

National Cooperative Highway Research Program (NCHRP)

Advancing Pavement Management and Design Through Research

June 2005

NCHRP- National Cooperative Highway Research Program

- **An AASHTO program sponsored by state DOTs**
- **Started in 1962**
- **Annual funding ~ \$35 million/year**
- **Contributes to advancements in all aspects of highways**
- **8 fields of research (Administration, Planning, Design, Materials and Construction, Soils and Geology, Maintenance, Traffic, and Special Projects)**
- **25 Subject areas (e.g., economics, forecasting, pavements, bituminous materials, mechanics and foundations, snow and ice control, illumination and visibility, and special projects)**

NCHRP: Goal Oriented Research

- **Responds to state DOT needs: DOTs and AASHTO committees propose research topics; SCOR selects projects.**
- **Ensures applicability of the results: state DOTs and other sectors of the highway industry participate in monitoring the research.**
- **Results are published by NCHRP (reports, digests, synthesis, CD-ROMs, and Web documents) or by AASHTO (guides/manuals, specifications, and test methods), and often adopted by state DOTs and other organizations.**

NCHRP and Pavements

NCHRP pavement-related projects deal with

- Pavement Design/Performance Prediction**
- Pavement Materials and Test Methods**
- Pavement Construction/Rehabilitation**
- Pavement Management and Evaluation**
- Special Projects (strategic planning, research needs)**

Pavement Design/Performance Prediction - Examples

- **Mechanistic-Empirical Design Guide**
- **Reflection Cracking Models**
- **Top-Down Cracking Models**
- **Traffic Data Collection and Forecasting**

Mechanistic-Empirical Design Guide

- **Recognizing the limitations of the current AASHTO Guide for Design of Pavement Structures (1993) and the need for projections far beyond the original data, NCHRP sponsored a \$7 million project to develop an improved guide. The Mechanistic Empirical Pavement Design Guide (MEPDG) and software are available:**

<http://www.trb.org/mepdg>

Reflection Cracking Models

NCHRP Project 1-41 will develop mechanistic-based models for predicting reflection cracking in HMA overlays of flexible and rigid pavements and associated computational software for use in mechanistic-empirical procedures for overlay design and analysis.

(completion: mid 2007)

Top-Down Cracking Models

NCHRP Project 1-42A will develop mechanistic-based models for predicting top-down cracking in HMA layers for use in mechanistic-empirical procedures for design and analysis of new and rehabilitated flexible pavements.

(contract pending)

Traffic Data Collection and Forecasting

NCHRP Project 1-39 developed

- **Guidelines for Collecting Traffic Data and Software for Traffic Forecasting (NCHRP Report 538)**
- **Guidance on Equipment for Collecting Traffic Data (NCHRP Report 509)**

Pavement Materials and Test Methods - Examples

- **Evaluating Fracture and Rutting of HMA Mixtures**
- **Procedures for Evaluating Air-Entraining Admixtures for Highway Concrete**
- **Improved Cement Specifications and Test Methods**
- **Performance-Related Aggregate Tests**

Simple Performance Tester for Superpave Mix Design



Simple Performance Test

NCHRP Project 9-19 developed

- **A test that allows a determination of a mixture's ability to resist fracture and permanent deformation under defined conditions.**
- **Test is recommended as a final stage in the Superpave volumetric mix design method (to confirm expected performance).**

(NCHRP Report 465)

Accelerated Laboratory Rutting Tests: Asphalt Pavement Analyzer

NCHRP Project 9-17 evaluated use of APA

- **Concluded that APA does not predict performance, but is useful as “pass/fail” type proof test for rutting-prone mix design.**
- **Developed a test procedure for using APA in determining rutting susceptibility of asphalt paving mixtures.**

(NCHRP Report 508)

Cement and Concrete Test Methods

- *NCHRP Project 18-10 will develop* procedures for evaluating and qualifying air-entraining admixtures for hydraulic cement concrete for highway applications (completion late 2005).
- *NCHRP Project 18-11 will recommend* potential improvements to specifications and test protocols to determine the acceptability of cements with processing additions (completion early 2006).

Performance-Related Aggregate Tests

- *NCHRP Project 4-19 identified a set of tests for screening aggregates used in HMA (predictors of performance) – NCHRP Report 405.*
- *NCHRP Project 4-20C identified tests for screening aggregates used PCC pavement (predictors of performance) – NCHRP RRD 281.*
- *NCHRP Project 4-23 identified a set of tests for screening unbound materials used in base and subbase layers of pavements (predictors of performance) – NCHRP Report 453.*
- *NCHRP Project 4-31 will identify tests for screening recycled HMA and PCC used in unbound pavement layers (completion early 2006).*

Pavement Construction/Rehabilitation - Examples

- **HMA Performance Related Specifications (PRS)**
- **PCC Early-Opening-to-Traffic (EOT) Concrete**
- **Pavement Texturing**
- **Dowel Alignment in Jointed Concrete Pavements**

PRS (HMA) and EOT (PCC)

NCHRP Project 9-27 developed

- **Performance-related specifications for hot-mix asphalt (NCHRP Report 455).**

NCHRP Project 18-04B developed

- **Guidelines for the proportioning, testing, and constructing “early-opening-to-traffic” concrete for pavement rehabilitation (6-8 and 20-24 hours) NCHRP Report 540 (in press).**

Texturing and Dowel Alignment

NCHRP Project 10-67 will recommend

- **A process for identifying and selecting appropriate texturing methods for defined conditions (completion early 2007).**

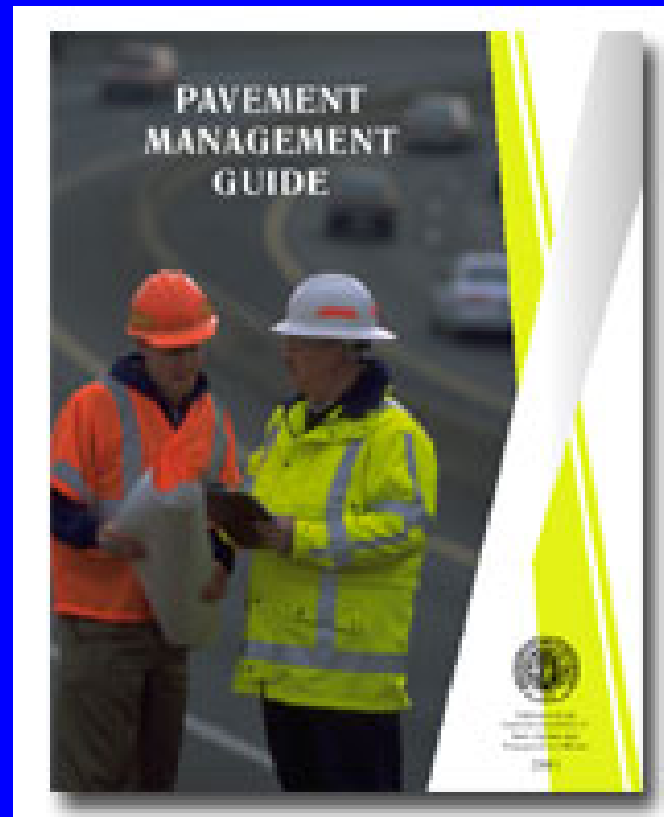
NCHRP Project 10-69 will develop

- **Guidelines for dowel alignment in concrete pavements (contract pending).**

Pavement Management and Evaluation - Examples

- **AASHTO Pavement Management Guide**
- **Guide for Pavement Friction**
- **Noise measurement/modeling**

Pavement Management Guide



Pavement Management Guide

- **Completed under NCHRP Project 1-35A; published by AASHTO in 2001 (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

NCHRP Project 1-43 will develop

- **A Guide for Pavement Friction**
- **Focus on frictional characteristics with recognition of effects on noise generation and other considerations.**
- **Expected to replace the 1976 AASHTO “Guidelines for Skid Resistant Pavement Design”**
- **Completion: late October 2005.**

Highway Noise Measurement & Modeling

NCHRP Project 1-44 will develop

- rational procedures for measuring tire-pavement noise applicable to both light and heavy vehicles operating at highway speeds and for all paved surfaces.

NCHRP Project 8-56 will

- *identify, locate, and quantify* the noise sources on typical commercial truck and tractor-semitrailer combinations for use in computer analysis of traffic noise impacts.

Special Projects - Examples

- **Strategic Planning/Business Needs**
- **Data Analysis in Support of LTPP**
- **Product Development in Support of LTPP**
- **Synthesis of Highway Practice**

Strategic Planning/Business Needs for Pavement Engineering

NCHRP Project 20-7(127) identified four business needs:

- **Achieving desired performance level and life.**
- **Supporting effective management of pavement assets.**
- **Minimizing adverse impacts on users.**
- **Enhancing practitioners knowledge and user understanding of pavements.**
 - **Adopted by the AASHTO Technical Committee on Pavements.**
 - **Summarized in NCHRP RRD 276.**

Data Analysis and Product Development in Support of LTPP

- *NCHRP Project Series 20-50 analyzed LTPP data to determine trends and draw preliminary conclusions on the effects of site, design, and construction features and other factors on pavement response and performance.*
- *NCHRP Project Series 20-51 supported the development of products resulting from the the LTPP studies.*
- **Final reports are available as NCHRP web documents.**

NCHRP Synthesis of Highway Practice - Examples

- **Measuring In-Situ Mechanical Properties of Pavement Subgrade Soils (NCHRP Synthesis 278)**
- **Evaluation of Pavement Friction Characteristics (NCHRP Synthesis 291)**
- **Significant Findings from Full-Scale/Accelerated Pavement Testing (NCHRP Synthesis 325)**
- **Automated Pavement Distress Collection Techniques (NCHRP Synthesis 334)**
- **Thin and Ultra-Thin Topping (NCHRP Synthesis 338)**

More Information on NCHRP Pavement Research

- **A list of “Current and Recently Completed Projects Related to Pavements” is available:**
 - **It identifies status of projects (completed, in progress, or anticipated).**
 - **It identifies available publications (reports, digests, web documents, etc.)**
- **Specific information or questions, contact Amir N. Hanna (ahanna@nas.edu/202/334-1892).**

NCHRP FY 2006 & FY 2007

Programmed for FY 2006:

- **22 Continuation projects (\$10.275 million)**
- **38 New projects (\$17.340 million)**
- **13 Contingent projects (\$4.900 million)**
- **Total 73 projects (\$32.515 million) in 17 problem areas (safety, planning, environment, hydrology/hydraulics, administration/policy, operations, security, bridges, maintenance, materials, pavements, etc.)**
- **Includes materials (4), pavements (2)**

Problem Statements for FY 2007 are due by September 15, 2005.

More Information/NCHRP Contact

- **www.trb.org → NCHRP**

- ***NCHRP Contact***

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