Wisconsin Transportation Update

Craig Thompson

WisDOT Secretary-Designee

Wisconsin Asphalt Pavement Association
Pewaukee, WI

Dec. 3, 2019

WisDOT’s Work With Asphalt

- FY19 – 2.5 million tons
- FY20 (projected) – 2.8 million tons
- Five year average (15-19) – 2.7 million tons

WisDOT’s Work With Asphalt

- Development of best practices
- Research partnerships
- Better pavement = longer-lasting investment

Research Brief

Wisconsin Highway Research Program
Project 0092-16-06
March 2019

Regressing Air Voids for Balanced HMA Mix Design

Research Objectives

- Develop protocols for testing WisDOT’s low-, medium- and high-traffic asphalt mixtures
- Evaluate the effects of air voids and mixture traffic level on resistance to rutting, cracking and moisture damage
- Recommend specifications for air void regression strategies

Research Benefits

- Demonstrated that regressing air voids can improve cracking resistance without compromising deformation resistance
- Recommended a three-stage implementation strategy for a regressed air void concept

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Background

Since the implementation of Superpave mix design strategies in the 1990s, industry professionals have successfully improved rutting resistance of hot mix asphalt (HMA) by specifying higher grades of asphalt binder and quality of aggregates. Currently, the primary mode of distress in HMA pavements is cracking, which can be caused by poor mix designs, increased use of recycled materials, problems with construction quality and failing to adequately address underlying pavement distresses during pavement rehabilitation. Many state transportation agencies are now specifying increased asphalt contents in their mix-design and acceptance programs to improve cracking resistance of HMA.

In volumetric mix design, the difference between air voids and voids in the mineral aggregate (VMA) controls the effective asphalt content. To increase the effective asphalt content in mixes, it is necessary to either target a lower air void content or increase the minimum VMA criteria. The objective of this study was to assess the impacts and determine the viability of increasing asphalt binder contents using the regressed air voids concept.

Methodology

The research team evaluated the effects of regressed air void mix designs on resistance to cracking, rutting and moisture damage. Six mixes were designed for low-, medium- and high-traffic levels, with various contents of recycled asphalt pavement (RAP) and recycled asphalt shingles (RAS). Three tests were conducted for each mix with asphalt contents corresponding to three air void contents (4.0, 3.5, and 3.0 percent). The Illinois Flexibility Index Test (I-FIT), Disc-Shaped Compacted Tension (DCT) test and Hamburg Wheel Tracking Test (HWTT) were conducted to evaluate intermediate-temperature cracking resistance, low-temperature cracking resistance; and rutting and moisture damage resistance, respectively.

Illinois Flexibility Index Test performed to evaluate intermediate-temperature cracking resistance

RESEARCH BRIEF

PAGE 1

Research Brief

Wisconsin Highway Research Program
Project 0092-16-02
March 2018

Evaluation of Protocols for Determining Asphalt Binder Content and PG Characteristics

Research Objectives

- Determine within-lab and between-lab variability of solvent extraction, ignition and asphalt analyzer procedures used to quantify asphalt content.
- Evaluate the variability in PG properties of extracted binder after recovery.
- Provide recommendations for improving WisDOT material and mix design standards.

Research Benefits

- Determined within-lab and between-lab variability of each asphalt content test.
- Recommended including ignition and asphalt analyzer tests in WisDOT specifications.
- Offered correction factors for ignition testing and tolerance adjustments to extraction testing to improve accuracy.

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Background

Accurate determination of asphalt content is critical to ensuring the quality of asphalt mixes used in Wisconsin’s road projects. The two most-common methods for determining asphalt content are the American Association of State Highway and Transportation Officials (AASHTO) solvent extraction and ignition tests. These procedures are well established; however, their accuracies are sensitive to variations in materials and high recycled binder content mixes commonly used in Wisconsin. Therefore, an evaluation is needed to assess within-lab and between-lab testing variability.

The main objectives of this research were to evaluate solvent extraction, ignition and asphalt analyzer test procedures; determine tolerances between methods; and modify WisDOT material and mix standards. The research team also evaluated the variability of the performance grade (PG) properties of extracted binder after recovery.

Methodology

The National Center for Asphalt Technology (NCAT) and several Wisconsin labs evaluated asphalt analyzer, AASHTO T 164 method A (centrifuge extraction) and method B (reflux extraction) and AASHTO T 308 ignition tests. The labs performed each of these tests on eight mixes, including virgin mixes and mixes with various recycled binder contents, containing four Wisconsin aggregates to quantify the variability in the determination of their asphalt content. NCAT also conducted centrifuge, reflux, and ignition tests on two sources of reclaimed asphalt pavement (RAP) and one source of reclaimed asphalt shingles (RAS).

Test results were analyzed per ASTM E 691 and ASTM C 802. Within-lab and between-lab variability for each test procedure was developed for Wisconsin materials and compared to the current AASHTO standards.

Unburned asphalt remains after an ignition test performed at 800°F for RAS material.

RESEARCH BRIEF

PAGE 1

Research Brief

Wisconsin Highway Research Program
Project 0092-15-04
March 2017

Asphalt Pavement Performance-Based Specifications

Research Objectives

- Identify effective asphalt testing procedures and evaluate the performance of common Wisconsin mixtures
- Establish relationships between test results and surrogate measures for production testing
- Ensure quality of high-RAM mixtures through the use of performance based testing
- Develop a criteria-type framework with suggested performance limits for future evaluation

Research Benefits

- Identified the most effective methods for evaluating resistance to rutting, moisture damage, fatigue and thermal cracking
- Confirmed that modifying aggregate properties and asphalt binder content significantly affects performance
- Determined that high-RAM mixtures perform adequately

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Background

The fundamental objective of asphalt mix design is to select an aggregate skeleton and asphalt binder content that balances constructability and performance. High performance mixtures that protect against rutting, cracking and moisture damage are difficult to achieve while still maintaining a workable mixture. When designing a pavement mixture, the Wisconsin Department of Transportation (WisDOT) follows a modified version of the Superpave mix design procedure and does not employ performance testing other than assessing moisture susceptibility using a modified Lottman (Tensile Strength Ratio) test.

Since the adoption of the Superpave method, advancements have been made in asphalt binder and mixture technologies that warrant reevaluation of design policy. The goal of this research was to identify which performance-related properties of mixtures to evaluate, which tests to conduct and how this information will be incorporated into WisDOT’s asphalt pavement mixture design and quality management program.

Methodology

The project involved four stages: evaluating mixtures that passed the Lottman test and met current specifications; evaluating the effects of production variability on mixture performance; providing additional guidance for high-recycled asphalt material (RAM) mixtures; and validating in-service field findings. Common WisDOT mixtures were replicated and subjected to the Hamburg Wheel Tracking (HWT), asphalt mixture performance tester (AMPT) flow number, semi-circular bend (SCB), dynamic modulus and disk compact tension (DCT) tests to evaluate resistance to rutting, moisture damage effects, fatigue and thermal cracking.

Asphalt and dust content were then adjusted, and the effects on mixture performance were measured. Linear blending charts and a developmental grading procedure provided guidance for determining the effective binder properties for high-RAM mixtures. Finally, field cores were compared to laboratory mixtures in order to develop relationships between laboratory test methods and field performance.

An SCB test is performed to assess fatigue cracking resistance.

RESEARCH BRIEF

2019 - 2021 State Budget

Program increases and investments include

- $320 million for state highway rehabilitation
- $1.9 million increase in local roads improvement
- $66 million for general transportation aids

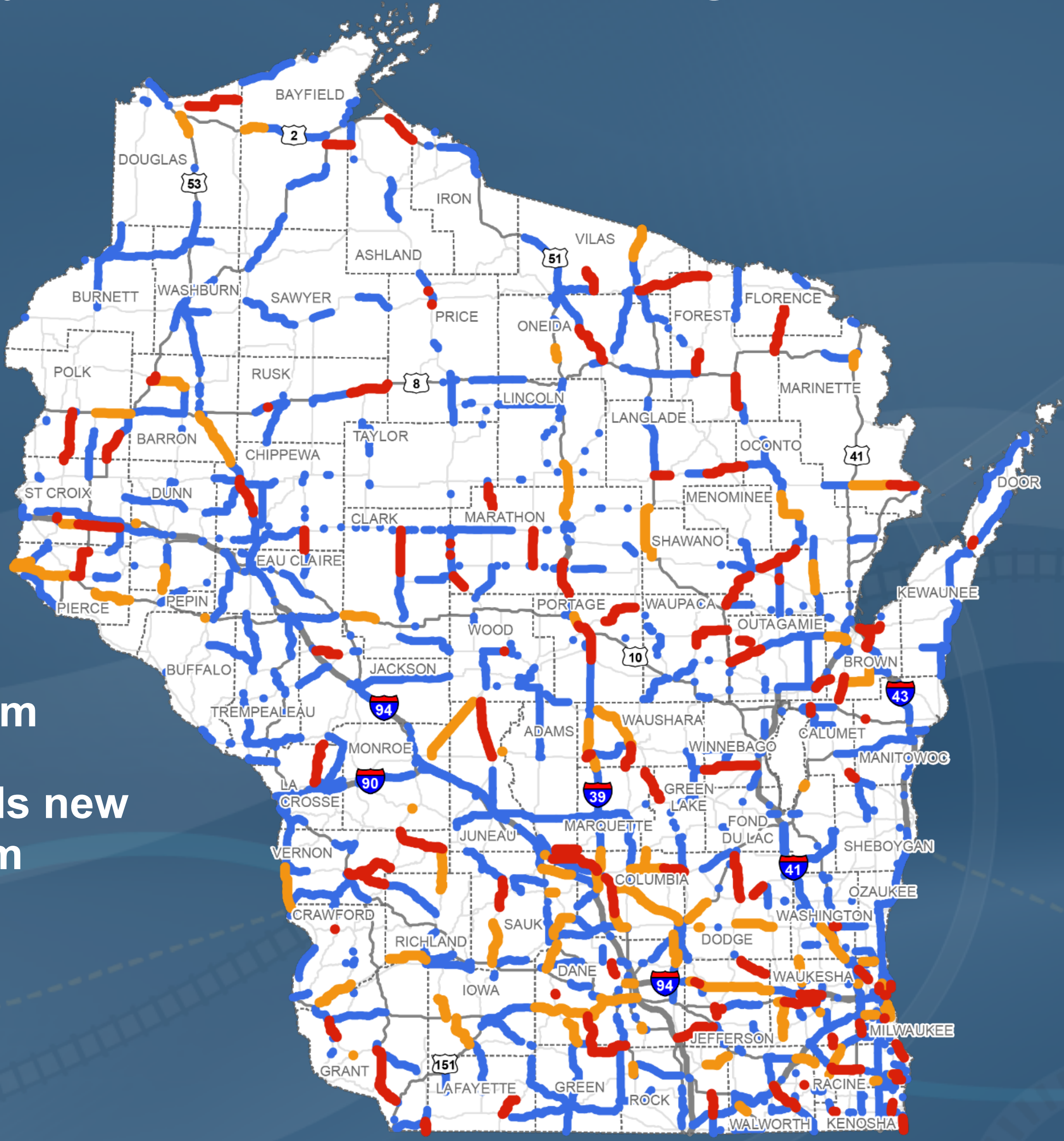
State Highway Rehabilitation Program

Governor’s Budget
Increased Revenue

🟦 **Base budget projects (2019 to 2024)**

🟧 **Increased revenue advances projects currently in the program**

🟥 **Increased revenue adds new projects to the program**

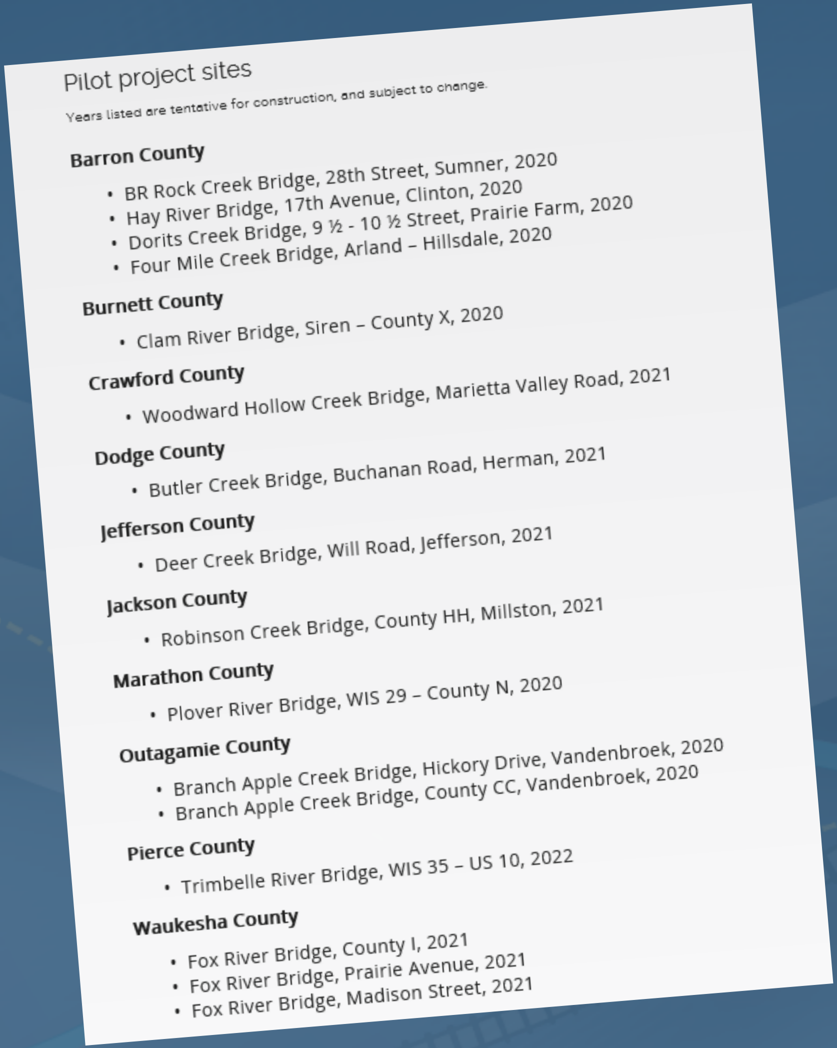


Multimodal Local Supplement

$75 million for local transportation grants

- One time, General Fund program
- Covers 90% of eligible costs for:
  - Road and bridge projects
  - Transit capital/facility grants
  - Railroad projects
  - Harbor improvements

Local Bridge – Low Risk Pilot



Pilot project sites

Years listed are tentative for construction, and subject to change.

Barron County

- BR Rock Creek Bridge, 28th Street, Sumner, 2020
- Hay River Bridge, 17th Avenue, Clinton, 2020
- Dorits Creek Bridge, 9 ½ - 10 ½ Street, Prairie Farm, 2020
- Four Mile Creek Bridge, Arland – Hillsdale, 2020

Burnett County

- Clam River Bridge, Siren – County X, 2020

Crawford County

- Woodward Hollow Creek Bridge, Marietta Valley Road, 2021

Dodge County

- Butler Creek Bridge, Buchanan Road, Herman, 2021

Jefferson County

- Deer Creek Bridge, Will Road, Jefferson, 2021

Jackson County

- Robinson Creek Bridge, County HH, Millston, 2021

Marathon County

- Plover River Bridge, WIS 29 – County N, 2020

Outagamie County

- Branch Apple Creek Bridge, Hickory Drive, Vandenbroek, 2020
- Branch Apple Creek Bridge, County CC, Vandenbroek, 2020

Pierce County

- Trimbelle River Bridge, WIS 35 – US 10, 2022

Waukesha County

- Fox River Bridge, County I, 2021
- Fox River Bridge, Prairie Avenue, 2021
- Fox River Bridge, Madison Street, 2021

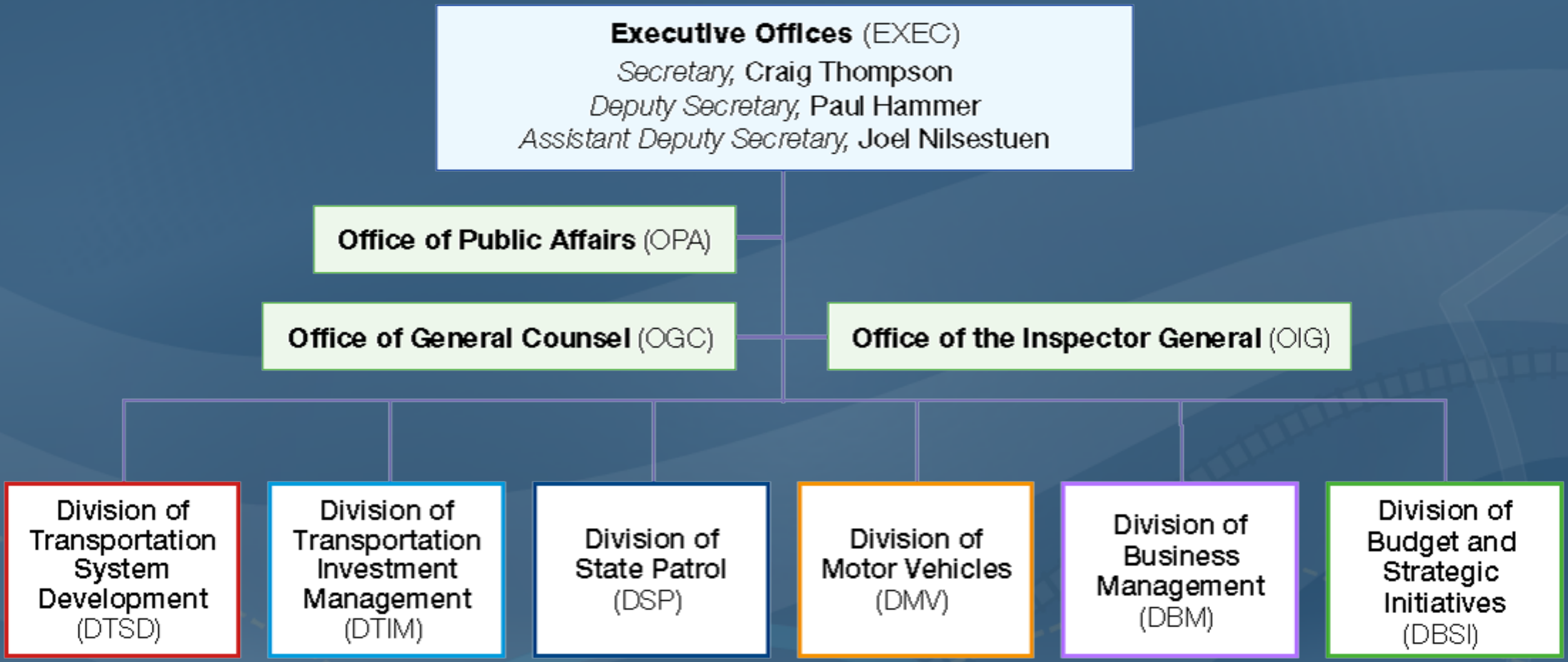
Learn more at wisconsindot.gov

Priorities

- Emphasis on strong partnerships, communication with stakeholders
- Deliver projects with the proper scope at the proper time
- Continue to support public safety, mobility and economic growth through strong partnerships and strategic infrastructure investments

Wisconsin Department of Transportation

Organizational Structure



Executive Offices (EXEC)
Secretary, Craig Thompson
Deputy Secretary, Paul Hammer
Assistant Deputy Secretary, Joel Nilsestuen

Office of Public Affairs (OPA)

Office of General Counsel (OGC)

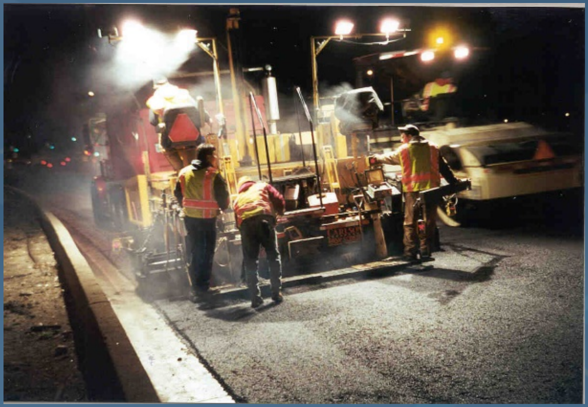
Office of the Inspector General (OIG)

- Division of Transportation System Development (DTSD)
- Division of Transportation Investment Management (DTIM)
- Division of State Patrol (DSP)
- Division of Motor Vehicles (DMV)
- Division of Business Management (DBM)
- Division of Budget and Strategic Initiatives (DBSI)

Mission: Provide leadership in the development and operation of a safe and efficient transportation system

Thank You

- Your partnership makes a difference.
- A quality transportation system is essential for public safety and economic prosperity.
- We look forward to working with you toward these goals



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