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 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 Construction Field Services 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 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</th>
<th>Route/Road</th>
<th>Region</th>
<th>County</th>
<th>Location</th>
<th>Description</th>
<th>Pavement</th>
<th>Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>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>HMA</td>
<td>$1,980,000</td>
</tr>
<tr>
<td>2003</td>
<td>M-84 SB</td>
<td>Bay</td>
<td>Bay/Saginaw</td>
<td>Pierce Road to Delta Road</td>
<td>Perpetual pavement</td>
<td>Concrete</td>
<td>$700,000</td>
</tr>
<tr>
<td>2004</td>
<td>M-3</td>
<td>Metro</td>
<td>Wayne</td>
<td>St. Aubin to McClellan</td>
<td>Thin unbonded overlay</td>
<td>HMA</td>
<td>$2,200,000</td>
</tr>
<tr>
<td>2005</td>
<td>M-13</td>
<td>Bay</td>
<td>Bay</td>
<td>Mary Drive to North Street</td>
<td>Low volume concrete</td>
<td>HMA</td>
<td>$1,200,000</td>
</tr>
<tr>
<td>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>Concrete</td>
<td>$4,800,000</td>
</tr>
<tr>
<td>2006</td>
<td>M-99</td>
<td>Univ.</td>
<td>Jackson</td>
<td>Village of Springport</td>
<td>Low volume concrete</td>
<td>HMA</td>
<td>$100,000</td>
</tr>
</tbody>
</table>
Table 1. Pavement Demonstration Project List

<table>
<thead>
<tr>
<th>FY Let</th>
<th>Route/Road</th>
<th>Region</th>
<th>County</th>
<th>Location</th>
<th>Description</th>
<th>Pavement Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>I-75 NB</td>
<td>North</td>
<td>Cheboygan</td>
<td>Topinabee Mail Road north for 2.37 miles</td>
<td>Perpetual pavement over rubblized concrete</td>
<td>$781,000</td>
</tr>
<tr>
<td>2009</td>
<td>M-1</td>
<td>Metro</td>
<td>Wayne</td>
<td>Tuxedo to Chandler</td>
<td>Thin unbonded overlay</td>
<td>$931,000</td>
</tr>
</tbody>
</table>

NB = northbound; SB = southbound; WB = westbound
FY = fiscal year

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

**I-75 Northbound (Ski Park Road to Roscommon County Line, Ogemaw County, North Region):**
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 continues to show the most amount of distress, with 77 of the concrete panels having a crack. This is an increase of five over the previous year, and represents approximately 3.7 percent of the total panels in this section. This section also exhibited the most instances of spalled longitudinal and transverse joints. Section 4 had two newly cracked panels, bringing the total to 18. The number of cracked panels increased from four to 12 in Section 1. Most of these cracks were in the left lane. The number of cracked slabs remained the same at three in Section 5. Section 2, which was distress-free until last year’s assessment, had developed three cracks. Section 2 is short in length and entirely on a hill, which allows moisture to drain away from the section very quickly. The above counts do not include the small number of cracked panels that were repaired in 2011. All sections showed low-to-medium severity spalling and some low-levels of faulting intermittently along the transverse joints. Overall, the number of distressed concrete panels for the entire project is still less than 2 percent. This project is performing well at age 13.

The rubblized project in the southbound direction continues to exhibit longitudinal and transverse cracking. The joint at centerline continues to open up, indicating potential poor joint construction.
M-84 (Pierce Road to Delta Road, Saginaw County, Bay Region): 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. 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 continues to show significant increases for both directions. This year, the transverse cracking on northbound (standard cross section) increased by 2,911 feet - an increase of 39 percent. For the southbound direction (perpetual pavement design), transverse cracking increased by 4,900 feet - an increase of 59 percent. 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 minimal at 126 feet and 165 feet, respectively, for northbound and southbound. With the cracking in the perpetual section increasing over the last few years, this pavement may be a candidate for the first mill and resurface project.

M-3 (St. Aubin Street to McClellan Street, Wayne County, Metro Region): 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

Overall, 951 of the 6-foot by 5.5-foot concrete panels are cracked (2.9 percent of the total in the survey area). This is an increase of 326 panels over 2012, which represents a 300 percent increase over last year. These counts do not include panels that were previously repaired, which is a total of 275. Including these in the total brings it to 3.7 percent of the panels in the survey area that are, or were, distressed. Of the 951 total, 433 are on northbound and 518 on southbound. The sealed sections are exhibiting fewer cracks than the unsealed (320 vs. 631), while the dense-graded HMA interlayer is exhibiting fewer cracks than the open-graded HMA (263 vs. 688). The unsealed category saw the largest increase in cracking (135 of the 162-panel increase). The pavement continues to show increases in cracking, raveling, and spalling throughout the project; with most of the distresses concentrated in and around intersections, transitions point of beginning and point of ending, 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 12 years of age, has outlasted the comparison HMA section. However, with the distresses continuing to increase and having one round of maintenance already, the performance would be considered fair.

**M-13 (Mary Drive to North Street, Bay County, Bay Region):**
This project is a low-volume roadway concrete pavement design that was 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:** 36 of the 5.5-foot by 5.5-foot panels were noted as having a crack this year. This is higher than last year by 10 panels. The cracked panels represent less than 0.6 percent of the total panels for this pavement. These counts do not include the 30 panels that are cracked at the south side of the bridge over the Pinconning River. The probable cause for the higher distress levels at the south side of the bridge may be the heavy equipment (large crane, etc.) that was parked there during a 2009 repair project on the bridge. There is also a significant amount of scaling and spalling at the joints, particularly at the south end of the project. Some of this is bad enough that they have been filled with a spray on patching material commonly referred to as AMZ. This joint deterioration is commonly related to the equipment used to saw the joints and the timing of the sawing operation. This distress can appear several years after construction. The right lane mid-lane longitudinal joint is exhibiting some widening and low levels of faulting at various locations along both northbound and southbound. This appears to have impacted the lane cross slope. Overall, the performance of this pavement section is characterized as good.

**I-96 Westbound (M-39 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 last year’s assessment. The longitudinal joints continue to be a problem on this pavement and exhibit the most distress. 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 had developed around the edges of a culvert along the westbound local lanes. The westbound express lanes were not assessed this year; however, based on the findings from previous years, it can be safely stated that no significant difference exists in the pavement condition for this year’s assessment. Overall, the performance of this pavement section is characterized as very good.

**M-99 (Village of Springport, Jackson County, University Region):**
This is the second low-volume roadway concrete pavement 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.
Latest Survey: One new cracked concrete panel was noted this year within the intersection close to the point of beginning or western end of the project. Some minor corner spalls were noted at a few additional locations along the length of the project. This brings the total number of distresses to 48. This matches previous surveys where the distress progression (number of distresses) has been fairly stable. 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. Overall, the performance of this pavement section is characterized as fair.

I-75 Northbound (Topinabee Mail 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. Three transverse cracks across both lanes were reported last year. This year a fourth transverse crack was observed along a core hole, which was possibly taken sometime during 2016. The longitudinal joint between lanes and between the right lane and right shoulder are both separating. Also, some localized areas on the pavement surface exhibited low levels of segregation. These are typically construction related issues. The pavement surface also displayed signs of age related oxidization and some aggregate staining. Overall, the performance of this pavement section is characterized as very good.

M-1 (Tuxedo Street to Chandler Street, Wayne County, Metro Region):
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: The pavement was noted to be in similar condition as observed during last year’s evaluation. A total of 221 of the 6-foot by 5-foot panels are cracked, which is 16 more than last year (an increase of 7 percent). This, however, represents approximately 2 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 good.

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