PG XX-34 AND TRANSVERSE CRACKING

- Mn/DOT Experience -

Presentation at the 15th Annual
TERRA Pavement Conference

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Overview of Presentation

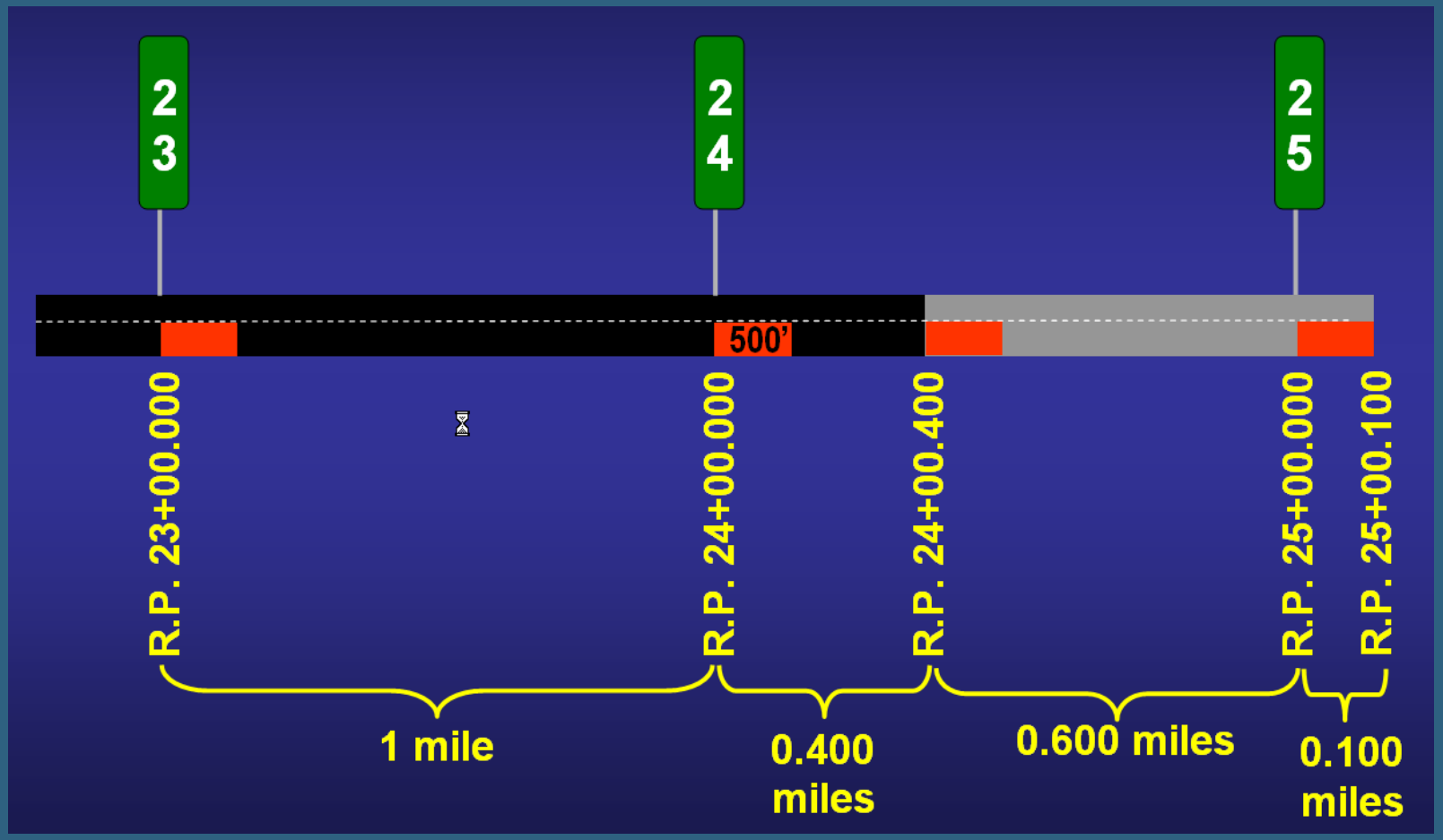
- Brief description of the Mn/DOT Pavement Management process
- Performance Graded Binder use in Minnesota
- Data Analysis
- Findings

Performance Monitoring

Data Collection

- Roughness and Rutting
  - Roads are driven and data collected in both directions
  - Data stored on a mile-by-mile basis
  - Roughness measured in left and right wheel path
    - Performance is based on the left wheelpath
- Cracking
  - First 500 feet of each mile is surveyed (~10% sample)
  - Outer lane is surveyed
  - Only one direction is surveyed on 2-lane roads
- Digital Video-log
  - Digital images of the right-of-way and pavement surface are collected on all roads driven.

Rating Locations



Pavement Rating Indices

- Ride Quality Index (RQI)
  - Calculated from the International Roughness Index (IRI)
  - 0 to 5 scale: 0 the worst; 5 the best
- Surface Rating (SR) - The Distress Index
  - Inputs for SR:
    - Cracking,
    - Rutting,
    - Patching
  - 0 to 4 scale: 0 the worst; 4 the best

Pavement Management

- Software: Highway Pavement Management Application (HPMA)
- Data Elements:
  - Monitoring Data
  - Construction Activities
  - Preventive Maintenance Activities
  - Traffic
  - Jurisdictional
- Analysis
  - Forecast Future Condition
  - Selects Optimal Construction, Rehabilitation, or Preventive Maintenance Activity

Mn/DOT Pavement System

Pavement Type	Miles	Percent of Network
Bituminous	1,367	10
Overlaid Bituminous	7,585	53
Bit overlaid Concrete	3,248	23
Concrete	2,083	15
CRCP	25	0
ALL	14,309	100

Asphalt Binders

- Penetration Graded prior to SuperPave
  - 85-100 Pen for higher volume
  - 120-150 Pen for lower volume
  - 200-300 Pen for very low volume for northern projects
- Performance Grading
  - Mn/DOT Started Using PG Binders in 1997

Performance Graded Binder

- Intent. Binder properties should relate to how it is used, so binder selection should consider:
  - Traffic
    - Resist repeated loadings without rutting
  - Climate
    - Tolerate high temperatures without rutting
    - Tolerate cold temperature without cracking
- Where did it come from?

Strategic Highway Research Program (SHRP) Asphalt Study

- Research began in 1987
- Project Produced
  - Superpave mix design methodology
  - Performance Graded binder tests and specification

Performance Grading Use in Minnesota

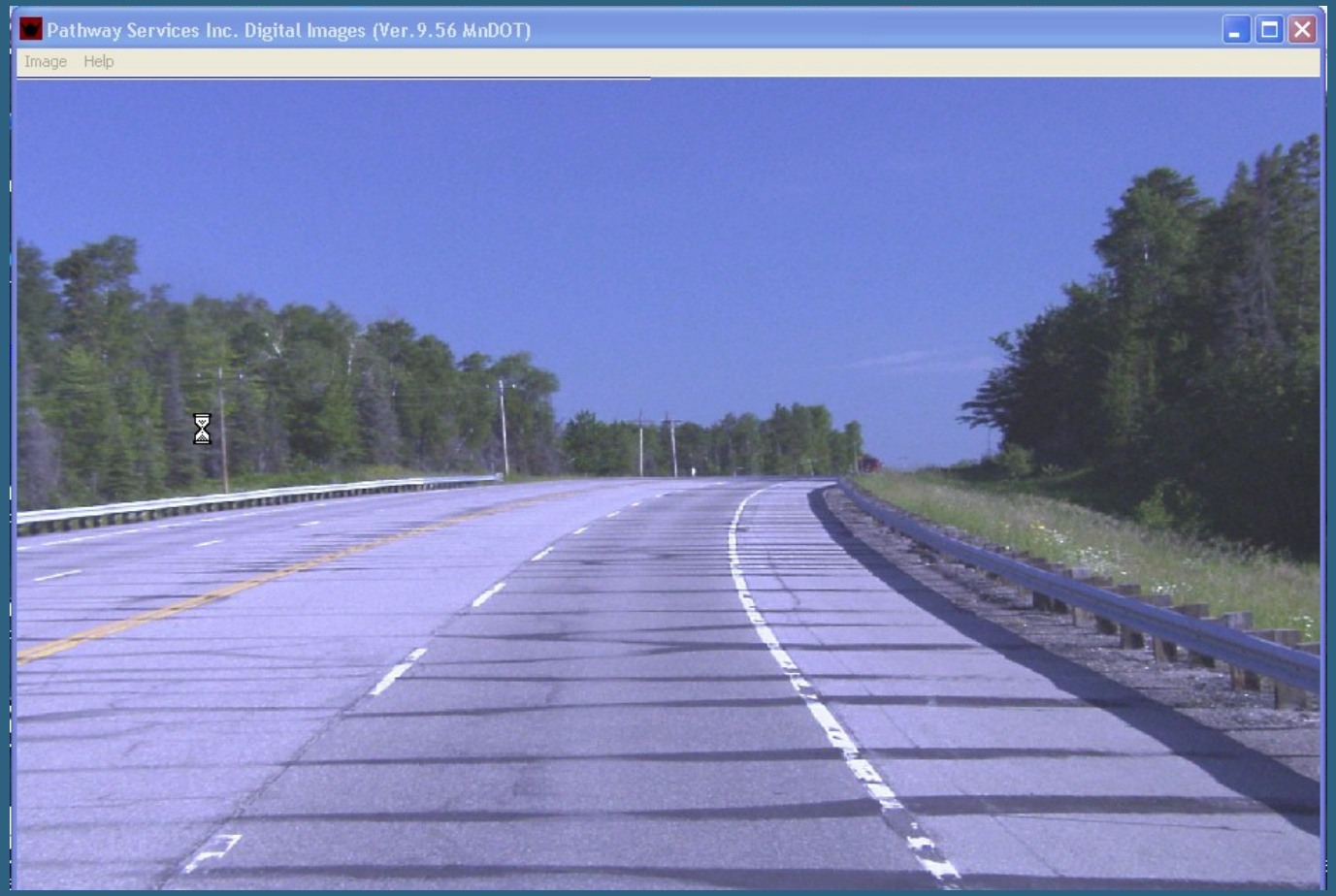
- Mn/DOT Started Using PG Binders in 1997
- Current criteria set in 1999
  - PG 64-34 on high volume **new** construction
  - PG 58-34 on low to moderate volume **new** construction
  - PG 58-28 or 64-28 for overlays

How Mn/DOT Rates Transverse Cracks

- Transverse Cracks are counted in the first 500 feet of each mile by severity: Low, Medium, and High
- Rating is 2 x count – maximum rating is 100
- Ratings occur every year on higher volume pavements and every other year on rest of the system

Transverse Crack

Transverse Cracking



Issue with Transverse Cracking

- Weakens the pavement structure
- Adds roughness (dips at cracks)
- Increases maintenance costs
- Decreases pavement life

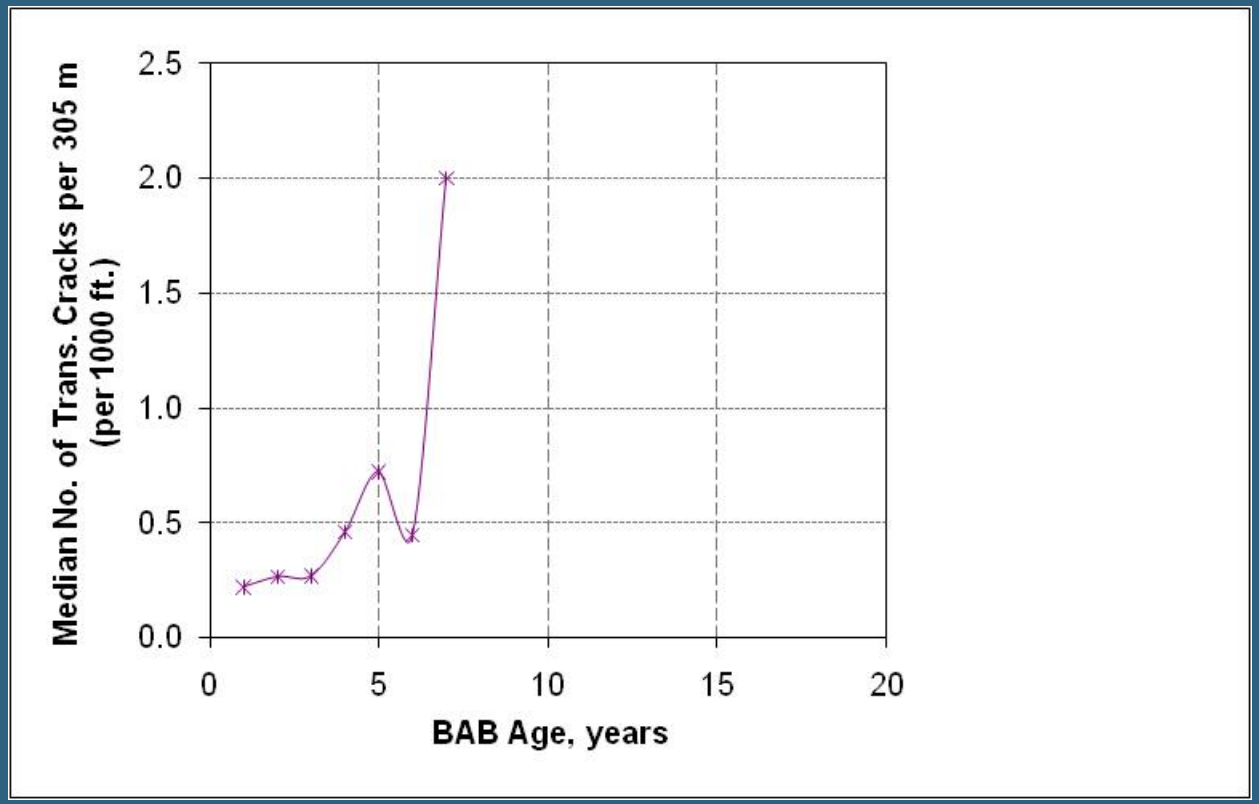
Investigation of PG and Transverse Cracking

- Conducted because less cracking was noticed
- Wanted to use pavement management data, but PG information was not in the database
- Bituminous Office records used to find projects that used PG binders with -34°C grading on new construction

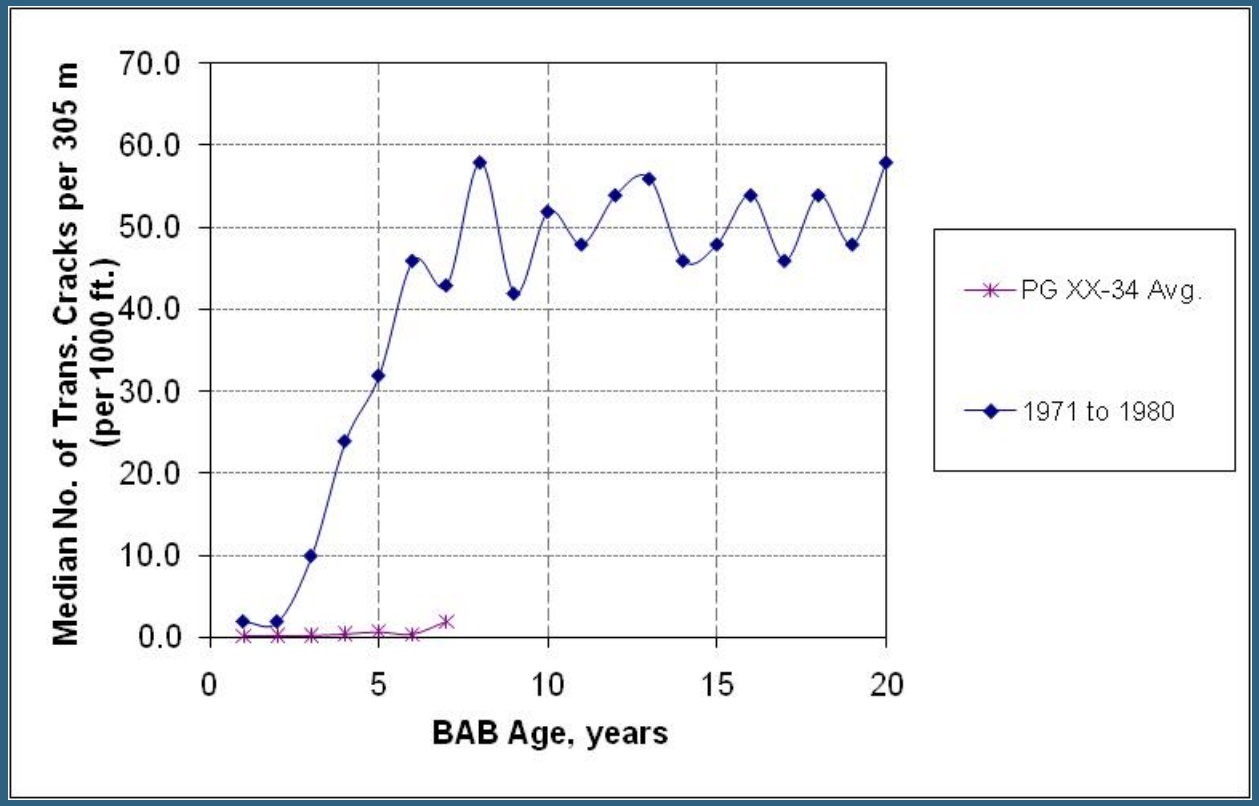
Investigation - continued

- 26 New construction projects were found
  - New construction consisted of new asphalt over an aggregate base, or
  - Full Depth Reclamation projects with new asphalt over the reclaimed material
  - 100 M-records (approximately 100 miles of roadway)
  - 2000 to 2007 construction

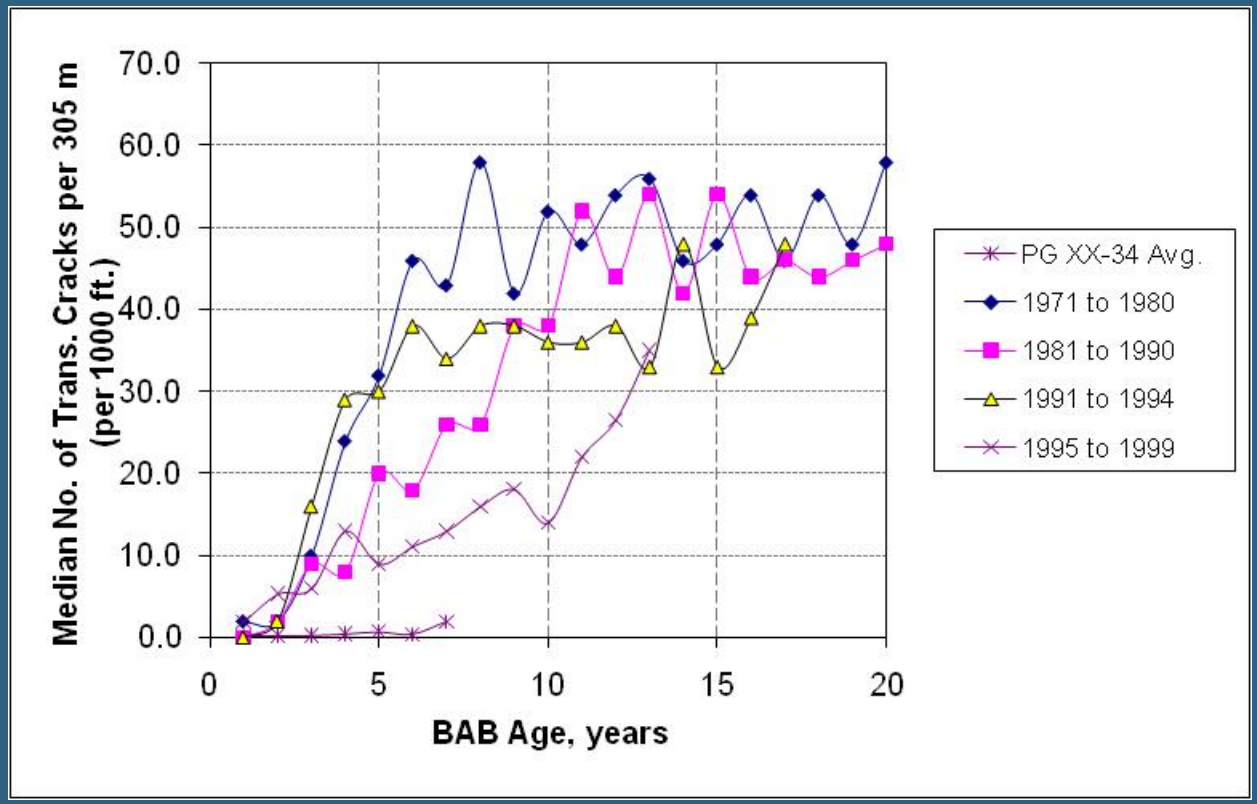
Amount of Transverse Cracking



What it Used to be



What it Used to be - continued



Differences Over the Years

- 1971-1980: Non-wear were recipe mixes
- 1981-1990: Hot Mix Recycling required a mix design
- 1991-1994: Quality Management
- 1995-1999: Mix Design uses VMA

Summary

- **Use of PG binders reduced transverse (thermal) cracking**
- **Other factors that might influence transverse cracking**
  - **Mix Design**
  - **Construction quality**

Thank You!
Next:

Questions?