Southeastern Superpave Center News

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National Center for Asphalt Technology
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Update on the Southeastern Superpave Center

Allen Cooley, Manager, Southeastern Superpave Center

The Southeastern Superpave Center (SSC) was formed in 1997 through a partnership between the National Center for Asphalt Technology, the Federal Highway Administration, the Alabama Department of Transportation, and the state Departments of Transportation of the Southeast. Originally, the purpose of the SSC was to help in the implementation of Superpave throughout the southeast. This work included conducting Superpave mix designs, asphalt binder testing, specialized mixture testing with the Superpave performance tests, and training courses on Superpave. The activities of the SSC are governed by a Management Committee. This Management Committee is comprised of a member of each participating state agency.

Through the leadership of the Management Committee, the SSC has evolved into a tool that the member states can use in order to conduct timely and practical research, serve as a technology transfer resource, and provide training on a number of hot mix asphalt subjects. Currently there are eleven departments of transportation participating in the SSC's pooled-fund effort: Alabama, Arizona, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee and Virginia. Shortly, Puerto Rico will be added as a twelfth member.

Since 1997, the SSC has been involved in eight research projects designed to help solve important, practical problems. Following is a list of research studies that have been undertaken by the SSC through the pooled-fund effort by the member states:

- Permeability of Superpave Mixtures: Evaluation of Field Permeameters
- Evaluation of the Effect of Flat and Elongated Particles on the Performance of Hot Mix Asphalt Mixtures
- Case Studies of the Tender Zone in Coarse-Graded Superpave Mixtures
- Use of Normal Propyl Bromide Solvents for Extraction and Recovery of Asphalt Cements
- Permeability Characteristics of Coarse-Graded Superpave Mixes
- Permeability of Fine-Graded Superpave Mixes
- Development of Mix Design Criteria for 4.75 mm Superpave Mixes
- Evaluation of VMA Requirements for Superpave Mixes

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Factors Affecting Permeability of Superpave Designed Mixes

Allen Cooley, Manager, Southeastern Superpave Center

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 (see figure). 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.

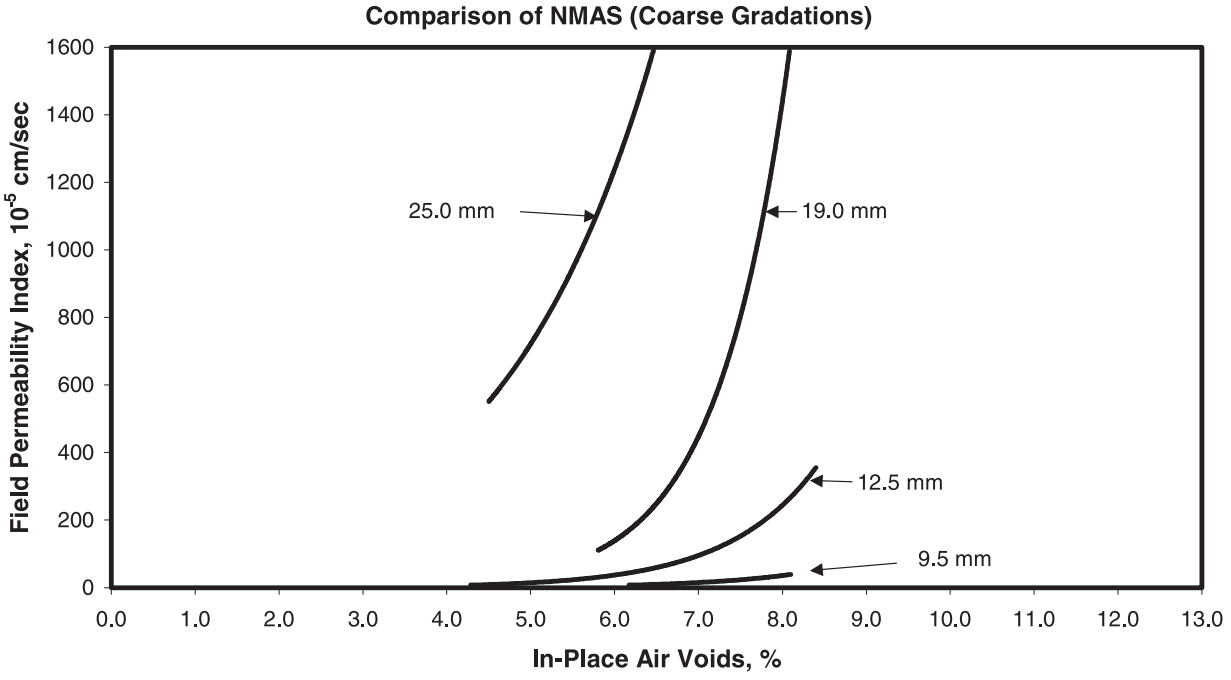
Another factor that affects permeability characteristics is a mixture's gradation shape. Gradations that pass below the maximum density line (MDL) tend to become excessively permeable at lower in-place air void contents than mixes having gradations that pass on the fine side of the MDL. Similar to NMAS, 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 for lift thickness to make 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 air voids are not interconnected. As lift thickness increases, the chance for voids being interconnected with a sufficient length to allow water to flow decreases. 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 tire 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.

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.



NCAT Teaches a Short Course on Pavement Construction

In February, NCAT taught a new course on hot mix asphalt construction. An excellent team of instructors was put together for this new course. In addition to NCAT staff, Terry Young provided detailed instruction on HMA production facilities. Placement equipment and techniques for HMA were described by Tom Skinner. Chuck Deahl provided insight on how to compact HMA pavements. Finally, Chuck Hughes discussed methods of developing and applying statistical quality control techniques during production.

NCAT plans to teach this course approximately eight times during the next training season. The class will be taught both at NCAT as well as other areas of the U.S. Anyone interested in sponsoring this type of instructional class, please call Doug Hanson at (334) 844-6228.

Superpave Update

Continued from Page 1

Each year at the Southeastern Asphalt User Producer Group meeting, the SSC's Management Committee meets to discuss the SSC's activities. At the 2000 meeting held in Charlotte, North Carolina, three new studies were selected: 1) Evaluation of Asphalt Pavement Analyzer for Moisture Sensitivity Testing; 2) Micro-Deval Testing on a Regional Basis; and 3) Refinement and Validation of Open-Graded Friction Course Mix Design Procedure. All final reports can be found on the SSC's web page at www.eng.auburn.edu/center/ncat/ssc/ssc.html. These final reports can be downloaded from the web page.

A distinct benefit of being a part of the National Center for Asphalt Technology is that the SSC has the capacity to be a clearing house for up-to-date information on hot mix asphalt technology. NCAT has an extensive library of past and present research results and participates in many studies dealing with new technology. This newsletter was developed as a way to keep everyone informed on current issues in the hot mix asphalt industry.

Because the SSC is part of the National Center for Asphalt Technology, it has the ability to conduct numerous types of training courses. Since the original intent of the SSC was to help in the implementation of Superpave, a course was developed to train how to conduct Superpave volumetric mix designs. This course has been taught more than 15 times since 1997 with over two hundred participants. A similar type of course was also provided on how to conduct the Superpave performance grading of asphalt binders. A new training course that NCAT offered for the first time in 2001 was a "Short Course in Asphalt Pavement Construction." This course is scheduled to be taught again during the winter of 2001-2002. NCAT is currently investigating the need for a course on inspector training.

Since 1997 the SSC has continued to evolve as the needs of the hot mix asphalt industry have also evolved. If you have any questions about the SSC, please feel free to contact Allen Cooley at (334) 844-6336 or coolela@eng.auburn.edu.

Superpave Gyratory Compactor Angles

The Superpave gyratory compactor (SGC) was developed as a tool in the Superpave mix design system to better simulate the field compaction of hot mix asphalt (HMA) mixes. All SGCs are designed to meet the specification criteria found in AASHTO TP4. Some SGC users have complained recently that two properly calibrated SGCs can provide differences in bulk specific gravity of compacted samples.

A possible reason for these differences is that various compactors calibrate and apply the angle of gyration by different methods. Research has shown that the gyration angle is different depending on whether calibration is conducted in the un-loaded or loaded condition. The gyration angle also changes during compaction with all SGCs, primarily due to the flexing of the SGC frame and pressure ram.

Work is currently being conducted by the Federal Highway Administration to develop an independent angle measuring device. This device will measure the gyration angle within the mold during compaction of HMA. If proven successful, this device will be very beneficial to the HMA industry. Properly calibrated SGCs should provide similar volumetrics.

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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

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
Website: http://www.asce.org/conferences/

Nov 28-30 **SEAUPG Annual Meeting**
Jackson Hilton on County Line Road
Jackson, MS
Contact: Jill Baumgardner E-Mail: SEAUPG@aol.com

Nov 30-Dec 4 **AASHTO Annual Meeting**
Fort Worth, Texas
Website: 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/

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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