of this pavement section is
characterized as good, with the exception of Section 3, (longer slab length and unsealed joints/no
load transfer) which is characterized as fair.
The rubblized project in the southbound direction continues to exhibit longitudinal and transverse
cracking, with more new transverse cracks being noticed this year. There is also evidence of
heaving at some transverse cracks. The joint at centerline continues to open up, indicating a
potentially poor joint construction. Efforts are currently underway to develop a project for this
section of I-75 that would mitigate the heaving observed at the transverse cracks, as well as the
longitudinal joint quality issues. Its performance is characterized as fair.

M-84/Bay Road Southbound (Pierce Road to Delta Road, Saginaw County, Bay Region):
This project is a 6.5-inch HMA 40-year design perpetual pavement completed in the fall of 2005.
This was a two-lane road that was upgraded to a four-lane boulevard section and 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. With the perpetual pavement concept, the cross-section and materials
used are designed to eliminate cracking that initiate at the bottom of the asphalt layer. This would
leave only surface cracking that can be maintained with mill/resurface preventive maintenance
fixes at intervals that could be as long as 15 years. The initial costs of a perpetual pavement,
however, can be significantly higher than a standard design.

Latest Survey: Transverse cracking along the northbound direction continues to show significant
increases, as it increased by 2,990 feet over last year, an increase of 34 percent. For the southbound
direction (perpetual pavement design), the transverse cracking increased only by 600 feet, an
increase of less than 5 percent over last year. The amount of longitudinal cracking in both
directions continues to be minimal, at less than 200 feet for both north and southbound. With the
distresses observed over the last few years, this pavement may be a candidate for the first mill and
resurface project. This project’s performance to date is considered fair. However, the perpetual
section is still exhibiting more surface cracking as compared to the other two perpetual demo
pavements (I-96 Metro Region & I-75 North Region). Therefore, additional investigation will have
to be completed to ascertain any benefit in the performance and condition of the perpetual section
(southbound).

M-3/Gratiot Avenue (St. Aubin Street to McClellan Street, Wayne County, Metro Region):
This project is a 4-inch unbonded concrete overlay with a 15-year design that was constructed in
the fall of 2005. Normal unbonded overlays are 6-inches or thicker. This project contains 4 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, 1,192 of the 6-foot by 5.5-foot concrete slabs are cracked (3.6 percent of the total in the survey area). This is an increase of 241 slabs (or 25 percent) over last year. Of the 1,192 total, 468 are on northbound and 724 on southbound. The sealed sections are exhibiting fewer cracks than the unsealed (516 vs. 676), while the dense-graded HMA interlayer is exhibiting fewer cracks than the open-graded HMA (453 vs. 739). The sealed category saw the largest increase in cracking (196 out of 241). The pavement continues to show increases in cracking, raveling, and spalling throughout the project. Most of the distresses are concentrated in and around intersections, transitions, bus lanes, and manholes.

A 2004 mill and resurface on the composite section directly to the north of this project (north of I-94) was being used as a comparison section. However, a new mill and resurface project was conducted in 2014, ending the life of the 2004 project at 10 years. The concrete section, at 13 years of age, has outlasted the comparison HMA section. With the distresses continuing to increase and having one round of maintenance (full depth repairs) already, performance would be considered good.

M-13/Euclid Avenue (Mary Drive to North Street, Bay County, Bay Region):
This project is a low-volume concrete pavement with a 20-year design that was 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: 66 of the 5.5-foot by 5.5-foot slabs were noted as being cracked this year. This is higher than last year by 27 slabs. The cracked slabs represent less than 1 percent of the total slabs for this pavement. These counts do not include the 35 slabs that are cracked at the south side of the Pinconning River Bridge. The probable cause for the higher distress levels at the south side of the bridge is heavy equipment (large crane, etc.) that was parked on the area during a 2009 bridge repair project. There is also a significant amount of scaling and spalling at the joints, particularly at the south end of the project, where they were filled with a spray-on patching material commonly referred to by its commercial name AMZ. This joint deterioration is commonly related to the equipment used to saw the joints and the timing of the sawing operation. The right lane mid-lane longitudinal joint in both directions is exhibiting some widening and low levels of faulting at various locations along both north and southbound. This appears to have impacted the lane cross slope. Overall, the performance of this pavement section is characterized as fair.

I-96 Westbound (M-39/Southfield Freeway to Schaefer Road, Wayne County, Metro Region):
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 pavement condition was similar to that observed during the previous annual assessment. The longitudinal construction joints continue to show widening along the joint between the outside lane and the on/off ramps along the project length. 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. No change was noticed in the condition of the two transverse cracks that developed around the edges of a culvert along the westbound local lanes. Overall, the performance of this pavement section is characterized as good.
M-99/Eaton Rapids Road (Village of Springport, Jackson County, University Region):
This is the second low-volume roadway concrete pavement with a 20-year design similar to 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: No new cracked concrete slabs were noted this year within the project limits. However, a number of existing distresses (cracks and corner breaks) were showing increases in severity levels. Similar to previous surveys, the progression of distress (number and severity of distresses) has been fairly stable. However, the number of distresses for such a small section of roadway is still considerable. Overall, performance of this pavement section is characterized as fair.

I-75 Northbound (Topinabee Mail Route Road north for 2.37 miles, Cheboygan County, North Region):
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: Overall, the pavement appears to be in sound condition. There were 4 transverse cracks across both lanes that were reported last year. This year a fifth transverse crack was observed in the left lane, whereas 4 additional transverse cracks were observed in the right lane. The longitudinal joint between lanes and between the right lane and right shoulder are separating in certain areas. Also, some localized areas on the pavement surface exhibited low levels of segregation. At the southern limit of the project, a pothole was observed in the right lane due to raveling in a segregated area. These are typically construction related issues. Overall, the performance of this pavement section is characterized as good.

M-1/Woodward Avenue (Tuxedo Street to Chandler Street, Wayne County, Metro Region):
This project is a 4-inch unbonded concrete overlay with a 15-year design 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: The pavement was noted to be in similar condition as observed during last year’s evaluation. A total of 267 of the 6-foot by 5-foot slabs are cracked, which is 46 more than last year (an increase of 17 percent). This, however, represents less than 4 percent of the total survey area. Similar to last year, intermittent black staining was again noted on either side of some longitudinal and transverse joints. Further investigation will be needed to determine its root cause. Overall, the performance of this pavement section is characterized as fair.

I-94 (M-60 to Elm Street, Jackson County, University Region):
This is a 6-lane (3 lanes in each direction) reconstruction project using a 13-inch thick continuously reinforced concrete pavement (CRCP). The decision to utilize CRCP was made to provide some safety against subsidence risk within the right-of-way due to the existence of underground abandoned mineshafts. This will be the first use of CRCP by MDOT since the mid-1980s. Construction is expected to begin in the spring of 2019. The annual reviews for this demonstration project will begin with the 2019 cycle of demo projects field reviews.
For all demo projects, except the perpetual pavement demonstration projects (WB I-96 Metro Region, NB I-75 Cheboygan, North Region, M-84 Bay Region), we are evaluating all project information to determine if there is enough to create appropriate performance curves and make a final determination as to their applicability to standard MDOT practice. The perpetual pavement projects are 40-year designs and therefore are too early in their life to provide adequate information.

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