The Centerline

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NAPA/FHWA Issue Construction Guidelines

Based on a NAPA and FHWA sponsored colloquium, guidelines to facilitate construction of Superpave projects have been developed and published. Dr. Ray Brown of NCAT authored the report. A group of about 20 representatives of industry organizations, contractors, equipment manufacturers, state DOTs, consultants and FHWA met in October, 1997, to discuss construction issues and develop recommendations for coping with and troubleshooting potential problems. These problems are not necessarily new to Superpave, but "may be magnified" by the typically coarse Superpave mixtures. Many of the problems discussed have been noted on coarse mixtures in the past. The report stresses that past experiences should not be thrown away but rather built on as Superpave is implemented. Good practices are necessary for constructing quality pavements using Superpave or other designs.Specific categories of construction practices discussed include materials, plant production, trucking, placement, compaction, quality control and troubleshooting. Some of the recommendations and things to watch for have been extracted from the report and are briefly described here.

AGGREGATES

- Coarse graded mixtures may be more difficult to heat and dry than fine graded mixes. In some cases, though, coarse gradings are easier to dry if the fine gradings have higher moisture contents, as they sometimes do.

- Higher aggregate angularities can lead to difficulties in workability during placement and compaction.

BINDER/MODIFIERS

- PG binder selections may lead to increased use of modified binders and, therefore, changes in production and placement, including increased temperatures.

- Binder properties may be tested for grade compliance after modification, which is important to consider if modifying at the mix plant.

- Follow manufacturer recommendations regarding storage, mixing and handling of modifiers.

STOCKPILES

- Good stockpile building and maintenance practices are no different than before, however, it may be more important to keep stockpiles well-drained due to the possibility that coarse gradations may be harder to dry.

COLD FEEDS

- More cold feed size fractions may help control gradation and reduce segregation.

- Higher proportions of coarse aggregate may be pulled from the cold feeds.

- Otherwise, cold feed operations should be similar to conventional HMA.

BINDER STORAGE

- More grades may need to be stored/available.

- Take care to avoid contamination of grades either mixing grades or mixing two incompatible sources of the same grade.

- Stiff binders may be harder to mix and handle.

- Storage temperatures may be higher and storage times may be limited. Recirculation may be

needed to avoid separation.

- Vertical tanks may be preferable to horizontal tanks for mixing and storage.

DRYING AND MIXING

- Aggregate breakdown can be accentuated for coarse mixtures and may need to be accounted for in mix design to meet volumetrics in the field.
- Coarse graded mixtures may cool more quickly than fine graded mixtures, reducing the time available for compaction.
- Wear on plant may be increased with coarse gradations.
- Mixing temperatures are typically higher and may result in increased emissions.
- Production rate may change.
- Hot bins may be unbalanced due to larger proportion of coarse aggregates used; best to control on cold feed.

MIX STORAGE

- Silo storage at higher temperatures may lead to increased binder hardening or increased binder draindown.
- Take care to avoid segregation.

TRUCKING

- Modified binders may stick more, so keep truck beds smooth and clean and use a release agent.
- Load properly to avoid segregation.
- Use tarps to retain more heat in mix.
- Watch for draindown, especially at high temperatures or over long hauls; attempt to reduce temperature if it is noted.

PLACEMENT

- "There are no major differences in placing Superpave and conventional HMA."
- Take care at longitudinal joints to get uniform material (avoid segregation).

COMPACTION

- Compaction has been a problem on some Superpave projects, as it has been on some conventional projects as well.
- Fine graded Superpave mixtures should not be much different from conventional HMA, although they may be somewhat harder to compact due to higher aggregate angularity and possibly lower binder content.
- Moisture content may have a large impact on behavior during rolling; watch for variations.
- The rough surface texture of coarse graded mixes may affect nuclear density readings so calibrate to core density or possibly use seating sand.

TEST STRIPS

- Test strips are recommended to check mixture volumetrics, placement and compaction.

LIFT THICKNESS

- A lift thickness of three times the nominal maximum aggregate size or greater is recommended.

ROLLING METHODS

- Keep rollers up close to the paver.
- Rubber tired rollers may be helpful; keep tires hot to minimize pick-up.
- Increasing contact pressure may help achieve density.

TENDER ZONE

- A tender zone between approximately 200 and 240°F has been observed on some Superpave mixtures. Densification typically cannot be achieved in this zone, except possibly with rubber-tired rollers.
- Get as much density as possible before the mix cools to the tender zone, perhaps using additional

breakdown rollers, then let mat cool below the tender zone before finish rolling. Alternatively, a rubber-tired roller may work through the tender zone.

- Changes in the mix design may eliminate or reduce tenderness problems.

QUALITY CONTROL

- QC is similar to conventional HMA.
- Do not make changes based on appearance, but measure volumetric properties. Mixture may look rich due to thick film thicknesses.
- Aggregate consensus properties apply to the blended aggregates, not individual stockpiles.
- Aggregate uniformity is important.
- Proper equipment calibration and round robin testing are recommended.

The full report includes much greater detail and expansion on these topics and others. A chart to assist in troubleshooting mixture problems is also included. This document should help contractors and others as they progress up the learning curve for constructing quality pavements with Superpave.

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Proper Design ESAL Critical for Success

As Superpave Volumetric Mix Design is implemented, the asphalt paving industry is learning to use the system. As one might expect, there is still some confusion as to the origin and definition of certain key terms that have a critical impact on materials selection. For example, a recent DOT experience with a Superpave mix design for a high volume pavement emphasizes the need to clearly differentiate Superpave s use of the term "20-year Design ESALs" from the agency s historical expected design life for a given mixture. Although an agency may assume a 10-year life expectancy for a typical surface mix, using 10-year design ESALs may have an unexpected negative impact on material quality and resulting pavement performance. While Superpave mix designs cover a wide range of traffic loads (e.g., remote rural roads to urban interstates), all Superpave mixture designs require the use of 20-year traffic projections to calculate design ESALs.

Superpave assumes that asphalt mixtures will achieve design density within three to five summers under traffic. All mixes used to determine the relationship between density and gyrations (N_{Design}) were from

pavements greater than 12 years old, and all had reached their final density. A misconception is that asphalt mixtures gradually densify over the entire life of the pavement. Pavements usually resist further densification after three years due to age hardening of the asphalt cement. So, if a Superpave mix design is designated for 10 years of traffic rather than 20, one will underestimate the effects of traffic during those first three critical years of pavement life.

As an example, notice in the table how design ESALs affect Fine Aggregate Angularity (FAA) and N_{Design} for a typical surface mix. A 20-year design of five million ESALs will yield a mix that requires a minimum FAA of 45 percent and an N_{Design} of 96 gyrations. Typically, mixes requiring 45 percent FAA will only allow five to 15 percent natural sand. The same mixture designed for 10 years may fall in the two million ESAL category. This will allow a minimum FAA of only 40 percent and an N_{Design} of 86 gyrations. This lower FAA may allow the use of 25 percent natural sand. The percent asphalt cement (percent AC) may or may not change depending upon the allowable Voids in the Mineral Aggregate (VMA). In addition, as the compactive energy (N_{Design}) is increased during mixture design, the mixture skeletal strength is increased.

While the intention of using 10-year design ESALs is to produce a mixture that is designed for 10 years, the result is a lower quality, weaker mixture that may be susceptible to rutting under the expected traffic loads. Whether we use 10 or 20 year design ESALs, the pavement will still experience the same traffic in the first three years of service.

Choosing the appropriate design traffic level is an engineering decision. To better achieve the desired performance of a Superpave mixture, use 20-year traffic projections to calculate design ESALs.

Design Years	Design ESALs (millions)	N_{Design}	Minimum Coarse Aggregate Angularity* (%)	Minimum Fine Aggregate Angularity (%)	Minimum Sand Equivalent	Approximate % AC for 9.5 mm Surface
20	5	96	85/80	45	45	5.5
10	2	86	75/-	40	40	5.5

* 85/80 denotes that 85 percent of the coarse aggregate has one or more fractured faces and 80 percent has two or more fractured faces

by Phillip Blankenship, Koch Materials Company

Editor s Note: Current experience is suggesting that the rate of load applications, especially early in the pavement life, can have a major impact on performance, as can total traffic over the design life. In other words, more damage may be done to pavements early in their lives so that the accumulated damage is not a straight line progression from year to year. As this concept is explored by the Mixture ETG and others, we will keep you informed of developments.

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TRB Preprints Available on CD-ROM

At the Annual Meeting of the Transportation Research Board (TRB) in January, Superpave was a major topic of discussion. Three sessions focused specifically on Superpave States Experiences with Binder Specifications, Evaluation of Mixture Design Criteria, and Construction of Asphalt Pavements. At least 10 other sessions included discussions related to Superpave in such areas as laboratory evaluation of mixtures, pavement performance, asphalt aging and more. Other sessions at the conference covered all modes of transportation.

Over 800 preprints of papers presented at this meeting are available on one CD-ROM. The CD is available for $30 from the TRB Publications Office, Box 289, Washington, DC 20055. The CD may be ordered by telephone (202) 334-3214, or fax (202) 334-2519. Many of these papers will be peer reviewed, revised, edited and published in the TRB Record series by the end of 1998. Due to budget restrictions, however, TRB can only publish about 40 to 50 percent of the papers submitted. Therefore, many papers available on the CD-ROM will not be published by TRB.

The Annual TRB Meeting was preceded by a workshop on Major Factors Affecting Asphalt Concrete Pavement Performance, which included presentations on contractor operations, paver operations, segregation, compaction and mixture variability. Speakers for the workshop included Charlie Potts (APAC), Tom Skinner (Blaw Know/Ingersoll-Rand), Dale Decker (NAPA), Jim Scherocman (consulting engineer) and Jon Epps (University of Nevada Reno). A video of this workshop (2-tape set) is available for $40 plus $10 shipping and handling from TRB at the address above.

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Implementation of the PG Binder for RAP

Recycling of asphalt pavements is an environmentally sound and economical method for the rehabilitation of pavements. The current methods for selecting recycling agent for asphalt pavement recycling are based on consistency and empirical tests such as viscosity and penetration. These methods do not provide complete and accurate rheological information about asphalt cement. SHRP did not look at asphalt pavement recycling. To effectively select an asphalt cement/recycling agent in a recycled mixture, it is necessary to accurately characterize the blended binder (mixture of two asphalts or a mixture of asphalt and recycling agents).

A research project was conducted at the University of Saskatchewan in Canada to study the PG binder system for blended binders and selection of recycling agent in recycled projects. The research team included Dr. A. T. Bergan and Hamid Soleymani from the University of Saskatchewan, and Dr. Hussain Bahia from the University of Wisconsin.

The findings of the research suggest that a linear relationship is adequate for the prediction of the PG testing parameters (G*, δ, S and m-value) and PG performance parameters (G*/sinδ, G*sinδ, S and m-value) of blended binders with the proportion of recycling agent. Two methods have been proposed for selection of recycling agent based on PG parameters, based on the findings of this and other research. Both methods are based on the fact that linear models can be used for prediction of changes in rheological properties of blended binders with proportion of recycling agent (percentage by weight) of the blended binders. In the first method, four charts are used for the selection of a recycling agent based on each PG performance criterion. The linear relationship of change in PG performance criteria with proportions of recycling agent can be used to estimate the type or the proportion of recycling agent in the recycled mixture. Three semi-logarithmic charts, for the G*/sinδ, G*sinδ and S, and one chart for m with normal scales in Y1 and Y2 axes can be used. The Y1 and Y2 axes correspond to the criteria of the aged asphalt cement and recycling agent. The X-axis, in all cases, is the proportion of recycling agent (percentage by weight) in the blends. In the second method, one graph is used to select the type and the ratio of recycling agent based on the linear relationship for change in the PG temperature grading of the aged and recycling agent. In this graph, the Y1 and Y2 axes depict the temperatures at which the aged asphalt cement and recycling agent satisfy the PG performance criteria, while the X axis depicts the proportion of recycling agent.

These methods have several advantages compared to the traditional method for selection of recycling agent, which is based on viscosity or penetration of aged asphalt and recycling agent. The most important advantage is that they can be used for selection of recycling agent to control low-temperature cracks for cold climate.

The findings of this study, for selection of recycling agent, are based on assuming total blending occurs between the aged asphalt cement in the RAP and the new asphalt cement/recycling agent. In addition, they are based on one laboratory aged asphalt cement and limited numbers of new asphalt cement/ recycling agent. Therefore, it is necessary to have more validation in this area. Although the results can be used for selection of recycling agent, the final decision on mix design of recycled mixture must be based on mixture study and performance tests.

In October of 1997, Dr. Soleymani joined the North Central Superpave Center to continue his research in the recycled area of the NCHRP 9-12 study. The purpose of this on-going research is to study the implementation of the Superpave system for RAP, which includes binder and mixture studies. The Superpave performance tests will be used for characterization of different asphalt recycled mixtures. If you need more information about the above summary research or current progress on the NCHRP 9-12 study, you can contact Dr. Soleymani at the NCSC at (765) 463-2317 phone, (765) 497-2402 fax, or

soleyman@ecn.purdue.edu e-mail.

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Hot Mix Asphalt Conference Addresses Superpave

Well over 500 people attended the Fifth Annual Hot Mix Asphalt Conference and Superpave Workshop in Phoenix, Arizona, last October. Lee Gallivan, Indiana Division of the FHWA, agreed to serve as our "special correspondent" from the conference. The following briefly summarizes his impressions of the Superpave workshop. For more information on this workshop and the rest of the conference (including topics such as quality, joint construction, segregation, compaction, production rates, smoothness, training and more), please see Gallivan s complete report on our website.

George Way and Julie Nodes of the Arizona DOT in Phoenix discussed Arizona s Superpave experiences. Arizona has been in the process of implementing Superpave over the past four years on eight test projects. The typical sections include Superpave mixes on the base, binder and surface lays topped off with another rubber modified surface course. In 1997 twelve different binder grades were used due to the wide temperature extremes throughout the state. There have been some minor problems encountered in moving toward the coarse graded Superpave mixes. Arizona admits that they are not a "purist" Superpave state as they have revised virtually all of the mixture criteria including air voids, VMA, FAA, VFA, aging, and other aggregate consensus properties.

Bob Erdman (Maricopa County, AZ), Pat Thurman (City of Glendale, AZ), Mike Worischek (Staker Paving and Construction, Salt Lake City, UT) and Ron Sines (New York DOT, Albany, NY) related their Superpave experiences. County experiences have been reported from good to bad. The poorer experiences relate to smaller type projects in non-mainline applications. There have not been any differences in the fine graded mixtures. Density has been achieved on all projects. Performance using the "pure" Superpave mix designs has been quite good as far as the city is concerned. More projects are planned for 1998. Construction experiences from Utah have been good, but there have been a few problems with the modified PG binder. The New York DOT has fully implemented Superpave throughout the state and has experienced excellent results with the coarse graded mixtures.

Ken Murphy of Anderson Columbia Company, Lake City, Florida, reported on contractors experiences with Superpave. Florida has begun using Superpave and has had generally good experiences. VMA and compaction are the largest problems; in particular, there have been some problems with compaction of the mixes depending on the type of HMA plant. Florida is moving toward incentives for densities after increasing the layer thickness for the 9.5 mm surface mixtures.

Jim Gee of the Arkansas DOT in Little Rock relayed Arkansas s Superpave experiences. Arkansas has increased the PG binder to PG 76-22 for all interstates with greater than 10 million ESALs. Additionally, polymer modification with three percent SBR has been added in order to resist rutting of the pavements. Their experiences thus far have been good, but permeability and compaction within the tender zone have caused some concern. There has been no significant increase in the price of HMA using Superpave criteria. Arkansas promotes the development of uniform testing protocols.

Jon Epps of the University of Nevada Reno gave an update on the WesTrack facility. This test facility provides for continuous (monthly) performance related testing on all the sections. As of this date, eight of the 10 coarse graded sections have been replaced where premature failures resulted as expected.

Specific recommendations are currently under development for coarse graded mixtures, including: 1) AC and binder stiffness; 2) increasing PG grading one grade when coarse graded mixtures are in the three to 10 million ESAL range and increasing two grades when over 10 million; 3) maximum VMA of two percent above the minimum criteria for 9.5 mm mixtures; and 4) performance related testing. An independent team consisting of industry and agency representatives from across the country is currently finalizing the WesTrack evaluation report for distribution early in 1998.

John D Angelo of the Federal Highway Administration in Washington, DC, overviewed Superpave specifications. Several FHWA/DOT groups are working in several different Superpave areas. At this time, there are not any major changes expected in the PG specifications with the exception of those that might come from the research relating to modified PGs. Aggregate testing is anticipated to remain as is for FAA, except that the minimum value for high volumes may be increased. Flat and elongated requirements are currently under evaluation and might be reduced to a three to one ratio.

Ed Harrigan of the National Cooperative Highway Research Program (NCHRP) in Washington, DC, discussed research activities toward improving Superpave. Various programs that the NCHRP is currently involved with were discussed, and all participants were reminded that the programs are being administered by the Transportation Research Board (TRB). There are currently six different, active NCHRP studies regarding Superpave related topics:

9-7 *Field Procedures and Equipment to Implement the SHRP Asphalt Specification*
9-9 *Refinement of the Superpave Gyratory Compaction Procedure*
9-10 *Superpave Protocols for Modified Asphalt Binders*
9-12 *Incorporation of Reclaimed Asphalt Pavement (RAP) in the Superpave System*
9-13 *Evaluation of Moisture Sensitivity Tests*
9-14 *Investigation of "Restricted Zone" in SHRP Superpave Aggregate Gradation Specification*

Charlie Pryor of the National Stone Association in Washington, DC, reviewed aggregate issues for Superpave implementation. He stated that the aggregate association is concerned with the Superpave specifications and the ability of the industry to meet the requirements. Currently there are production quarries in 49 states (every state but Rhode Island), and there are widespread problems with the restricted zone, FAA, VMA, and the "rigid" application of the voluntary AASHTO specifications. (See related article in this newsletter.)

April Swanson of Amoco Oil in Naperville, Illinois, gave an update on Superpave binder issues. In general, 1997 was a good year for asphalt manufacturing. The introduction of PG binders into the marketplace has been better than expected. One of the big pluses is the adoption of AASHTO PP26, the Approved Supplier Certification Program, since the program puts the responsibility for the materials in the hands of the suppliers who are ultimately the only ones who can adjust production of the materials. Adoption of the program is not universal yet, but good progress has been made. Using the correct asphalt temperatures from the manufacturer for mixture production and laydown operations is very critical. PG binders from different sources should not be mixed, and care of modifiers is important due

to special heating requirements.

Matt Witczak of the University of Maryland College Park spoke on Superpave, the Search for a Simple Strength Test. The Models study by FHWA is continuing with the second phase. Phase I consisted of the evaluation of the original SHRP models and has been slow due to numerous problems with the original programs. Phase II will develop enhancements to the original concepts. Conclusions from Phase I contained substantial corrections and the re-modeling is not complete. The development of a strength test is a new task resulting from Phase I of the study. The format of the test is not known yet, but triaxial, shear, static creep, lateral pressures, and rut depth methods will be evaluated. It will take 18 months to evaluate each of the existing processes and to develop the criteria for a recommended test.

Don Steinke of the Federal Highway Administration in Washington, DC, asked "How is Superpave Doing?" Superpave implementation, according to the AASHTO Lead States, is progressing very well with over 50 percent implementing the binder specifications in 1997 and over 75 percent by the year 2000. In 1996, there were 100 Superpave projects nationally, with over 300 in 1997 including local governments. Successes have been reported by the states of Arizona, Maryland and Indiana. Superpave is on track for full national implementation by the year 2000.

Dale Decker of NAPA closed the conference by pointing out that the single most repeated word during the conference and workshop was "quality" a word that effectively summarizes the focus of the entire conference. The Sixth Annual HMA Conference will be in Portland, Oregon, November 4-6, 1998.

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Read All About It: Superpave in the News

It seems that Superpave is everywhere these days. Many recent issues of industry magazines have included articles about Superpave. If you have not already seen these articles, you may want to check them out. *Asphalt: The Magazine of the Asphalt Institute*, for example, devoted its Fall 1997 issue to "Superpave the Real Story." This issue features stories including a review of 1996 Superpave construction projects, why states are turning to Superpave, case studies of using Superpave specifications in Colorado and Oklahoma, the FHWA Extended Superpave Delivery Team, and WesTrack.

The January issue of *Roads & Bridges* includes an article by Dale Decker of NAPA, who discusses the changes that are taking place as Superpave implementation progresses, drawing a great analogy to Cortez ordering his men to "burn the ships," signifying there is no turning back. Decker summarizes the current status and challenges in relation to materials and mix design, aggregates, binder, plant operations, placement and compaction, field management, performance testing and training. "The

HMA industry is quickly moving towards the Federal Highway Administration (FHWA) goal of Superpave implementation in 2000," notes Decker. The same issue includes a larger overview of the significant changes and critical issues that the HMA industry is facing by Mike Acott, president of the National Asphalt Pavement Association. Superpave is one of the many changes cited.

The February issue of *Roads & Bridges* also includes two more articles on Superpave this time focusing on compaction and field management. Mike Prather, Koch Materials Company, gives his perspective on field compaction, especially regarding the mix "tenderness" sometimes observed in the range of 240° to 190°F. Prather s discussion focuses on the possible changes in compaction behavior due to the asphalt binders, aggregates and moisture in Superpave mixtures. In the second article, Charles Deahl, Compaction America, notes that Superpave "mixes can be compacted productively." This requires good management in the field. Deahl advocates giving the contractor control over and responsibility for mix design. Communication and process control, proper selection of equipment, establishing adequate rolling patterns and operator training are all necessary to achieve density in the field.

An article in the February issue of *Better Roads* reviews some Superpave projects experiencing problems last year, such as WesTrack, and barriers to Superpave implementation. The article goes on to look at the experiences of three lead states Florida, Maryland and New York and their commitment to Superpave. As Dale Decker notes, "With any new technology, there are a few quirks that need to be ironed out." Adjustments need to be made as we progress up the learning curve.

Charlie Pryor, National Stone Association, discussed the implications of changing the specification limits for flat and elongated particles in the December 1997 issue of *Stone Review*, the magazine of the National Stone Association. The possibility of changing the specification from a five to one ratio (with a limit of 10 percent maximum) to a three to one ratio (20 percent maximum) of maximum to minimum dimension was discussed at the September 1997 Mixture ETG meeting. Pryor questions the rationale behind making this change and urges specifiers to consider aggregate geology and the economic impact of making such a change. (The Mixture ETG has formed a subcommittee to look at this specification and make recommendations.)

The impacts of Superpave on the aggregate industry are also discussed in an article by Lucy T. Avera, in the February 1998 issue of *Asphalt Contractor*. Avera interviewed David Jahn (Martin-Marietta Aggregates), John D Angelo (FHWA), Charlie Pryor (NSA), and Chuck Marek (Vulcan Materials), to get their viewpoints for the article "Between a Rock and a Hard Place," which discusses flat and elongated particles, crusher types, the restricted zone, VMA and fine aggregate angularity, among other issues.

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NCSC's Second Training Season Eclipses First

The North Central Superpave Center s second training season was even busier than our first. This season, NCSC staff presented four *Superpave Volumetric Mix Design* courses to approximately 60 students, and two *Superpave Binder* courses to approximately 25 students. The courses were held alternately at the NCSC s Mixture Branch in West Lafayette, Indiana, and the Binder Branch in Indianapolis. NCSC staff also presented specialized Superpave training to approximately 65 students in Iowa and Minnesota. The NCSC participated in National Highway Institute courses, presenting *Superpave for Local Governments*, *Superpave for Senior Managers*, and *Superpave for the Generalist Engineer and Project Staff* to approximately 300 students in Iowa, Kansas, Michigan, Missouri, Nebraska and Ohio.

Responses to our courses continue to be very positive. The students report that the courses are relevant to their jobs; for many, the hands-on focus (including workshop sessions) of the courses is particularly useful.

We found that our average second season student had more Superpave experience coming into our courses than first season students. Many people have built Superpave projects and are now seeking to understand the theory and rationale behind the system. For next year, we are considering offering a detailed course for beginners, which will include extensive hands-on sessions, and an abbreviated course for more experienced users who want to concentrate more on system theory and rationale.

Please continue to call us with your training requests. Although we schedule our courses during the winter to avoid conflicts with the summer construction season, we can organize a summer training session if there is enough interest. As always, the NCSC staff is available to teach our Superpave courses or specialized training of your choice at our facility or yours. If you are interested in Superpave training, please contact Julie Smith at the NCSC at (765) 463-2317 *phone*, (765) 497-2402 *fax*, or warble@ecn.purdue.edu *e-mail*.

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Study Assesses Benefits of Superpave

A recent RoadSavers report published by FHWA, *Assessing the Results of the Strategic Highway Research Program*, (Publication No. FHWA-SA-98-008), summarized the results of a study looking into the benefit:cost ratio of SHRP in all of the main program areas. The study was coordinated by the University of Nevada Reno with an economic analysis conducted by the Texas Transportation Institute.

Regarding Superpave, the study found that the use of the Superpave binder specification "could increase the service life of an asphalt overlay by 25 percent (to 10 years from eight years)." Even accounting for

increased initial costs of using Superpave binders (on average increasing overlay cost by seven percent) and costs for equipment and training, the study found great savings resulting over a 20-year period from a switch to Superpave binders. Depending on how quickly states implement the binder specifications, savings of $484 to $637 million per year could result from the improved service lives. The traveling public could save an additional $1.3 to $1.7 billion per year over a 20-year period from reduced travel delay and vehicle "wear and tear." Both projections are based on the states implementing Superpave within five to 10 years; faster implementation leads to greater savings. These projections also take increased traffic loads and volumes into account.

Copies of the report and individual RoadSavers Case Studies are available from the FHWA, Research and Technology Report Center, 970-1 Philadelphia Court, Unit Q, Lanham, MD 20706.

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Wisconsin Binder Round Robin Shows Improvement

The results are in from the first round of the Wisconsin Binder Round Robin of 1998. The results show that the coefficient of variation in the test data is decreasing or staying roughly the same as the previous round and is generally lower than earlier round robins. Apparently, labs and technicians are becoming more experienced with the test procedures and the variability is being reduced, as indicated by the general trends in the data. Results vary from one round to the next, so only general trends can be gleaned from the overall data. The real value to participating labs is seeing how their results compare to those of other labs testing the same material.

The coefficient of variation based on all of the data from the participating labs is shown below. A separate analysis reflects the averages of the data from each participating lab.

A total of 42 laboratories participated in this round. Three additional rounds are scheduled for the remainder of 1998.

			Coefficient of Variation (%)					
Round Robin	No. of Participants	Rotational Viscosity	DSR Original	DSR RTFO	DSR PAV	Mass Loss	BBR S-Value	BBR m-value
97-3	35	4.590	7.965	9.405	13.766	35.059	5.381	2.804
97-4	39	5.045	10.822	10.957	17.469	37.390	9.150	3.602
97-5	35	4.181	4.935	7.729	11.287	14.218	6.843	3.448
98-1	42	12.700	6.799	8.632	8.846	15.443	7.573	3.177

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AASHTO Lead States

Following the recent Superpave Mixture ETG meeting in Orlando, Florida, the Superpave Lead States and a number of other state DOT engineers met on March 12, 1998. At the request of the AASHTO SHRP Implementation Task Force, the purpose of this FHWA-hosted meeting was to organize discussion of recommendations and guidance on issues to improve the use of the Superpave mix design and provisional AASHTO specifications (MP-2 and PP-28).

"Lead State Guidance on Superpave Issues," a document generated during the meeting, will be distributed by the Superpave Lead States to all the state DOTs within the next few weeks, following concurrence by the Superpave Mixture ETG.

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NCAUPG Adopts New Schedule

At the last meeting of the North Central Asphalt User-Producer Group (NCAUPG), a new meeting schedule was approved. Future meetings of the full group will be held once a year, rather than twice a year, as has been our practice. The next meeting of the NCAUPG is likely to be held in January 1999, a time that is hoped to reduce schedule conflicts and encourage more contractor participation.

Technician meetings similar to those that have been held on the day preceding the full NCAUPG meeting may be held mid-year, if there is sufficient interest and need. Please keep Tom Bryan, Ken Archuleta or the NCSC informed of topics you think would be important for the technicians group to discuss. These meetings have been well-received in the past and may be one of the few times when technicians involved with Superpave can gather to share their experiences.

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Calendar of Events

June 1-4	**12th Annual Rheology Symposium** *Mendenhall Inn, Brandywine Valley, Pennsylvania* For more information, e-mail Liz Walsh at ewalsh@tainst.com
July 20-21	**AASHTO Highway Subcommittee on Maintenance** *Nashville, Tennessee*
October 12-16	**2nd Asphalt Technology Conference of the Americas** *Renaissance Hotel, Austin, Texas* For more information, please call (512) 471-3396
November 4-6	**6th Annual U. S. Hot Mix Asphalt Conference** *Portland Hilton, Portland, Oregon*
December 8-10	**AASHTO Annual Meeting** *Boston, Massachusetts*
January 10-14 **(1999)**	**Transportation Research Board Annual Meeting** *Washington, District of Columbia*
March 8-10	**Meeting of the Association of Asphalt Paving Technologists** *Palmer House Hotel, Chicago, Illinois*
May 22-24 **(2000)**	**4th International Symposium on Pavement Surface Characteristics of Roads and Airfields** *Convention Center of Nantes, Nantes, FRANCE* For more information, e-mail Michel Boulet at Michel.Boulet@lcpc.fr

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Note on the WesTrack Report

In the last issue of this newsletter, we noted that the final report of the WesTrack evaluation team was due at the end of 1997. The report was delayed so that more data could be analyzed; it is expected to be issued sometime later this spring. As soon as it is available, we will post it on our website and summarize it in the next issue of this newsletter.

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Masthead

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