November 29, 2001

Mr. John C. Horsley
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Ms. Mary Peters, Administrator
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Dear Mr. Horsley and Ms. Peters:

This is the seventh letter report of the Transportation Research Board's Superpave Committee. The Superpave® system of asphalt paving materials selection and mixture design was initially an outcome of the Strategic Highway Research Program (SHRP). The American Association of State Highway and Transportation Officials and the Federal Highway Administration are engaged in a joint effort to further develop and deploy the Superpave system among transportation agencies. Throughout its existence, the SHRP was guided by a tripartite arrangement among the FHWA, AASHTO, and the National Research Council (NRC). By mutual agreement of the three parties, the NRC, through its TRB Superpave Committee, will continue to provide advice and assistance on the conduct of the Superpave deployment and development program.

The seventh meeting of our committee was held on September 6 and 7, 2001. The focus of this meeting was review of the current status of the overall Superpave deployment program, including progress toward completing the long-range plan for deployment. The committee also developed research problem statements to be recommended for the National Cooperative Highway Research Program (NCHRP) and Federal Highway Administration FY 2003 programs. The committee also continued discussion on several items reported in my letter of August 10, 2001. These discussions and related committee recommendations are summarized below. I have enclosed a committee roster (Appendix 1) that indicates those members in attendance at this meeting. The recommendations included in this letter report were developed in closed sessions held on September 6th and 7th.

REVIEW OF CURRENT STATUS

In reviewing the current status of the program, the committee heard reports on program activities from FHWA and NCHRP staff, the Mixture and Aggregates Expert Task Group (ETG), the Asphalt Binder ETG and the Communications and Training ETG. The committee also heard reports regarding adoption of Superpave-related standards by the AASHTO Highway

Subcommittee on Materials. In general, the Committee is pleased with the evident continued progress. I have enclosed a summary of all Superpave related research that has been completed or is in progress (Appendix 2).

SUPERPAVE PROJECTS RECOMMENDED FOR FISCAL YEAR 2003

The committee has only two problem statements to recommend for inclusion in the fiscal year 2003 work program for the NCHRP. This is far fewer than we have recommended in past years and reflects both the progress made toward meeting the long-term goals of the Superpave development and deployment effort and the success achieved by your organizations in conducting the research and development activities we have recommended in the past.

One problem that has become apparent as agencies and their industry partners have gained experience with the Superpave system is that the current suite of asphalt binder test methods do not reliably predict the aging characteristics of some modified binders. In particular, recent research and experience, including research managed by the NCHRP, indicates that the Rolling Thin Film Oven Test, long a standard laboratory test for asphalt binders, is inadequate for binders containing some commonly used asphalt modifiers. We are recommending that research be undertaken to develop a new test procedure for asphalt binder aging that more properly mimics the short- and long-term aging characteristics of both modified and unmodified asphalt binders. A problem statement for consideration by the AASHTO Standing Committee on Research (SCOR) is enclosed (Appendix 3).

The second "problem statement" is actually a request for partial NCHRP support for the next renewal of the periodic Superpave technology transfer conferences. The purposes of this conference include: (1) to disseminate up-to-date information on the practical experiences of agencies and industry in the deployment of Superpave and (2) to describe changes to the standards and specifications defining Superpave which resulted from these practical experiences. We submitted a similar request last year, but SCOR deferred action until the degree of private sector support for this conference became known. The committee has worked with the member organizations of the Asphalt Pavement Alliance (APA) to develop a co-sponsorship arrangement. The Alliance has proposed that the conference be held in conjunction with the "World of Asphalt 2003" trade show schedule for March 17-19, 2003.

Under this arrangement, the APA and ConExpo/Con-Agg Management Services, managers of the trade show, will assume the outreach, secretariat and site management functions of the conference. Through an appointed steering committee, TRB's Technical Activities Division will develop and manage the technical program. TRB staff has estimated that $64,000 will be required to fund the TRB elements of the program. We are recommending that $35,000 of NCHRP funds be committed to provide partial support of this conference. These funds will be used to keep the registration fee to an amount reasonable for the target audience of agency and industry hot-mix asphalt paving technologists. The name of the conference will be the "National Asphalt Pavement Conference: Superpave 2003." A problem statement for the consideration of SCOR is enclosed (Appendix 4).

The small number of research problem statements recommended for the NCHRP FY 2003 program reflects that we are closing in on the goals we set in our long-range plan. Most of the R&D needed for the effective deployment of the Superpave system is either complete or in progress. Presuming this research is successfully completed and the findings integrated into the Superpave system over the next three to four years, most of the challenges unique to the deployment of the Superpave system will have been met. This does not mean that all other challenges to hot-mix asphalt design and construction will be met or even that the Superpave system should not be subject to continuous improvement through research. As we monitor progress toward full deployment of Superpave, we will be developing a "parking lot" of research needs and innovations related to hot-mix asphalt design and construction as they are encountered. We will share the contents of this parking lot with you as your organizations develop their own hot-mix asphalt research agendas. We will probably not be advancing additional problem statements and requesting NCHRP funding unless an unanticipated need specifically related to Superpave deployment is encountered.

VALIDATION OF NEW MODIFIED BINDER TESTS THROUGH ACCELERATED PAVEMENT TESTING

NCHRP Project 90-07 has been underway at the FHWA's Turner Fairbank Highway Research Center for some years. The objective of this project has been to evaluate new test methods and specifications that would facilitate the reliable extension of the Superpave system to modified asphalt binders. This project is drawing to a close and several promising tests have been identified. In our fifth letter report, dated November 27th, 2000, we recommended the evaluation of the findings of Project 90-07 through full-scale accelerated pavement testing. We further recommended that this work be pursued as a pooled fund project, because the outcome of the project will have immediate impact on a selected group of states that rely heavily on modified binders for hot-mix asphalt pavement construction.

The FHWA has incorporated this recommendation into a fiscal year 2002 national pooled fund study solicitation entitled "Full-Scale Accelerated Performance Testing for Superpave and Structural Validation." The work on performance validation of the new modified binder tests is only one part of this proposed project. Other potential components of such a comprehensive full-scale testing project include:

- validation of the proposed 2002 Pavement Design Guide now under development;
- crumb rubber modified asphalt pavements;
- use of recycled materials in pavement base layers; and
- comparisons of the quality and reliability of data from various falling weight deflectometers.

Because of the broad scope and significance of this proposed research, we request that a discussion of the project be added to the agenda of the technical meeting of the AASHTO Standing Committee on Highways when that committee meets on November 30, 2001.

SUPERPAVE SOFTWARE

At our meeting of May 14 and 15, Dr. Anthony Kane, AASHTO's Director of Engineering and Technical Services, briefed the committee on the suspension of licensing, technical support, and product maintenance of the AASHTO Superpave software as of June 30, 2001. While the committee found this news disappointing, the need to limit the financial losses related to distribution of the software was obvious and no objection was raised. Some committee members did express concern with the AASHTO proposal for public dissemination of the source code. Public dissemination might lead to unintended consequences. In particular, premature distribution might limit future integration of the Superpave software with other emerging hot-mix asphalt pavement design and construction packages emerging from current NCHRP research. Public distribution might also confound efforts of the National Academy of Sciences to protect the Superpave trademark.

I am happy to report that staff level discussions among our three organizations have led to revisions to the AASHTO "Superpave Sunset Policy" that have allayed our concerns. Under terms of the revised policy, source code distributions will be limited to AASHTO member agencies holding valid licenses to use the software. Further dissemination of the source code would be stringently controlled. In addition, if any member agency makes or authorizes changes to the software, the Superpave trademark will be excised from the revised product. These changes will allow our three organizations to thoroughly consider issues related to further development or disposition of the software. These issues include:

- current usage and current problems
- merits of release to the public domain
- potential unintended consequences of public release
- relationship to anticipated, emerging software products from other asphalt research projects.

While a number of staff members of our organizations were engaged in the discussions leading to the revised policy, I would like to offer special thanks to Ms. Jan Edwards, the AASHTOWare Project Director. Her cooperative spirit and knowledge of the issues involved led to prompt resolution our concerns.

In a related matter, the committee also asked TRB staff to identify any intellectual property rights held by outside individuals or organizations that might inhibit future disposition of the software. I am pleased to report that all computer code and routines for which others hold copyright have been deleted from the current software.

SUPERPAVE FOR LOCAL ROADS

Among state DOTs, Superpave is rapidly supplanting other systems of hot-mix asphalt materials selection and mixture design. Among local agencies, however, Superpave deployment is lagging. This situation is not uncommon. New highway technologies are often introduced at the state level and then disseminated among local agencies at a much slower pace. In the case of Superpave, however, this situation may lead to unintended consequences for many local

agencies. If the rate of deployment among state departments of transportation (DOTs) continues to outpace deployment among local agencies, the hot mix asphalt paving industry will either have to support dual systems or the Superpave system will be practically imposed on local roads agencies.

Annually, the New York State DOT and the FHWA conduct a survey of Superpave usage among state DOTs. For the 2000 construction season, 14 state DOTs reported that all HMA paving projects had Superpave mixture designs. Another 7 DOTs reported that 50% or more of all HMA projects were Superpave designs. The nationwide cost premium for Superpave mixes was less than one dollar/ton or 2.6% of the total purchase price. Among states with large usage, the cost of Superpave mixes is frequently lower than the cost of "conventional" HMA. As overall economics is ceasing to be a barrier to implementation, Superpave will quickly become the dominant or only materials and mix design system used by most state DOTs.

The state DOTs, however, directly control only about 20% of the nation's 2 million miles of asphalt surfaced roadways.

Extending the deployment of new technology to the local roads community is always challenging. This community is very large, diverse in its needs, and generally must manage a full array of public services, not just roadways. It is unlikely that a single approach to deployment of Superpave among local agencies is to be found. Furthermore, until the true needs of local agencies are known and potential barriers identified, no effective strategy can be developed. The needs of large metropolitan areas will differ markedly from suburban and residential areas. Rural local roads agencies will have different set of needs altogether.

We bring this issue to your attention so that your organizations might consider if a special technology transfer effort to introduce the Superpave system to local agencies is warranted. The committee is taking a number of steps to better understand the nature and scale of the needs of local agencies. We have initiated fact gathering through appropriate groups representing, or with access to, the local roads community. Interaction with the TRB Low Volume Roads Committee has already begun, as has a dialog with staff of the National Association of County Engineers. The Asphalt Institute has volunteered to collect information on local agency usage of and concerns with Superpave through its local representatives. Similar contacts are planned with the National Asphalt Pavement Association. Our Communications and Training ETG is identifying current training that is available to the local roads community and how widely these training opportunities are attended.

As we gather this information, we will share it with your organizations. We also look forward to the cooperation of the appropriate units within AASHTO and FHWA in this effort.

POTENTIAL AMENDMENTS TO AASHTO SUPERPAVE STANDARDS

When the Superpave asphalt materials selection and mixture design system first emerged as a product of SHRP, it included a number of "consensus" aggregate properties and criteria. These criteria represented then current best practices for aggregate selection and gradation control for hot-mix asphalt mixtures. One of these criteria has been popularly known as the "restricted

zone." The basis for inclusion of the restricted zone criterion, which controls the use of fine or sand-sized aggregate particles in the HMA mix, was to reduce the incidence of mixes prone to rutting or tenderness. When AASHTO adopted the standards that now define the Superpave system, the restricted zone was included as a guideline.

Although not a required AASHTO standard, the "restricted zone" guideline caused some consternation among highway agencies and hot-mix asphalt materials suppliers because its application excluded from use certain asphalt aggregate mixtures with a history of adequate performance. Furthermore, the guideline did not distinguish between rounded and angular sand particles. This difference in particle shape is also known to influence performance of asphalt paving mixtures and fine aggregate angularity is otherwise specified in the Superpave system.

In response to these concerns, the NCHRP initiated Project 9-14, Investigation of the Restricted Zone in the Superpave Aggregate Gradation Specification. This investigation, completed this summer, concluded that the restricted zone is redundant if the asphalt aggregate mix design strictly meets all other fine aggregate angularity and volumetric mixture design requirements included in the AASHTO Superpave specifications. Our ETG on Mixtures and Aggregates reviewed this report with staff of the National Center for Asphalt Technology, the agency that conducted the research, and concurs with the finding. The TRB Superpave Committee recommends that this finding be brought to the attention of the AASHTO Subcommittee on Materials for consideration as an amendment to the current specification.

However, the ETG noted that removal of the restricted zone from the AASHTO specifications will introduce one unintended consequence. Many highway agencies specify coarse-graded or fine-graded mixes for different purposes and define coarse or fine gradation through a relationship to the restricted zone. If the restricted zone is removed from the specifications, these definitions will be lost. The ETG subsequently drafted suggested language to replace the current definitions (Appendix 5); future committee action will be needed to bring this draft language to the Subcommittee on Materials.

Lastly, at our meeting, we learned that the AASHTO Standing Committee on Quality has recognized the Superpave Support Team, comprised of staff members from each of our organizations, as a "Pathfinder for Innovation Quality." Our committee members certainly concur that the Support Team merits this award for the effort they have shown in making the Superpave deployment effort work. We also believe that this award reflects the strong sense of commitment and cooperation shown by your organizations in this effort. This commitment and cooperation has brought the goals of Superpave deployment near completion.

Sincerely,

Joseph A. Mickes, Chairman
TRB Superpave Committee

Appendix 1

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As of August 18, 2001

Superpave Program
Project Status Report

Background

The TRB Superpave Committee has developed the following status report of all Superpave-related projects, their major objective, the intended product and the major follow-up activities that will ultimately need resolution. All of the projects relate at least in some measure, to accomplishing the Superpave 2005 goals.

The report is divided into the following sections, with projects listed numerically:

- NCHRP Projects
- FHWA Projects (w/NCHRP funds)
- NCHRP Synthesis Projects
- National Pooled Fund Studies
- Future Potential Pooled Fund Studies
- State-managed Pooled Fund Studies
- Other National Studies

National and regional training will be added at a later date.

NCHRP Projects

NCHRP 4-30, Improved Testing Methods for Determination of Critical Shape/Texture Factors for Aggregates

Due: Panel in Formation Research Agency: Cost: $500,000

Two promising procedures for aggregate evaluation that offer potential improvements are the multiple ratio shape analysis and the use of imaging technology (x-ray tomography) to model and quantify aggregate shape and texture. Information on these procedures has been recently presented at the Superpave Mixture/Aggregate Expert Task Group meetings.

The current Superpave procedure for determining and describing an aggregate sample's particle shape (one number for a given ratio of maximum compared with minimum particle dimensions) provides very limited detail about the variety of particle shapes found within the sample. An improved procedure for determining an aggregate samples particle shape is needed. Multiple ratio analysis gives an accurate picture of an aggregate samples particle shapes by evaluating the sample on five

different ratios instead of one (<2:1, 2:1 to 3:1, 3:1 to 4:1, 4:1 to 5: 1, >5: 1). This procedure can be conducted with a relatively simple piece of equipment/caliper device.

The objective of this research is to develop tests/criteria to better define measurement of aggregate shape and texture and the relation to mixture Performance. The work will also include aggregates used with hydraulic cements.

The AASHTO Standing Committee on Research instructed that this research must also address aggregate shape and texture issue pertinent to hydraulic cement concrete, as outlined in Problem statement 2002-D-04, "Objective Measurements of Aggregate Shape."

NCHRP 9-07, Field Procedures and Equipment to Implement SHRP Asphalt Specifications

Due: Complete Research Agency: Brent Rauhut Engineering Cost: $1,085,784

The objectives of the project were to (1) recommend QC/QA procedures for measuring and monitoring the volumetrics of plant-produced Superpave HMA and (2) develop a simplified field shear test (FST) device and method for field QC/QA of plant-produced Superpave HMA and for use as a mix design tool for predicting the susceptibility of HMA to permanent deformation in service.

This project developed a quality control/quality acceptance (QC/QA) plan in AASHTO standard format for hot mix asphalt (HMA) paving projects incorporating Superpave mix designs. See NCHRP Report 409, "Quality Control and Acceptance of Superpave-Designed Hot Mix Asphalt." However, the research team, while developing a prototype FST device, was only able to complete limited validation testing. See follow-up work in NCHRP 9-18.

Implementation – NCHRP has asked Gerry Huber to review the current practice included in the report to see how it can be advanced.

NCIIRP 9-09, Refinement of the Superpave Gyratory Compaction Procedure

Due: Complete Research Agency: Auburn University Cost: $499,850

The key product is a recommendation soundly supported by experimental results to reduce the present number of possible design gyration values in AASHTO MP2 and TP4 from the present 28 to 4. This recommendation was accepted by the FHWA Mixture Expert Task Group and referred to the AASHTO Lead States Team and Highway Subcommittee on Materials; it has been incorporated in the standards.

NCHRP 9-9(l) Verification of Gyration Level in the N_{design} Table

Due: June 2003 Research Agency: Auburn University Cost: $276,482

The objective of this project is to verify through a series of field project evaluations that the gyration levels in the N_{design} table in AASHTO MP2 are correct for the stated project traffic levels and to modify the levels as required. Data collection is now underway on 75% of the projects. Data looks reasonable, on average, but there is a wide variation.

NCEW 9-10, Superpave Protocols for Modified Asphalt Binders

Due: Complete Research Agency: Asphalt Institute Cost: $995,148

The objectives of this research was (1) to recommend modifications to the Superpave asphalt binder tests for modified asphalt binders and (2) to identify problems with the Superpave mixture performance tests in relation to mixtures made using modified asphalt binders. The final report has been published.

Currently, NCHRP 90-02, 90-04 and the Binder ETG are doing a validation/verification of the recommendations included in this project. Final recommendations on AASHTO Provisional Standards PP5 and MP 1 should be forthcoming by the end of 2002.

NCIIRP 9-12, Incorporation of Reclaimed Asphalt Pavement in the Superpave System

Due: Complete Research Agency: NC Superpave Center
(Purdue) Cost: $464,202

The objectives of this research were to (1) develop guidelines for incorporating RAP 'in the Superpave system and (2) prepare a manual that can be used by laboratory and field technicians. Both have been completed and published.

Currently, the Mix/Aggregate ETG is reviewing the report. Changes to MP2 and PP28 were forwarded to AASHTO and included in provisional standards. Additionally, NCHRP is developing an implementation document that summarizes the report and includes implementation recommendations.

NCHRP 9-13, Evaluation of Water Sensitivity Tests

Due: Complete Research Agency: U of Nevada-Reno Cost: $150,000

The objectives of this research are to (1) evaluate AASHTO T-283, and (2) recommend changes to make it compatible with the Superpave system. The revised final report has been published as *NCHRP Report* 444, "Compatibility of a Test for Moisture-Included Damage with

Supreme Volumetric Mix Design." No further work is contemplated; no further implementation is expected.

NCHRP 9-14, Investigation of the Restricted Zone in the Superpave Aggregate Gradation Specification

Due: Complete Research Agency: Auburn University w/NCAT Cost: $515,392

The objectives of this research were to determine through evaluation of the performance properties of hot mix asphalt (HMA) if the restricted zone requirement is redundant with fine aggregate angularity (FAA) and volumetric mix criteria and, if appropriate, to identify the traffic levels at which it is redundant. Results show that conformance to the restricted zone is unnecessary when a mix design satisfies all consensus standards (focusing on fine aggregate angularity – FAA) and volumetric mix criteria. The Mix/Aggregate ETG will review the results and considering the full removal of the restricted zone.

NCHRP 9-15, Quality Characteristics and Test Methods for Use in Performance-Related Specifications of Hot-Mix Asphalt Pavements

Due: December 2001 Research Agency: Fugro-BRE Cost: $449,995

The objectives of this research are to (1) identify construction-related quality characteristics of HMA pavement that affect long-term pavement performance; (2) identify quality characteristics of as produced FMA that reflect compositional, volumetric, and fundamental engineering properties 'in terms of long-term pavement performance; and (3) select and prepare for use in PRS simple, practical, and rapid tests that measure these quality characteristics in the field. An experimental plan has been developed and is currently being implemented.

Results will feed directly into subsequent PRS contract work.

NCHRP 9-16, Relationship Between Superpave Gyratory Compaction Properties and Permanent Deformation of Pavement in Service

Due: November 2001 Research Agency: Asphalt Institute Cost: $250,000

Superpave mix design is based on material properties, volumetric mix properties, and densification characteristics during gyratory compaction. Properties of the densification curve are believed-to be related to permanent deformation, bit their connection has not been quantified.

The objectives of this project are to (1) determine the relationship between mix properties measurable during Superpave gyratory compaction and permanent deformation of pavements in service and (2) recommend any practical modifications to existing Superpave gyratory compactors, test methods, or both, to measure the identified properties.

Results to date suggest there are SGC parameters with potential to estimate rutting susceptibility,

The final report is expected shortly from the research agency.

NCHRP 9-18, Field Shear Test for Hot Mix Asphalt

Due: October 2001 Research Agency: Penn State Cost: $200,000

This is follow-on to NCIIRP 9-07. The objectives of this project are to (1) enhance and refine the field shear test (FST) device and procedure for quality control and quality assurance (QC/QA) of the production and lay down of Superpave hot mix asphalt; (2) validate the effectiveness of the FST method in field QC/QA and as a mix design tool for predicting the susceptibility of HMA to permanent deformation in service; and (3) facilitate the implementation of the FST as a standard method in field QC/QA and in mix design. This is envisioned as a multi-phase project.

Phase I results were highly encouraging, and the panel recommended a contract extension of several months to provide the project team with adequate time to evaluate a promising prototype field shear test device of new design. Results suggest that the complex shear modulus measured with the FST MK II (a redesigned version of the original FST) may be a reliable, sensitive parameter for field QC/QA.

The draft final report is currently under review.

NCHRP 9-19, Superpave Support and Performance Models Management

Due: March 2002 Research Agency: U of MD Cost: $2,100,000

This Project continues work started in July 1995 under sponsorship of the Federal Highway Administration (FHWA). The original FHWA project was divided into two phases. Phase 1, completed in September 1996, evaluated the Superpave performance models developed through the Strategic Highway Research Program. In Phase U, begun in November 1997, the contractor was tasked with development and validation of an advanced material characterization model and the associated calibration and testing procedures for hot mix asphalt used in highway pavements. It also includes a discrete Nit important task to identify a simple performance test to complement the Superpave volumetric mix design method.

Task A. User support for Superpave Version 2.0 Software. Complete.

Task B. Enhanced and re-calibrated version of the Superpave thermal cracking model. Complete. The model has been incorporated in the 2002 Design Guide.

Task C. Finalize protocols for simple performance tests that can be incorporated in the Superpave volumetric mix design method. The candidate tests for permanent deformation and low-temperature cracking

gave results that are highly correlated with the field performance of MnRoad, WesTrack, and FHWA ALF experiments; the correlation for the fatigue cracking test is only fair. Field evaluation is currently underway. Eventually, the output will feed into NCHRP 9-29 and a national pooled fund for procurement.

Task D and E are coordination tasks.

Task F. Develop an advanced material characterization model and associated calibration and testing procedures to support performance prediction models for permanent deformation, fatigue cracking, thermal cracking, and reflection cracking distresses in HMA pavements.

A panel meeting is scheduled for October 2001.

NCHRP 9-20, Performance-Related Specifications for Hot-Mix Asphalt Construction

Due: Complete Research Agency: Nevada Auto Test Center Cost: $1,500,000

Commonly known as the WesTrack Project, the objectives of this research were to (1) develop performance-related specifications (PRS) for HMA pavement construction by examining how deviations in materials and construction properties, such as asphalt content and degree of compaction, affect the eventual pavement performance; and (2) provide early field verification of the Superpave mix design method.

The final report is composed of four parts: (1) WesTrack Project Overview, (2) Performance-Related Specification; (3) WesTrack Database (Overview and User's Guide); and (4) Observations and Lessons. It will be published as NCHRP Report 455. The Federal Highway Administration is publishing the supporting technical reports and the WesTrack database on CD-ROM for joint distribution with the NCBRP report. The *PAV SPEC* software is not available for public distribution at present; it is being beta-tested and validated as part of NCHRP Project 9-22.

NCHRP 9-21, Superpave Advisory Structure

Due: Continuous Management Agency: TRB Cost: $250,000/yr

This project provides for the organization, management, and documentation of the TRB Superpave Committee and support activities with Expert Task Groups (ETG). The project funding is subject to annual review and request. Currently, three ETGs have been established. They consist of the Mix/Aggregate ETG, the Binder ETG, and the Communications and Training ETG. It is expect that the Committee will stay in formation through completion of the Long Range Plan.

NCHRP 9-22, PRS - Beta Testing and Validation of HMA

Due: January 2004 Research Agency: Fugro-BRE Cost: $500,000

The objectives of this project are to (1) evaluate and define the HMA PRS and supporting software developed through the WesTrack project in a series of field trials, (2) calibrate and validate the performance models for Levels I and H, and (3) develop a training course curriculum and materials to assist the implementation of the HMA PRS and software by state highway agencies. NCHRP Projects 9-15 and 9-20 feed directly into this project.

Work is currently underway to conduct shadow efforts using software developed under NCHRP 9-20. Future work will include incorporating the 2002 Design Guide models into the next version of PRS, rather than the WesTrack models.

Fieldwork is being done under NCHRP 90-01.

NCHRP 9-23, Integrated Climatic Model (ICM) Validate with LTPP Seasonal Monitoring Program

Due: August 2003 Research Agency: AZ State Cost: $350,000

The objectives of this research are to (1) validate the latest version of Integrated Climatic Model (ICM) developed in NCBRP Project 1-37A with data from the full Long Term Pavement Performance Seasonal Monitoring Program; (2) develop practical guidelines for selecting ICM input data sets; (3) verify the estimated period or rate of aging simulated by the current Superpave binder and hot mix asphalt conditioning procedures --AASHTO provisional practices PP I and PP2 -- with data from Long Term Pavement Performance Specific Pavement Studies and other relevant field experiments; and (4) revise the current conditioning procedures as necessary for their use with the materials characterization test and model under development in NCBRP Project 9-19 for the Superpave performance model system.

NCHRP 9-25, Requirements for Voids in Mineral Aggregate for Superpave Mixtures

Due: October 2003 Research Agency: AAT Cost: $400,000

The objective of this research is to develop recommended mix design criteria for VMA, VFA, or calculated binder film thickness, as appropriate, to ensure adequate HMA durability and resistance to permanent deformation and fatigue cracking for coarse and fine, dense-graded mixes in the context of the Superpave mix design method.

NCHRP 9-26, Precision Statement for AASHTO T 312

Due: January 2003 Agency: AASHTO Materials Reference Laboratory Cost: $150,000

The objectives of the research are to (1) develop a precision statement for AASHTO T 312-01, "Standard Method for Preparing and Determining the Density of Hot Mix Asphalt (HMA) Specimens by Means of the Superpave Gyratory Compactor"; (2) update the current precision statements for AASHTO T 166, "Bulk Specific Gravity of Compacted Bituminous Mixtures" and ASTM D2041-00, "Standard Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures;" and (3) develop a preliminary precision statement for determination of the bulk and maximum specific gravities of bituminous mixtures math the CoreLok device.

Currently, the interlaboratory work is underway with 27 laboratories participating.

NCHRP 9-27 HMA in-place Air Voids, Lift Thickness and Permeability

Due: October 2003 Research Agency: Auburn - NCAT Cost: $350,000

The objectives of this research are to (1) determine the minimum HMA lift thicknesses and minimum m-place density necessary to achieve an impermeable, durable pavement and (2) recommend improvements to AASHTO T 166, "Bulk Specific Gravity of Compacted Bituminous Mixtures Using Saturated Surface-Dry Specimens," to achieve a precise, uniform, and more accurate determination of the bulk specific gravity of compacted HMA specimens.

Work began in April 2001.

NCHRP 9-28, Field Verification of the Advanced Materials Characterization Model and Test

Due: Same as 9-19 Panel Research Agency: ASU Cost: $400,000

Task F of NCHRP Project 9-19, "Superpave Support and Performance Models Management," win provide three products: an advanced materials characterization (response) model for Superpave performance model system; a materials characterization test to support the model; and a general description of the performance prediction model framework. Model calibration and evaluation in Task F is limited to a single reference mix design, although sensitivity testing will be conducted to confirm that the measured laboratory responses and material responses are sensitive to changes in mix properties, such as asphalt and air voids content.

The final step of the material characterization model is its verification with materials of known performance in controlled field experiments. This effort will employ, as is possible, materials and data from the field performance evaluation underway in Task C of NCBRP Project 9-19, but additional controlled field performance projects, such as LTPP SPS- I and SPS-9, may be included if possible.

The objectives of this research are to conduct a field verification of the selected material characterization model and material characterization test; to prepare the verified test in the form of draft AASHTO standard methods; and to recommend test equipment configurations to carry out the draft method in routine laboratory operations.

This work will be done as Task G under NCHRP 9-19.

NCHRP 9-29 Simple Performance Tester (SPT) for Superpave Mix Design

Due: April 2003 Research Agency: AAT Cost: $349,937

NCHRP Project 9-19, "Superpave Support and Performance Models Management," is tasked with identifying these simple performance tests. Three good candidates for permanent deformation and one for fatigue cracking were recently identified. A test protocol has been developed for each test by the Project 9-19 research team. One of the recommended simple performance tests, dynamic modulus, is also the prime candidate for HMA materials characterization for pavement structural design in NCBRP Project 1-37A, "Development of the 2002 Guide for the Design of New and Rehabilitated Pavement Structures: Phase H."

Adoption of the simple performance test for routine use in the Superpave mix design method will require the production of commercial test equipment. This will include development of equipment specifications, equipment evaluation, ruggedness evaluation, and final procedure verification -- all leading toward a national procurement for the state DOTs and eventual widespread adoption and use in the HMA industry.

The objective of this research is to design, procure, and evaluate simple performance testers for use in Superpave mix design and in HMA materials characterization for pavement structural design. The testers will evaluate the resistance of Superpave-designed HMA to permanent deformation and fatigue cracking during mix design and, possibly, in field quality control.

To date, two workshops have been held – the first to review the protocols and explore the possibility that one piece of equipment could do both mix evaluation and quality control. The consensus was that it would be very difficult to do both. The second workshop was held with potential manufacturers to obtain their comments and recommendations. The Research Agency will be issuing an RFP to buy two first article unite for evaluation.

NCHRP 9-30, Development of a Models Validation Experimental Plan

Due: Proposal under Review Research Agency: Cost: $200,000

The Superpave mix design method will confirm and refine volumetric mix designs on the basis of predicted performance (permanent deformation, fatigue cracking, and low-temperature cracking) for project-specific structural section, traffic, and climate. Development of the required performance model system is planned for completion in FY 2005 and is expected to heavily rely on the state-of-the-practice performance models identified for hot-mix asphalt in NCBRP Project 1-3 7A, *Development of the 2002 Guide for the Design of New and Rehabilitated Pavement Structures.*

The objective of this research is to develop a detailed, statistically sound and cost-effective experimental plan to calibrate and validate the Superpave performance model system with material property, field performance and associated data from selected controlled and -uncontrolled field experiments.

NCHRP 9-31, Air Void Requirements for Superpave Mix Design

Due: Contract Pending Research Agency: Cost: $250,000

In the Superpave mix design method, specified volumetric mix properties are evaluated at a design air void content of 4 percent regardless of the traffic loading and climatic conditions. However, because of local experience and concerns about achieving adequate hot-mix asphalt (HMA) durability and performance, some agencies have modified this requirement.

The objective of this research is to recommend for future field validation the range of design air void content, within the context of the Superpave mix design method, required for adequate durability and resistance to permanent deformation and fatigue cracking of dense-graded HMA.

NCHRP 9-32, Evaluation of Indirect Tensile Testing and Identification of Future Activities

Due: Will be added to 9-29 Research Agency: AAT Cost: $100,000

The Strategic Highway Research Program (SHRP) developed the Indirect Tensile Tester QDT) to measure HMA material properties for use in prediction of low-temperature cracking. The IDT test method is contained in AASHTO TP9. Both the NCHRP Projects 9-19 and 1-37A contractors have identified the TP9 method as the most promising available for predicting low temperature pavement performance. Work is also underway to examine whether AASHTO TP9 can be performed with simpler, less expensive equipment than the current IDT,

The objectives of this research are to collect and analyze available IDT test data and derived HMA material properties; evaluate the application and utility of the test in mix designs and analysis; and recommend a future course of action for the equipment and associated test method.

NCHRP 9-33, Superpave Mix Analysis Method, Software, and Manual

Due: Panel in formation Research Agency: Cost: $500,000

The objective of this research is to develop a complete working version of a Superpave mix design method for preparing project-specific mix designs that are durable and well performing. The method will take advantage of (1) the volumetric design method in AASHTO NV2 and PP28, (2) the simple performance tests developed in Task C of NCHRP Project 09-19, (3) the EMA materials characterization tests and performance models from the 2002 Pavement Design and (4) the fully calibrated integrated climatic model from NCHRP Project 09-23.

NCHRP 9-34 Improved Test Procedure for Determining the Moisture Damage Susceptibility of Bituminous Pavements

Due: Panel in formation Research Agency: Cost: $400,000

The objective of this research is to develop an improved test method for the moisture sensitivity of compacted HMA from the existing ECS method and the SPT developed under NCHRP Project 09-19. The new procedure will be sensitive to the effects of normal variability in material and mix properties expected during laboratory mix design and field construction.

FHWA NCHRP Projects

NCHRP 90-01, Superpave Mix - Protocol Refinement and Field Validation

Due: December 2004 Research Agency: FHWA Cost: $2,750,000

This project provides for the validation of the results from selected NCERP projects quickly and efficiently through the use of the staff and resources of the FHWA Mix Team. Under this project, the Federal Highway Administration (FHWA) has refined and validated over 15 new and modified pieces of SHRP mix test equipment and procedures since the research was formally concluded. As NCHRP research continues to fill the gaps in the Superpave system, parallel and follow-up work is required for refinement and validation.

The scope of work includes the following

Task 1 - Support Field Testing of Simple Performance Tester (NCHRP 9-19 and 9-29)

Task 2 - Gyratory & Permanent Deformation (NCHRP 9-16)
Task 3 - Evaluation of Aggregate Tests (NCHRP 4-19(2))
Task 4 - Superpave Compaction & Performance (NCHRP 9-20)
Task 5 - QC/QA (NCBRP 9-07)
Task 6 - Development and ruggedness testing of Superpave Gyratory Validation Kit

Current Activities

Revised calibration procedure for the ignition oven; compensation for dust in the mix. Hydrated lime effects the calibration, in addition to the asphalt binder. The laboratory experiment has been expanded to include various binders. This study is currently on hold until completion of the gyratory Angle Validation Kit work is done.

Gyratory comparison procedure field data indicates variability in gyratory data from lab to lab, a procedure for defining this variability is needed. Manufacture of a new device for calibration of the gyratory, the Superpave Gyratory Angle Validation Kit (AVK), is complete. An experimental design has been developed to evaluate AVK. Preliminary data indicates the internal angle for the gyratory compactor is less than the reported by measurement of the external angle. The current experiment will provide data to establish the required internal angle and a procedure to calibrate the SGC. This new specification should remove variability caused by differences in the gyratory compactors.

Refine NCHRP 9-7 tolerance database, on additional and larger projects. Data is being compiled from the existing laboratory database on completed field trials to determine production variability of volumetric properties. A paper detailing data collection and test variability was presented at AAPT. Additionally a refined procedure for filed mix verification has been prepared and is currently being reviewed by the TRB Mix/Aggregate ETG.

Evaluation of the Bulk Specific Gravity procedure for compacted specimens to reduce van ability and improve accuracy. The preliminary laboratory experiment has been completed and data analysis is underway.

Evaluations of NCHRP 9-9 and Lead State recommended changes to Superpave.

Work as part of NCHRP Project 9-22 Performance Related Specifications field trials and validation work – AZ, CO, FL

Upcoming Activities

Work on NCHRP 9-29 Development of the Simple Performance Test.

Documentation

An interim report on the AVK will be released in September 2001.

Five other reports, all included in various TRB publications, have been completed.

NCHRP 90-02 Superpave - Binder Equipment & Test Procedures - Refinement and Field Validation

Due: December 2004 Research Agency: FHWA Cost: $1,000,000

This work will concentrate on the implementation of NCBRP 9- 10, Modified Asphalts, and the output of NCHRP 90-07, Understanding the Performance of Mixtures with Modified Asphalt Binders, as well as the support of studies emanating from the Binder ETG recommendations. Under this study, updated specifications for modified binders and new test procedures will be completed. The Superpave Centers, AASHTO Materials Training Course, NM courses, and private sector training will also develop training documentation for use.

Current Activities

Ruggedness for the Direct Tension Test - the first set of binders has been tested and the data analysis from the first sample will be used to refine the ruggedness procedure.

A new low temperature, binder criteria was developed and has been included in the AASHTO provisional specifications as MP1A. This new specification will make the low temperature criteria blind to modifier type.

Minutes for the Binder ETG were developed and distributed.

Evaluation of NCHRP 9-10 recommended changes to the RTFO Test - Laboratory experiment has been completed and a report developed indicating that the Modified RTFOT procedure developed by NCHRP 9-10 does not produce the results indicated by the contractor.

NCHRP 90-03, Superpave Mix Tenderness

Due: December 2001 Research Agency: Asphalt Institute Cost: $50,000

On several construction projects, Superpave mixes have developed tenderness problems during placement, which leads to difficulty in achieving proper compaction. FHWA, through a cooperative agreement with the Asphalt Institute (AI), intends to determine the cause of this problem, and recommend methods to avoid the problem. The research is intended to produce a new mixture design guide to help designers avoid mixes prone to tenderness during construction. Validated/Refined Test procedures for identifying tender mixes.

Lab experimentation has begun on the project. A method was developed to produce mixes in the lab with up to 2% moisture in the Mix. These mixes will be used to determine the effect of excess moisture on mix

properties. A procedure is also under development to sample mix at the hot mix plant and capture the actual moisture in the mix at the time of sampling.

A field study was conducted in Florida to evaluate the moisture content of tender mixes on the roadway. During the field sampling tenderness problems were not present on the roadway.

The research team is currently attempting to identify several projects with tender mixes in the field to be used for field validation and to field validate previous lab results.

An interim report has been submitted to TRB for publication in the 2002 proceedings.

NCHRP 90-04, Investigation of Modified Asphalt Systems

Due: December 2003 Research Agency: FHWA & Asphalt Institute Cost: $200,000

This project will validate and refine the Laboratory Asphalt Stability Test (LAST) and the Particulate Additives Test (PAT) developed under NCBRP 9-10, Protocols for Modified Asphalt Binders. Products include the development of a commercial version of the LAST, and refinement of the protocols for both the LAST and the PAT.

A report to the Binder ETG in August 2001 on the PAT test will recommend no further work.

A report to the Binder ETG on LAST is due in September. While It is anticipated that the report recommendation will include no further work be done, leaving its use to the discretion of producers.

NCHRP 90-05, Fine Aggregate Specific Gravity Test

Due: December 2001 Research Agency: NCAT Cost: $200,000

The Superpave Design System centers on the determination of volumetric properties of the hot mix asphalt. A key test 'in this process is the Fine Aggregate Specific Gravity Test. This test is used to determine aggregate properties as well as volumetric properties of the mix. The current test is subject to operator interpretation of aggregate saturated surface dry appearance, which leads to high variability in the test results. An automated process for determining the Fine Aggregate Specific Gravity would remove operator interpretation and reduce variability in the test results and the determination of mix properties. This work is being performed through a cooperative agreement with the National Center for Asphalt Technology.

Three manufactures have supplied prototype equipment, Gilson, Instrotek, and Thermolyne. This equipment is currently being evaluated to compare test results from the existing AASHTO against the new

procedures. Thermolyne and Instrotek have each changes their procedure some after initial testing. Testing is continuing on the revised procedures.

NCHRP 90-06 Ruggedness Testing of Superpave Shear Tester and Indirect Tensile Tester

Due: Complete Research Agency: Multiple Cost: $250,000

This effort consisted of ruggedness testing of two separate SBRP developed devices the Superpave Shear Tester (SST) and the Indirect Tensile Tester. The Superpave Regional Centers and FHWA's Turner-Fairbanks Highway Research Center (TFHRC) conducted the work with the assistance of the Asphalt Institute.

The project is now complete with information used to update AASHTO TP7 and TP9. Reports have been distributed.

NCHRP 90-07 & 09, Understanding the Performance of Mixtures with Modified Asphalt Binders and Asphalt Mastics

Due: December 2003 Research Agency: FHWA Cost: $1,450,000

NCHRP 9-10 entitled, "Evaluation of SHRP Binder Protocols," has developed new tests and procedures to address deficiencies in the current Superpave binder specification. AASHTO requires that the 9-10 work be validated prior to acceptance of any proposed changes. This project will, through accelerated performance testing, validate and refine the recommendations from NCHRP 9-10 and develop a Superpave binder specification that will better distinguish the performance of modified asphalt binders.

Tasks include:

- Identify modified asphalt binders representative of those currently specified by State highway agencies;
- Evaluate these modified binders using existing and proposed asphalt binder tests.
- Prepare Superpave mixes with the tested asphalt binders;
- Conduct DSR Mastic testing;
- Evaluate the mixtures using accelerated laboratory performance tests, including the proposed Simple Performance Test, and determine distresses related to rutting, fatigue, thermal cracking, and moisture sensitivity. Certain mixtures will then be selected from this process for full-scale testing at the FHWA load test facility.
- Recommend to AASHTO as to adoption of the new specification, after full consultation and guidance from the Binder and Mix/Aggregate ETGs.

The data generated from this project will also be used to validate the products being developed under NCHRP 9-19, "Superpave Models Contract" and the proposed models in the new AASHTO 2002 Design Guide.

A Pooled Fund Study is now in draft format for distribution to the States. The study is aimed at validating the proposed binder tests and specification.

Six interim reports have been written and distributed to the Binder and Mix/Aggregate ETGs.

NCHRP Synthesis Program

Research on Aggregate Properties and Effects on Superpave Designed Mixes

Due: Contract to be initiated in FY 2002 Cost: $75,000

The performance of the hat mix asphalt is influenced by the characteristic of its two main constituents, asphalt binder and aggregate. While under SHRP, considerable emphasis was placed on developing new binder test bit only limited efforts were dedicated to aggregate tests and criteria. Over the last ten years, condensable efforts have been conducted to study the measurement of aggregate properties and most importantly the effects on asphalt mixture performance. The Mix/Aggregate ETG believes that there is considerable research and evaluation ongoing in the US and internationally. Before recommending further research, they believe the highway industry needs to collect his information in an organized format to determine what is and is not being studied. This would then allow for better organization of future research efforts.

Originally, this was to be a synthesis; it will be released as a research contract.

National Pooled Funds

Study Number SPR-2 (176)

Validation of NCHRP Asphalt and Asphalt Mixture Specifications Using Accelerated Loading

Lead:	FHWA
Participating States:	AR, CA, CT, FL, GA, IL, IN, IA, KS, MA, MI, MN, ND, NE, NJ, NC, OH, OK, OR, PA, SC, TX, VA, WA, WI
Contractor:	Purdue University
Phase 1:	Evaluate the sensitivities of tests used to measure the rutting resistance of an asphalt

paving mixture, to changes in three material properties: (1) voids in the mineral aggregate, (2) fine aggregate angularity, and (3) aggregate gradation. Four tests were evaluated: (1) a full-scale accelerated pavement tester, (2) a laboratory Wheel-tracking test called the PurWheel, (3) a triaxial compression test, and (4) the Superpave Shear Tester. Phase II - Expansion of Phase 1. The properties of the materials tested in Phase I were varied widely *in order to evaluate the pavement and laboratory mixture tests. The best tests were then to be used in Phase H. Under Phase H, the number and types of materials were expanded to determine how the three material properties affect rutting performance.

Objective: Validate the device for precision and bias for testing Bulk Specific gravity of HMA samples.

Status: Work has been completed, and a computer disc (CD) documenting the work is available from Indiana DOT.

Study Number SPR-2 (211)

Bulk Specific Gravity Round Robin Using the CoreLok Vacuum Seal Device

Lead: FHWA

Participating States: AL, CA, CT, GA, MN, MT, NB, RL SC, TX, WA, WY, CFL, and WFL

Contractor: NCAT

Objective: Validate the device for precision and bias for testing Bulk Specific gravity of HMA samples.

Status: States have received their equipment. NCAT has prepared and shipped samples. State testing is underway.

Completion Date: December 2001

Future Potential National Pooled Fund Projects

FHWA ALF - Field Validation of 90-07 Mixes with Modified Binders

Laboratory testing done under NCHRP 90-07 suggests that a field validation for rutting and fatigue properties are desirable for the family of binders used in the study. It is proposed to conduct a pooled fund study and the FHWA ALF. A preliminary plan is now under

development; a decision will be made after consultation with representatives from the Binder and Mix/Aggregate ETGs.

A report is available.

Simple Performance Tester

Upon completion of the work under NCHRP 9-29, the FHWA will seek support for the national procurement of the final version of the Simple Performance Tester.

State - Managed Pooled Funds

Study Number: SPR-3 (084)
Title: Use of Dynamic Modulus (E*) in Hot Mix Asphalt Designs
Lead State: Connecticut
Participating States: CT, CA, JIL, MO, NE, NC, and PA

Study Number: SPR-3 (044)
Title: North Central Superpave Center
Lead State: IN
Participating States: IL, IA, KS, MI, MN, MO, and WI

Study Number: SPR-3 (045)
Title: Use of Reclaimed Asphalt Pavement Under Superpave Specifications
Lead State: IN
Participating States: IL, MI, MN, WI, and MO

Study Number: SPR-3 (048)
Title: South Central Superpave Center
Lead State- TX
Participating States: OK, LA

Study Number: SPR-3 (056)
Title: North East Superpave Center
Lead State: Pennsylvania
Participating States: DC, MA, NK NJ, NY, PA, VT, DE, MD, RI, and ME

Other Studies

Western Research Institute

The Western Research Institute has received nearly $40M for basic asphalt research work under both ISTEA and TEA-21. The research team has several tasks that may impact Superpave. They are:

- Task 3, Asphalt-Water Interaction (Moisture Damage)
- Task 4, Mastics/Asphalt Thin Film Behavior
- Task 5, Aging

- Task 6, Macro-damage and micro-damage healing
- Task 7, Asphalt Chemical and Physical Analyses
- Task 8, Asphalt-Additive Interactions

The area of most concern to the Committee was the asphalt-water interaction. WRI admitted to the enormous complexity of the issue and its seriousness. They do not believe that much can be accomplished until the major mechanisms are clearly considered and understood. They are not limiting their search to just physical tests but also chemical tests. They are addressing step-by-step adhesive failures, cohesive failures, dissolution of the aggregate (raveling), fatigue cracking from wet oxidation, and stripping from oxidation products forming surfactants and acids. They are also addressing waxes (linear hydrocarbons) that protect the pavement from stripping and water-in-oil emulsions that decrease the viscosity of asphalt and lead to rutting.

National and Regional Training*

[To be added by Communications and Training ETG]

2nd STAGE PROBLEM STATEMENT

I. PROBLEM NUMBER

2003-XXXX

II. PROBLEM TITLE

Improved Procedure for Laboratory Aging of Asphalt Binders Pavements

III. RESEARCH PROBLEM STATEMENT

In order to fully implement the Superpave asphalt binder specification it is necessary to have a laboratory binder test procedure that accurately and reliably predicts or ranks the binder aging that occurs in the mixture during field mixing and compaction and in-service aging. Availability of time and money during the SHRP program did not allow a major investigation of either short- or long-term binder aging. The currently used Superpave procedures, the Rolling Thin Film Oven Test (RTFOT) and the Pressure Aging Vessel (PAV) were selected on the basis of testing expediency or in the case of the PAV because it has been used previously by other researchers and showed promise based on laboratory testing and limited testing of unmodified binders recovered from in-service pavements.

Recent research and experience shows that the RTFOT test, while satisfactory for neat binders, is not a satisfactory aging procedure for modified binders. During the test procedure when testing modified binders the film of asphalt binder does not rotate within the bottle, violating the basic premise of the test method – that the binder is exposed in a continuously moving thin film. This problem was evaluated by the NCHRP 9-10 researcher, who came to the same conclusion, that the RTFOT does not simulate the aging that occurs in the field.

There has been considerable activity in recent years, both in the U.S. and in other countries, to seek a more effective laboratory aging procedure for asphalt binders. Most of this activity has been focused on mimicking the physical property changes that occur during aging, however researchers have also considered chemical changes that occur during aging, particularly with respect to the kinetics of long-tern field aging. Therefore, the development of a new binder aging protocols must include both short- and long-term aging as well as consider both physical and chemical characterization as was done during the SHRP program.

Clearly, a new aging procedure(s) that properly mimics both short-term and long-term aging is required in order to properly implement the new SuperPave binder specification. The method should eventually be validated and calibrated through field studies. That is not considered in this proposed work. The first step in this development is the identification of a potential procedure and the validation and calibration of that procedure with the aging of laboratory mixtures. Field validation and calibration should be pursued as a subsequent study.

OBJECTIVE

The objective of this study is to recommend, develop, and validate a procedure for the laboratory aging of asphalt binders, both neat and modified, such that it mimics the **RESEARCH** aging that occurs in laboratory aged mixtures. The procedure must be suitable for routine specification use, be user friendly, have a short completion cycle, and be potentially applicable to long-term field aging. Ideally, a single procedure, as long as it properly represents both short- and long-term field aging mechanisms, may ultimately replace both the RTFOT and PAV procedures.

It is anticipated that the research will encompass at least the following tasks:

Task 1. Literature Review. The proposers will search the literature both within and outside North America to establish current practice with respect to laboratory aging procedures applicable to both neat and modified asphalt binders. .

Task 2. Experiment Design. The proposers will prepare, as part of the report for Task 1, an experiment for validating the proposed test procedure. The experiment design will include both neat and modified binders with a selection of modified binders that represent current and expected field practice. It is expected that mixture types and gradation as well as aggregate type (source) will also be considered in the experiment design.

Task 3. Laboratory Validation. The experiment design will be executed as part of this task. The proposers are expected to state a-priori their criteria for declaring that equivalent (chemically and physically) aging occurs in both the binder and mixture aging procedure and that the ranking in both the binder and mixture procedure is equivalent.

Task 4. Analysis and Preparation of Report.

Task 5. Develop a Field Validation Plan. For a potential future project

V. ESTIMATE OF PROBLEM FUNDING AND RESEARCH PERIOD

The estimated funding for this project is $500,000. This research will require approximately 30 months to complete.

VI. URGENCY, PAYOFF POTENTIAL, AND IMPLEMENTATION

A reliable binder aging procedure that accurately simulates the aging that takes place in the field is critical to our ability to evaluate the performance characteristics of asphalt binders. This procedure must be blind to modification type and simple to use. An aging procedure that is blind to modification is key to completing the Superpave Binder Specification and making it truly performance related. The proper characterization of asphalt binders will help save millions of dollars through the effective selection of the best binder for the best location. Accurate prediction of aging is also critical to any

pavement performance modeling. To accurately predict pavement performance you must understand the aging process and how it changes material properties.

VII. DATE AND SUBMITTED BY

1 December 2001

TRB Superpave Committee

NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM
Transportation Research Board, National Research Council

Second Stage Problem Statement

I. PROBLEM NUMBER

2003-XXX

II. PROBLEM TITLE

National Asphalt Pavement Conference: Superpave 2003

III. RESEARCH PROBLEM STATEMENT

The Superpave development and deployment effort spearheaded by AASHTO and FHWA has led to an extended period of continuous improvement to the Superpave system. In addition, usage of the system has continued to expand, deepening the pool of experience with Superpave. From time to time, FHWA, in cooperation with other organizations including AASHTO, TRB and the Asphalt Institute, has sponsored conferences on the progress of Superpave deployment. Given recent and anticipated changes to the system, including extension to recycled asphalt, modified binders and aggregate specifications and guidelines, the TRB Superpave Committee has recommended a renewal of this occasional series in 2003.

In 1998, the "Superpave: Today and Tomorrow" forum was held in St Louis. It was acclaimed as an important and necessary activity, and one that should be repeated periodically to aid in Superpave implementation. Over 500 people attended the 1998 forum, from nearly every segment of the highway industry as well as 11 foreign countries. The forum provided an opportunity for the asphalt pavement community to see where we have been with Superpave and where we needed to go to achieve the maximum benefits of Superpave.

The Forum 2000, held in Denver, was also attended by over 500 people, representing industry and as well as various government agencies. It focused on the next stage of Superpave adoption. The emphasis of presentations centered on the user perspective.

The 2003 conference will be held in conjunction with the "World of Asphalt 2003," an asphalt industry trade show to be held March 17-20, 2003 in Nashville, Tennessee. Through this arrangement, the Asphalt Pavement Alliance, an industry consortium, will be able to sponsor the outreach, secretariat and site management functions. The Technical Activities Division of TRB will organize and conduct the technical program and disseminate the resulting information.

IV. RESEARCH OBJECTIVE

The objective of this effort is to conduct in 2003 a nation level forum on the effects of adoption of the Superpave system and recent changes to and extensions of that system.

Task 1. Appoint a TRB steering committee to define and manage the technical program of the conference.
Task 2. Announce conference, solicit technical contributions, invite speakers and develop the conference program.
Task 3. Conduct Conference.
Task 4. Disseminate Proceedings.

V. ESTIMATE OF PROBLEM FUNDING AND RESEARCH PERIOD

The estimated funding requested from NCHRP for this project is $35,000. The cost of the TRB elements of the conference is estimated at approximately $65,000. Of this, about $30,000 will be recovered from registration fees through contract with the co-sponsors. The $35,000 supplement from NCHRP will permit reduction of the registration fee to a level appropriate to the target audience of agency and industry asphalt paving specialists.

The research period, from organization of the TRB steering committee to dissemination of proceedings, will likely extend from May 2002 to July 2003.

VI. URGENCY, PAYOFF POTENTIAL, AND IMPLEMENTATION

Currently, the Superpave system is used for the materials selection and mixture design for over 50% of the hot-mix asphalt placed by state departments of transportation. The price differential between Superpave mixes and conventional HMA is rapidly disappearing. Given this, rapid expansion of the use of Superpave should be anticipated to those agencies, contractors and materials suppliers currently unfamiliar with the system. Similarly, it becomes increasingly important to provide information on to agency and industry specialists on use of the system with recycled asphalt pavement and modified binders. This conference will provide attendees to share experiences and provide information on user experience and impact of the system on pavement performance. These lessons and experience if properly applied will benefit all the highway agencies and allow them to continue enhance their design of asphalt pavements.

VII. DATE AND SUBMITTED BY

1 December 2000

TRB Superpave Committee

Appendix 5

TRB Superpave Committee
Superpave Mixture and Aggregates Expert Task Group

Suggested Language for Re-Defining Fine- and Coarse-Graded Hot Mix Asphalt Mixtures

The Expert Task Group suggests the following changes to AASHTO specification MP2 to re-define fine- and coarse-graded mixtures without reference to the "restricted zone" guideline, if that guideline is removed from the AASHTO specifications for Superpave. This suggested wording was accepted by consensus at the ETG meeting on August 28, 2001. All citations shown refer to AASHTO MP-2.

Add the following text:

3.10 – Primary Control Sieve (PCS): The sieve defining the break point between fine and coarse graded mixtures for each nominal maximum aggregate size.

Remove the existing Section 6.1.3

Add the following:

6.1.3 – Gradation Classification – The combined aggregate gradation shall be classified as coarse graded when it passes below the Primary Control Sieve (PCS) control point as defined in Table 4. All other gradations shall be classified as fine graded.

Remove the existing Table 4

Add:

Table 4 – Gradation Classification

PCS Control Point for Mixture Nominal Maximum Aggregate Size (% Passing)					
Nominal Maximum Aggregate Size	37.5 mm	25.0 mm	19.0 mm	12.5 mm	9.5 mm
Primary Control Sieve	9.5 mm	4.75 mm	4.75 mm	2.36 mm	2.36 mm
PCS Control Point	47	40	47	39	47