

National Cooperative Highway Research Program (NCHRP)

Advancements in Pavement Management and Design (focus on NCHRP research)

June 2003

NCHRP- National Cooperative Highway Research Program

- **The NCHRP--an AASHTO program sponsored by state DOTs--contributes to advancements in all aspects of highways, including pavement management and design.**
- **NCHRP responds to state DOT needs as identified by the DOTs and AASHTO committees.**
- **NCHRP engages state DOTs, and other sectors of the highway industry in monitoring the research to ensure applicability of the results.**

NCHRP and Pavements

- **NCHRP pavement-related projects deal with**
 - **Pavement Materials**
 - **Pavement Design, Construction, and Rehabilitation**
 - **Pavement Management and Evaluation**
 - **Special Projects (strategic planning, research needs)**
- **Results are published by NCHRP (reports, digests, synthesis, CD-ROMs, and Web documents) or by AASHTO (guides/manuals, specifications, and test methods); often adopted by state DOTs and other organizations.**

Current Pavement Design Approach

- **The current AASHTO Guide for Design of Pavement Structures (1993) is based on empirical equations developed using the AASHTO Road Test (1950s) data. Limitations:**
- **Limited structural sections (1950s designs)**
- **One location (one subgrade type)**
- **One location (one climate over 2 years)**
- **Modest traffic level (1.1 million load repetitions)**

Recognizing these limitations and the need for projections far beyond the original data, the AASHTO Joint Task Force on Pavements (Mr. Gary Sharpe, chair) undertook an initiative to develop an improved guide.

The Guide Package

- **Guide for Mechanistic Design and Analysis**
- **Software Package**
- **Implementation and Training Materials**

The New Guide: Vision

- **Based on mechanistic-empirical principles**
- **Uses validated state-of-the-art technologies**
- **Provides a uniform basis for the analysis of all pavement types**

The Design Guide

NCHRP
Design Guide
PAVEMENT ANALYSIS & DESIGN SYSTEM

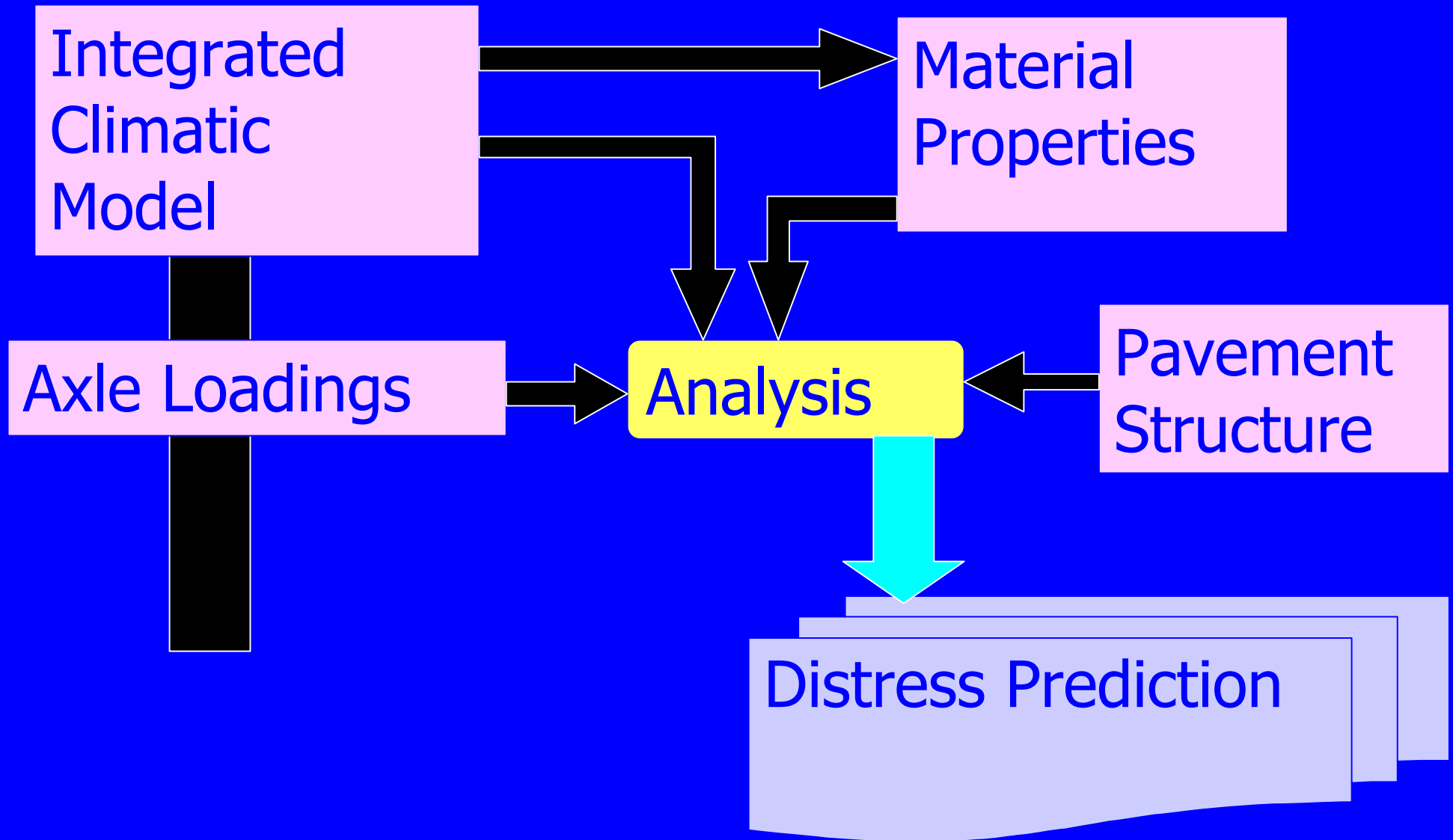
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This software is furnished only for review by members of the NCHRP 1-37A project panel and is regarded as fully privileged. Dissemination of this software must be approved by the NCHRP.

The Mechanistic Analysis Process



The Design and Analysis Process

- **Output: Predicted distress and smoothness**
- **Compare results to threshold levels/consider other factors (LCCA, other impacts)**
- **Iteration/comparisons (changes in thickness, materials, properties, layers, etc.)**

Summary: The new Guide provides an integrated analysis process for predicting pavement condition over a period of time, it accounts for the interaction among traffic, climate, and structure, and is presented on a user-oriented computational software.

Scope of the Guide

- **Procedures for pavement design/analysis**
- **Procedures for evaluating existing pavements**
- **Overview of rehabilitation strategies**
- **Procedures for LCCA, reliability, and traffic analysis**
- **Procedures for refinement for regional/local conditions**
- **Guidance on developing agency-specific procedures/catalogs**

Pavement Types

- **New and Reconstructed Pavements**
 - **Flexible:** AC on granular base, AC on AC stabilized base
 - **Rigid:** JPCP and CRCP
 - **Semi-Rigid:** AC on cementitious base
- **Rehabilitated Pavements**
 - **Flexible:** AC overlay, concrete overlay, ultra-thin overlay
 - **Rigid:** AC overlay, unbonded concrete overlay, bonded concrete overlay, restoration

Software Package

User-oriented computational software

- **Software (on CD-ROMS) for both units of measurement (U.S. Customary and SI units)**
- **Documentation/User manuals**

Implementation and Training

- **Implementation Material**
 - Video tape
 - CD-ROM
 - Informational material
- **Training Material**
 - Training course

Related Research

Traffic Data collection and forecasting

- **Guidelines for Collecting Traffic Data**
- **Software for Traffic Forecasting (TrafLoad)**
- **Guidance on Equipment for Collecting Traffic Data**

Distress prediction models

- **Top-down cracking of HMA layers**
- **Reflection cracking of HMA concrete overlays**

Related Research (cont.)

- *Materials test methods*
- **Dynamic modulus for asphalt concrete mixtures**
- **Resilient modulus for granular materials**
- **Coefficient of thermal expansion of portland cement concrete**

- *Materials screening tests (HMA)*
- **Simple performance test**
- **Asphalt Pavement Analyzer**

Simple Performance Test

Confirm that volumetric mix designs provide adequate resistance to rutting and fatigue cracking.

Simple Performance Tester for Superpave Mix Design



Accelerated Laboratory Rutting Tests: Asphalt Pavement Analyzer

- **Is the APA suitable as a method of predicting HMA rutting potential during mix design?**
- **APA does not predict performance, but is useful as a “pass/fail” type proof test for rutting-prone mix designs.**

Related Research (cont.)

- *Materials screening tests (aggregates)*
- **For use in HMA**
- **For use in PCC**
- **For use in unbound layers**
- **Recycled asphalt and concrete**

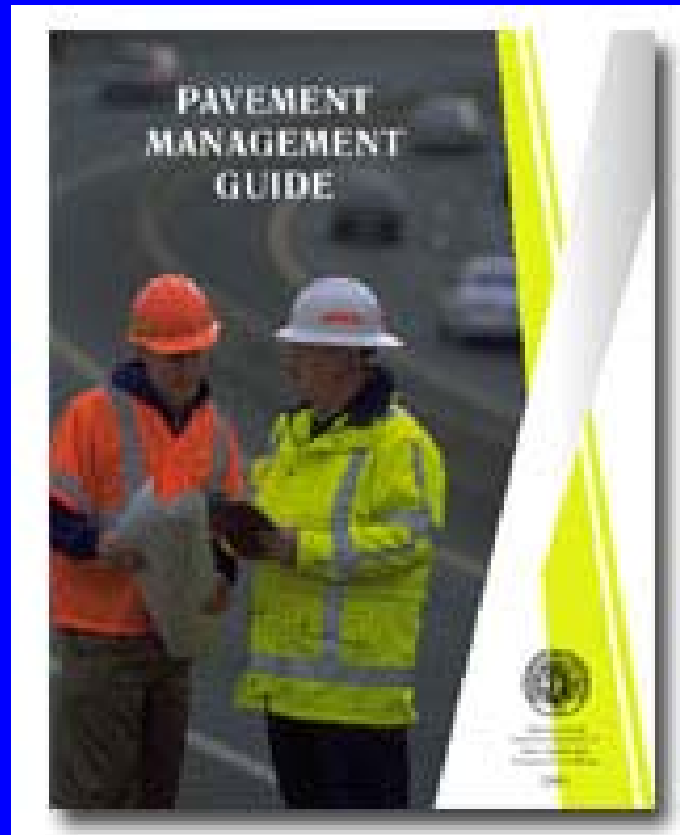
Facilitating Implementation of the Guide

- *NCHRP* will sponsor educational/training workshops for state DOTs personnel
- **FHWA** will develop and conduct NHI courses

Pavement Management and Evaluation

- **AASHTO Pavement Management Guide**
- **Guide for Pavement Friction**

Pavement Management Guide



Pavement Management Guide

- **Replaced the 1990 AASHTO “Guidelines for Pavement Management Systems”**
- **Addresses state-of-practice processes and technologies relevant to the development, implementation, and operation of pavement management systems.**

Guide for Pavement Friction

- **Deals with pavements constructed with asphalt and concrete surfaces**
- **Identifies technologies, processes, and practices suited for designing and constructing pavements with good frictional characteristics**
- **Recognizes effects on noise generation and other relevant issues.**
- **Addresses collection, analysis, and use of frictional measurements**
- **Expected to replace the 1976 AASHTO “Guidelines for Skid Resistant Pavement Design”**

More Information

- www.trb.org → NCHRP
(completed research, active research, RFPs,
anticipated projects, publications, etc.)
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