Superpave
IMPLEMENTATION UPDATE
SPRING–SUMMER 2000

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U.S. Department of Transportation
Federal Highway Administration

Long-Range Plan Calls for Superpave Completion in 2005

By the end of 2005, the complete Superpave mix design system—including performance-based quality control—could be fully developed, according to a long-range plan released by the Transportation Research Board (TRB) Superpave Committee in December 1999.

The TRB Superpave Committee—which includes 14-16 members from State and local highway agencies, industry, universities and the Federal Highway Administration (FHWA)—developed the long-range plan at the request of the American Association of State Highway and Transportation Officials (AASHTO). Chaired by Joseph A. Mickes of the Missouri Department of Transportation, the TRB Superpave Committee was established by TRB at AASHTO's request in 1998 when the Transportation Equity Act for the 21st Century (TEA-21) did not provide sufficient funding to the FHWA for continued federally sponsored Superpave research and implementation. The AASHTO-funded and TRB-administered National Cooperative Highway Research Program (NCHRP) took over much of the ongoing Superpave implementation management when the federal funds were no longer available. The TRB Committee's mission is to provide oversight and advice on the NCHRP Superpave research. Two Expert Task Groups (ETGs) are funded by NCHRP and provide advice to the TRB Superpave Committee and the AASHTO Subcommittee on Materials: the Binder ETG and the Mixture/Aggregate ETG. NCHRP panels also guide the individual NCHRP projects.

The TRB Superpave Committee's long-range plan has been forwarded to AASHTO

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Superpave Lead States Call for New Partnerships, Funding Mechanisms

New partnerships and funding mechanisms among the States, AASHTO, TRB, and the FHWA will be needed to fully implement Superpave in its mature form, according to a transition plan developed by the Superpave Lead State Team.

The Lead State Team, established by the AASHTO Task Force on SHRP Implementation and scheduled to sunset this year, has published a transition plan outlining what needs to happen next in order for Superpave to reach its full potential.

"Assuming that the [TRB Superpave Committee's] Long Range Plan to complete the requisite research is both comprehensive and completed, implementation remains a challenge," the transition plan states. "And implementation brings with it at least three distinct challenges:

"The first is state-of-the-art implementation by the States. State decision-makers will need both comprehensive and timely information to commit to the implementation of Superpave enhancements as they become state-of-the-art. Their technical staff will need training in order to act on the guidance of their management.

"The second is 'universal' implementation. Superpave is clearly the HMA system of choice for most State DOTs. It has the potential to be *the* universal system of choice for all HMA placed in the United States. If it is to achieve its potential, it must be adopted

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and FHWA to serve as a framework for future Superpave research and budget planning. The plan defines unresolved technical issues, estimates the technical resources required to resolve the issues, and establishes a timetable for completing development of the Superpave system. A brief summary of the plan follows. (See pps. 3-7 for more information about current progress in NCHRP's Superpave research projects.)

Modified binders: "The most critical remaining binder issue is the development of a binder specification that addresses complex (modified) binders," the plan states. NCHRP Project 9-10 is providing preliminary recommendations for new procedures for high-temperature properties as well as new fatigue criteria and test equipment. If all goes well, the final test protocol and equipment could be completed by December 2003.

N_{design}: The long-range plan also notes that "there is still a concern with respect to N_{design} and its relationship to traffic," and that "some DOTs remain concerned with the low-volume design element of Superpave." The Committee states that "a national field validation experiment with Superpave mixes under in-service traffic may be required."

Aggregate Issues: The long-range plan calls for the Aggregate Issues Task Force of the TRB Mixture/Aggregate Expert Task Group (ETG) to prioritize and recommend research that can be completed within the 2005 timetable to address aggregate issues that the ETG has identified. These issues relate to local and regional availability of aggregates; VMA values; the restricted zone; consensus aggregate procedures; the need for standard test procedures; performance of fine-graded mixes; fine aggregate angularity; and flat-and-elongated criteria.

Simple Performance Tester: "The State DOTs have ranked this item at the top of the list of unresolved Superpave issues. This is an extremely challenging but important part of the overall Superpave system," the report states. "Even if the NCHRP 9-19 panel supports the researcher's May 2000 recommendations, DOTs and industry advocates will probably support other options. The TRB Mix and Aggregates ETG will thoroughly evaluate these other options—Repeated Shear, Static Creep, Dynamic Creep, Loaded Wheel Testers, etc. It is expected that they will employ a focus group to bring consensus to the issue. Assuming the ETG can make a clear recommendation by December 2000, work could begin immediately on the development of a production model. The sequence for this equipment development would be: first article design, limited procurement, calibration, validation, ruggedness, precision/bias, field validation, final protocol, and bulk procurement by FHWA for the States. This entire effort will probably take until 2003."

Moisture Sensitivity: In July 1999, at the request of the TRB Superpave Committee, a Moisture Sensitivity Focus Group convened and recommended a continuing four-year research program to adjust current AASHTO test procedures to better predict stripping potential. Target date for completion is December 2003.

Model Development: On the subject of development of Pavement Response and Distress Prediction Models: "Nobody connected with Superpave doubts the complexity of this work. It will require extensive review and evaluation every step of the way. The key is the material characterization test—can it be adequately related to pavement response and then to a series of distress prediction models?" The models are scheduled for completion in 2005.

Superpave Shear Tester (SST) / Indirect Tensile Tester (IDT): The full version of the SST cannot be considered as a simple performance test. However, sub-elements from this system will continue to be used—especially by the research community. Recently completed work at WesTrack as well as at other locations has shown some correlation between certain SST test parameters and performance. "The IDT probably will be approved to measure creep compliance and mix strength determinations at intermediate and low temperatures," the TRB Committee report states.

Performance-based Quality Control: Regarding the three-level performance-related specification (PRS) structure that emerged from NCHRP Project 9-20 (WesTrack) (see p.5), the report states: "All three levels will require extensive national implementation, including beta testing of software, shadow and pilot project trials, calibration and validation of models, and training. In reality, the PRS specification will be continuously updated through 2005. The final level is the most critical for completion of Superpave—the inclusion of the final distress models and how these models are influenced by material and construction variables."

Budget: The plan estimates that approximately $19 million will be needed to fund Superpave completion in fiscal years 2001-2005, in addition to the $9.28 million already approved. The cost estimate is very conservative (low), and assumes $1.7 million for training but no cost for outreach programs, although the long-range plan notes that there will be a continuing need for training and outreach. The TRB Committee has established a Task Force on Communication and Training, chaired by Paul Mack of the New York State DOT, to develop a Superpave Communications Program, establish milestones, and identify needed resources. The Task Force will report to the full TRB Committee at its June 1-2, 2000 meeting.

Is the Restricted Zone Necessary? Answers Expected Later This Year

To help reduce the incidence of tender, or rutting-prone paving mixes, the Superpave mix design system includes a recommended guideline addressing aggregate properties. The guideline includes a restricted zone that lies along the maximum density gradation between the intermediate size (either 4.75 or 2.36 mm, depending on the nominal size of the aggregate) and the 300-micrometer size. It is suggested that mix gradations avoid passing through this zone.

The use of the restricted zone has been controversial, particularly in localities where the local aggregates fall into the restricted zone. Some highway agencies and suppliers contend that it is possible to produce paving mixes that perform well without complying with the restricted zone requirement. *NCHRP Project 9-14, Investigation of the Restricted Zone in the Superpave Aggregate Gradation Specification*, is investigating whether the restricted zone is necessary, and, if so, under what conditions. The research is being conducted by the National Center for Asphalt Technology (NCAT) at Auburn University. Principal Investigator is P.S. Kandhal.

NCAT is designing mixes using five different aggregate gradations. Three of the aggregate gradations pass through the restricted zone. The two other gradations are controls that avoid the restricted zone. Ten different fine aggregate gradations with varying degrees of quality (as defined by fine aggregate angularity) are being used in the experiment, along with two coarse aggregates (a high-quality crushed granite and a marginal-quality crushed gravel). The main factors being tested in the 80 experimental mix designs are gradation, fine aggregate angularity, and coarse aggregate quality.

The volumetric properties in the mix design are being tested against the Superpave volumetric criteria. The mixes that meet the Superpave volumetric criteria are being tested for rutting using: (1) the asphalt pavement analyzer; (2) the repeated shear test at constant height (using the Superpave Shear Tester); and (3) the dynamic confined creep test.

Results of the initial testing will be reviewed by an expert panel in late March 2000. The next step in the research will be to test the mixes at different traffic levels. The project is scheduled for completion later this year.

Recommendation for a Simple Test for Rut and Crack Resistance Expected this Spring

For years asphalt contractors and specifying agencies have asked for a mechanistically based performance test for Superpave mixes, similar to the Hveem and Marshall tests for traditionally designed mixes. This spring, researchers working to develop such a test are expected to announce their recommendations. The next step will be to develop test protocols and to conduct field trials to validate the recommended test.

The University of Maryland research team is charged with developing a reliable design and quality control test that can be conducted in about one hour with affordable equipment (initial equipment investment of approximately $40,000 or less). Working through a long list of candidate tests and test equipment, the researchers are correlating laboratory test results for a variety of mixes with performance at three pavement research facilities—the Minnesota Department of Transportation's MnRoad, the Federal Highway Administration's WesTrack facility in Nevada, and the Advanced Loading Facility (ALF) at the Turner-Fairbank Highway Research Center in McLean, Virginia. The final test recommendation will be made based on the results of the completed work at MnRoad, ALF, and WesTrack.

Principal Investigator Matthew Witczak said the early results indicate that the unconfined static creep test results correlate very well with rut depths at MnRoad. In the static creep test, a static load is applied to a 3 inch-diameter, 6-inch tall specimen, and the time it takes for the material to progress into plastic flow is measured. For cracking, the indirect fatigue test worked well. But even after tests are selected, challenges will remain.

"The difficult part will be to develop a set of national guidelines to use for any given traffic, temperature, or mix," Witczak said. "It's a very elusive thing."

The development of a simple performance test for Superpave mixes has been continually supported and was initially financed by the Federal Highway Administration (FHWA). More recently the work has been funded through the National Cooperative Highway Research Program (NCHRP) due to FHWA Research & Development program budget cuts. NCHRP is funded through the American Association of State Highway and Transportation Officials (AASHTO) and administered by the National Research Council's Transportation Research Board (TRB).

Identification of the simple perfor-

mance test is one task under *NCHRP Project 9-19, Superpave Support and Performance Models Management*, being conducted by the University of Maryland. NCHRP is already planning a follow-on *Project 9-24, Validation of a Simple Performance Test Device*. This project will validate the recommended test and test protocols through field trials prior to full-scale implementation by the highway community.

A related project at Auburn University's National Center for Asphalt Technology (NCAT), *NCHRP 9-17, Accelerated Laboratory Rutting Tests: Asphalt Pavement Analyzer*, is investigating the relationship between Asphalt Pavement Analyzer (formerly known as the Georgia Loaded Wheel Tester) results and pavement performance (specifically, rutting). Like the NCHRP 9-19 team, the NCAT researchers, headed by Principal Investigator P.S. Kandhal, are working with the materials from test sections at MnRoad, WesTrack, and ALF. The pavement analyzer will be used to test the materials specimens in a full factorial experiment, where the variables are air void content, the hose diameter of the pavement analyzer equipment, test temperature, and specimen type. The objective will be to determine which set of test conditions is best at predicting rutting behavior. Testing began earlier this year. The objectives are to determine the suitability of the Asphalt Pavement Analyzer as a general method of predicting rutting potential, and for use in field quality control and quality acceptance operations, as well as to compare its effectiveness to the simple strength test being developed under NCHRP Project 9-19.

Yet another related project is investigating the use of the Superpave Gyratory Compactor as a confirmation test. *NCHRP Project 9-16, "Relationship Between Superpave Gyratory Compaction Properties and Permanent Deformation of Pavements in Service,"* being conducted by the Asphalt Institute, is investigating the relationship between mix properties measurable during Superpave gyratory compaction, and subsequent rutting of the in-service pavement. A second objective of the project is to recommend any practical modifications to existing Superpave gyratory compactors and/or test methods that might be needed to measure the identified properties. This two-year project is scheduled for completing in May 2001. Principal Investigator is R. Michael Anderson.

The Next Horizon: Performance Prediction Models and Specifications

Those who have followed the evolution of Superpave may recall that the original vision for Superpave called for a three-part system:

- binder specification;
- mixture specification; and
- performance prediction model and performance-related specifications.

With the binder and mixture specification substantially implemented, the next horizon is development of reliable performance prediction models and specifications. Reliable performance prediction models and specifications have the potential to make performance contracting a practical option for both contractors and highway agencies. When the performance life of a mix can be predicted accurately, contractors will be able to guarantee pavement performance with confidence.

A performance-related specification (PRS) would describe the material properties and various other aspects of construction (e.g. soundness of joint construction, absence of segregation, in-place density, permeability, and ride quality) that correlate with fundamental engineering properties that predict performance. The PRS would describe quality characteristics that are measurable, and under the control of the contractor.

Here is a rundown of the status of the various NCHRP-sponsored research projects that are related to development of performance prediction models and specifications:

***Project 9-15**, Quality Characteristics and Test Methods for Use in Performance-Related Specifications of Hot Mix Asphalt Pavements, Fugro—BRE, Inc., Principal Investigator Brian Killingsworth:* The objectives of this research are:

- to identify *construction-related* quality characteristics of HMA pavement that affect long-term pavement performance;
- identify quality characteristics of *as-produced* HMA that reflect compositional, volumetric, and fundamental engineering properties in terms of long-term pavement performance; and
- select and prepare for use in PRS simple, practical, and rapid tests that measure these quality characteristics in the field.

Based on a review of the contractor's recommendations as submitted in a Phase I report in October 1999, the project panel has directed that the contractor concentrate on the following quality characteristics in Phase II of the research:

- a rapid measure of dynamic modulus of the as-built pavement;
- initial ride quality;
- segregation;
- permeability;
- air voids content or density at longitudinal joints; and
- in-place pavement density.

During Phase II, the contractor will prepare a specific test method to measure each quality characteristic for use in PRS, conduct field validation studies, and develop recommended specification criteria. This project is scheduled for completion in December 2001.

***Project 9-19**, Superpave Support and Performance Models Management, University of Maryland, Principal Investigator Matthew Witczak:* Among the several tasks under this contract are to "develop and validate an advanced material characterization model and the associated calibration and testing procedures to support performance prediction models for permanent deformation, fatigue cracking, thermal cracking, and reflection cracking distresses in HMA pavements." This task is currently forecast to end in November 2001.

***Project 9-23**, Adaptation of the FHWA Integrated Climatic Effects Model to the Superpave Performance Models System*, will develop an environmental effects model (EEM), adopted from the FHWA Integrated Climatic Model, for use with the Superpave system that accounts for aging effects. This work will be closely coordinated with NCHRP Project 9-19. The RFP for this project has not yet been released. The results of this project will be used for the development of the Superpave performance prediction models described above.

***Project 9-20**, Performance-Related Specifications for Hot Mix Asphalt Construction, Nevada Automotive Test Center, Principal Investigator Jon Epps*: Under this contract, data from the WesTrack Pavement Test Facility (WesTrack) was used to examine how deviations in materials and construction properties—such as asphalt content and degree of compaction—affect the eventual pavement performance. The key work product of the project was a recommended performance-related specification for HMA, as well as its integral performance models and supporting software. The four-part preliminary draft final report, and the alpha version of the performance-related specification—in computer software program format—was delivered in February 2000 for panel review. The specification incorporates performance-prediction models for HMA with the guide specification. The specification includes two applications levels. The first level is based on material and construction properties (e.g., asphalt content, gradation, in-place air voids, and ride quality). These properties are currently obtained by public agencies for use in materials-and-method, end-result, and QA/QC types of specifications. Direct regression equations relating these properties to pavement performance at WesTrack (specifically, permanent deformation and fatigue cracking) are the primary basis for calculation of pay factors.

The more advanced (Level II) HMA PRS uses a more sophisticated mechanistic-empirical analysis of the results of laboratory performance tests as well as the WesTrack property-performance relationships to determine pay factors.

The HMA PRS attempts to calculate pay factors by comparing the life-cycle cost of the as-designed and as-built projects. It is hoped that this will be a significant improvement over current specifications, as the HMA PRS provides tools for objective calculation of equitable, consistent pay factors.

***Project 9-22**, Beta Testing and Validation of HMA PRS, proposals due March 31, 2000*: This project will evaluate and refine the performance-related specification for hot mix asphalt (HMA PRS) produced under Project 9-20 (above). The performance models in the HMA PRS are grounded in the results of the WesTrack experiment, which measured the effect on pavement performance of deviations in material and construction properties from design values for a single climate and a limited number of aggregates and asphalt binders. This project will broaden the calibration of the performance models using new and existing data from accelerated pavement tests and full-scale field projects representing the range of material types, climate, and project characteristics found in the United States.

The project's objectives are to:

- evaluate and refine the HMA PRS and supporting software;
- calibrate and validate the PRS performance models; and
- develop a training course curriculum and materials to assist the implementation of the HMA PRS and software by State agencies.

Work is scheduled to begin in June 2000 and be completed in late 2003.

Using Modifiers with Superpave Binders: New Concepts Emerging

After more than three years of research, ideas are emerging for new tests and procedures to refine the Superpave system for use with modifiers.

Under National Cooperative Highway Research Program (NCHRP) Project 9-10, the Asphalt Institute is developing Superpave protocols for modified asphalt binders. Specifically, the researchers were charged with recommending modifications to the asphalt binder tests for use with modified asphalt binders, and identifying problems with the Superpave mixture performance tests in relation to use with modifiers.

Principal Investigator Hussain Bahia of the University of Wisconsin-Madison said new tests are recommended for storage stability and particulate additives. The research team also has developed a concept for performance grading of modified binders.

The Superpave system was originally developed based on research conducted by the Strategic Highway Research Program (SHRP) on mixes made with unmodified asphalt cement binders. As a result, the current performance-graded (PG) binder specification needs to be refined to better account for important issues

related to the performance of modified binders. These include the modified binder's effect on mixing and on compaction temperature, its storage stability, the effects of solid additives on binder consistency, and how the modifier changes the pavement's response to traffic volume and speed, and pavement structure. While the basic Superpave binder specification can be used with some modified asphalts, others are more rheologically complex and require adjustment of the mixture specification.

The researchers suggest a system for grading modified binders to determine whether the binders are "simple" or "complex." "Simple" binders are defined as having the following characteristics:

- Stable during storage;
- No solid additives.

If a binder does not satisfy the criteria above, it would be "complex."

The researchers suggest a new test could be used to evaluate storage stability. The Laboratory Asphalt Stability Test (LAST) measures the potential for phase separation and thermal degradation of asphalts. Specifically, the test measures the effects of extended storage at high temperatures; the effects of mechanical agitation; and the change in performance-related properties with time of storage. (See Figure 1.)

A second new test, the Particulate Additive Test (PAT), separates the additive and evaluates the volume of particulate matter. The test is based on the concept that particulates are not part of the binder—but rather are part of the aggregate. The proposed system will be applicable to analysis of crumb rubber as a solid modifier. (See Figure 2.)

Different modifiers react differently to temperature and load, and the researchers suggest additional testing to consider these varying effects. Pavement structure, which has an important impact on pavement performance, also would be considered.

The researcher's ideas are being evaluated by an Industry Advisory Group, the NCHRP project panel, and the TRB Binder Expert Task Group. Copies of the preliminary specification are available for loan from NCHRP. For more information, contact NCHRP's Ed Harrigan, (202) 334-3232, or the NCHRP web site at *www.nas.edu/trb.*

FIGURE 1

The Lab Asphalt Stability Test (LAST)

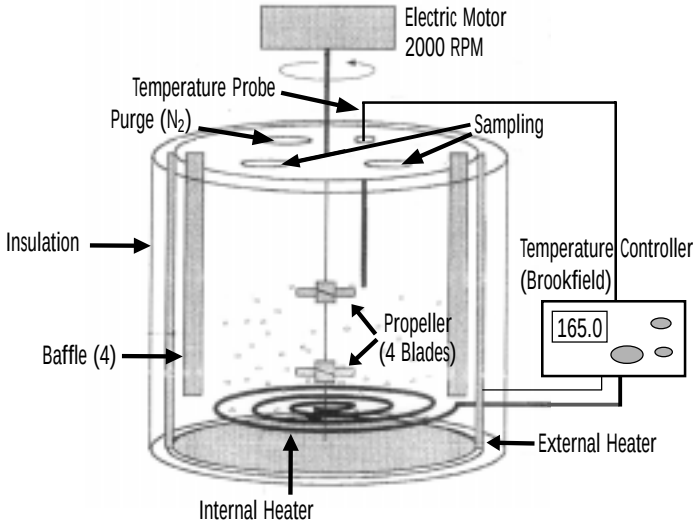
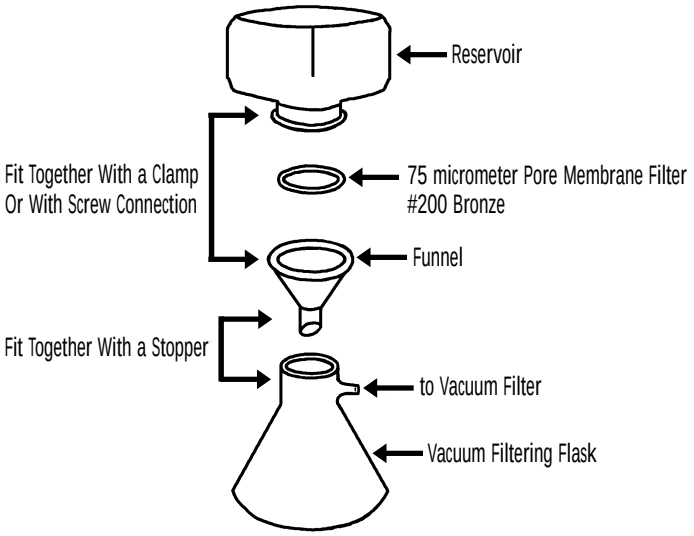


FIGURE 2

Particulate Additive Test (PAT)



Membrane Filtration Assembly

New Research Project Hopes to Verify Superpave Aggregate Tests

Project 4-19 (2), Validation of Performance-Related Tests of Aggregates for Use in Hot-Mix Asphalt Pavements, will evaluate the validity of certain aggregate tests as predictors of pavement performance using accelerated load tests and/or in-service pavement studies. The tests, which were previously identified in NCHRP Project 4-19, include: (1) sieve analysis; (2) uncompacted void content of coarse aggregate; (3) flat or elongated particles (2:1 ratio) in coarse aggregate; (4) uncompacted void content of fine aggregate; (5) methylene blue test of fine aggregates; (6) particle size analysis of P200 materials for determining D60 and D10 sizes; (7) micro-deval test; and (8) magnesium sulfate soundness test. As we went to press, the research contract award was pending.

AASHTO Subcommittee on Materials Considering Recommended Techniques for Identifying and Evaluating Effects of Segregation

Segregation of the aggregate from the binder is a common construction problem that occurs throughout the United States. Because most of the methods for identifying segregation are subjective and visual, many disagreements occur between contracting parties that could be resolved by established procedures for identifying, measuring, and evaluating the effects of segregation. Such procedures are being developed under NCHRP Project 9-11, *Segregation in Hot-Mix Asphalt Pavements*, a project recently completed at the National Center for Asphalt Technology (NCAT) at Auburn University. Principal Investigator was Mary Stroup-Gardiner.

The NCAT researchers found that infrared thermography and the ROSANv laser surface texture measurement were the best technologies for detecting and measuring segregation during pavement construction. Criteria for classifying levels of segregation from infrared thermography and laser surface texture measurements were developed from field test data. In addition, a laboratory testing program established the effect of these levels of segregation on rutting potential, loss of fatigue life, permeability, and several other performance-related HMA properties. Provisional standard methods for identifying segregation using these two non-destructive test methods have been recommended to the AASHTO Subcommittee on Materials for review and possible adoption.

Other NCHRP Projects

Project 9-09 (1), Verification of Gyration Levels in the Ndesign Table, National Center for Asphalt Technology (NCAT), Auburn University. Dr. E. Ray Brown, principal investigator. The objective of this "follow-on" project is to verify through a series of field project evaluations that the gyration levels in the N_{design} table in AASHTO TP4 are correct for the stated project traffic levels, and to modify the levels as necessary.

Project 9-12, Incorporation of Reclaimed Asphalt Pavement in the Superpave System, North Central Superpave Center, Purdue University, Rebecca McDaniel, principal investigator. The objectives of this research are to (1) develop guidelines for incorporating recycled asphalt pavement (RAP) in the Superpave system; and (2) prepare a manual that can be used by laboratory and field technicians. A final report is due in April 2000 and will build upon the guidelines issued by the mix ETG in 1998.

State Implementation Status Update

By 2001, more than 80 percent of HMA tonnage constructed by State highway agencies will be Superpave, according to the 1999 Superpave Implementation Survey conducted by the Superpave Lead States Program. (Figure 1)

In 1999 Superpave's market share for State projects was approximately 45 percent of tonnage and 40 percent of projects, up from 30 percent of tonnage and 20 percent of projects in 1998.

FIGURE 1
Percent of State Tonnage
(projected past 1998)

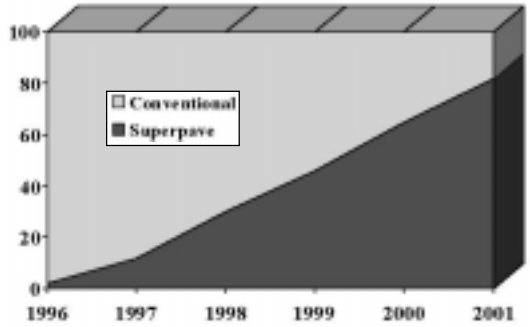


FIGURE 2
Superpave Binder Implementation
Nationwide

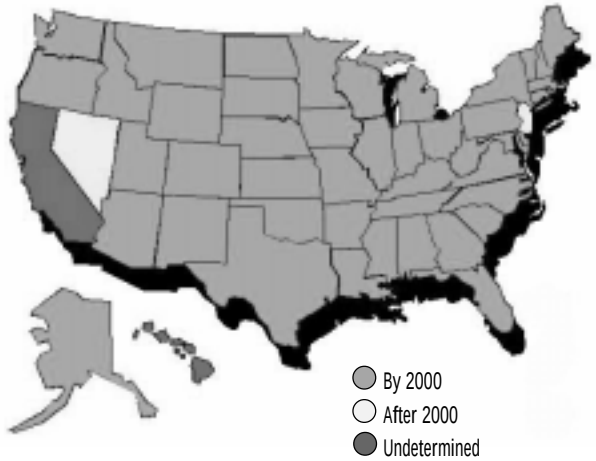
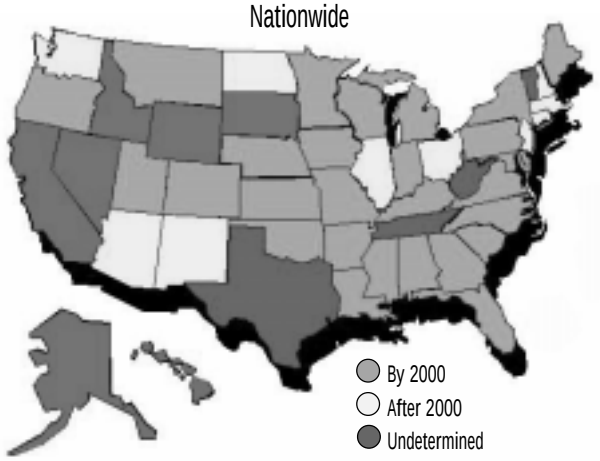


FIGURE 3
Superpave Mixture Implementation
Nationwide



The steady, sharp increase in Superpave projects reflects the fact all but four States will have implemented the Superpave binder specification by the year 2000 (Figure 2), and most are adopting the Superpave mixture specification as well (Figure 3).

SUPERPAVE ON LOCAL ROADS

Superpave Design Concepts Used to Correct Rutting at Heavy-Load Intersection

The Flying "J" Truck Stop—located near the intersection of I-465, the Indianapolis ring road, and State Road 37—is a popular destination for truckers travelling through Indianapolis. Thompson Road, a 500-meter local road leading to the truck stop entrance, began to rut almost immediately after it was repaved in the summer of 1997, because the specified pavement mix, designed for residential streets, could not withstand the daily load rate of 1,100 trucks on Thompson Road.

Concerned about the asphalt industry's image, Heritage Research Group of Indianapolis offered to design a mix that could be used to patch the rutted areas until the city found funds to redo the entire project. Superpave design concepts are essential to designing a mix that will withstand the special conditions at heavily loaded intersections, said Heritage's Associate Director of Re-

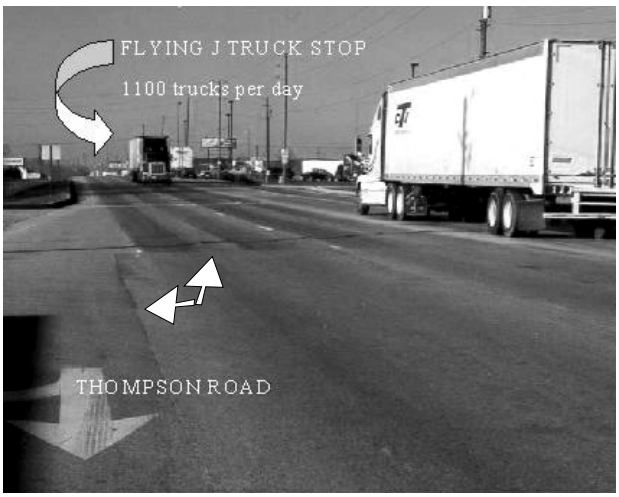
search, Gerry Huber.

"Asphalt is a viscoelastic material, which means that its stiffness behavior is related to the rate of loading," Huber said. "To understand this, think about water, another viscoelastic material. If you just put your hand in water, it doesn't feel very stiff. But if you dive into water from a height, you definitely feel the stiffness, because you have increased the rate of loading." (Water skiing takes advantage of the same viscoelastic behavior.) "Consequently a mixture that does not have enough stiffness for the load will often begin to rut first at intersections, where traffic is moving slower. Temperature is the other major determinant of stiffness, and a pavement will rut everywhere if it is asked to perform under higher temperature conditions than that for which it was designed."

Huber used the Superpave shear tester to measure the stiffness of the mix used to patch Thompson Road. A PG-76-16 binder was specified. In September 1997, 5.5 inches of the pavement in the two most heavily-rutted areas of Thompson Road were removed and replaced with 3.5 inches of 19 mm coarse-graded mixture and 2 inches of 12.5 mm coarse-graded mixture. The patches have performed well, with only an eighth of an inch of rutting as compared to more than 3 inches in the non-repaired section. The contractor and the city cost-shared the patching project. The City of Indianapolis plans to resurface the entire project in the summer of 2000, and is now designing all of their mixes using the Superpave mix design system.

Huber said the stiffness concepts that Heritage used to design the truck stop intersection mix were first developed during a 1996 resurfacing project for the Indianapolis Motor Speedway, where the narrower tires and heavier weights of NASCARs had caused pavement performance problems. "Even though the loadings were different, the concepts used in mix design were the same," Huber said. *For more information, contact Gerry Huber, (317) 390-3141, or gerald.huber@heritage-enviro.com*.

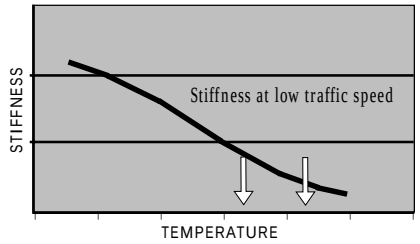
FIGURE 1



Superpave design concepts were used to design the mix used to patch ruts at intersections on this heavily trafficked road leading to a truck stop. The first patch is in the foreground (left center arrows). The curved arrow points to the location of the second patch, located where the trucks turn in to the "Flying J."

FIGURE 2

Using Stiffness for Rutting Test



The stiffness of a mix decreases at higher temperatures, and at lower speeds. At temperatures between the two arrows, a pavement will start to rut at intersections where speeds are lowest. At temperatures above the arrows, the pavement will rut everywhere.

Brochure Available on High Performance Asphalt Intersections

The Asphalt Institute has recently published a brochure on how to plan and design intersections to accommodate the increasing loading demands of these high-stress pavement applications. The eight-page illustrated *High Performance Hot Mix Asphalt Intersections* is available from the Asphalt Institute for $6.00. (606) 288-4960, or order online at *www.asphaltinstitute.org*.

St. Louis County Among First Local Agencies to Try Superpave

The St. Louis County, Missouri Department of Highways and Traffic began its Superpave program in 1994, making it one of the first local highway agencies in the country to use Superpave technology. This year the county will build its first full-depth Superpave projects on arterial roads with a traffic load ranging from 3 to 10 million ESALS. The first project will include 1,500 tons of a Superpave in the 19 mm base course, and another 18,000 tons in the 12.5 mm wearing coarse. In 1999, Rick Holesinger, a St. Louis County highways materials engineer, and Vince Ogar, materials analyst, developed a set of Superpave specifications now being

used by the county. The agency now specifies Superpave for all projects greater than 300,000 ESALs, replacing its 75-blow Marshall mix.

"Back in the early 1990's, we were having a lot of traffic-related rutting and shoving problems, and were experimenting with polymer modified binders, when we realized that the modified binders were not going to give us everything we were looking for. J. Michael Dooley, the director, is very progressive and was willing to try new and innovative ways of doing things. So when Superpave came on the scene, we were more than ready to try it. Our first project in 1996 went so well it was scary," said Ogar.

The county is also considering using Superpave on lower-volume roads. "We are going to conduct studies over the next few winters comparing our 50-blow Marshall mix to a 50-gyration Superpave mix," Ogar said. "We need to have something to replace what we call our "County C" mix before we pull it, because a lot of other municipalities in the St. Louis area are using the County's C-mix specifications."

Beginning in 1994, St. Louis County started a five-year Superpave program, budgeting $30,000 each year to purchase Superpave equipment. With training and support from the Asphalt Institute, and additional help from the Missouri Department of Transportation, the transition to Superpave has been relatively smooth.

E D I T O R I A L

Please Help Keep the [Correct] Information Flowing

Superpave's rapid evolution and implementation over the past decade represents a great accomplishment for the highway community. By working together, we have been able to transform research results into better roads throughout the country. A key element in this success has been effective communications.

As members of the Superpave Implementation Team at the FHWA, we have been privileged to work with our many partner organizations to help provide highway agencies throughout the country with the knowledge and resources they need to correctly implement the Superpave system. We also have had an opportunity to observe (and sometimes correct) a tremendous amount of misinformation about Superpave.

Many—even those who are using it—continue to believe Superpave is a product rather than a mix design methodology. Some said it would never work. Some said it should be mandated by federal law. Our request is simple: when you hear these kinds of things being said about Superpave, set the record straight.

Encourage everyone you know to consult and use the acknowledged sources of information about Superpave, including not only the FHWA, but our partners at the Asphalt Institute, the National Center for Asphalt Technology, AASHTO, TRB, the Lead States, and the Superpave Centers. In particular the AASHTO specifications are the definitive procedures that should be followed regarding Superpave.

—John D'Angelo
—John Bukowski
—Tom Harman

The FHWA's Superpave Implementation Team achieved national recognition during National Engineer's Week, winning an Engineering Excellence Award for their accomplishments in implementing the Superpave System. They were the first-ever team to receive this prestigious award. L-R: Tom Harman, John Bukowski, John D'Angelo.

PARTNERSHIPS / from page 1

at the municipal and commercial levels.

"The actual implementation of any good research cannot be taken for granted. The 1991 Intermodal Surface Transportation Efficiency Act authorized $108 million to underwrite SHRP implementation and for the continuation of the long-term pavement program. If Superpave is to be fully implemented in its mature form, new partnerships and funding mechanisms will need to be developed among the States, AASHTO, TRB and the FHWA."

The transition plan suggests that "a new funding partnership with AASHTO and its member States will need to be established." Specifically, the plan suggests that the States might establish and contribute to a national pooled fund for enhanced Superpave delivery, and Congress might restore some FHWA funding by approving technical corrections to TEA-21, as proposed by the AASHTO Standing Committee on Research. If these corrections are adopted, the FHWA would again be positioned to lead delivery of enhancements to the Superpave System. Even though the proposed funding is not extravagant, some financial support from AASHTO would likely be needed, the Lead States say.

Chairman of the Superpave Lead States Team is Paul Mack of New York State DOT.

Superpave Software Available Through AASHTO

Software that eliminates much of the paperwork and hand calculations involved in Superpave volumetric mix design and quality assurance/

quality control (QA/QC) is now available through the American Association of Highway and Transportation Officials' (AASHTO's) "AASHTOWare" web site at *www.aashtoware.org*.

The recently released AASHTO Superpave software is easier to use than previous versions. The latest version incorporates more than 50 changes to the four AASHTO mix design standards approved last year, and includes a comprehensive temperature database to help users select the correct binder for temperature conditions. (The temperature database, which includes temperature algorithms and weather station data, was first developed for FHWA's *LTPPBind* software). Other improvements include modules for checking QA/QC in the field, and simplified compaction levels recently adopted by AASHTO's Subcommittee on Materials.

"The AASHTO Superpave software enhances the ability of contractors to perform the Superpave mix design. It allows the contractors to build on experiences with materials they traditionally use by providing them a database built into their mix design process," said Dave Newcomb, vice president for research and technology at the National Asphalt Pavement Association.

The AASHTO Superpave software is priced at $350 for a single user or PC workstation, or $250 per station for customers purchasing ten or more copies. Potential buyers may download it free for a 30-day evaluation period at *www.aashtoware.org/superpave /spdown.nsf*. The web site also offers online user support.

The Superpave software was originally developed under the Strategic Highway Research Program and initially released in 1996. The University of Maryland further developed the software under contract to the FHWA. Late last year, the University of Maryland completed its work on the software under National Cooperative Highway Research Program (NCHRP) Project 9-19. An AASHTO Task Force chaired by Sam Miller of the Maryland State Highway Administration will oversee software licensing, support, maintenance, and enhancement. The support contractor is iENGINEERING Corporation of Elkridge, Maryland.

For more information, contact Kurt Johnson of AASHTO, [tel. (202) 624-5821, e-mail kurtj@aashto.org]; or Riaz Ahmad of iENGINEERING [tel. (410) 579-8560, e-mail rahmad@iengineering.com].

NCAT Publishes White Paper on Tender Zone

The National Center for Asphalt Technology (NCAT) has published a White Paper offering guidance on alternative approaches to solve tender zone problems.

"The tender zone problem has been around for many years, but it has gotten more attention now that Superpave mixes are being used," the paper concludes. "The problem does appear to occur more often with Superpave, but it occurs on no more than 20-25 percent of the jobs. Generally, contractors have been able to work around the tender zone problem to be able to get an acceptable mixture. From a performance standpoint, the biggest problem caused after a tender mix has been rolled (assuming adequate compaction) appears to be roller marks and the associated loss in smoothness.... It is important to remember that there are a lot of causes for tender mix problems and therefore, the method that was used to solve the problem on one project may not be successful on the next project. However, the guidance [provided in the White Paper] ... offers several alternatives that should be sufficient to solve most tender zone problems."

To obtain a copy of the White Paper, entitled *Hot Mix Asphalt Tender Zone*, contact the office of Dr. E.R. Brown at NCAT (334) 844-6228.

SUPERPAVE CALENDAR

- **April 10-12, 2000: Superpave: Building Roads for the 21st Century, Denver Marriott Tech Center, Denver, CO.** Cosponsored by The Asphalt Institute, FHWA, and AASHTO. *Contact Seminar Coordinator, Asphalt Institute, (606) 288-4964, fax (606) 288-4999, or register through www.asphaltinstitute.org.*

- **May 1-4, 2000: Orlando, FL; May 8-11, Las Vegas, NV; May 15-18, Indianpolis, IN; June 19-22, College Park, GA. Management, Maintenance, Rehabilitation of Pavements Seminar.** Presented by The Asphalt Institute. *Contact Seminar Coordinator, Asphalt Institute, (606) 288-4964, fax (606) 288-4999. For more information, check the Institute's web site at www.asphaltinstitute.org.*

- **November 15-17, 2000: 8th Annual Hot Mix Asphalt Conference, Regal Cincinnati Hotel, Cincinnati, OH.** *Contact conference coordinator, National Asphalt Pavement Association (888) 468-6499, fax (301) 731-4621. For more information, check NAPA's website at www.hotmix.org.*

- **December 10-14, 2000: Asphalt Technology 2000, Renaissance Austin Hotel, Austin, TX.** *Contact Sharon Campos (512) 232-5168.*

- **February 4-8, 2001: NAPA's 46th Annual Convention and World of Asphalt Trade Show, Wyndham Palace Spa & Resort, Orlando, FL.** *Contact conference coordinator, National Asphalt Pavement Association (888) 468-6499, fax (301) 731-4621. For more information, check NAPA's website at www.hotmix.org.*

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FEDERAL HIGHWAY ADMINISTRATOR
Kenneth R. Wykle

SUPERPAVE TECHNOLOGY DELIVERY TEAM
John D'Angelo
Tom Harman
John Bukowski

EDITOR
Karen Haas Martin
Phone: 301-949-8581
Fax: 301-949-8582
editorsink@starpower.net

FEDERAL HIGHWAY ADMINISTRATION
400 Seventh Street, SW
Washington, DC 20590
Phone: 202-366-0121

U.S Department
of Transportation

Federal Highway Administration

400 Seventh St., S.W.
Washington, DC 20590

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