



Pavement Rehabilitation Selection Understanding the Problem





Pavement Assessment

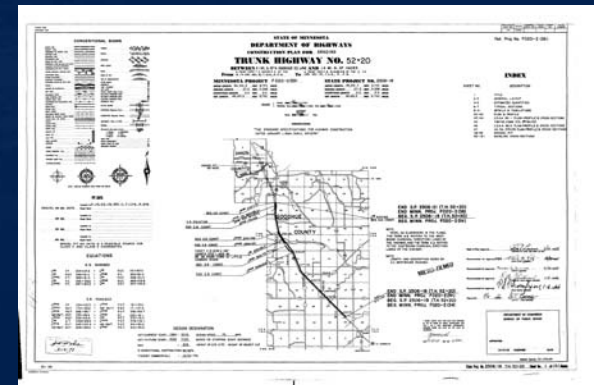
- Pavement assessment is the first step in making good decisions.
- The condition of the existing pavement is assessed through:
 - Pavement History
 - Pavement Condition/Distress Survey
 - Pavement Strength Evaluation
 - Surface, Base and Subgrade Analysis
 - Surface and Subsurface Drainage Review
 - Others?





Pavement Assessment Pavement History

- Historic or existing information for the pavement should be gathered and assessed, including:
 - Original design information
 - As-built/constructed data
 - Quality Control/Quality Assurance construction data
 - Pavement Management System (PMS) data
 - Maintenance activity records





Pavement Assessment

Pavement Condition/Distress Survey

- What is a pavement condition survey?
 - A detailed visual inspection which rates all of the surface irregularities, flaws and imperfections found in a given area
 - A link to key insights into the causes of deterioration
 - Project level versus network level

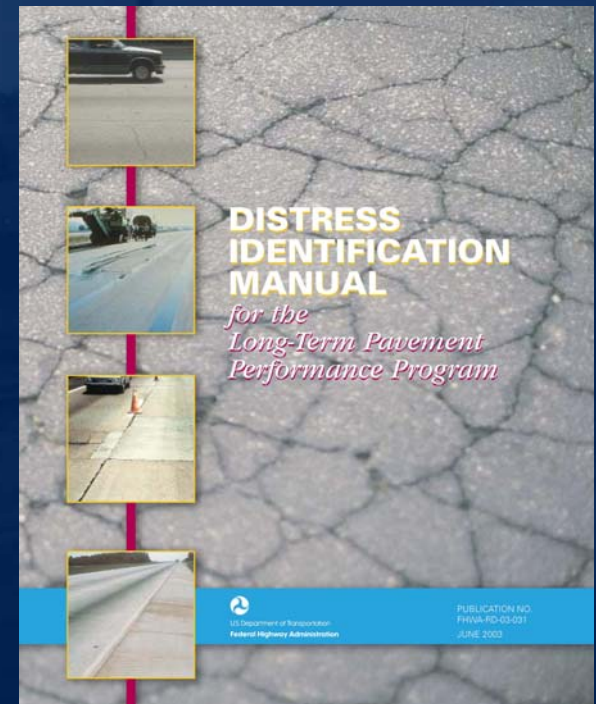




Pavement Assessment

Pavement Condition/Distress Survey

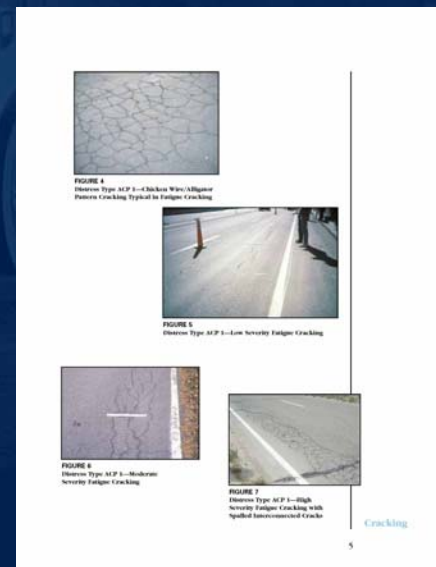
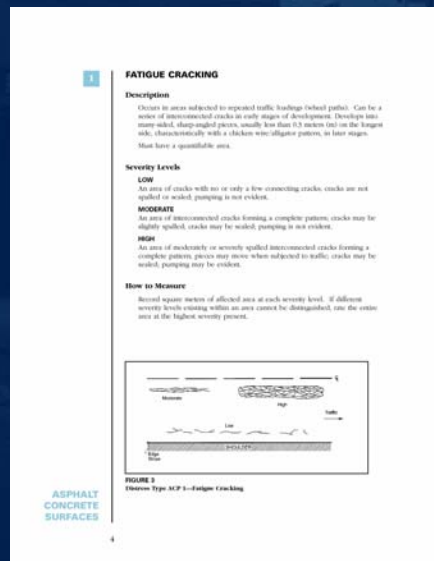
- How is pavement condition determined?
 - There are numerous resources available to assist in conducting pavement condition surveys:
 - FHWA-SHRP
 - Mn/DOT
 - LRRB
 - ASTM D5340-93
 - FP² Electronic Guide
 - Corps of Engineers-Micropaver
 - Others





Pavement Assessment Pavement Condition/Distress Survey

- Procedures generally use a manual with detailed descriptions of:
 - Description of distress
 - Severity level and frequency
 - How to measure



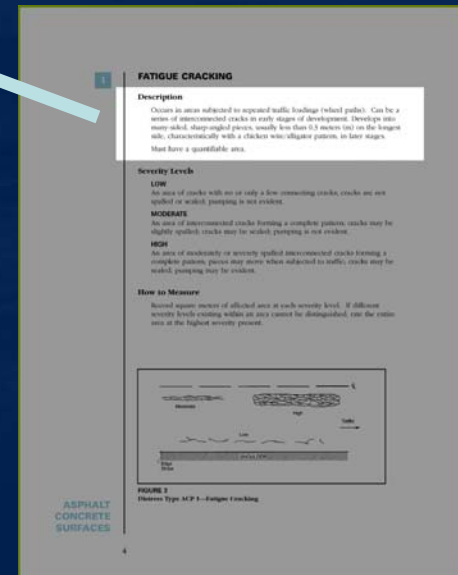


Pavement Assessment Pavement Condition/Distress Survey

Description

Occurs in areas subjected to repeated traffic loadings (wheel paths). Can be a series of interconnected cracks in early stages of development. Develops into many-sided, sharp-angled pieces, usually less than 0.3 meters (m) on the longest side, characteristically with a chicken wire/alligator pattern, in later stages.

Must have a quantifiable area.





Pavement Assessment Pavement Condition/Distress Survey

Severity Levels

LOW

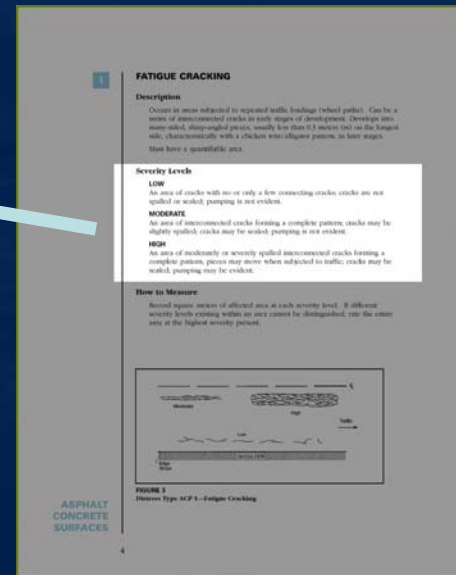
An area of cracks with no or only a few connecting cracks; cracks are not spalled or sealed; pumping is not evident.

MODERATE

An area of interconnected cracks forming a complete pattern; cracks may be slightly spalled; cracks may be sealed; pumping is not evident.

HIGH

An area of moderately or severely spalled interconnected cracks forming a complete pattern; pieces may move when subjected to traffic; cracks may be sealed; pumping may be evident.

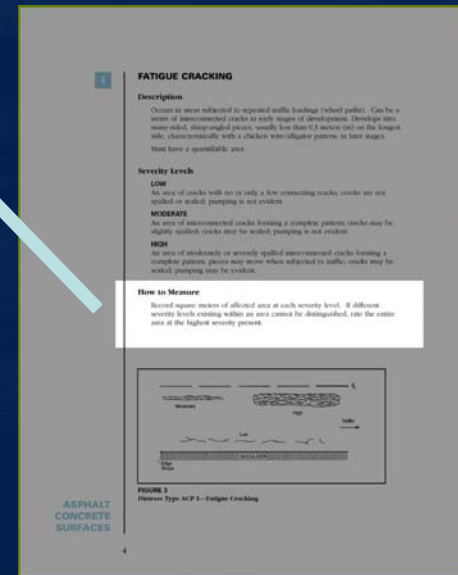




Pavement Assessment Pavement Condition/Distress Survey

How to Measure

Record square meters of affected area at each severity level. If different severity levels existing within an area cannot be distinguished, rate the entire area at the highest severity present.





Pavement Assessment Pavement Condition/Distress Survey

Pavement Condition Data
can be collected either **Manually**
or with **Automated** equipment.





Pavement Assessment Pavement Condition/Distress Survey

Manual Data Collection

- An individual with pavement knowledge:
 - Walks the portion of pavement to be rated
 - Entire project
 - Statistical sampling
 - Measures and records the type, quantity and severity of each pavement distress
 - Determines the pavement's rating based on the numerical value of each type of pavement distress





Pavement Assessment Pavement Condition/Distress Survey

Automated Data Collection

- The following surface pavement condition data is collected by automated equipment (e.g. Mn/DOT method):
 - Roughness and Rutting
 - Wheel path in both directions
 - Cracking and other surface distresses
 - First 500 feet of each mile is surveyed (10% sample)
 - Outer lane is surveyed
 - Only one direction is surveyed on 2-lane roads
 - Video-log
 - Digital images of the right-of-way and pavement surface





Pavement Assessment Pavement Condition/Distress Survey

Automated Data Collection

- Collection of data using automated or semi-automated equipment is increasing due to:
 - Improvements in technology
 - Increased concern for surveyor safety
 - Rising cost of manual inspections
 - Cost and inconvenience to motorists

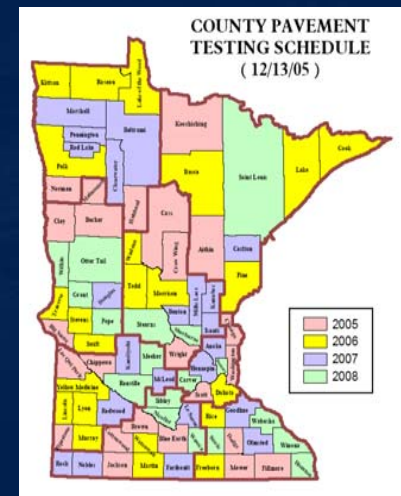




Pavement Assessment Pavement Condition/Distress Survey

Automated Data Collection

- Mn/DOT's Office of Materials and Division of State Aid have entered into an agreement to test one-fourth of the CSAH system each year over the next 8 years.
- The Mn/DOT Pavement Management Unit will collect, analyze and disseminate the data to the counties.
- Testing began in the spring of 2005





Pavement Assessment Pavement Condition/Distress Survey

Bituminous Pavement Distresses





Pavement Assessment Pavement Condition/Distress Survey

Bituminous Pavement Distresses

- ✓ Fatigue (Alligator) Cracking
- ✓ Bleeding
- ✓ Block Cracking
- ✓ Corrugation and Shoving
- ✓ Depression
- ✓ Reflective Cracking
- ✓ Longitudinal Cracking
- ✓ Patching
- ✓ Polished Aggregates
- ✓ Potholes
- ✓ Raveling
- ✓ Rutting
- ✓ Slippage Cracking
- ✓ Stripping
- ✓ Transverse (Thermal) Cracking
- ✓ Water Bleeding and Pumping





Pavement Assessment Pavement Condition/Distress Survey

Concrete Pavement Distresses





Pavement Assessment Pavement Condition/Distress Survey

Concrete Pavement Distresses

- ✓ Blowup (Buckling)
- ✓ Corner Break
- ✓ Durability Cracking (“D” Cracking)
- ✓ Faulting
- ✓ Joint Load Transfer System Deterioration
- ✓ Linear (Panel) Cracking
- ✓ Popouts
- ✓ Pumping
- ✓ Punchout
- ✓ Patching
- ✓ Polished Aggregate
- ✓ Reactive Aggregate Distress
- ✓ Shrinkage Cracking
- ✓ Spalling





Pavement Assessment

Pavement Strength Evaluation

- Evaluation of the structural capacity of an existing pavement can be determined by destructive or non-destructive methods
 - Non-destructive testing methods include Falling Weight Deflectometer (FWD), Ground Penetrating Radar (GPR) and Dynamic Cone Penetrometer (DCP)
 - Destructive testing methods include soil borings, probe holes, test pits and coring



Pavement Assessment

Pavement Strength Evaluation

- FWD Testing
 - Data used to calculate pavement strength, capacity and remaining life





Pavement Assessment Pavement Strength Evaluation

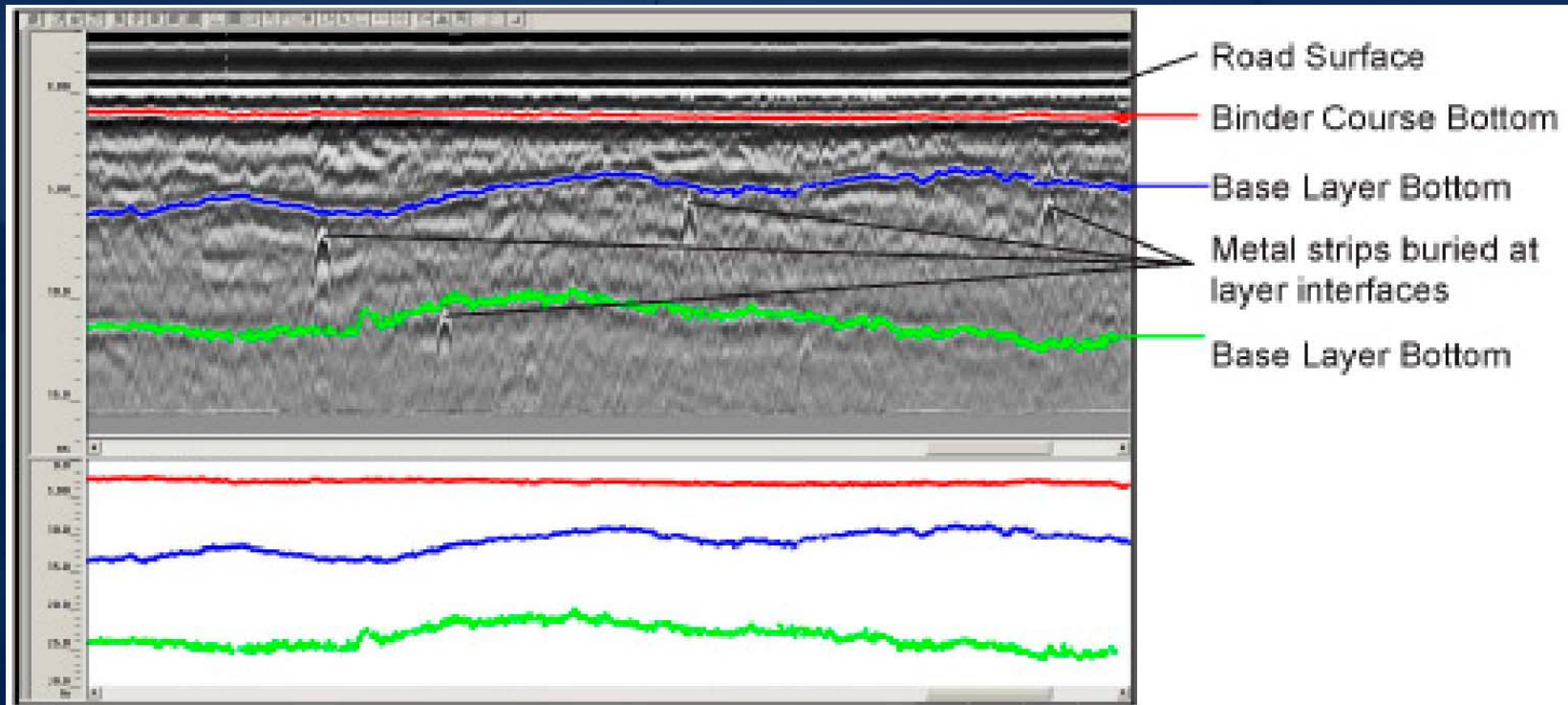
- Ground Penetrating Radar (GPR) Data
 - Provides a “picture” of pavement structure
 - Used for FWD Analysis





Pavement Assessment

Pavement Strength Evaluation





Pavement Assessment

Pavement Strength Evaluation

- Coring Data
 - Pavement layers (surface, base and sub-base) are measured, classified and photographed
 - Asphalt cores are measured and analyzed for stripping/segregation
 - Concrete cores are measured and analyzed for thickness and materials integrity
 - Data used to calibrate GPR data





Pavement Assessment Surface, Base and Subgrade Analysis

- Coring
 - Determination of pavement thickness, layering, condition of each layer, bonding between layers, presence of materials related to distress and strength
- Soil Borings/GPR
 - Thickness, type or classification, moisture content, contamination, strength determination





Pavement Assessment Surface and Subsurface Drainage Review

- Visual inspection for presence of:
 - Curb and gutter
 - Ditches
 - Subsurface drainage installed
 - Is it working?
- Soil borings:
 - Base material type
 - Subgrade material type





Pavement and Materials Assessment Approximate Costs

- Coring - \$1,000 to \$1,500 (per project < 2 miles)
- Soil / pavement borings ~\$1,000 (per mile)
- FWD w/ analysis - \$2,000 to \$5,000 (per project < 2 miles)
- Sampling & subgrade testing - \$2,500 (per project < 2 miles)
- DCP - equipment costs \$1,500 (per project < 2 miles)

**Costs will vary depending on many factors,
especially mobilization and traffic control**





Pavement Inventory

- Network Level
 - Looking for sufficient data to manage your system
 - Making macro/long-term decisions based on more general information
- Project Level
 - Site specific data used to evaluate the in place materials and make economic decisions on the best rehabilitation
 - Sufficient information to develop a construction plan and specifications

