Pavement Demonstration Project Annual Report
Public Act 51 of 1951, Section 247.651i
(as amended by Public Act 457 of 2016)
June 2022

Project Selection

Selection of candidate projects is a collaborative effort among MDOT Construction Field Services pavement personnel, MDOT region personnel, and pavement industry groups. Once a demonstration project is identified, it 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 MDOT region's rehabilitation and reconstruction budget.

Project Finalization Process

All demonstration projects are continually evaluated to determine if there is enough information to create appropriate performance curves and make a final determination as to their applicability to standard MDOT practice. Final recommendations are and will be outlined in this Pavement Demonstration Program Status Report. A separate technical report, Pavement Demonstration Program Project Evaluation, provides further details about final recommendations and is available upon request. A final comprehensive report on each project will be available once final recommendations are officially approved by MDOT.

Project List

The following represents the list of pavement demonstration projects:

Pavement Demonstration Project List

Built	Route/Road	Region	County	Location	Description	Pavement Costs*	
						Asphalt	Concrete
2003	I-75 NB***	North	Ogemaw	Ski Park Road to Roscommon County Line	Unbonded concrete overlay		$1,980,000
2005	M-84/Bay Road SB	Bay	Bay/ Saginaw	Pierce Road to Delta Road	Perpetual pavement	$700,000	
2005	M-3/ Gratiot Avenue	Metro	Wayne	St. Aubin Street to McClellan Street	Thin unbonded concrete overlay		$2,200,000
2005	M-13/ Euclid Avenue	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/ Eaton Rapids Road	University	Jackson	Village of Springport	Low volume concrete		$100,000
2008	I-75 NB	North	Cheboygan	Topinabee Mail Route Road north for 2.37 miles	Perpetual pavement over rubblized concrete	$781,000	
2010	M-1/ Woodward Avenue	Metro	Wayne	Tuxedo Street to Chandler Street	Thin unbonded concrete overlay		$931,000

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Built	**Route/Road**	**Region**	**County**	**Location**	**Description**	**Asphalt**	**Concrete**
2020	I-94	University	Jackson	M-60 to Elm Street	Continuously reinforced concrete pavement		$3,488,000**
2023	US-24	Metro	Wayne	Grand River to north of 8 Mile Road	Asphalt reconstruction modification per stabilized subgrade	$3,190,500**	

* = estimated costs of the pavement during design phase
** = costs include pavement and engineered cross-section
*** = project finalized - no further annual monitoring or reporting
NB = northbound; SB = southbound; WB = westbound; FY = fiscal year

The following is a brief description of the status or condition of each project based on field visits in April and May of 2022. Condition ratings of 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. Ratings are intended to provide a general sense of the performance (in terms of anticipated distress and ride quality per the design type) of each project and may not reflect future decisions about performance after all relevant 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, 0.260 miles
- Section 2: 10-foot transverse joint spacing, sealed joints, no load transfer bars, 0.252 miles
- Section 3: 12-foot transverse joint spacing, unsealed joints, no load transfer bars, 1.439 miles
- Section 4: 12-foot transverse joint spacing, sealed joints, no load transfer bars, 1.421 miles
- Section 5: 12-foot transverse joint spacing, sealed joints, load transfer bars, 0.478 miles

The southbound direction, constructed at the same time, was rubblized (existing concrete pavement broken into smaller pieces resembling gravel) and overlaid with 6.5-inches of hot mix asphalt (HMA). This section serves as an approximate comparison to the northbound demonstration project in consideration of the time of construction and similar existing cross-sections prior to their overlays.

This demonstration project no longer requires annual monitoring due to final reporting including closeout recommendations per the MDOT report RR-784, “Pavement Demonstration Program Project Finalization I-75 Northbound Unbonded Concrete Overlay (MDOT Job Number 73873).” As summarized in this report, since an adequate amount of time has passed and enough data is available to fully evaluate this project and its experimental aspects (unsealed joints, no dowel

bars, reduced joint spacing), MDOT recommends monitoring of this demonstration project conclude and be considered complete. Per the findings and conclusions of the report, unbonded concrete overlays should have sealed transverse and longitudinal joints. Additionally, transverse joints should be doweled along with longitudinal joints being tied. Finally, a 12-foot joint spacing should be maintained for 6-inch (or more) concrete pavement with adequate provisions to ensure proper drainage of the HMA open graded interlayer.

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 reconstruction completed in the fall of 2005. This was a two-lane road upgraded to a four-lane boulevard section and built over a two-year period. The northbound direction contains a standard 6.5-inch HMA cross-section (20-year design) built in 2004. The southbound direction contains the perpetual pavement, which is a 40-year design. Polymerization of the asphalt binder used in the HMA, and a thicker unbound aggregate 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 initiated at the bottom of the asphalt pavement. This would leave only surface cracking to be maintained with mill and resurface preventive maintenance fixes at intervals up to 15 years. The initial costs of a perpetual pavement, however, can be significantly higher than a standard design.

Project Evaluation Recommendation: Per the February 2021 Pavement Demonstration Program Project Evaluation technical report, it is recommended monitoring of this demonstration project conclude following the final report since there will be enough condition data and evidence to indicate it is ready for project close out. Moreover, while cracking will likely increase, the relative annual increase is decreasing (slowing). Additional annual field reviews are unlikely to add benefit since cracking is unlikely to significantly change and/or alter conclusions. This is further supported by 2020 coring and falling-weight-deflectometer (FWD) testing (which is also summarized in the Evaluation report). Monitoring of this project will continue until the final report is officially approved by MDOT.

Latest Condition Survey: Transverse (thermal) cracking for both directions continue to increase, as northbound increased by 71-feet/lane-mile over the last year (an increase of 3 percent) totaling 2,534-feet/lane-mile and southbound increased by 699-feet/lane-mile over the last year (an increase of 18 percent) totaling 4,654-feet/lane-mile. While the increase on southbound is greater than northbound, the cracks in southbound remain tight (approximately 1/16 inch) and those in northbound are much wider (approximately 1 inch) with some observed faulting. The amount of longitudinal and fatigue (structural) cracking in both directions continues to be very low. The perpetual design concept of this demonstration project appears to be effectively supporting the traffic loadings and preventing structural damage, but it is performing poorly in thermal cracking, which is likely due to the HMA mixture characteristics. As supported by the 2020 coring data, FWD testing, and narrow crack widths, most of the cracking is isolated to the surface course so this pavement would be a good candidate for its first mill and resurface project to renew the surface and resist thermal cracking. While this project is performing poorly in thermal cracking, the structural characteristic of this pavement is considered good.

M-3/Gratiot Avenue (St. Aubin Street to McClellan Street, Wayne County, Metro Region):
This project is a 4-inch thin unbonded concrete overlay with a 15-year design constructed in the fall of 2005. Standard MDOT unbonded overlays are 6-inches or thicker. Transverse joints are spaced at 6-feet, while the longitudinal joints are spaced at 5.5-feet. 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 standard dense-graded HMA and a more open-graded (drainable) HMA. The test sections are as follows:

- Section 1: Open-graded HMA interlayer, unsealed joints, 1 mile
- Section 2: Open-graded HMA interlayer, sealed joints, 0.85 miles
- Section 3: Dense-graded HMA interlayer, sealed joints, 0.75 miles
- Section 4: Dense-graded HMA interlayer, unsealed joints, 0.80 miles

Project Evaluation Recommendation: Per the February 2021 Pavement Demonstration Program Project Evaluation technical report, this fix type of thin unbonded concrete overlay has been standardized for MDOT use, so a final report will be composed for this project. Monitoring of this project will continue until the final report is officially approved by MDOT.

Latest Condition Survey: Overall, 13 percent of the concrete slabs are cracked or repaired. This is an increase of approximately 3.3 percent from last year. Of the slabs cracked or repaired, 55 percent are on northbound and 45 percent on southbound. Like last year, the sealed sections are exhibiting a slightly higher frequency of cracked or repaired slabs than the unsealed (13.3 percent vs. 12.6 percent). Also like last year, the dense-graded HMA interlayer sections are exhibiting a slightly higher frequency of cracked or repaired slabs than the open-graded HMA (13.5 percent vs. 12.5 percent). From last year to this year, the unsealed category saw the largest increase in frequency of cracked or repaired slabs (8.9 percent to 12.6 percent). All section categories are now exhibiting similar performance per their number of cracked or repaired slabs. This may suggest performance is indifferent to the interlayer or sealing, or inconsistent overlaid materials and/or construction related issues may be influencing the results. This will be further investigated during the final reporting of this project. The pavement continues to show increases in cracking, raveling, and spalling throughout the project. The longitudinal joint in the middle of the rightmost northbound lane has significant spalling. It is most severe in Sections 2 and 3. Most of the distresses are concentrated in and around intersections, transitions, bus lanes, and manholes. To address these distresses, annual maintenance work was conducted. Locations in poor condition have been repaired and/or maintained and 87 percent of the remaining slabs exhibit no cracking. The overall performance of this pavement section is characterized as fair.

A 2004 HMA multicourse resurface on the composite section directly adjacent to the north end of this project (north of I-94) was used as an approximate comparison section. This section has had three contracted repair projects since being constructed (crack treatments in 2008 and 2019, and a single course HMA resurface in 2014). This location has sealed and unsealed cracking.

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 constructed in 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 (transversely and longitudinally) and are unsealed. A dense-graded unbound aggregate base was used instead of the standard open-graded aggregate base material.

Project Evaluation Recommendation: Per the February 2021 Pavement Demonstration Program Project Evaluation technical report, it is recommended low-volume concrete pavement be standardized for MDOT use, so a final report will be composed for this project. Monitoring of this project will continue until the final report is officially approved by MDOT.

Latest Condition Survey: A total of 200 of the concrete slabs were noted as being cracked or repaired which is 6 more than last year. The number of cracked or repaired slabs is minimal, representing approximately 2.4 percent of the total slabs for this pavement. These counts include approximately 41 slabs that are cracked or repaired 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 (e.g., large crane parked on the area during a 2009 bridge repair project). There is intermittent scaling and spalling at the joints, particularly within the first 550-feet of the south end of the project in the northbound lanes, where they were filled with a spray-on asphalt emulsion patching material (commonly referred to by its commercial name AMZ). This joint deterioration is commonly related to the timing of the sawing operation. The repairs continue to deteriorate, due to age and further concrete spalling or slab movement; but, about half of the repairs remain stable. The mid-lane longitudinal joint of the rightmost lane, in both directions, is exhibiting some widening and low levels of faulting at various locations. The performance of this pavement section is characterized as good.

I-96 Westbound (M-39/Southfield Freeway to Schaefer Road, Wayne County, Metro Region):
This project is a 14-inch HMA perpetual pavement reconstruction completed in fall of 2005 in the westbound local and express lane sections. The eastbound local and express lanes were reconstructed using standard MDOT concrete design. The concrete is a 20-year design, while the perpetual pavement is a 40-year design, so this is not a direct comparison.

Project Evaluation Recommendation: Per the February 2022 Pavement Demonstration Program Project Evaluation technical report, it is recommended monitoring of this perpetual pavement demonstration project conclude with its final report since it has reached a reasonable age with enough condition data points for project close out. Monitoring of this project will continue until the final report is officially approved by MDOT.

Latest Condition Survey: Since the last annual assessment, intermittent repair patches were conducted in both the local and express lane sections. This comprises about 7.6 and 10.6 percent of the surface area of the local and express sections, respectively. Almost all of this patching was within the longitudinal joints (between lanes and the shoulders) to repair joint raveling and

separation (1- to 2-feet wide). Longitudinal joint problems are typically a construction related issue and are, therefore, not considered a problem of the perpetual pavement design and its structural characteristics. The observed pavement distress is very low for both sections. For the local lanes, 21-feet/lane-mile of longitudinal cracking, 12-feet/lane-mile of transverse cracking, and 29 potholes were observed. For the express lanes, 110-feet/lane-mile of longitudinal cracking, 41-feet/lane-mile of transverse cracking, and 35 potholes were observed. Like past reporting, no change was observed in the condition of the two transverse cracks which developed around the edges of a culvert along the westbound local lanes. The performance and structural integrity of both pavement sections 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 (5.5-feet joint spacing in both directions); except, the joints for this project are spaced at 6-feet in both directions. It was constructed in summer/fall of 2006 and is approximately 800-feet in length. Like M-13, a dense-graded unbound aggregate base was used instead of the standard open-graded aggregate base material.

Project Evaluation Recommendation: Per the February 2021 Pavement Demonstration Program Project Evaluation technical report, it is recommended low-volume concrete pavement be standardized for MDOT use, so a final report will be composed for this project. Monitoring of this project will continue until the final report is officially approved by MDOT.

Latest Condition Survey: Only 4 new cracked concrete slabs were observed within the project limits. Similarly, only 3 additional slabs had noted spalling as compared to last year. Severity of existing distresses, including cracks, spalls, and corner breaks remained mostly unchanged from last year. Approximately 7.9 percent of all slabs are cracked or repaired and approximately 13.4 percent of all slabs have some amount of spalling. About 21.3 percent of all slabs are cracked, repaired, or have some spalling. While this percentage is elevated, construction related issues are at least in part contributing to this, including construction warranty repairs and initial spalling due to late sawing of the joints. This spalling is consistent with observations of the first annual review in 2007, where early cracking within inches of the joint was observed. There is some faulting, but it is isolated and minimal. Similar to previous surveys, the progression of distress (number and severity of distresses) is steady. 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 a 40-year HMA perpetual pavement design over rubblized concrete constructed in the fall of 2008. Concrete rubblization is a process which pulverizes and crushes the existing concrete pavement into small fragments, similar to an aggregate base. HMA over rubblized concrete is a standard fix type; however, the HMA resurfacing is normally a 20-year design.

Project Evaluation Recommendation: Per the February 2022 Pavement Demonstration Program Project Evaluation technical report, it is recommended monitoring of this perpetual pavement

demonstration project conclude with its final report since it has reached a reasonable age with enough condition data points for project close out. Monitoring of this project will continue until its final report is officially approved by MDOT.

Latest Condition Survey: A chip seal with fog coat capital preventive maintenance project (Contract ID 16091-204267) occurred in 2020. The following summary of observed distresses will be significantly different from reviews conducted prior to 2021 and may not be directly comparable. Since last year, transverse cracking minimally increased from 18 locations to 20 locations (216-feet to 228-feet total). All crack locations are unsealed, and most are full width. The cracking is tight, and the amount of transverse cracking is very low at approximately 48-feet/lane-mile. Prior to the maintenance project, longitudinal cracking is very low (22-feet total); however, like last year, no longitudinal cracking was observed. The longitudinal joint between the right lane and right shoulder had some raveling and was widening in some locations, by up to 2-inches. This was improved by the chip seal project, so only a few locations are raveling at the shoulder. Unlike last year, more locations are starting to ravel. Potholes and delamination at the southern and northern transitions to and from the project are still present (mostly in the right lane). This distress is typically due to construction related issues. 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 thin unbonded concrete overlay with a 15-year design like the M-3 project. It was constructed in 2010 and contains a single uniform test section (unlike M-3, which has four different sections). All joints were sealed and the same dense-graded HMA interlayer was used throughout. Transverse joints are spaced at 6-feet, while the longitudinal joints are spaced at 5-feet.

Project Evaluation Recommendation: Per the February 2021 Pavement Demonstration Program Project Evaluation technical report, this fix type of thin unbonded concrete overlay has been standardized for MDOT use, so a final report will be composed for this project. Monitoring of this project will continue until its final report is officially approved by MDOT.

Latest Condition Survey: Similar to 2020, additional intermittent full-depth concrete slab replacement occurred in 2021. A total of 959 concrete slabs are cracked or repaired, which is 116 more than last year (an increase of 14 percent). This represents 9 percent of the total survey area. Like previous years, intermittent black staining was noted on either side of some longitudinal and transverse joints. Further investigation will be needed to determine its cause. This may be due to pumping of water at the HMA interlayer. The associated slabs of this staining do not show much distress and most joints remain in fair to good condition. While not tracked in the counts due to parking, most of the slabs in the outside parking lanes have been repaired. As noted in past reviews, prior to being repaired, many of these slabs were shattered and faulted. Similarly, the outermost travel lanes (next to the parking lanes) have more distressed or repaired slabs than the inner travel lanes, consisting of about 73 percent of the noted cracked or repaired slabs. This may be due to a water drainage issue (as the water travels to the outside of the roadway and gets trapped in the interlayer) and/or due to propagation of the distress from the parking lanes. The

parking lanes may have been constructed at a different time than the rest of the travel lanes and may be made of different material (due to their color difference in comparison to the rest of the travel lanes); therefore, their observed distresses may be material related. Further investigation is needed to determine the observed performance differences. It appears annual maintenance work over the last 4 years has been conducted. Locations in poor condition have been repaired and/or maintained. 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). Due to the existence of underground abandoned mineshafts within the right-of-way of this roadway, CRCP was selected to provide additional safety against the risk of subsidence. This is the first use of CRCP by MDOT since the late-1970s. Construction began in spring of 2019, with the eastbound direction completed in the same year. The westbound direction was completed during 2020.

Latest Condition Survey: The CRCP pavement type is designed to have tight transverse cracks, spaced from 1.5-feet to 6.0-feet apart to maximize load-transfer efficiency and minimize flexural stresses. Thus far, for both bounds, tight transverse cracks continue to appear as expected. Some are in groups spaced 3-feet to 6-feet apart and others appear as single cracks, spaced more than 10-feet from the next crack. Transverse cracks should continue to appear as the pavement ages and crack spacing is expected to reduce (as new transverse cracks appear and reduce isolated cracks). This crack spacing is adequate, but some intersecting cracks were observed in both bounds, which are concerning at this early stage. Cracks should be relatively straight and not intersect. These will be monitored for future progression and potential for distress. For the eastbound section, some of these cracks have developed very minor spalls and additional cracks are converging, particularly west of the Cooper Street overpass. For example, a minor spall was observed in the right lane at station 2131+30 and converging cracking was observed in the center lane at station 2137+00. A very straight and defined transverse crack was observed at station 2147+20, which could indicate a stopped paving sequence or sympathy cracking from the shoulder transverse joint. A similar transverse crack with minor spalling was observed in the westbound section at station 2149+00. These locations should be monitored for future potential distress. No longitudinal cracks were observed for both bounds. The jointed plain concrete pavement shoulders have straight and tight joints. It should be noted, during the I-94 eastbound construction, the concrete supply to the paver was intermittent from stations 2153+00 to 2154+50; therefore, additional hand finishing was required in this area. Additionally, the middle lane had a full-depth patch at station 2132+10 because of construction damage to the newly paved CRCP. To date, there are no observed problems at these locations. For westbound construction, there are several areas where diamond grinding was required to achieve initial ride quality tolerance, particularly west of the Cooper Street off ramp. This may indicate concrete material delivery quality and finishing issues and/or poor uniformity of the base, so these locations will be closely monitored for ongoing performance. The pavement is considered in good condition, but the future crack propagation is still uncertain.

US-24 (Grand River Avenue to 8 Mile Road, Wayne County, Metro Region):
This will be an HMA reconstruction project and is now planned to be constructed in 2023. Within the project limits, US-24 is a boulevard with four lanes in each direction and additional intermittent inside and outside turn lanes. The cross-section (from bottom to top) will be 8-inches of sand subbase, 16-inches of open-graded drainage course, and 7-inches of HMA pavement. Two sections will stabilize the subgrade, with one of those sections eliminating the 8-inches of sand subbase. This project will be split into three sections with descriptions and locations defined in the following test sections:

- Section 1: Stabilized subgrade and no sand subbase, 0.37 miles
- Section 2: Stabilized subgrade, 0.34 miles
- Section 3: Standard section (control without stabilization), 0.27 miles

This pavement demonstration project should provide MDOT with information regarding the benefits to HMA reconstruction projects due to stabilizing subgrade. The three sections will help MDOT understand the influence of stabilized subgrade on the performance, and if the engineered cross-section can be reduced due to the improved subgrade (test section number 1). In accordance with the anticipated end of construction, the annual reviews for this demonstration project are expected to begin in 2024 and will be first reported in the 2024 Pavement Demonstration Program Status Report.