

RESEARCH SPOTLIGHT

Project Information

REPORT NAME: Evaluation of MDOT's Methodologies for Both Quantifying Pavement Distress and Modeling Pavement Performance for Life Cycle Cost and Remaining Service Life Estimation Purposes

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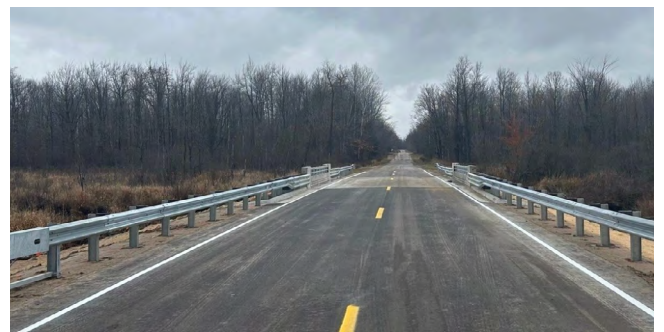
André Clover, Ben Krom, Tim Lemon, Dan Sokolnicki and Marcus Whithers.

Updating the pavement condition measure for planning and performance

To plan road improvements, set budgets and communicate funding needs, the Michigan Department of Transportation (MDOT) relies on clear, reliable pavement condition data. For years, MDOT collected detailed information about cracks, potholes and other pavement distress, but MDOT's complex distress definitions and severity assignment caused the method to be increasingly out of step with national best practices. As data collection technologies and industry standards evolved, MDOT needed a contemporary approach to assess pavement health. This research resulted in a simplified, data-driven pavement condition score that supports short-term repair decisions, long-term planning and consistent statewide evaluation.

PROBLEM

MDOT relies on pavement condition data to prioritize road projects, determine appropriate repairs and estimate the longevity of those repairs. To support these decisions, MDOT historically used a distress index (DI) based on highly detailed pavement data collected from roadway images that was translated into a numerical score. While effective in the past, the DI required complex raw data and specialized interpretation. Over time, this approach became increasingly complicated, costly and difficult to maintain. It was also inconsistent with national practice, limiting vendor availability.



Reliable pavement condition scores support data-driven planning and maintenance decisions on highways across Michigan.

In 2020, MDOT suspended detailed distress collection, essentially ending the use of the DI for network-level planning. Without a compatible condition score, MDOT lacked a practical way to assess current pavement health, forecast future performance and evaluate service life across the system. At the same time, the agency needed condition

“MDOT’s pavement condition monitoring will see benefits from this research. It lays the groundwork for a more rational method for pavement distress definitions, data collection and condition forecasting, and meshes with the current direction the state of the practice is headed nationally.”

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forecasting tools that could support federal reporting requirements, which rely on standardized measures of cracking, rutting, faulting and ride quality. These challenges highlighted the need for an updated condition measure that aligned with industry standards and MDOT’s long-term planning needs.

RESEARCH

Researchers developed the Pavement Distress Score (PDS), a single numerical score that summarizes pavement surface condition on a scale of 100 (best condition) to 0 (worst condition). The team reviewed pavement condition indices used by transportation agencies nationwide and evaluated how well each approach aligned with Michigan’s climate, materials and maintenance practices. A Minnesota Department of Transportation method served as a key reference because of the similarity between Minnesota’s and Michigan’s conditions and operating environment.

Distress definitions were simplified, severity levels were standardized and weighting factors were calibrated using MDOT’s historical maintenance and rehabilitation data to ensure the new score reflected real-world engineering judgment. Performance models for asphalt and

concrete pavements were developed to predict future pavement condition, estimate how long fixes will last and support life cycle cost analysis.

RESULTS

The PDS provides MDOT with a clear, consistent way to summarize complex pavement distress data into a single, easy-to-understand condition measure. Higher scores represent pavements in better condition; lower scores reflect increasing levels of cracking and surface damage. The score is based on distress data that can be reliably collected using current industry practices, making it practical to implement statewide with minimal disruption to existing processes.

When applied across MDOT’s network, PDS values aligned closely with historical maintenance and rehabilitation decisions. Pavement sections that previously received preventive maintenance typically showed higher scores, while sections requiring significant rehabilitation or reconstruction had lower scores. This alignment confirms that the PDS reflects how MDOT engineers already evaluate pavement condition in practice and supports continuity with past decision-making.

The performance models and network-level forecasting tools allow MDOT to estimate how pavement conditions will change over time and project future pavement conditions under various maintenance strategies and funding levels. These tools enable MDOT to evaluate both short- and long-term impacts of investment decisions, compare alternative maintenance strategies and track performance trends across the statewide network.

The PDS also improves communication and transparency. Engineers, managers and decision-makers can more easily explain pavement conditions, performance trends and funding needs using a single, defensible metric. Rather than relying on highly technical distress definitions, MDOT now has a modern condition score that supports consistent decision-making, clearer reporting and long-term asset management.

IMPLEMENTATION

MDOT is currently integrating the PDS into its pavement management systems. Vendors began collecting distress data using the new definitions in 2021; the agency is converting historical data so PDS values can be applied consistently across decades of pavement records, allowing MDOT to track long-term performance, estimate fix life and support future project programming.

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The final report is available online at

[MDOTjboss.state.mi.us/TSSD/
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