

Incorporating Pavement Preservation Into Pavement Design

**From the AASHO Road Test
to the MEPDG**

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Presentation Overview

- **Background**
- **Preservation and design: past and present**
- **Preservation and design: moving forward**
- **Barriers**
- **Suggested Solutions**

Background

- **Since the AASHO Road Test (ART) of 1958-60 AASHTO design procedures have represented state of practice**
- **Design procedure which emerged from ART based on serviceability-performance concept**
 - **Pavements designed to provide acceptable serviceability over established period**

Design Procedure Background

The AASHTO design procedure developed from observations from the ART and in use for over three decades relates applied loads to failure, based on limited variations in:

- Support conditions**
- Materials**
- Environment**

More Background

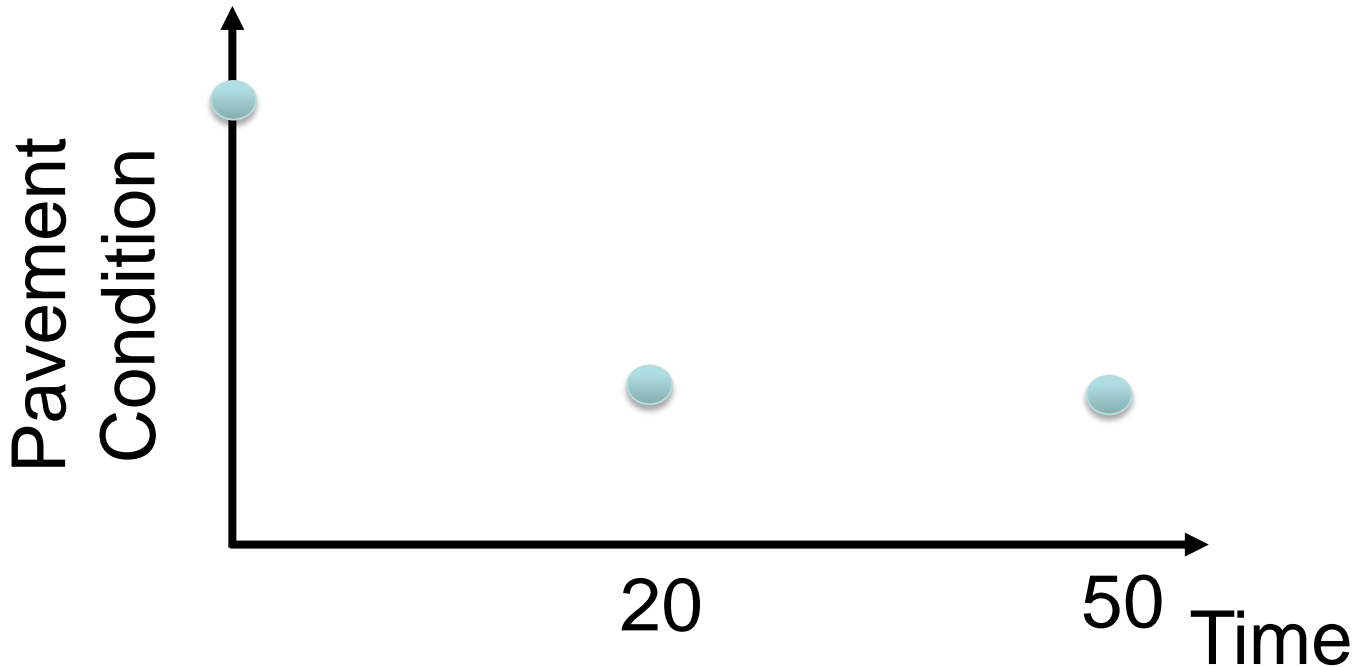
- For a long time, designing pavements for 20 years was accepted standard
- Over time this changed
 - Many pavements lasted longer
 - Replacing pavements after 20 years not cost effective
 - Frequent construction not politically acceptable in highly trafficked urban areas

Design and Life

- **Today's practice trends toward longer design lives**
- **1993 Guide recommends 35 to 50 years for high-type roads**
- **Long-life designs have been developed for 60 years**
- **One industry even speaks of perpetual pavements**

Life Questions

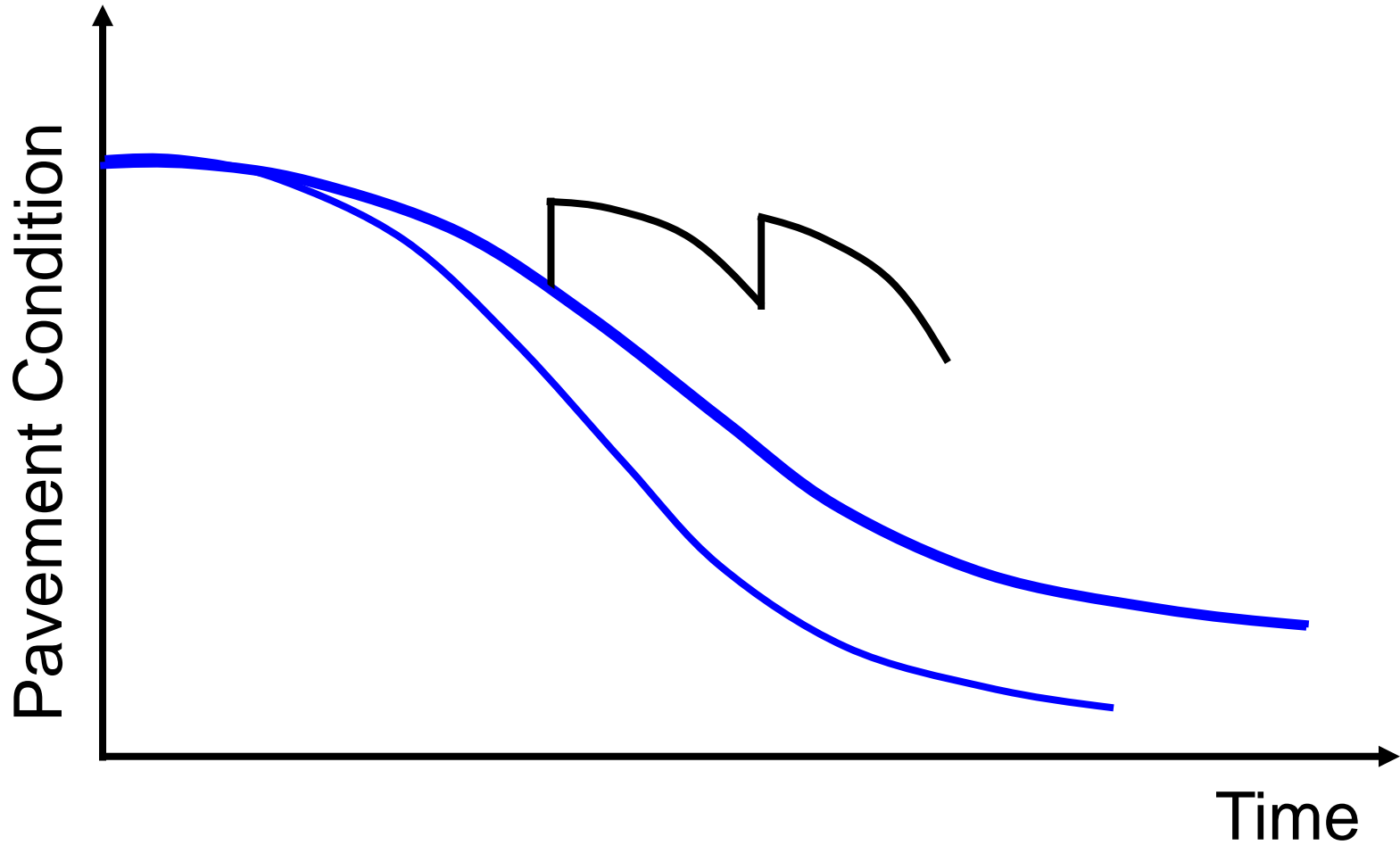
- How long do pavements actually last?
- How do they do that?



A Proposition

- They didn't get there on their own

Effects of Preservation



From AASHTO 1993

One of the least understood areas of state of the art rehabilitation concerns the ability to confidently and accurately predict probable performance (e.g., serviceability-traffic loading/time) for nonoverlay rehabilitation solutions

More From AASHTO 1993

This is one of the most significant limitations of the rehabilitation guidelines, and user agencies are strongly encouraged to build a continuous and accurate performance data base to increase the overall accuracy and confidence level of performance predictions.

Meanwhile

- **Most SHAs and many cities/counties/MPOs have preservation programs**
- **Maintenance is less of an afterthought**
- **“Preservation first” is a more prevalent mindset**

Some Contentions

- **Maintenance and preventive maintenance play a role in pavement performance**
- **Without preservation, pavements would need rehabilitation or replacement sooner**
- **Preservation enables pavement designs to reach or exceed their intended lives**

AASHTO Design Procedure Update

- **The AASHTO design procedure (1993) is being/has been replaced with the MEPDG**
- **MEPDG models reflect the effects on pavement performance of the interactions between:**
 - **In situ conditions**
 - **Materials**
 - **Vehicle loading characteristics**
 - **Pavement designs**

MEPDG and Preservation

Pavement preservation programs and strategies are policy decisions which are not considered directly in the distress predictions. Pavement preservation treatments applied to the surface of HMA [hot-mix asphalt] layers early in their life may have an impact on the performance of flexible pavements and HMA overlays. The pavement designer needs to consider the impact of these programs in establishing the local calibration coefficients or develop agency specific values – primarily for load and non-load related cracking.

Interim MOP (2008)

MEPDG and Preservation (cont.)

Preservation is considered in JPCP design only in the ability to design a restoration project

Moving Forward: 3 Approaches

- **Develop pavement preservation response models and distress transfer functions**
- **Local calibration using pavement preservation performance results**
- **Incorporation of preservation treatments after distress prediction: adjustment of distress and life predictions by modifying material and/or structure properties**

Approach 1: Preservation Models

- **Specific to a treatment and/or strategy**
- **Develop experimental design**
- **Construct test sites and monitor performance**
- **Develop, calibrate, and validate performance models**
- **Consider performance measures not in MEPDG, such as surface characteristics**

Approach 2: Local Calibration

- Follows available guidance on process**
- Establish hierarchical input level for each parameter**
- Develop local experimental plan**
- Determine sample size, select segments, evaluate and analyze data**
- Based on availability of preservation performance results**

Approach 3: Distress/Life Based on Material/Structure Properties

- **Start with typical ME pavement design**
- **Identify time when a preventive maintenance treatment is applied in terms of MEPDG condition/performance**
- **Quantify impacts of treatment on surface material properties**
- **Consider immediate and long-term effects (impact of treatment on deterioration rate)**

Barriers

- **Structural pavement design should not include functional considerations**
- **Data to develop these approaches are not available**
- **Compared to the effort that went into the MEPDG, the preservation industry is behind**

A Caution

- **Accountable organizations insist that expenditures provide benefits**
- **Preservation is one area where we are spending an increasing amount of transportation funding**
- **Is this funding challenged in the long run if models used for design show no benefit from preservation?**

Suggested Solutions

- Consider if local calibration is sufficient
- Without definitive approach, outline in detail what is needed for each alternative and begin the effort

Bring A Game to Preservation

- **Select good candidate projects and good treatments for those pavements**
- **Build it right**
- **Keep track of what was done where**
- **Document conditions before, after, and beyond**

Thank You!



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