DEPARTMENT OF TRANSPORTATION

OFFICE OF RESEARCH & INNOVATION

TECHNICAL SUMMARY

Descriptive Category	RQI Range	Performance Measure Category
Very Good	5.0 – 4.1	Good
Good	4.0 – 3.1	Good
Fair	3.0 – 2.1	
Poor	2.0 – 1.1	Poor
Very Poor	1.0 – 0.0	Poor

MnDOT uses a five-point RQI to express a pavement segment's overall condition.

Investigating Pavement Segments With Long-Term Poor Ratings

What Was the Need?

The Moving Ahead for Progress in the 21st Century Act (MAP-21), the 2012 federal transportation funding bill, was an important step toward standardizing state department of transportation (DOT) pavement management practices. One MAP-21 requirement was that state DOTs devise transportation asset management plans (TAMPs) to manage their highway systems. MnDOT's 2014 TAMP called for the development of a method to annually track, monitor and identify road segments listed in poor condition for longer than five years and to consistently consider them in surface maintenance planning.

MnDOT expresses pavement condition through a ride quality index (RQI), a quantitative measure of roughness from 0 to 5. Data for this index is acquired using an inspection vehicle equipped with accelerometers that measure up-and-down movement as the vehicle travels along the pavement. An RQI of less than 2.0 is considered poor. MnDOT determines remaining service life of pavement segments from RQI values. The agency depends upon the accuracy of data used for these calculations to schedule timely pavement maintenance and to budget funds effectively.

Researchers investigated certain pavement segments within MnDOT's pavement management system that had received a poor ride quality level rating for more than five years. Their investigations showed that for most segments, the true pavement conditions differed from listed ratings due to the pavement segments' unique characteristics.

A very small number of pavement segments in most districts have been in poor condition for longer than five years. MnDOT needed to learn if the RQI values of these segments accurately conveyed their true condition. If quantitative values were not correct or not sufficient to convey their true condition, adjustments to the system would be necessary.

What Was Our Goal?

The project's goal was to determine the actual condition of pavement segments rated as poor for longer than five years. In some instances, the RQI may not effectively measure the pavement's true condition. Conversely, instances of consistently poor ride quality could be affecting motorists' experience, generating reactive maintenance costs. A clear understanding of the actual characteristics of these pavements will allow MnDOT to assess their effects within the system and better inform future investment decisions.

What Did We Do?

Researchers first conducted a literature review to determine if deferring pavement preservation for long periods is commonly practiced across state agencies. They also surveyed state DOTs to learn how agencies address the TAMP provision to devise methods to track, monitor and identify road sections rated in poor condition for more than five years.

Then they analyzed MnDOT's Highway Performance Management Application (HPMA) database to identify pavement sections that had been rated in poor condition for longer than five years. Across each of the eight regional districts, pavement sections with the most prolonged poor condition ratings were gathered. Engineers from each of MnDOT's eight districts were interviewed about particular pavement segments, as well as district pavement management and planning procedures.

Pavement roughness is measured with a digital pavement inspection vehicle, which is equipped with accelerometers that record differences in pavement incline. Other methods of determining pavement condition involve visual evaluation of the surface, such as signs of cracking, rutting and faulting.

Researchers then analyzed the condition parameters MnDOT used to rate road performance, investigating how these parameters could be expanded or modified to effectively identify pavement segments with anomalies to clarify their condition.

What Was The Result?

The literature review showed that each state DOT has some kind of pavement management system. The goal is to implement life-cycle planning, providing the highest possible level of service while minimizing overall life costs. A survey showed that most state DOTs employ pavement maintenance strategies that move toward this goal.

Examining MnDOT's HPMA, researchers found 658 pavement sections of varying lengths within the eight districts were rated as poor. Of these, 187 sections (28.4%) had held that rating beyond five years, representing 118.4 miles of pavement.

Researchers' interviews with district engineers showed that most pavement segments with poor ratings had unique characteristics that significantly affected how these segments were rated and repaired. Most were urban sections with curbs and gutters, manholes, sewer grates or dramatic shifts in grade at intersection crossings. These characteristics increase the measured roughness of good pavement. Many smaller sections contained bridge transitions or railroad crossings, which can cause measured roughness. Unless properly identified, these would generate a poor rating when the pavement's structural condition is actually good.

Other conditions, such as small sections awaiting a larger repair job or awaiting a jurisdictional change, further showed that most pavement segments listed in poor condition for extended periods are anomalies with unique characteristics affecting their condition rating. Their true condition is not poor.

What's Next?

Researchers concluded that some pavement segments must be classified differently, as an urban section, or rated using additional parameters, such as surface ratings. Additional information will serve to convey these pavement segments' true condition within MnDOT's system.