Pavement Warranties in Highway Construction

Project Selection and Evaluation

Presented by:
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Warranty Background
Pavement Warranty Study
NCHRP 10-68

- **Scope**
  - Literature review - reports, guidelines, and specification documents
  - Targeted interviews
  - Project selection tool
  - “Best-practice” guidelines
  - Technical guide specification revisions
Warranty “Pressure”

- **DOT Internal Decision**
  - Most (MS, WI, IN, CO, FL)

- **Legislative Mandate**
  - LA, MI, OH, IL

- **Industry**
  - Suppliers, Bonding
Warranty Types

- **Type 1**
  - material and workmanship

- **Type 2**
  - short-term performance

- **Type 3**
  - long-term performance
Pavement Warranty Definitions

Type 1: Material & Workmanship

- Typically 5 years or less
- Traditional delivery (D-B-B)
- Prescriptive specifications
- No contractor design responsibility
- Warrantor responsible for defects related to materials & workmanship under its control
Material & Workmanship Warranties

Design  Construction  Maintenance

Contractor Involvement

Length: 5 years or less
Pavement Warranty Definitions

Type 2: Short-Term Performance

- Range 5-10 years
- Mix of prescriptive and performance specifications
- Traditional (D-B-B) or Alternative delivery (D-B or multi-parameter bidding)
- Increased control of material selection, mix design, equipment selection, traffic control, and aspects of structural design
- Responsibility for correcting deficiencies under contractor control
Shorter-Term Performance Warranties

Length: 5 to 10 years
Type 3: Long-Term Performance

- Greater than 10 years
- Performance specifications
- Alternative Delivery (D-B-W or O&M)
- Contractor control of design
- Responsibility for planned and unplanned maintenance during life of warranty
Long-Term Performance Warranties

Design

Construction

Maintenance

Contractor Involvement

Length: More than 10 years
HMA Pavement Warranties

- 22 states
- 700+ projects
- Let but no bidders MD, AL
- Dropped ID, HI
- Planning to Use: MT, TX
Microsurfacing/Crack Treatment/Chip Sealing Warranties

- 9 states
- 140+ projects
Pavement Warranties
Findings from Specifications

- **Type 2**
  - Mix Design & Material Selection
- **Type 3 (D-B)**
  - Structural Design >> Maintenance
Warranty Provision Comparison

**Material and Workmanship**
- Method specifications

**TYPE 1**
- CA 1-yr HMA
- FL 3-yr HMA & PCC
- IL 5-yr HMA & PCC
- LA 3-yr HMA & PCC
- MI 5-yr R&R
- OH 7-yr PCC

**TYPE 2**
- CO 3&5-yr HMA
- MN 2&5-yr HMA
- OH 7-yr HMA
- KY 10-yr HMA & PCC
- MS 5-yr
- MI 3-yr CPM
- IN 5-yr HMA & PCC
- WI 5-yr HMA & PCC

**TYPE 3**
- VA
- MO
- NM

**Short-Term Performance**
- Mix design only within requirements
- No contractor-controlled structural design
- Some contractor-controlled structural design (i.e. thickness)

**Long-Term Performance**
- Performance specification
Pavement Warranties

Project Selection Criteria

- Authority to apply warranties
  - District (CO, MS, OH, WI)
  - Central Office (IN, LA)
  - Collaboration (CA, IL)

- Warranties applied as a standard
  - FL and MI
Pavement Warranties

District Level Application

- **Colorado**
  - Structural design life, minimum tonnages, primary scope, WIM nearby or included in scope

- **Mississippi**
  - Base conditions, expected level of competition

- **Ohio**
  - Simple scope, free of complicating factors that would be classified as outside the control of the contractor, comply with legislation

- **Wisconsin**
  - Projects with a high chance of success for performing well under the warranty
Pavement Warranties
Central Office Application

- Indiana
  - Time-sensitive, highly visible projects
- Louisiana
  - New construction only
Pavement Warranties
Collaborative Application

- **California**
  - Minimum requirements for total combined cracking, transverse cracks, longitudinal cracking, rutting and bleeding

- **Illinois**
  - Design-life, comply with legislation
Pavement Warranties
Project Selection Criteria

- **Project Considerations**
  - Project size and scope, existing defects and pavement condition, design-life

- **Other Considerations**
  - Expected level of competition, procurement method, legislative mandates, ability to measure performance
Pavement Warranties

Programmatic Criteria

- DOTs
  - How to measure performance?
    - Ability to define distresses and correlate to long-term pavement performance
  - How to measure success?
    - Perceived versus qualitative benefits
Pavement Warranties
Programmatic Criteria

- Contracting Industry
  - Investment in understanding of
    - Design
      - Job Mix Formula
      - Pavement Design
    - Placement Strategies
    - Testing and Inspection
    - Quality Assurance Measures
Warranty Decision Tool

Seven-Step Approach

Convene Decision Committee → Weigh Warranty Objectives → Evaluate Likelihood of Success Based on Weighted Objectives → Proceed Yes or No → No - STOP

Assemble list of candidate projects → Evaluate Risk of Different Warranty Types Based on Project-Level Selection Criteria → Select Warranty Type

Type 1
Type 2
Type 3
Identify and Objectives

- Consistency of the overall network
- Substantial performance improvements on a specific project
- Additional assurance against catastrophic failures
- Contractor innovation
- Redirect DOT inspection forces
- Shift responsibility for long-term operation and performance
Evaluate Likelihood of Success

- Relates directly back individual objectives
- Focuses on programmatic or cultural considerations
- May not be necessary if warranty program is already established
Warranty Decision Tool

**Decision to Proceed**

- Can stated objectives be accomplished within the programmatic or cultural boundaries

<table>
<thead>
<tr>
<th>69% and below</th>
<th>70-79%</th>
<th>80-89%</th>
<th>90-100%</th>
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<tbody>
<tr>
<td>NO-GO</td>
<td></td>
<td></td>
<td>GO</td>
</tr>
</tbody>
</table>
Warranty Decision Tool

- Project-Level Risk Assessment
  - Classify project
    - Pavement Preservation
    - Rehabilitation
    - New Alignment or Full-Depth Reconstruction
# Warranty Decision Tool

## Pavement Preservations

### Possible Warranty Types: 1 and 2

#### Risk Assessment for Pavement Preservation Project

<table>
<thead>
<tr>
<th>Description</th>
<th>Type 1</th>
<th>Type 2</th>
<th>Risk Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>3A.1 Scope</td>
<td>M</td>
<td>L</td>
<td></td>
</tr>
<tr>
<td>3A.2 Surface Conditions</td>
<td>M</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>3A.3 Level of Accuracy- ESALs</td>
<td>L</td>
<td>L</td>
<td></td>
</tr>
<tr>
<td>3A.4 Mix Design Control</td>
<td>L</td>
<td>H</td>
<td>Contractors have to be given some level of control of the mix in a Type 2 situation</td>
</tr>
<tr>
<td>3A.5 Equipment Control</td>
<td>L</td>
<td>H</td>
<td>Contractors have to be given some level of control of the mix in a Type 2 situation</td>
</tr>
<tr>
<td>3A.6 Phasing Control</td>
<td>L</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>3A.7 Thresholds</td>
<td>M</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>3A.8 Maintenance</td>
<td>L</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>3A.9 Performance</td>
<td>M</td>
<td>M</td>
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</table>
### Possible Warranty Types: 1 and 2

#### Risk Assessment Summary for Pavement Rehabilitation Project

<table>
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<th>Description</th>
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<th>Risk Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>3B.1 Scope</td>
<td>M</td>
<td>L</td>
<td></td>
</tr>
<tr>
<td>3B.2 Base Conditions</td>
<td>L</td>
<td>L</td>
<td></td>
</tr>
<tr>
<td>3B.3 ESALs Predicted</td>
<td>L</td>
<td>L</td>
<td></td>
</tr>
<tr>
<td>3B.4 ESALs Monitored</td>
<td>L</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>3B.5 Mix Design Control</td>
<td>H</td>
<td>L</td>
<td>The period is not long enough to shift this responsibility away from the agency</td>
</tr>
<tr>
<td>3B.6 Thickness</td>
<td>L</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>3B.7 Equipment/Application</td>
<td>H</td>
<td>M</td>
<td>The period is not long enough to shift this responsibility away from the agency</td>
</tr>
<tr>
<td>3B.8 Phasing Requirements</td>
<td>L</td>
<td>L</td>
<td></td>
</tr>
<tr>
<td>3B.9 Performance Indicators</td>
<td>M</td>
<td>L</td>
<td></td>
</tr>
<tr>
<td>3B.10 Warranty Thresholds</td>
<td>L</td>
<td>L</td>
<td></td>
</tr>
<tr>
<td>3B.11 Maintenance</td>
<td>L</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>3B.12 Performance Expectation</td>
<td>M</td>
<td>M</td>
<td></td>
</tr>
</tbody>
</table>
# Warranty Decision Tool

**New Construction or Reconstruction**

- **Possible Warranty Types:** 1, 2, and 3

## Risk Assessment Summary for New Roadway or Major Rehabilitation of the Subgrade

<table>
<thead>
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<th>Description</th>
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<th>Type 2</th>
<th>Type 3</th>
<th>Risk Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>3C.1 Scope</td>
<td>M</td>
<td>L</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>3C.2 Foundation Conditions</td>
<td>M</td>
<td>L</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>3C.3 ESALs predicted</td>
<td>L</td>
<td>L</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>3C.4 ESALs monitored</td>
<td>L</td>
<td>L</td>
<td>L</td>
<td></td>
</tr>
<tr>
<td>3C.5 Mix Design Control</td>
<td>M</td>
<td>L</td>
<td>L</td>
<td></td>
</tr>
<tr>
<td>3C.6 Structural Design Responsibility</td>
<td>L</td>
<td>M</td>
<td>H</td>
<td>Contractors have to be given some level of control in a Type 3 situation.</td>
</tr>
<tr>
<td>3C.7 Equipment/Application</td>
<td>H</td>
<td>M</td>
<td>L</td>
<td>Period not long enough to shift this responsibility away from the agency.</td>
</tr>
<tr>
<td>3C.8 Phasing Requirements</td>
<td>L</td>
<td>M</td>
<td>H</td>
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<td>M</td>
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<td>L</td>
<td>L</td>
<td>L</td>
<td></td>
</tr>
<tr>
<td>3C.11 Maintenance</td>
<td>L</td>
<td>M</td>
<td>H</td>
<td>Upfront cost unfavorable if reducing LCC is not priority.</td>
</tr>
<tr>
<td>3C.12 Performance Expectations</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td></td>
</tr>
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</table>
Summary

- Decision process involves both programmatic and project level considerations
- Assess objectives and apply a warranty type consistent with the characteristics of each contract, project, or program
- Warranties can raise the quality bar
  - Must continue to weigh the required investment against value received
Recommendations

- **DOTs**
  - Partner with industry (performance parameters, durations, implementation, inspection, etc.)
  - Select appropriate projects
  - Streamline and automate data collection
  - Explore/test alternatives to bonding
  - Implement alternative contracts (D-B, best-value and/or special prequalification)
  - Measure success based on LCC, post construction assessments
Recommendations

- Industry
  - Participate in warranty policy discussions
  - Become educated on warranty issues and risks
  - Understand investment required for warranty projects
  - View warranty expertise as competitive advantage
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