



Track C – Benefits of
Asphalt Design & Construction:
Pavement Maintenance Strategies

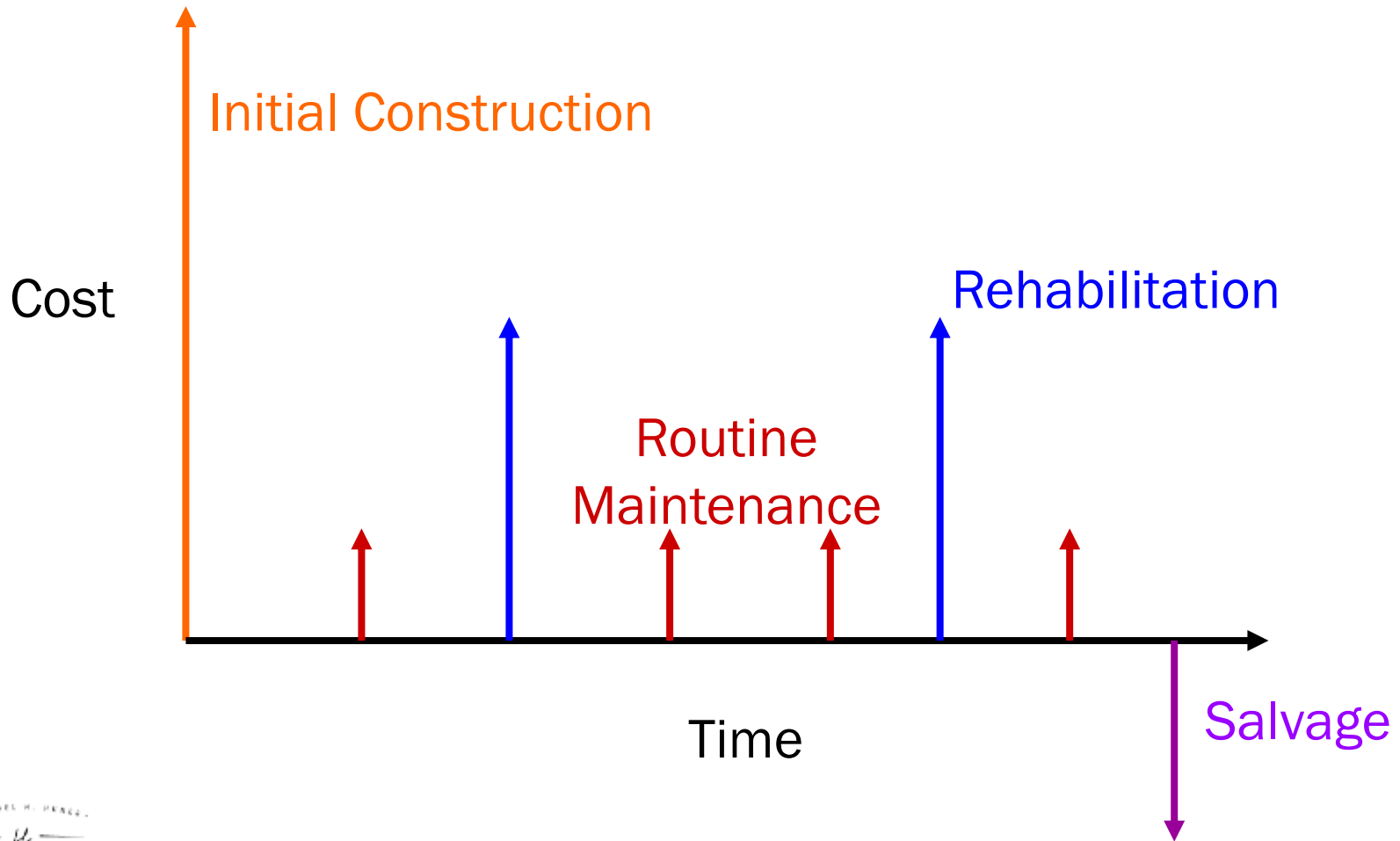
2020 MAPA Spring Training – *Black to Basics*
Holiday Inn Executive Center – Columbia, MO
February 27-28, 2020



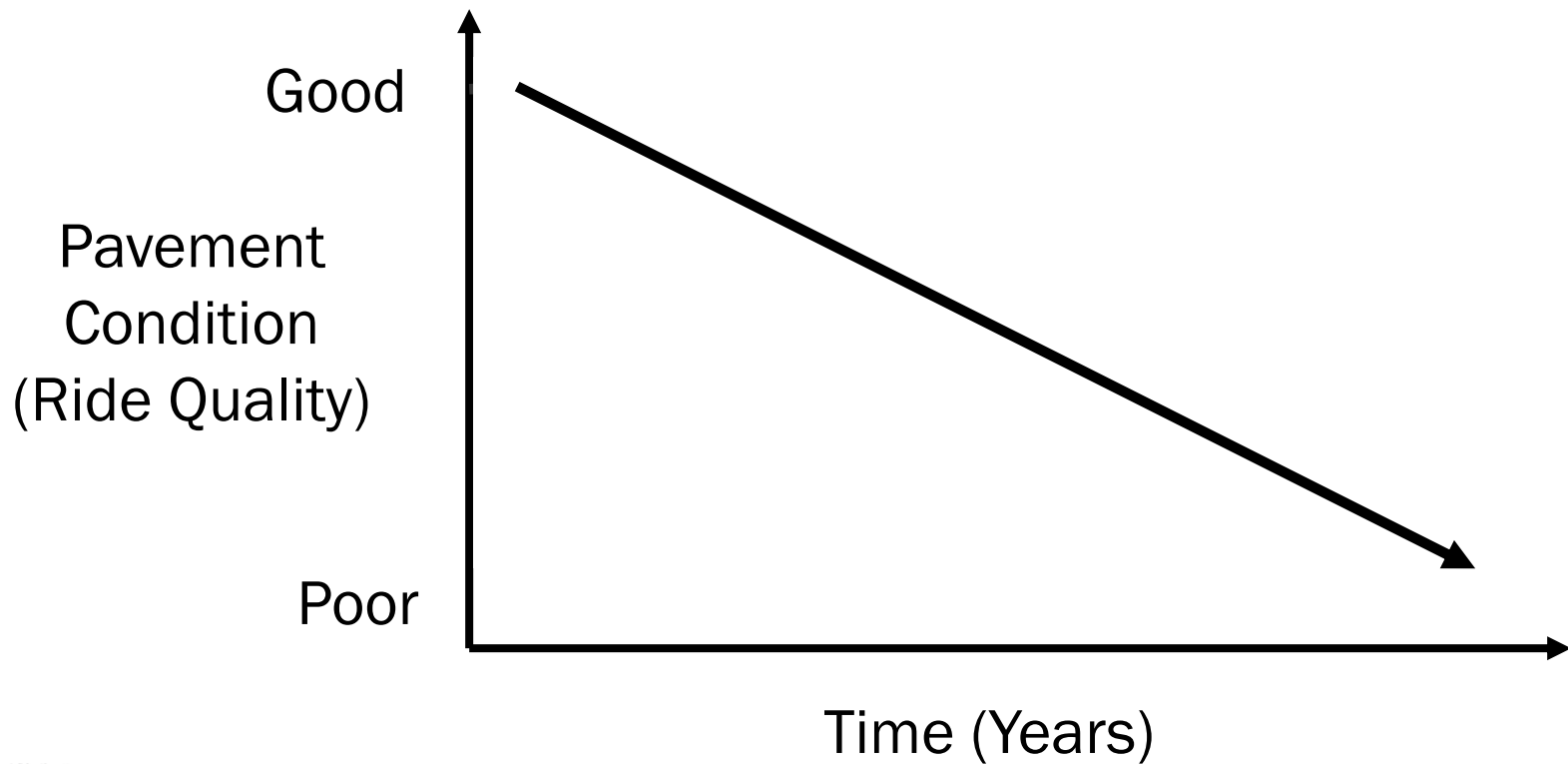
Pavement Life Cycle – Costs

- Initial Construction
 - Material, Labor and Traffic Control
- Routine Maintenance
 - Crack Sealing, Patching, Surface Treatments
- Rehabilitation
 - Structural Patching, Milling, Overlays, etc...
- Salvage/Perpetual?
 - Eliminating structural distresses can lead to perpetual life

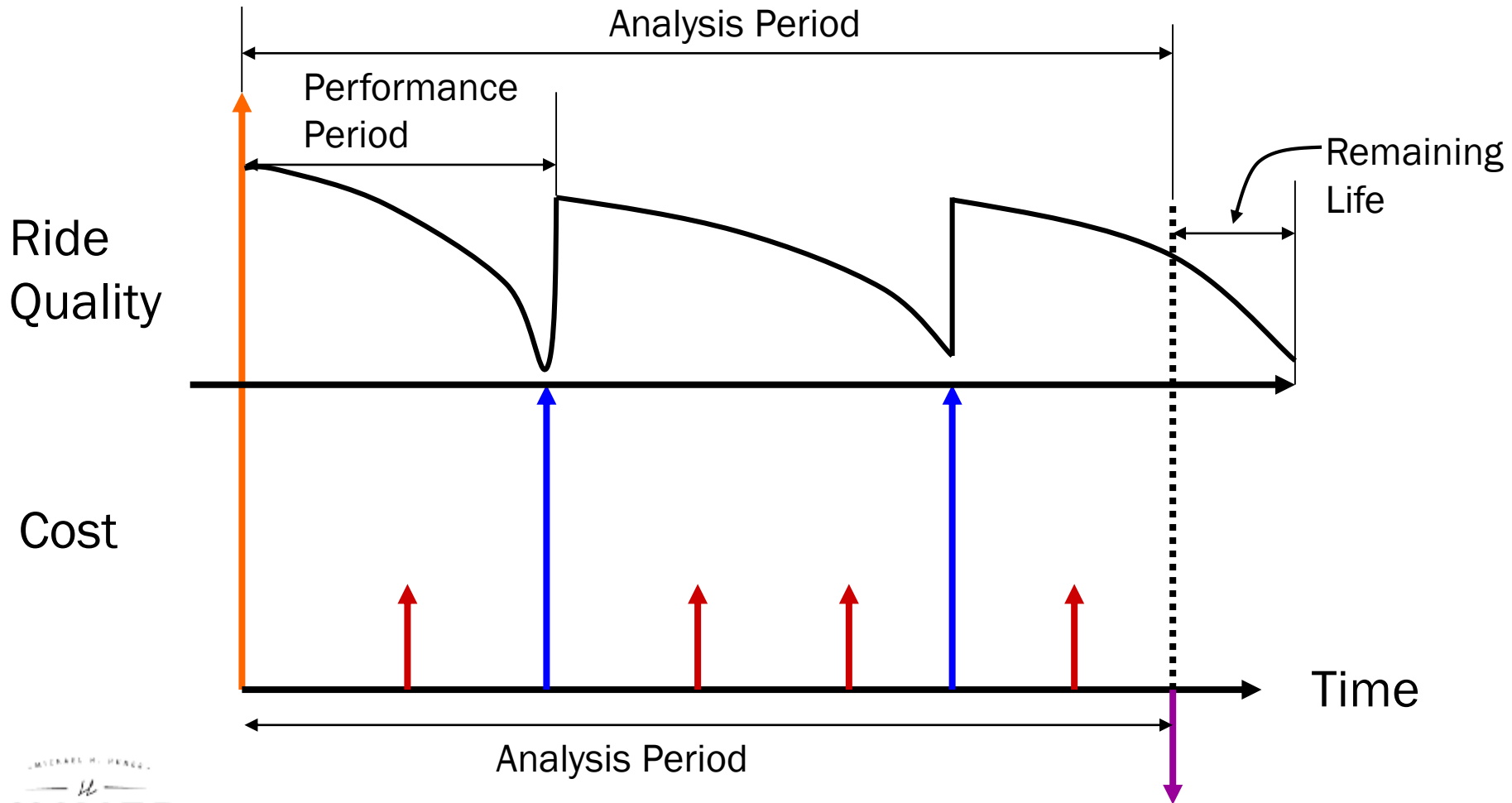
Pavement Life Cycle – Costs



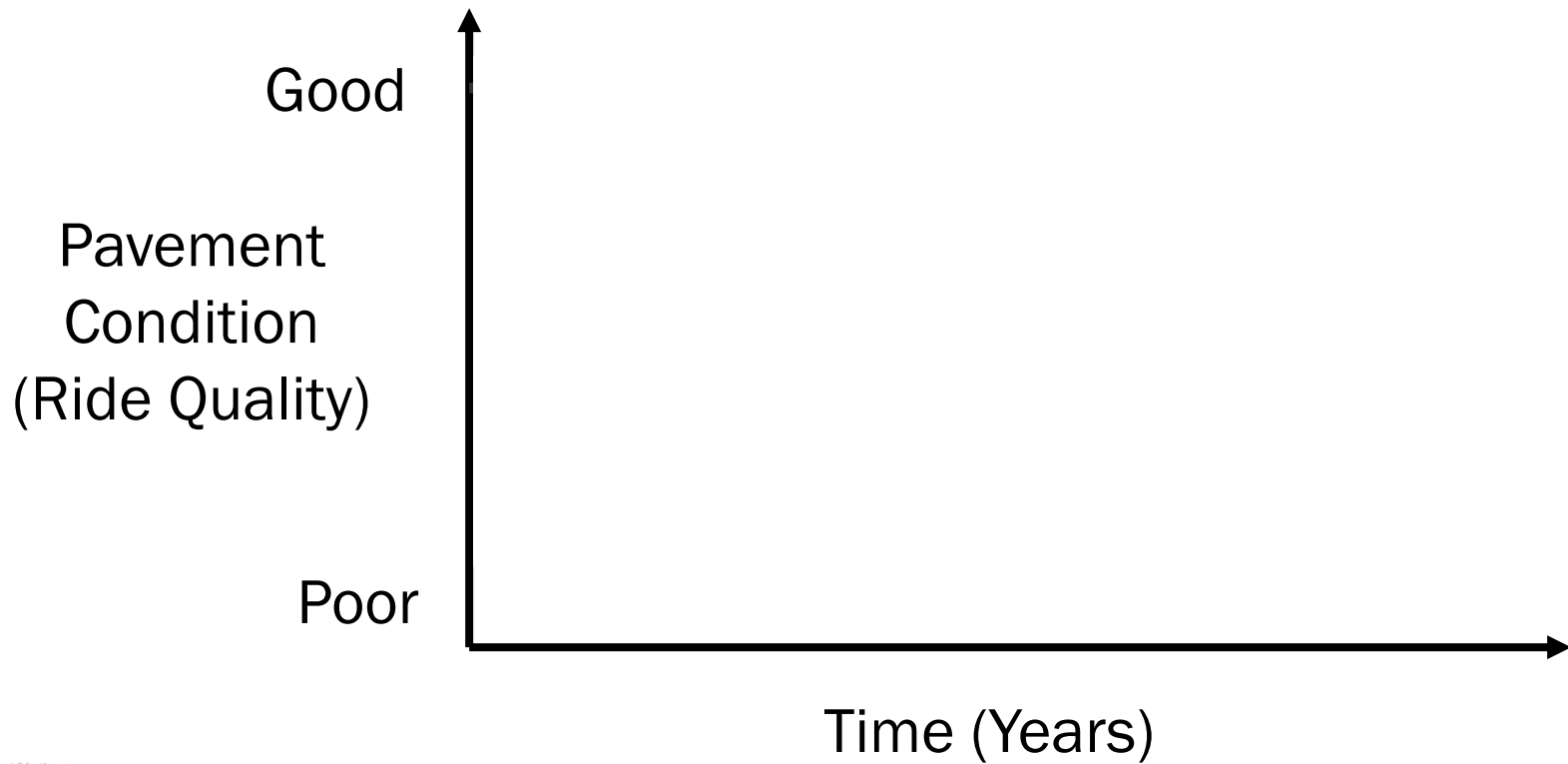
Pavement Life Cycle – Ride Quality



Pavement Life Cycle – Cost vs. Ride Quality

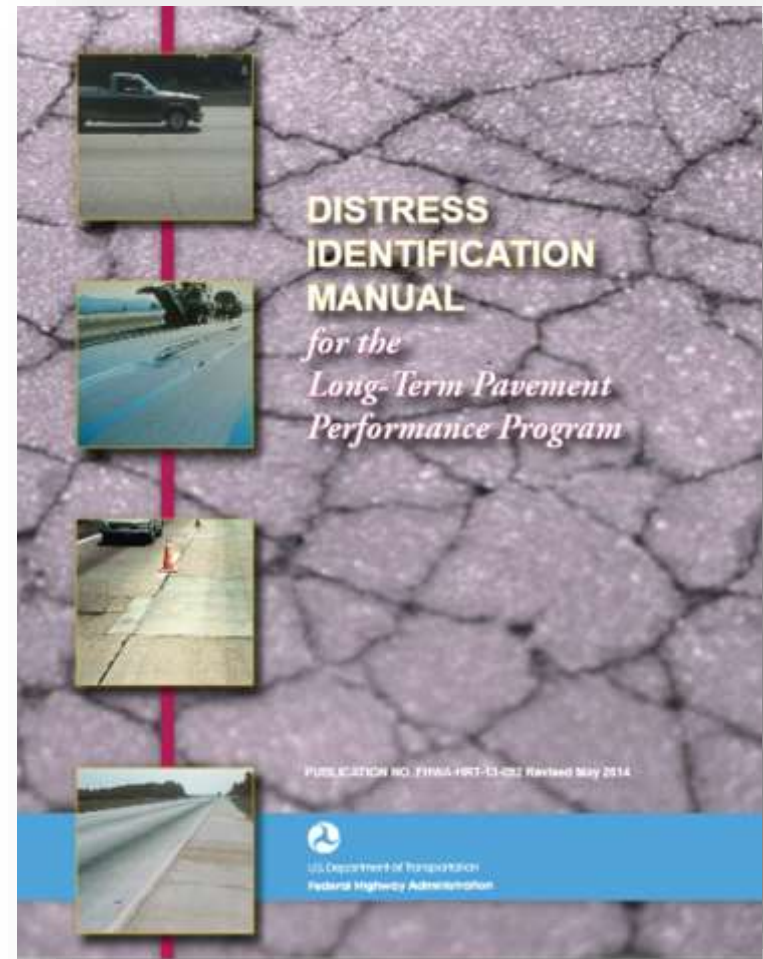


Pavement Condition?



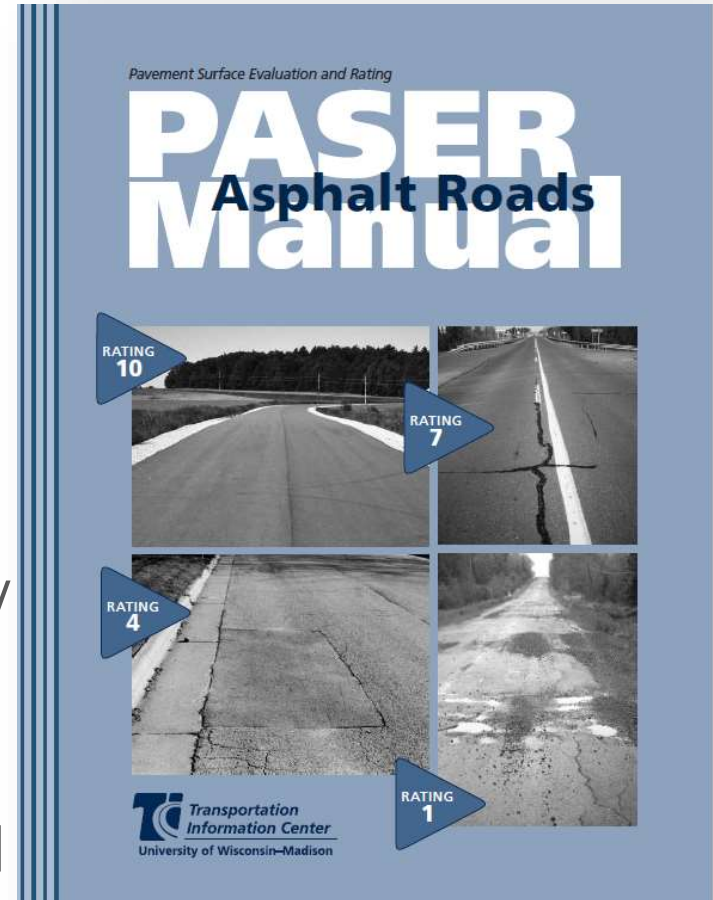
FHWA's LTPP Distress Identification Manual

- Research-oriented
- All pavement types
- Distress definitions
 - Description
 - Severity levels
 - How to measure
- Schematic drawings
- Photographs
- Data collection forms

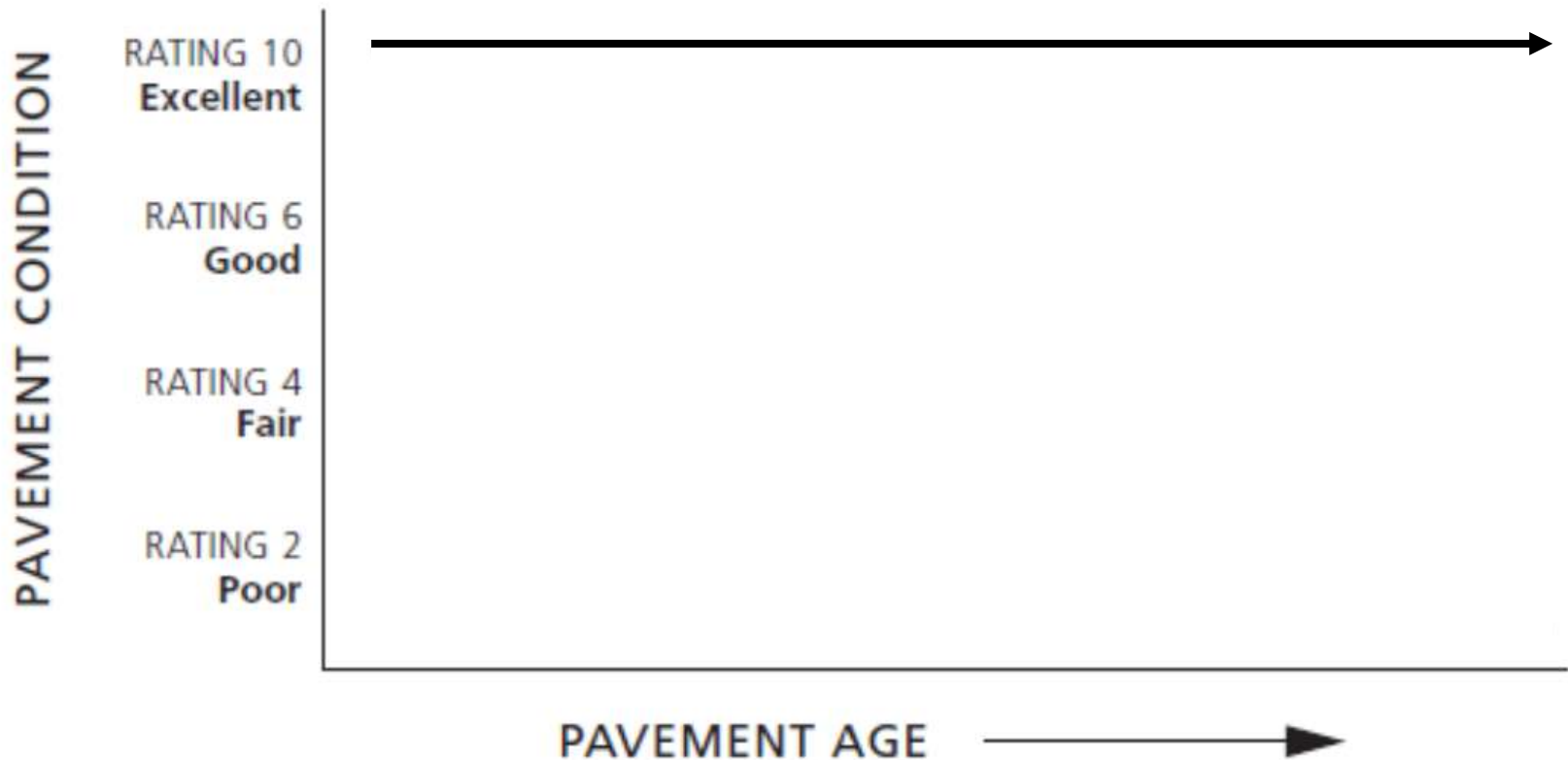


Pavement Surface Evaluation and Rating (PASER) Manual

- Transportation Information Center at the University of Wisconsin - Madison
- Manuals for various pavement types
- Asphalt distress types and descriptions
- Provides a simple system to visually rate the pavement condition
- Photographs
- Tables and charts of recommended criteria



Pavement Condition Rating – PASER



Identification of Pavement Distresses

- Surface Defects
 - Raveling, Flushing, Polishing
- Surface Deformation
 - Rutting/Distortion
- Cracking
 - Transverse, Reflective, Slippage, Longitudinal, Block, Alligator
- Patches and Potholes

Identification of Pavement Distresses

- Fundamental pavement performance indicator
- Characterized by:
 - Type – What is it?
 - Severity – How bad is it?
 - Cause – What is causing the distress?

Pavement Condition Rating – PASER

<i>Surface rating</i>	<i>Visible distress*</i>	<i>General condition/ treatment measures</i>
10 Excellent	None.	New construction.
9 Excellent	None.	Recent overlay. Like new.
8 Very Good	No longitudinal cracks except reflection of paving joints. Occasional transverse cracks, widely spaced (40' or greater). All cracks sealed or tight (open less than 1/4").	Recent sealcoat or new cold mix. Little or no maintenance required.
7 Good	Very slight or no raveling, surface shows some traffic wear. Longitudinal cracks (open 1/4") due to reflection or paving joints. Transverse cracks (open 1/4") spaced 10' or more apart, little or slight crack raveling. No patching or very few patches in excellent condition.	First signs of aging. Maintain with routine crack filling.
6 Good	Slight raveling (loss of fines) and traffic wear. Longitudinal cracks (open 1/4"–1/2"), some spaced less than 10'. First sign of block cracking. Slight to moderate flushing or polishing. Occasional patching in good condition.	Shows signs of aging. Sound structural condition. Could extend life with sealcoat.

Pavement Condition Rating – PASER

<p>5 Fair</p>	<p>Moderate to severe raveling (loss of fine and coarse aggregate). Longitudinal and transverse cracks (open 1/2") show first signs of slight raveling and secondary cracks. First signs of longitudinal cracks near pavement edge. Block cracking up to 50% of surface. Extensive to severe flushing or polishing. Some patching or edge wedging in good condition.</p>	<p>Surface aging. Sound structural condition. Needs sealcoat or thin non-structural overlay (less than 2")</p>
<p>4 Fair</p>	<p>Severe surface raveling. Multiple longitudinal and transverse cracking with slight raveling. Longitudinal cracking in wheel path. Block cracking (over 50% of surface). Patching in fair condition. Slight rutting or distortions (1/2" deep or less).</p>	<p>Significant aging and first signs of need for strengthening. Would benefit from a structural overlay (2" or more).</p>
<p>3 Poor</p>	<p>Closely spaced longitudinal and transverse cracks often showing raveling and crack erosion. Severe block cracking. Some alligator cracking (less than 25% of surface). Patches in fair to poor condition. Moderate rutting or distortion (1" or 2" deep). Occasional potholes.</p>	<p>Needs patching and repair prior to major overlay. Milling and removal of deterioration extends the life of overlay.</p>
<p>2 Very Poor</p>	<p>Alligator cracking (over 25% of surface). Severe distortions (over 2" deep). Extensive patching in poor condition. Potholes.</p>	<p>Severe deterioration. Needs reconstruction with extensive base repair. Pulverization of old pavement is effective.</p>
<p>1 Failed</p>	<p>Severe distress with extensive loss of surface integrity.</p>	<p>Failed. Needs total reconstruction.</p>

Pavement Condition Rating – PASER

RATINGS ARE RELATED TO NEEDED MAINTENANCE OR REPAIR

Rating 9 & 10 No maintenance required

Rating 8 Little or no maintenance

Rating 7 Routine maintenance, cracksealing and minor patching

Rating 5 & 6 Preservative treatments (sealcoating)

Rating 3 & 4 Structural improvement and leveling (overlay or recycling)

Rating 1 & 2 Reconstruction

Forensic Investigations

- Identify and/or determine the cause for the distresses that are seen using forensic analyses



Forensic Investigations

- Project Documentation
 - Layer Thicknesses?
 - Materials & Mixtures?
 - Traffic Levels?
 - Performance History?
 - Maintenance Actions?
 - Soil & Drainage?



Framework for Forensic Investigations

- FHWA's *Framework for LTPP Forensic Investigations*
 - Recommendation for forensic investigation
 - Development of forensic investigation plan
 - Implementation of forensic investigation plan
- Details on the activities to be performed in each element

Framework for LTPP Forensic Investigations—Final April 2004

Prepared by:

FHWA-LTPP Technical Support Services Contractor
MACTEC Engineering and Consulting of Georgia, Inc.
12104 Indian Creek Court, Suite A
Beltsville, MD 20705-1242

Prepared for:

Office of Infrastructure R&D
LTPP Team, HRDI-13
Federal Highway Administration
6300 Georgetown Pike
McLean, VA 22101
202-493-3153



U.S. Department of Transportation
Federal Highway Administration



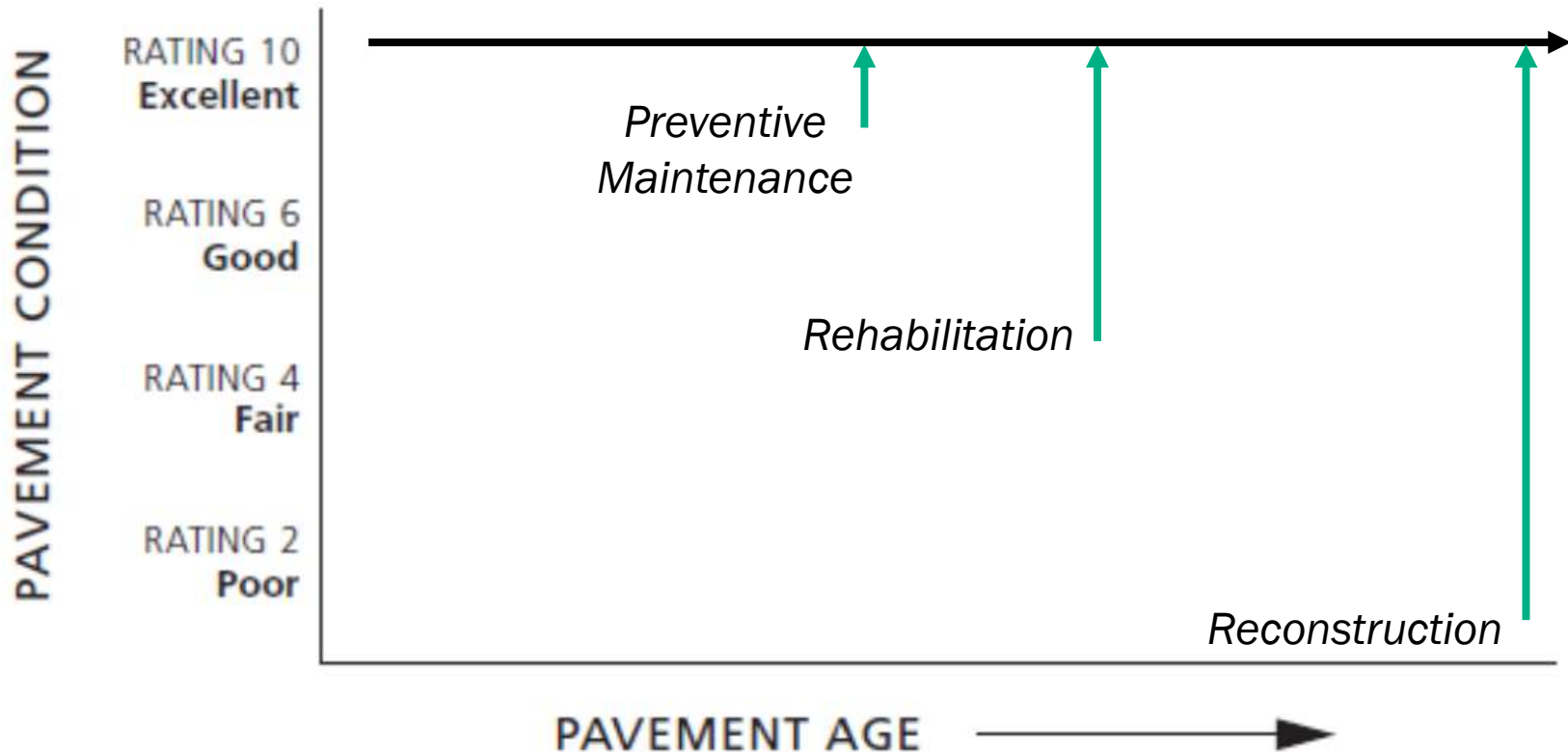
Long-Term Pavement Performance
Serving your need for durable pavement

Forensic Investigations

- “Tools in the Toolbox”
 - Identified Distresses
 - Dry Drilling
 - Wet Coring
 - Trenching
 - Deflection Testing
 - Ground Penetrating Radar



So, where are you on the curve?



Preventive Maintenance

“A planned strategy of cost-effective treatments to an existing roadway system and its appurtenances that preserves the system, retards future deterioration, and maintains or improves the functional condition of the system (without significantly increasing the structural capacity).”

AASHTO Standing Committee on Highways, 1997

Preventive Maintenance

- Preventive Maintenance Strategies
 - Crack Sealing/Filling
 - Patching
 - Surface Treatments
 - Mill & Inlay?

Preventive Maintenance

- Crack Sealing/Filling
 - Preserve the intended design life
 - Extend the service life of the existing asphalt concrete by reducing moisture infiltration
 - Prepare the existing pavement prior to construction of an asphalt concrete overlay



Preventive Maintenance

- Patching

- Repair localized distress
- Improve motorist safety
- Reduce pavement roughness
- Reduce rate of deterioration
- Repair pavement prior to overlay
- Utility cuts



Preventive Maintenance

- Structural Patching
 - Many distresses that we see on the surface are a result of deep structural issues
 - Prior to any surface treatment or asphalt overlay, steps should be taken to address the source of the distress
 - Just because we can cover it up, doesn't mean the problem goes away!



Preventive Maintenance

- Surface Treatments
 - Waterproof cover
 - Increase skid resistance
 - Improved aesthetics of old surfaces
 - Slows oxidation of pavement
 - Seals surface voids
 - Seals hairline cracks
 - Increase life

Fog Seals & Sand Seals

- Seal pavement surface of old, oxidized Asphalt Concrete
- Provide delineation
- Post coating of seal coat “sand” to improve friction



Scrub Seals

- Surface restoration that rejuvenates asphalt and fills voids and cracks
- Application process
 - Apply polymer-modified asphalt emulsion
 - Broom asphalt into voids and cracks
 - Apply sand or small aggregate
 - Broom aggregate and asphalt mixture
 - Roll with pneumatic tire roller



Chip Seals

- Provide wearing course
- Improve surface friction
- Rubberized
 - Bridge and seal cracks
 - Delay reflective cracking



Slurry Seals

- Seal pavement surface
- Retard surface raveling
- Improved surface friction



Micro-Surfacing

- Level pavement surface, fill minor rutting
- Restore surface friction
- Traffic in 1 hour
- Improved Slurry Seal with polymer emulsion



Thinlay Asphalt

- Thin layer of HMA or WMA that is placed less than 1”
- Volumetric mix design
- Fills minor rutting
- Seals surface, improves smoothness and friction



Sandwich Seals & Cape Seals

- Double-layer Chip Seals
- Combination of Chip Seal followed by Slurry Seal or Micro-Surfacing
- Seal pavement surface
- Improve surface friction
- Delay reflective cracking



Pavement Surveys

- Type of distress
 - Determines surface treatment type
- More severe cracking
 - Recommend “Heavier” surface treatment
- Distorted pavement surface
 - Select “leveling” treatment

What Surface Treatment is Applicable?

- Oxidation
 - Fog Seal
 - Sand Seal
 - Scrub Seal
 - Slurry Seal
- Bleeding
 - Sandwich Seal
 - Cape Seal
- Friction
 - Chip Seal
 - Slurry Seal
 - Micro-Surfacing
 - Thinlay Asphalt

What Surface Treatment is Applicable?

- Cracking
 - Scrub Seal
 - Chip Seal
 - Slurry Seal
 - Micro-Surfacing
 - Thinlay Asphalt
 - Sandwich Seal
 - Cape Seal
- Rutting (minor)
 - Micro-Surfacing
 - Thinlay Asphalt

Preventive Maintenance – Mill & Inlay?

- Removal of surface distresses
 - Minor rutting, Top-down cracking, Oxidized surface, Raveling
- Restore curb line
- Restore cross slope
- Restore surface friction
- Restore smoothness



Preventive Maintenance – Mill & Inlay

“If the surface can be milled out, we have not only conserved a valuable resource, but if no adjacent lane has to be matched this mill-and-fill may give us two opportunities for smoothness.”

Roadtec Technical Paper T-123



Summary

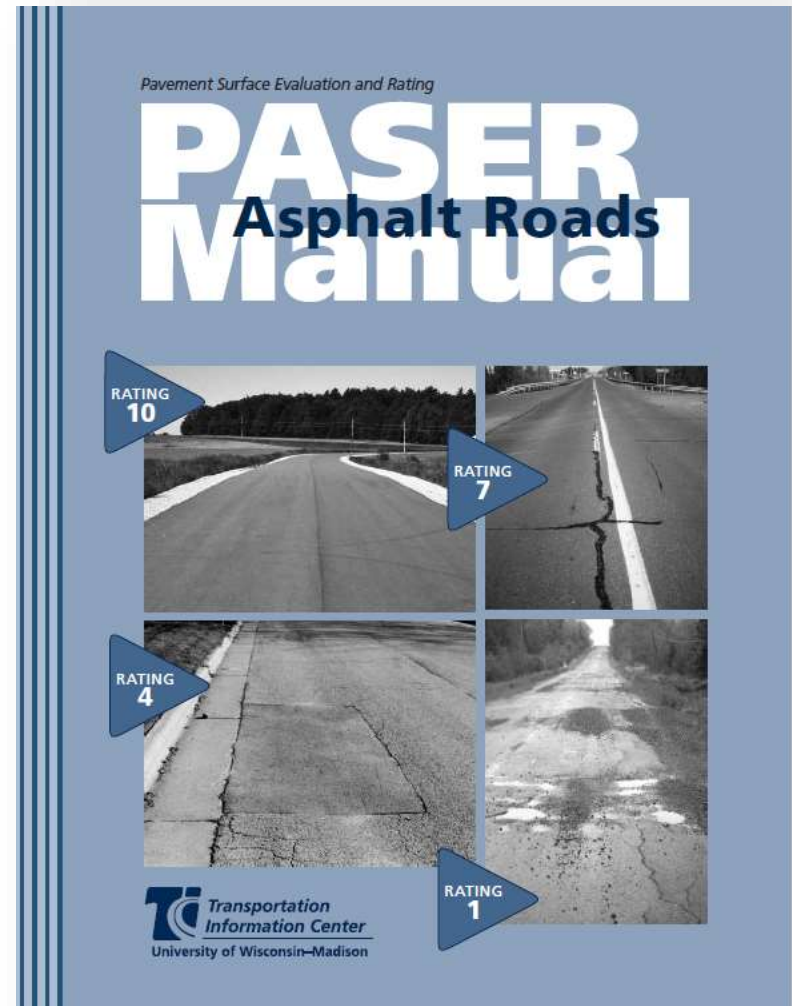
- Proper preventive maintenance starts with identifying pavement distresses and knowing where you are on the pavement condition curve
- Be sure to identify, evaluate, and address any deep structural problems before placing surface treatments and overlays
- Selecting the appropriate surface treatment based on pavement distress severity will help to achieve “the best bang for you buck”

Summary

- Thinlay Asphalt is a pavement preservation treatment option that can provide a minor structural enhancement
- Profile milling provides an opportunity to remove surface distresses, recycle materials, correct profiles, and leads to a smoother, longer life pavement

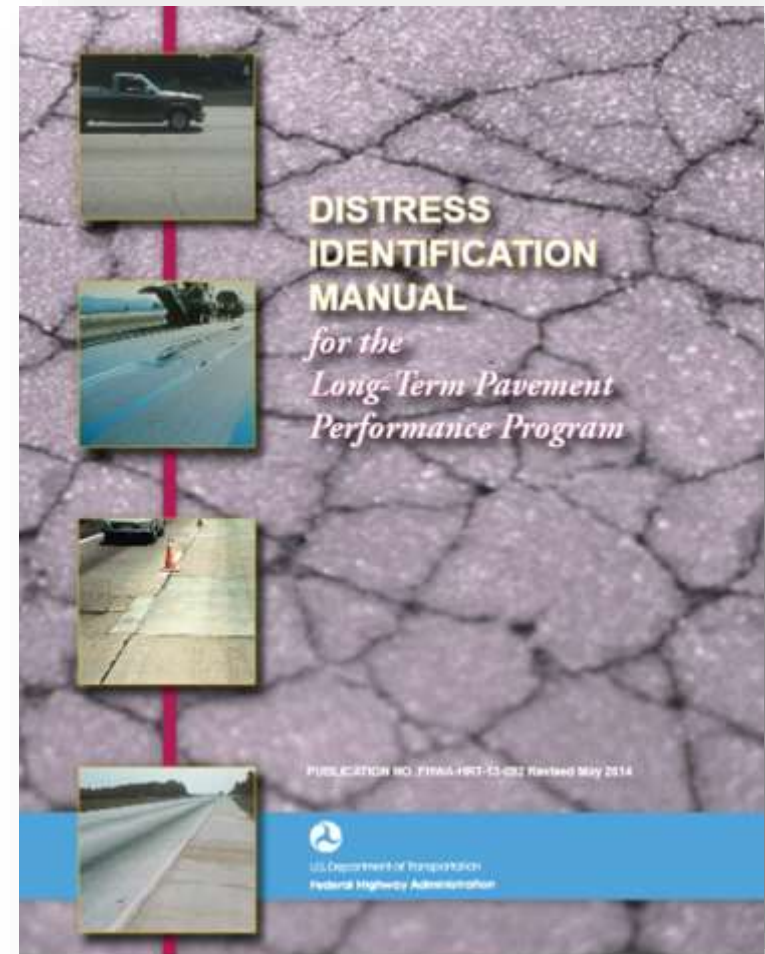
Key References

- Transportation Information Center at the University of Wisconsin – Madison.
Pavement Surface Evaluation and Rating (PASER) Manual
- https://www.michigan.gov/documents/tamc/asphaltpaser_602531_7.pdf



Key References

- FHWA Publication:
*Distress Identification Manual
for the Long-Term Pavement
Performance Program*
FHWA-HRT-13-092
Rev. May 2014
- <https://www.fhwa.dot.gov/publications/research/infrastructure/pavements/ltpp/13092/13092.pdf>



Key References

- FHWA Publication.
Framework for LTPP Forensic Investigations - April 2004
- <https://www.fhwa.dot.gov/publications/research/infrastructure/pavements/ltpp/framework/>

Framework for LTPP Forensic Investigations—Final
April 2004

Prepared by:

FHWA-LTPP Technical Support Services Contractor:
MACTEC Engineering and Consulting of Georgia, Inc.
12104 Indian Creek Court, Suite A
Beltsville, MD 20705-1242

Prepared for:

Office of Infrastructure R&D
LTPP Team, HRDI-13
Federal Highway Administration
6300 Georgetown Pike
McLean, VA 22101
202-493-3153



U.S. Department of Transportation
Federal Highway Administration



Long-Term Pavement Performance
Serving your need for durable pavement

Questions?



Michael H. Huner, P.E.
Huner Consulting, LLC
www.hunerconsulting.com
mike@hunerconsulting.com
(615) 477-5079 CELL