

# North Central Superpave Center News

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### **NCSC Vision and Mission:**

To be an industry-recognized source of Superpave expertise and to lead further development and implementation of Superpave technology by providing services to its customers, through excellence in research, training, and communication.



## **NCSC Prepares for a Busy Spring and Summer**

With the arrival of spring and beginning of the construction season, the focus of activities at the NCSC is shifting. Another successful training season has drawn to a close and most of the major conferences are over. That means the NCSC staff can devote its attention to research, ruggedness testing and communication. While most of the industry heads out into the field, we'll be heading to our lab and computers!

Research on RAP was completed this winter at the NCSC. The final report on NCHRP 9-12, *Incorporation of Reclaimed Asphalt Pavement in the Superpave System*, was completed and will be published as a web document available at [www4.trb.org/trb/onlinepubs.nsf/web/nchrp\\_web\\_documents](http://www4.trb.org/trb/onlinepubs.nsf/web/nchrp_web_documents). The Technicians' Manual and Guidelines for specifying agencies will be published as paper documents. The companion regional pooled fund research project is complete and is undergoing review by the seven participating states prior to publication.

Work is on going on an evaluation of fibers in Superpave. Mixture and binder testing for that project will be a major focus of summer activities. Work is also underway on a study for the Indiana DOT looking at how their typical Superpave mixtures perform in various performance-related tests.

A new project getting underway this spring is looking at friction of Superpave surfaces and the possibility of maximizing macrotexture to reduce the reliance on aggregate microtexture. Securing high quality aggregates to provide high microtexture often requires shipping the aggregates over long distances and boosts costs considerably. This project is being conducted with Iowa State University and is currently funded by the Indiana and Iowa DOTs.

Sample collection is also beginning this spring for a project looking at how typical North Central mixtures will perform in terms of Superpave shear tests and the candidate simple performance tests being developed at Arizona State University. We will also be testing SMA mixtures under this study funded by FHWA.

Ruggedness testing of the binder direct tension test will begin at the NCSC in May. This intensive effort will look at the influence of temperature, elongation rate, conditioning time, specimen age and chilling of the specimen on the test results. The work is being coordinated with FHWA to provide data to support establishment of allowable ranges in the test protocols.

Work will also continue this summer on developing a searchable database of Superpave information. We are working right now on locating and summarizing all the information we can find on Superpave. We are searching the web for research in progress, newsgroup communications, technical papers and reports, etc. We will collate all of this information into one database, so that you can search *in one place* to find what is available on a given topic. We will then provide

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# MIDWEST HOSTS ANNUAL TECHNICAL TRAINING AND CERTIFICATION WORKSHOP

The Midwest states and FHWA will once again conduct a technical training and certification workshop. This workshop allows states from not only the Midwest but all over the country to get information on:

1. New Materials Under Development
2. Certification Issues
3. FHWA News and Views on Training and Certification
4. State's Problems and Hopefully Helpful Ideas and Solutions

Past workshops have been attended by over 20 states from across the country.

Topics to be covered this year include the work of the Transportation Curriculum Coordination Council, North Central Asphalt User Producer's work on test standardization, National Ready Mix Association's Plant Certification Course, QC/QA Course developed by the New England states, PCC Mix Design Course development. The group plans on having information on course design and discussion on the development of a train-the-trainer course.

One highlight of the meeting will be time for open discussion that will allow states to ask questions of the group and give input on new ideas that are being initiated in the states. The agenda has not been completed yet, so any items you would like to see discussed could be added. An agenda will be sent out to all registered individuals before the meeting.

The meeting will start at 12:00 P.M. on June 19 and will end at 12:00 P.M. on June 21. This year's meeting will be held in Des Moines, Iowa, at the Holiday Inn Conference Center. Room reservations need to be made at least three weeks prior to the meeting to be assured availability and the group rate of \$67.00 single or \$77.00 double plus 12% sales tax. (Mention you are reserving a room under the Iowa DOT block to be sure and get the above rate.) The registration fee this year will be \$50.00 to cover meal expenses.

For more information, contact Chris Anderson at the Iowa DOT:  
Phone: 515-239-1819  
Fax: 515-239-1092  
E-mail: Christie.Anderson@DOT.STATE.IA.US

## NCAUPG to Readdress Standardization

Several years ago, Gerry Huber and Rich Wolters, on behalf of the North Central Asphalt User Producer Group, reviewed the asphalt related AASHTO specifications and suggested how to standardize and unify the procedures. There are so many allowable options in many of the specifications that even though different labs are following AASHTO procedures, they may have very different test protocols. For example, when looking at allowable options in the Rice test for maximum specific gravity, there are over 20 ways to run the test that all meet AASHTO standards. These differences logically result in increased variability in test results between labs.

Though this work has been praised widely and the states in the North Central region expressed their willingness to adopt uniform test procedures, nothing much has changed. Until now.

At the last meeting of the North Central Asphalt User Producer Group, the issue of variability in the test methods was raised at the Technicians' Workshop. Those in attendance again expressed their interest in adopting uniform procedures. Beginning this summer, small task groups will begin looking at individual test methods to determine where the differences in procedures lie and, if possible, why those differences arose. The objective will be to determine if there is a real, solid basis for the differences or if they are just the result of "the way we always did it." Knowing the underlying reasons for differences will help the states come to agreement on specifics of how to standardize the tests. If needed, small experiments can then be done to quantify the effects of procedural differences.

The ultimate goal is to eliminate needless variations in how the tests are done. If we can reach consensus in the North Central region, training and reciprocity of certification across state lines will be greatly facilitated. We may even set an example for the rest of the country to follow.

Why is this effort different, with a better chance of success than past efforts? This time standardization will be approached one test at a time rather than all at once. Also, technicians - the people who know the tests best - will be involved.

Mike Heitzman of the Iowa DOT and Rich Wolters of the Minnesota Asphalt Pavement Association will be leading the effort.

## Ayesha Shah Joins Staff

We welcome Ayesha Shah as the new Research Engineer for the North Central Superpave Center. She has been pursuing her Ph.D. in Civil Engineering at Purdue University. Her area of specialization is bituminous pavements and materials. Shah holds a bachelors degree in Civil Engineering from Andhra University in Visakhapatnam, India; a masters degree in Civil Engineering from Iowa State University at Ames, Iowa; and will complete her Ph.D. in Civil Engineering from Purdue University in August 2001.



She has been a Teaching Assistant in soil mechanics, mechanics of materials and construction materials courses. Shah also has been a Research Assistant at the School of Civil Engineering and the North Central Superpave Center on various bituminous projects.

Ayesha will be managing the NCSC research projects as well as conducting tests and data analysis. She will also write proposals and reports and will assist with teaching. Ayesha is a great addition to the NCSC staff and will enhance our productivity and performance.

# Factors Affecting Permeability of Superpave Designed Mixes

**Allen Cooley and Rebecca S. McDaniel**

Permeability in hot mix asphalt pavements is not a new problem. However, since the adoption of the Superpave mix design system the problem has gotten a lot of publicity. Numerous research studies have been conducted in recent years. Based upon this research, a number of mixture and construction factors have been shown to significantly affect the permeability characteristics of pavements.

Probably the most prevalent factor that affects permeability is in-place pavement density. As in-place air voids increase, permeability also increases. Work has also shown that mixtures with different nominal maximum aggregate size (NMAS) gradations have different permeability characteristics. As the NMAS increases, the in-place air void content at which a pavement becomes excessively permeable decreases. The reason for this is that as the NMAS increases, the size of individual air voids within the compacted mix also increases. This increase in air void size leads to an increased potential for interconnected air voids. The existence of these interconnected air voids is what leads to permeability within pavements. Interconnected air voids are the pathways through which water flows.

Another factor that affects permeability characteristics is a mixture's gradation shape. Gradations that pass below the maximum density line (MDL) tend to become excessively permeable at lower in-place air void contents than mixes having gradations that pass on the fine side of the MDL. Similar to NMAS, gradation shape likely affects the size of the air voids within a compacted pavement. Coarser gradations contain a higher percentage of coarse aggregate, which results in larger individual air voids and, thus, a higher potential for interconnected air voids.

Since larger NMAS and coarse gradations tend to have more potential for permeability problems, it can be surmised that the fine aggregate content may control permeability in hot mix asphalt pavements. In both instances, less fine aggregate is available to fill the void space between the larger aggregate particles.

A construction issue that could also affect permeability is the lift thickness at which a pavement is placed. As the lift thickness increases,

the potential for permeability likely decreases. There are two reasons why lift thickness makes a difference. First, thicker lifts are generally easier to compact in the field because a thicker lift retains heat better and allows more room for aggregate particles to orientate properly; hence, an increase in pavement density. Secondly, permeability is the result of interconnected voids. Within a dense-graded hot mix asphalt, all the air voids are not interconnected. As lift thickness increases, the chance decreases that voids will be interconnected with a sufficient length to allow water to flow. For this reason, thinner pavements may have more potential for permeability.

Another construction issue that may influence permeability is roller type. It has been suggested in the past that the use of pneumatic tired rollers may decrease the potential for permeable pavements. Pneumatic rollers tend to knead the pavement during compaction, which may reduce the potential for interconnected voids.

This issue is a concern in the North Central region, and many states have taken steps to address it. For example, Iowa used the NCAT field permeameter last year and compared field and laboratory measurements of permeability. They did find significant permeability and are planning more testing with refined test protocols this year. Nebraska will begin permeability testing this Spring due to their concern about the issue. Other states, like Missouri, have not seen evidence that their Superpave pavements are more permeable than their previous pavements.

Some states in the region are also looking at changing their lift thicknesses to allow more room for better compaction and, hence, reduced permeability. Indiana and Wisconsin are among the states evaluating their lift thicknesses. Indiana has implemented a staged approach to changing lift thickness. For existing contracts, districts have the option of increasing lift thicknesses provided they have funding to cover the increased costs. The pavement design guidelines are being rewritten to increase the lift thickness for the standard 12.5mm surface mix to 37.5mm (1.5").

## Busy Spring and Summer

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source information so that you can go to the source for more information, if needed. Intensive work will be done this summer on collecting information and putting it into the database. The database will be on-line within the next month and will continue to expand in coverage throughout the summer. Watch our web site at <http://bridge.purdue.edu/~spave/> for new features. Maintenance and updating of the database will be an on going activity.

As a part of our searchable database, we will also go into the movie business! We plan to make videos of best lab practices for sample preparation and testing, starting with binder tests. These video clips will be digitized and put out on the web. These will not replace hands on training, but may supplement it and can serve as refreshers for technicians who have already been trained. The clips can also be accessed through the searchable database. If you do a search on the bending beam rheometer, for example, the search engine will pull up articles about the BBR, comments from folks who have used the BBR, round robin test results and a video showing sample preparation.

Summer will also give us the opportunity to update our training materials for the next training season to incorporate the latest revisions to the test procedures. We will develop a math primer to distribute to our class participants prior to each hands on course so that they can brush up on needed math skills before the class starts. Our courses typically include a wide range of people, so the math primer will help to make sure everyone is up to speed on needed math skills before the class starts.

As always, if you need assistance during the construction and testing season, feel free to call us. We are available for phone consultations and can make field visits, if appropriate. If we can't help you, we'll find someone who can.

Permeability in pavements is not a new issue in the hot mix asphalt industry. Research on this problem goes back into the 1950's, if not earlier. However, it seems to have come to the forefront since the adoption of Superpave. As we learn more about the causes, then we should be able to alleviate the problem.

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The National and Regional Superpave Newsletters are published three times a year and are coordinated by the North Central Superpave Center. The NCSC is one of five Superpave Regional Centers established to assist with implementation of the Superpave performance-based system for designing asphalt pavements. The NCSC is a joint effort of Purdue University, the Indiana Department of Transportation, and the Federal Highway Administration and is administered by the Joint Transportation Research Program at Purdue University.

# Calendar of Events

2001

May 21-23

## **Sixteenth Annual Rheology Symposium**

Harbor Court Hotel Baltimore, MD  
Register on the TA Instruments website: <http://www.tainst.com>

June 19-21

## **Midwest Annual Technical Training and Certification Workshop**

Holiday Inn Conference Center Des Moines, IA  
Contact: Chris Anderson, Iowa DOT, Phone: 515/239-1819  
E-mail: [Christie.Anderson@dot.state.ia.us](mailto:Christie.Anderson@dot.state.ia.us)

July 29-Aug 1

## **Second International Symposium on Pavements and Technological Control**

Auburn University Conference Center Auburn, AL  
Website: <http://home.olemiss.edu/~cvuddin/2001Symposium.html>

Oct. 10-13

## **Civil Engineering Conference & Exposition: Engineers in a Changing World**

George R. Brown Convention Center Houston, TX  
Contact: ASCE Conferences at [conf@asce.org](mailto:conf@asce.org)  
Website: <http://www.asce.org/conferences/>

Nov 30-Dec 4

## **AASHTO Annual Meeting**

Fort Worth, Texas  
Website: [http://www.aashto.org/mtng\\_events/a\\_me.html](http://www.aashto.org/mtng_events/a_me.html)

2002

Jan 13-17

## **Transportation Research Board Annual Meeting**

Washington, DC  
Contact: TRB (202) 334-2934 FAX: (202) 334-2003  
website: <http://www.national-academies.org/trb/>

Jan 29-31

## **NCAUPG Annual Meeting**

Detroit, Michigan  
Contact: North Central Superpave Center, (765) 463-2317 ext. 224  
Website: <http://bridge.ecn.purdue.edu/~spave/>

March 18-20

## **Meeting of the Association of Asphalt Paving Technologists**

Doubletree Hotel  
Colorado Springs, CO  
Contact: AAPT, (651) 293-9188  
Website: <http://www.asphalttechnology.org/>



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