





Evaluating Wisconsin Warranty Projects: Before, During and After

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Wisconsin HMA Warranties

- Part of a series presented at AAPT.
 - 1a. "Warranty Construction-**Wisconsin Asphaltic Pavement Warranties**" (1996)
 - 1b. "Warranty Construction-HMA Warranty in Wisconsin: **A Contractor's Perspective**" (1996)
 - 2. "Specifying Performance into Asphalt Pavements: **Wisconsin Warranty Specification and the I-39 Experience**" (2001)

Wisconsin Warranty Projects through 2004

Year	No. of Projects	Ave. Project Length	Cumulative Warranted Miles
1995	3	5.7	17.04
1996	3	7.4	39.11
1997	3	9.7	68.1
1998	4	6.6	88.0
1999	5	16.4	137.1
2000	7	15.3	183.0
2001	9	9.3	267.0
2002	11	7.2	346.2
2003	10	4.8	393.9
2004	15	3.2	442.3
Total	70	Warranty Projects	



HMA Warranty Background

- Who's warranting HMA pavements:

Alabama	California	Colorado
Florida	Indiana	Illinois
Ohio	Michigan	Minnesota
Wisconsin		

***FHWA Special Experimental Project 14 (SEP 14)
"Innovative Contracting Practices"***

HMA Warranty Types

- Who's warranting HMA pavements:
 - **Workmanship and materials:**

Alabama	California	Colorado
Florida	Indiana	Illinois
Ohio	Michigan	Minnesota
 - **Performance:**
Wisconsin

Warranty Types

Workmanship & Materials

- Method Specification
(based on agency experience and/or tradition)
 - control of paving operations
 - control of materials during construction
- Acceptance upon pavement completion
(based on construction/production test results)

Contractor Perspective

Workmanship & Materials Warranty

- Agency controls:
 - mix design
 - lab testing
 - paving operations
 - materials during construction
- More paperwork
- More required oversight
- Limited Flexibility – build according to agency design and specifications
- The big stick approach – more penalties than rewards

Contractor Perspective *(cont)*

Workmanship & Materials Warranty

Limited pavement performance improvement

- Increased total project costs
 - paperwork
 - staffing
- Responsibility actually being transferred back to agency.

BUT ...

Where's the Partnering and Innovation?

Warranty Types

Performance Warranty

- Specification based on agency's pavement performance expectations
- Agency allows the contractor to construct the HMA pavement as they see fit
- Agency accepts the pavement at the end of the warranty period

Fosters Partnering and Innovation

Historical Warranties

Not really a new Concept

The Hammurabi Code of 2200 B.C. contained specific language spelling out:

- a. **Desired Performance** - structure doesn't fail.
- b. **Builders Responsibility** - repair failures at his expense.
- c. **Performance Testing** - builder will be the first to cross a new bridge.
- d. **Disincentives** - replacement of damaged property or death of the builder.

Warranty Goals

- Improve pavement performance
- Reduce total project costs

Wisconsin warranty objectives :

- **Decrease total project costs**
- **Continue the shift in product responsibility**
- **Allow contractor innovation and partnering**
-per WisDOT Facilities Development Manual
12-10-2003

Warranty FAQs

1. What happens at 5 years and one day after the warranty expires?
2. How can better performing pavements be achieved with warranty specifications?
3. How can warranty projects cost less than conventional?



Developing A Warranty Specification



What It Takes :

- DOT / Contractor Partnership and Commitment
- Historical Pavement Performance Data
- Clearly Defined Pavement Performance Expectations
- An Established Pavement Monitoring Program
- Clearly Defined Pavement Distress Remedial Action Scenarios
- An Understanding of the Bonding Industry

The Wisconsin Partnership

Historical Key Events

- Mid 80's ■ HMA Performance Issues (rutting)
- 1990 ■ Development of New Mix Designs (50 blow Marshalls)
- 1994 ■ QMPs & Highway Technician Certifications
- Since Early 90's ■ Continued Open Communication through DOT/Industry Technical Committees
- 1994 ■ Stakeholder Development of the HMA Warranty Specification
- 2000 ■ Superpave Mix Design Implementation

Performance Expectations

What's being Warranted:

- | | |
|---------------------------|-----------------------------|
| ■ Alligator Cracking | ■ Rutting |
| ■ Block Cracking | ■ Surface Raveling |
| ■ Edge Raveling | ■ Transverse Cracking |
| ■ Flushing | ■ Transverse Distortion |
| ■ Longitudinal Cracking | ■ Patching |
| ■ Longitudinal Distortion | ■ Potholes / Slippage Areas |

Risk Assessment

What Voids a Warranty:

- Improper Base Course Construction
Thickness: plan thickness off 2" or more
- Improper Subgrade Construction
Density: less than 90% of optimum

Performance Interpretations

Established Conflict Resolution Team

- Resolve disputes by a majority vote
- Team consists of 5 members:
 - 2 Contractors
 - 2 WisDOT representatives
 - 1 Third-party representative (mutually agreed upon)

Through 2005, not been used . . .

Developing Pavement Distress Thresholds

"Tolerable" & "Non-Tolerable" Distresses

- **"Non-Tolerable"**: safety concern and/or critical performance concern
➔ zero to minimal threshold level
- **"Tolerable"**: transverse and longitudinal cracking, rutting
➔ acceptable threshold level

Reality = Pavements eventually do fail

Defining Threshold Levels

Acceptable "Tolerable" Threshold Level

- Typical distress development (historical)
 - WisDOT pavement management data producing 18 year service life is tabularized
- Distress severity/extent level selected
 - A 90% success percentile is achieved

Analyzing Thresholds Levels Ex: Transverse Cracking

TRANSVERSE CRACKING Pav't Condition

PERCENTAGES OF ASSESSMENT BetterWorse

Extent	cracks/sta	1-5	6-10	11+	6-10	11+
Severity	crack width	<=1/2"	>1/2"	<=1/2"	>1/2"	>1/2"
AGE	NONE					
0	100					
1	70	26		2		1
2	41	55		2		1
3	37	54	3	2	1	2
4	35	55		5	1	3
5	26	63		3	2	5
6	8	73	6	5	2	5
7	8	73	2	7	1	8
8	5	64	1	19	1	8
9	5	46	6	20	5	10
10	5	28	7	25	9	18

Approximately 90% met 18 yr life 11% failing Threshold Level

Threshold Parameters

Transverse Cracking Threshold

- Transverse cracking PDI survey segment
 - 1 station = 100'
- Warranty segment
 - 1 segment = 528' (0.1 mile)

Warranty Threshold Parameter:

5 crack/STA x 5 STA/warranty segment
= **25 cracks** (>1/2") per segment

Pavement Monitoring Program*

- WisDOT system: **PDI**
 - 0 is good, 100 is bad (cumulative stresses)
- Automated Survey Collection**
 - the "spider van" (standardized)
- 2 Year Survey Cycle**
- Warranty Surveys:**
 - 2 year cycle and/or when requested

*Based on Federally Mandated Pavement Management System

Remedial Action Scenarios

- "Fit the punishment with the crime"
 - route and seal cracks
 - micro surfacing
 - chip seal
 - remove and replace
- Specification identifies when and what

Bonding

- Amount required:** cost of 1.75 in. overlay of entire warranty segment
- 5-year Bonding period:** allow 3 bonds to cover the 5 years (1+2+2)
- Identify Industry's Bonding Capacity:** establish limits for the number of projects (and warranty period)

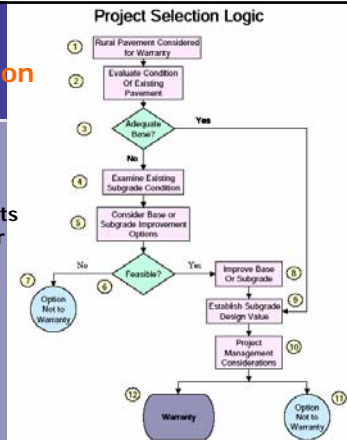
The Goal: Low Cost Security

Applying the Specification

- Current WisDOT Procedure (next slide)
Choice projects (limited risk)
- Future WisDOT Procedure
 - "Improved Subgrade" initiative
 - ➔ - DOT Secretary initiative **for 2006**
50% (or more) of all paving projects will be warranty.

WisDOT Warranty Selection Flow Chart

All rural pavements are considered for warranty specification.



WisDOT Draft Warranty Selection Flow Chart

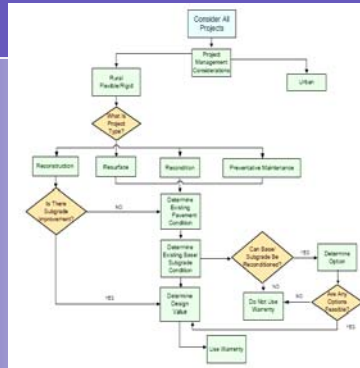
Under review:

- Rural vs Urban
- Overlays-over what?
- Pavement Thickness

For:

- Smoothness,
- Crack Resistance,
- Pavement Life

HINT: Thicker is better (> 7 in)



Agency Perspective

- Lower Project Cost
 - Unit Prices
 - Project Staffing Efficiencies
- Increased Pavement Performance
- Continued growth of partnership
- Reduced Legal claims
- Able to "close-out" projects quicker

Contractor Perspective

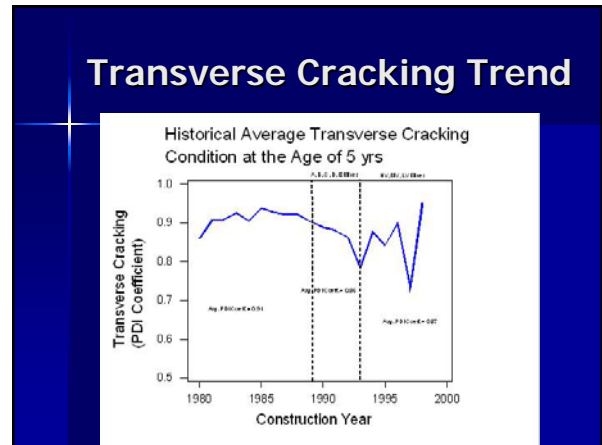
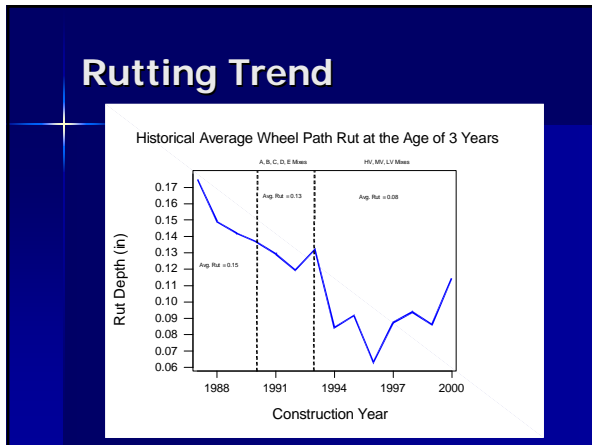
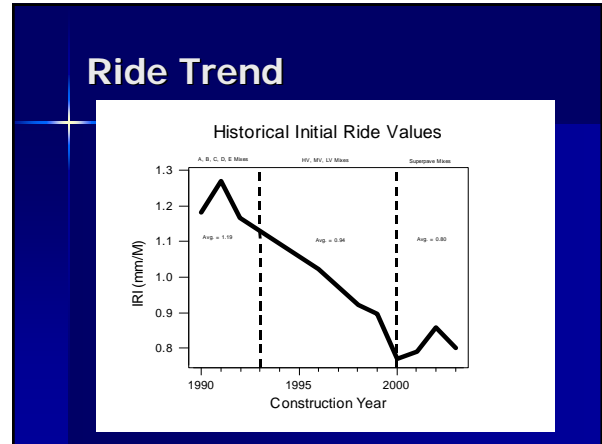
- **Increased Responsibility** and real-time decision making for:
 - Mix Design
 - QMP and Production Adjustments
 - Project Scheduling
- Allows for **Contractor Innovation**
- Lower profit margins, but promotes higher pavement performance which fosters **potential Industry market growth**

Contractor Innovation

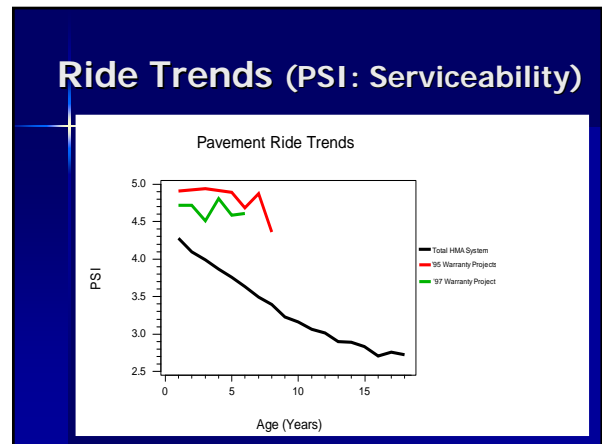
Some Examples:

- Proprietary Mix Designs
 - Semi permeable
 - "Gorilla Mix"
- Construction Staging (reduced user delay)
- New Equipment usage
 - Material Transfer Vehicles
 - Joint Heaters
- New Construction Standards
 - Longitudinal Joints

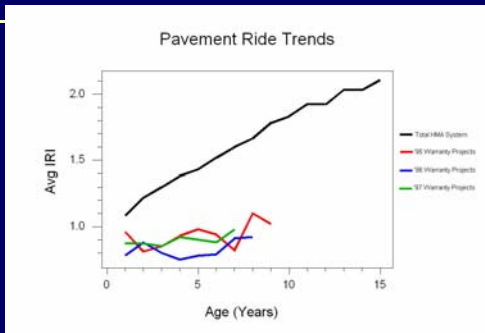
Wisconsin Historical Pavement Performance

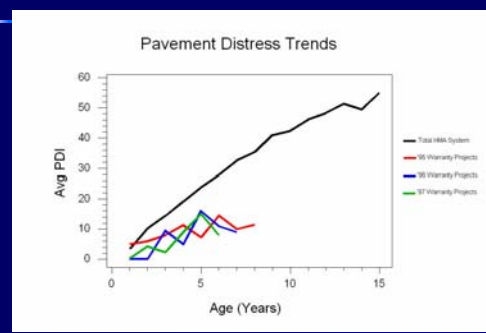
Warranty Pavement Performance

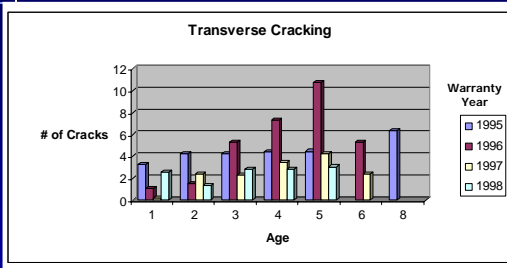
Ride Trends (IRI: Roughness)



PDI Trends (Distress Index)

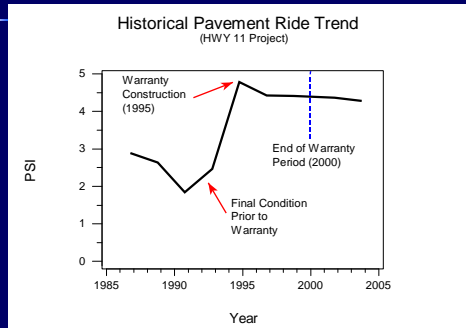


Transverse Cracking Trends

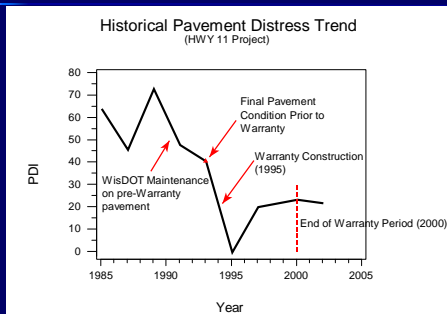


Note: Threshold is 25 cracks

Historical Project Ride



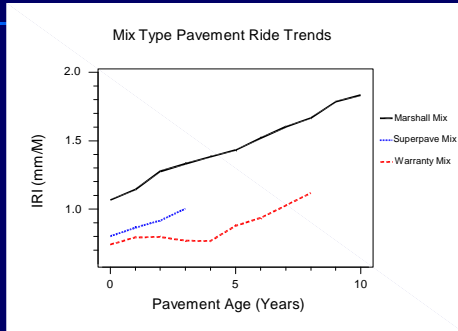
Historical Project Distress



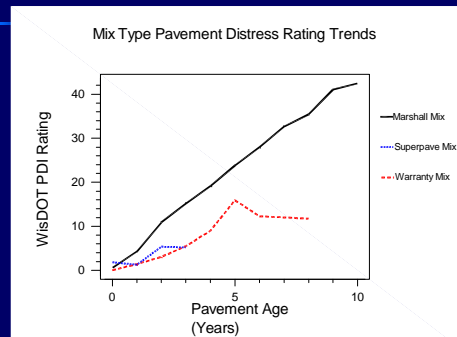
Pavement Performance Comparison



Ride Trend Comparison



Distress Trend Comparison



Answering The FAQs

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Pavement performance

STH 35 - 9 years old




Pavement performance

USH 10



Pavement performance

STH 21 - 8 years old



Pavement performance

STH 21 - 8 years old



Pavement performance

After milling-prepaving IH 94 - 2002

3 years old - cracks filled after first winter



Pavement performance

IH 39 - 1999



Summary of lessons learned

IH 39 - 5 years, 1 week

Performance Warranty Pavements cost less !

LCCA analysis indicates that 5 or more years of extended life offsets any increase in initial construction cost.





Wisconsin HMA Warranty Update

Future projections and actual implementation:

In 2005 approximately 20 warranty projects
Actual: 15 - HMA projects (4 - PCC pilot projects)

In 2006 probably 30 to 40
Actual: 25 - HMA projects (5 - PCC and Retrofit)

In 2007 ????

WisDOT's HMA Program

Historically (last 5 years)
WisDOT's HMA Letting program averages:

- 7 Projects per Letting greater than 10,000 Tons @ 32,000 Tons per project ~13 lane miles
- 31 Projects per Letting @ 9,700 Tons per project, ~7 lane miles

WisDOT Warranty Bond

Warranty specification requires a bond in the amount of the cost of a 1 1/4" overlay of the entire project.

- Scenario 1: 7 projects (13 lane miles)
 - WisDOT bond requirement \$330,687 per project
- Scenario 2: 33 projects (7 lane miles)
 - WisDOT bond requirement \$178,062 per project

OR ... ?

Evaluating Wisconsin HMA Warranties

Thank You !

Erv Dukatz : Mathy Construction Company
Scot Schwandt : Wisconsin Asphalt Pavement Association
Judie Ryan : Wisconsin DOT

