North Central Asphalt User/Producer Group

Meeting Minutes of January 19-20,2000 in Kansas City
Airport Hilton Hotel, Kansas City, MO

Moderator: Tom Cackler, Co-Chair , NCAUPG ,Iowa DOT

Introduction

Tom Cackler, Co-Chair of the NCAUPG, Division Director of Product Development for the Iowa DOT called the meeting to order at 1:00PM. This was followed by a welcome by Garry Chegwidden, Division Engineer, Materials from the Missouri DOT. Henry Hungerbeeler, Director, and J. T. Yarnell, Chief Engineer, sent their regrets for not being able to welcome all of you to Missouri. They are participating in the Governor's Conference on Transportation. Garry welcomed everyone to Missouri, home of the RAMS, the Chiefs and to Kansas City. We've got our fingers crossed that you will get to see the RAMS twice more this season and they will end the season as World Champions (Editors note: which they did in grand style).

Missouri is ideally located in the geographic and population center of the United States. St Louis is within 500 miles of one third of the nation's population. We have the sixth largest highway system- 32,000 miles +. We have the second and third largest rail yards. We have two of the most navigable rivers. St. Louis is the nation's second largest inland port. We have two international airports. All of this and other assets add up to an enormous potential.

Missouri is not unique in these issues. So what are "our" needs because of this? We need modern, high-efficiency, high capacity intermodal terminals. We need to provide seamless interchanges between the travel types. Our rails, highways, airports, waterports should all connect to these intermodal terminals. And by doing so, we will connect individuals, rural areas and cities with worldwide transportation.

So what are our problems in Missouri? We rank fifth lowest in the nation – in revenue per mile. Our fuel tax is lower than most states in the Midwest. We have the second highest median household income, when compared to surrounding states, but the second lowest investment/expenditure per mile. States with better systems are investing more. To put it in perspective, Illinois and Kansas just recently passed big new transportation programs. Not to take anything away from Illinois, because I'm sure they need the funding or the public would not have given it to them, but they were spending three times what Missouri was spending prior to this new program. So you can readily see the severity of our problem. And as I understand it, they are now taxing alcohol and tobacco for use for improving the infrastructure (GOOD FOR THEM).

So what are we doing about it? We, MoDOT, have developed a Strategic Plan – Safety is our # 1 Goal. We have reorganized the general headquarters and districts for efficiency. We have hired a chief operating officer and chief financial officer to emphasize the need to operate more like a business; we are looking at how to improve business and operating

processes. We are balancing preservation with construction. One method is the elimination of cold mix by changing to hot mix by contract this year. We value our public partnerships and that is where you and this organization (NCAUPG) can help.

We support the efforts of this group; the workshops, the sharing of knowledge, information and ideas; and the interaction of industry, contractors, suppliers and government.

We support the cooperative efforts of those states that have signed the Agreement to Work for Reciprocity in the Qualifications of Technicians among states in bituminous testing and sampling and invite other states to join us in this effort here in the Midwest.

We also support the North Central Superpave Center and their efforts and help in implementing new development and research, training, sharing new information through newsletters and reports and in just answering questions of those interested in making improvements towards a quality product.

We are glad that you are here. The Agenda looks great. And we hope everyone has the opportunity to share experiences, learn something and have a good time.

Again, thanks for coming to Missouri for this meeting. We are glad to have you.

Sunsetting of Lead States: Dave Andrewski, Indiana DOT, Materials

Just as with SHRP, the Lead State program will end. Following the slashing of FHWA funding under TEA-21, the states, operating jointly through AASHTO, stepped in to continue the important work of moving Superpave into routine practice. It would take 30-45 minutes to explain where all these activities would go under the new scenario. I discovered that Joe Mickes, who will follow my presentation, is prepared to give nearly the same presentation explaining these activities; therefore, in the interest of time, I will defer to Joe the explanation of these activities.

The Lead State was a good program. It got a lot of people together to compare notes on how to improve implementation and solve our problems. We were in the middle of the Lead State Program when TEA-21 changed all the rules. That's where AASHTO stepped in to fund and manage the Superpave development and implementation activities. They came up with a resolution to fund immediate critical research, carry the Lead State program, take over the TRB Superpave committees, ETG's and the TWG's to deal with the Superpave implementation activities. With that, I will give the floor to Joe to explain the TRB Committee on Superpave Implementation.

TRB Committee on Superpave Implementation: Joe Mickes, Consultant, Retired Chief Engineer, Missouri DOT

SHRP and Superpave is a big deal with me. I believe in research, but the greatest weakness has been in implementation of research findings. In 1992, I was Chairman of the TRB SHRP Implementation Committee. The goal was to take the research findings that came out of SHRP and put it to use on the road. SHRP was begun in the early 80's when TRB, AASHTO and FHWA sponsored an NCHRP Study, which recommended a concentrated effort on research needs identified in the early 80's.

As Dave Andrewski mentioned, Tea-21, while increasing funds for highways in general, was hard on research funding. The Federal funds for Superpave implementation were particularly hard hit. In 1991-92 SHRP sunsetted and TRB passed the program for further development and implementation to the FHWA. Initially, this effort was well funded. Technical Working Groups and Expert Task Groups were formed to help with the implementation. The SHRP Implementation Committee, chaired by Joe Mickes, worked on putting the findings into practice, however, this was also sunsetted. Superpave was not fully developed or implemented, therefore, TRB, AASHTO and FHWA came up with a way to continue the needed activities.

In late 1998, the AASHTO Board resolved to support Superpave development and deployment, at least temporarily, with NCHRP funds. AASHTO and FHWA asked TRB to create an oversight or advisory committee to review and advise on what was becoming a joint FHWA/AASHTO program. In essence. TRB was asked to re-create and update the old SHRP Asphalt Advisory Committee. The Lead State Program was one of the best things that AASHTO did. AASHTO wanted to emulate the success of the Lead State program. FHWA had no money and Superpave had a lot of unresolved issues. The implementation was coming along with states increasing their tonnage of Superpave asphalt pavement every year. Among the things still needed is prediction models etc. In 1998 the AASHTO Executive Committee decided to fund the continuation out of NCHRP funds, although this was not an ideal solution.

The National Research Council's (NRC) governing Board approved creation of the TRB Superpave Committee in December 1998 and Dr. Bruce Alberts, Chairman of the NRC and President of the National Academy of Sciences (NAS) approved the committee roster in January 1999. We had our first meeting in February 1999. The committee is part of TRB Special Programs Division along with sister program advisory committees for LTPP, Improved Concrete Pavements and the TRB IDEA Program. The committee makeup has eight from state and local DOT's from Senior Managers and Technical Professionals; three Senior Managers from industry; four prominent Academic Researchers; and six liaison members from AASHTO, FHWA, C-SHRP, NAPA, AI, ARTBA. There is a Superpave Support Group --Staff of FHWA; AASHTO; TRB;

NCHRP to provide active support to the committee which meet frequently and keep all three organizations on the same page.

What does the committee do? It reviews progress of Superpave deployment; advises FHWA and AASHTO on future work; and provides technical advice
On conduct of current activities. In pursuing these tasks the committee seeks answers to three simple questions? What has been accomplished? ; What remains to be done? ; Can we do it better in the future than we have in the past? These questions are not only asked by researchers, but of users, trainers, suppliers and everyone touched by Superpave. Our concern is not the completion of elegant research but the successful deployment of that research.

How does the committee do its work? It holds periodic meetings with FHWA and NCHRP project managers to review progress and assess plans; letter reports of findings and advice to the Federal Highway Administrator and the Executive Director of AASHTO, and liaison with government, industry associations and committees. At every meeting, FHWA and NCHRP project managers review progress and findings with the committee. These are frank and open discussions.

Subsequent to these meetings, the committee develops a letter report transmitting its consensus findings to FHWA and AASHTO. The word consensus is important. Recommendations transmitted in these letter reports are the consensus of the committee. If we a cannot reach consensus, we will organize ad hoc focus groups to gather relevant facts or consult with our expert task groups to reach consensus. The members of the committee want to see the Superpave standards implemented, but they also want to avoid unintended consequences that only delay things.

Our recommendations are subject to NRC review procedures. This is a further check that we have not overstepped our bounds, have been diligent in gathering pour facts and have delivered sound recommendations.

The committee recommended ten research problem statements related to Superpave for FY 2000 NCHRP Work Program and another ten for the FY 200l.

AASHTO is under no obligation to accept the committee's recommendations. The AASHTO Standing Committee on Research can, and does, defer recommended problem statements, adjust funding and make changes to the scope of the work as it considers our recommendations along with all others. Given the chaos caused by TEA-21, everyone seems to be

Knocking on the NCHRP door and SCOR has a difficult task in developing an annual work plan that serves the best interests of the states.

No one committee can gather to itself all of the expertise's it may need to develop the sound recommendations needed. For this reason, our committee has continued the

practice begun by SHRP and continued by FHWA of relying on expert task groups for technical advice.

For special problems we can appoint special groups to explore specific issues. Such as our focus group on moisture damage. The discussions of this group have led to our recent recommendation for a two-pronged attack on this very knotty problem.

We have also developed our own long-range vision of where we think Superpave should be headed. We will share this plan publicly as soon as our most recent letter report is delivered.

Our Expert Task Groups have familiar names and carry on in the SHRP tradition. We have, however, added an emphasis on aggregates to the Mixtures ETG. As the major component of asphalt mixtures, we can soft-pedal aggregates issues no longer. An aggregate subgroup has been created within the Mixture ETG and that subgroup is now at work on the first steps needed to create a Superpave aggregate R&D agenda.

ETG meetings are open to the public and are well attended. Fifty asphalt technicians and researchers attended the most recent Mixture ETG Meeting. The discussions are dynamic.
The Binder ETG is chaired by Cameron Peterson of the Utah DOT and the Mixture and Aggregate ETG by Ronald Sines of the New York State DOT.
If the pace of the Superpave deployment is to be maintained, if the meager resources available are to be optimized and those unintended consequences are to be avoided, the entire asphalt paving community needs to understand Superpave and its progress toward full deployment.
The Committee has adopted as a primary objective for the expansion and expansion of outreach and coordination. We have reached the point where technology transfer must be a principle focus of the development and dep-loyment program. We are actively engaged in communication with the Superpave Centers. Committee members are actively communicating with the Regional Asphalt User/Producer Groups and industry associations. My

Appearance here is in furtherance of this outreach message and I will welcome your suggestions on how to meet this objective for the year 2000.

Superpave Update: John D'Angelo, FHWA

The Superpave System – Where does the Future take us? Where we are today? The 1999 Lead State Survey provides us with a benchmark. By 2000 the survey shows us that the Superpave Binder implementation has been widely accepted. The Superpave Mixture implementation has been accepted by a majority of the states. In 1998, less than 20 projects and 1-20 projects per state were built on the national highway system. Between 1996 and 1999 over 3000 projects or about 50% were Superpave projects.

Are we finished with the implementation of Superpave? The mantra of the Superpave users is "*We still need to address several items within the Superpave System"*. As many an old researcher says, "*We need more research"*. So what are some of the user needs?

- Adopt simple field performance test device
- Improve binder characterization
- Improve RAP use
- Improve asphalt modifier protocols and equipment
- Complete equipment ruggedness testing; *Direct tension; Shear Tester; Indirect Tension Tester*
- Resolve construction tenderness issue
- Refine aggregate standards

Research Needs:

- Continue performance model development
- Investigate mastic concept
- Develop Performance –Related Specifications (PRS) framework
- Find a NEW moisture sensitivity test
- Validate

Superpave Long Range Plan:

- Goal 1. Mix design completed by 2003. Recommended binder type and mixture based on anticipated environment, loading conditions, and layer locations

- Goal 2. Performance predictions available by 2005. Predict the ability of a mix to withstand rutting, fatigue, thermal cracking, and moisture damage through a series of laboratory tests and mechanistic models.

- Goal 3. Integrate the binder and mix requirements into a performance-based quality control system during construction by 2005.

- Goal 4. Superpave to be fully understood by public and private-sector engineers, technicians and contractors through continued training and outreach programs.

- Goal 5. Integrate the Superpave models with a fully mechanistic pavement structural design system by 2008.

The quality control system should produce penalties for non-compliance that relate to performance criteria that are based on true changes in performance.

We have some short term needs that Matt Witzcak and his team that are specific and some which will be resolved right away. This work is being done cooperatively by FHWA and AASHTO through NCHRP.

There will be a new Direct Tension tester. The bending beam rheometer which tests the fracture strength at low temperature will have a revised low temperature specification

which has been recommended to AASHTO. There is a proposed MP1A Specification for modified asphalts that will provide a new way to evaluate these binders. The University of Wisconsin has been doing some testing of accumulated strain under loading, which are fewer tendencies for rutting. The test is blind to the modifier used.

There is a new test for fine aggregate angularity and the voids in the mineral aggregate and a new specific gravity test. The new test will reduce variability by taking out operator error. The new test equipment will measure the temperature and moisture in and the same things as it goes out.
The process will be automated. NCAT is working on this.

We are still working on gyratory comparisons for repeatability of test results. There is a new internal measuring device inside the gyratory compactor to measure the angle and pressure inside the mold. There is load plate inside the mold that will measure how the load is transferred to the specimen.

Some changes recommended by the Lead States are:
- Base mixes reduced Ndesign 1 level
- F/A ratio 0.6 to 1.6
- Flat and elongated particles needs work
- Field aging of mix
- Ninitial on low volume roads is too restrictive
- SMA is part of Superpave

The specifications for roadway densities are the same but the mixes are quite different. Harsher mixes are more difficult to compact while some mixes are tender when attempting compaction right behind the paver. These mixes have contrasting stone skeletons and thereby have different mechanisms during compaction. Roadway densities are affected by the lift thicknesses. It is recommended that the lifts should be 3 to 4 times the nominal maximum size or 2.5 to 3 the maximum size of aggregate.

There is a study underway with the Asphalt Institute on mix tenderness. They believe the major cause of tenderness is moisture with only a minor effect from gradation.

The Superpave System is in place and it does work. There is a great deal of work to fill in the gaps in the system. Work will be continuing to fill these gaps in knowledge. We plan to complete the system by 2005. We will continue to work to develop a better understanding of how to improve the system.

National Perspective Construction Issues: David E. Newcomb, PE, PhD.

Today, I would like to give you a contractor perspective on Superpave implementation. The National Asphalt Pavement Association conducted a survey of contractors

surrounding the implementation of Superpave. We wanted to get a feel for the issues involved with the construction of Superpave projects. Much more needs to be done regarding the uniformity of testing procedures.

The major issues for Superpave implementation noted from the contractor survey were:

- Materials
- Mix Design
- Constructability
- Quality control
- Other types of HMA
- Life cycle costs

Aggregate issues involved adapting Superpave design and specifications from high volume roads to low volume roads and everything in between. We need more aggregate product sizes, especially the intermediate sizes. Should the blend of flat and elongated particles be 5:1 Vs 3:1? We need to understand the variability between the aggregates used for mix design and the real live production through the plant at project startup with real live production materials.

The binder issues must take into account the aggregate used especially if you are concerned about rutting. The internal friction of the aggregate is a contributing factor as well as the characteristics of the asphalt binder. A performance grade binder of and by itself does not tell the whole story.

We need to differentiate between neat and modified asphalts. We need to ask ourselves " How much is a thermal crack worth? How easy are the cracks to maintain? Is it worth routing and sealing? Should you saw and seal a new pavement instead of using Superpave asphalt?" Maybe on a low volume road there is a better solution. We need to look at each project to make an economic comparison based on good research data. (LTPP?) How do we deal with the problem that all PG 64-22's are not equal? How do we determine the mixing and compaction temperatures? What happens when we operate at high operating temperatures? What are you doing to the mix? How about fumes around the operators of the laydown equipment? We need good guidelines on mixing and compaction temperatures on the construction site.

Superpave offers us a grand opportunity to adopt standardized test methodologies. We need a adopt and maintain national test methods and specific criteria which could lead to national certification and training. This will further improve our pavements across the nation if we could just end this proliferation of modification of test methods in this country. There may a need to accommodate local variations in materials and environment, but to the fullest extent possible we need to agree on certain standard test procedures. We may be able to change the test criteria to accommodate local materials and still have specific standard test methods. We need a national training and certification program. The states, FHWA and industry need this if we are to be successful in implementing Superpave at the highest level. We need to do this to make industry

more efficient. We should have a workable multi-state certification system with a minimum of bureaucracy. There are some people who say a national specification and test procedures won't work. Why don't you try to adapt Superpave to your own location? We also need to question how well defined are the criteria for Superpave? If we refine these criteria, what are the consequences?

We need a practical, rapid performance test for field operations.
There are no universally accepted procedures for an end result test for the field. The contractor needs to know during his operations whether or not he is producing an unacceptable or inferior product. About all we can do today is use some kind of rut tester etc. Other tests will evolve, but when will one be ready?

Binder grade bumping depends on traffic volume and speed of traffic. Maybe we need a stiffer binder instead of increasing N gyrations? We need to use caution as we move ahead. Rutting resistance in the mix comes from the cohesion of the binder and the internal friction of the aggregate. Bumping ignores the role of the aggregate. On high volume roads, we should do our homework on the mixture.

There are variations in determining specific gravities of materials. We need a round-robin program for mixture design. Before this can become effective we need to establish standard test methods so that we are comparing apples and apples, not apples and some other kind of fruit.
We need protocols to change molds. We need standards for storing and re-heating specimens. We need to address fines generated when the aggregate moves through the plant. Some contractors are running their aggregates through the plant for their use in making initial mix designs, therefore there are no surprises during real live production.

There are economic and environmental concerns for the use of RAP in our mixes. We need to know the effective specific gravity of the RAP as well as engineering judgement.

Coarse and fine aggregate Superpave are very different. We should consider eliminating the restricted zone. The restricted zone is a gradation test. It is not a measure of stability. This is not necessarily a good test. The fine aggregate angularity and compaction requirements should be enough.
Getting density is a problem on some jobs. The minimum lift thickness should be 3 times the nominal aggregate size. The tender mix zone (140-260 degrees) is a problem. There is no magic recipe. There are guidelines under development. Tenderness is difficult to predict. You need to look at it during the construction process.

Permeability depends on an interconnected void structure. It is related to lift thickness, gradation and the maximum aggregate size. There is a field test being developed to measure.

Quality control is tied up in standardization of test procedures training and certification. Technician certification must include proficiency evaluation. A national program is

needed to provide standards and reciprocity. We also need laboratory accreditation and materials certification. We need contractor mix design, standardized test procedures with specifications set by local experience of what has been successful in the past.

Some other hot mix asphalt types will work also. Stone matrix asphalt has been very successful for high traffic routes and has now been incorporated into Superpave.

All customers do not want or need a coarse mix. There are many successful fine mixes on local and commercial projects that are performing very well. We need to combine what worked in the past successfully and compare that with the Superpave design.

We need one mix design process, We need to use the same set of rules.

Life cycle costs are important, however they require good traffic data and projections. Life cycle costing is another way of saying " How much am I getting for my money" Superpave holds out the promise of longer lasting pavements. We need to apply this increased performance appropriate to its application. We need to ask ourselves" How good is good enough?" We need to account for the increased performance in the life cycle costing application.

Now about the Superpave survey.

Materials and Mix Design:

- Possible change in binder content
- Coarser, cleaner aggregates with less natural sand
- Contractor mix design
- Struggles to get volumetric properties

Plant Operations

- Greater attention to detail
- Higher mix temperatures
- Constant small changes
- Customer relations
- Generally business as usual

Paving Operation:

- Good paving practices are critical
- Handwork more difficult
- Mix may cool more quickly
- No problem with segregation

Compaction:

- More effort for compaction
- Mix thickness sensitivity (roller location, tender zone, etc.)

- Density consistently achieved
- Attention to detail
- Hard, but not impossible

Some of the key challenges we face in the future are:

- Longer lasting pavements
- Maintain coherence between states
- Design appropriate to application
- Fill research gaps
- Use engineering judgement

Superpave reinforces the need for good mix design and construction practices.

In conclusion, Superpave has generally shown positive construction results. The main issues were volumetric properties, compaction and attention to detail.

North Central Superpave Center Update: Becky McDaniel, Technical Director, North Central Superpave Center

Becky McDaniel reviewed the current activities and future plans of the North Central Superpave Center (NCSC) as well as the other centers. She mentioned that all five centers are currently active, although, the South Central Superpave Center has moved from The University of Texas at Austin to Texas A&M in College Station. Jon Epps has retired from the e University of Nevada, Reno (Western Superpave Center) and has been replaced by Pete Sebaaly. NCSC activities continue to be focused on training, communication and research. Over 1000 people, including about 50% from industry, have been trained by the NCSC. We have traveled from New York to Oregon teaching National Highway Institute classes. Regionally, we have participated in the development of standard training materials for hot-mix asphalt to be distributed on CD by FHWA. Research is on going on RAP at the national and regional level and new research is being proposed to industry and the states. Communication through the newsletter, web site and personal presentations continues as a major activity. The NCSC will participate in ruggedness testing of the new binder-testing device. The NCSC Steering Committee set priorities for where they would like to see the NCSC direct its efforts at a summer meeting, guiding the NCSC activities over the next couple of years.

The Steering Committee recommendations are:

- Evaluate new equipment
- Evaluate existing techniques
- Newsletters
- Website
- Regional Study/Investigation
- Lessons learned
- Sharing successes/failures
- Roadway Technician training
- Research in progress
- Specialized testing
- Attendance at appropriate meetings
- Performance measures
- Standardized certification test procedures

Binder Update: Mike Anderson, Asphalt Institute

Mike talked about the NCHRP 9-10 Research Project "Modified Asphalt Binders in Superpave". What, Who, When, Why, four of the Five W's.

What? It is a project to study modified asphalt binders in the Superpave system and is sponsored by AASHTO and TRB.

Who? This is a joint effort of the Asphalt Institute (AI), the National Center for Asphalt Technology and the University of Wisconsin at Madison. This was started in April of 1996, the Principal Investigator (P.I.) is Dr, Hussain Bahia (UW) with Mr. Doug Hansen (NCAT) as a Co-P.I. and Ms. Pamela Turner (AI) as the AI Task Leader. It is a 54-month contract for 1 million dollars.
The project started in April of 1996, which was originally a 30-month contract but was extended to August of 2000.

Why? There was a concern by the states and industry that the AASHTO MP 1 was not properly characterizing modified asphalt binders. They thought the specification could be fooled with inferior products.
The question was: Do all PG 76-22 binders perform the same? The product of NCHRP 9-10 was revised tests and/or specifications changes to better characterize modified asphalt binders.
The research tasks were divided into three phases:

- Phase 1 was a literature search which began in 1997;
- Phase 2 was the asphalt binder testing which started about midway through 1998;
- Phase 3 was the mix validation and testing.

The findings reported from Phase 1 raised several concerns in the agencies; compatibility and separation of modified binders; the rolling thin film oven test; the mixing and

compaction temperatures. Most thought the temperatures were too high especially compared to normal mixes.
The commonly used modifiers are elastomers (SBS,SB,and SBR)-SBS most common (greater than 50%).Others include plastomers (EVA), fibers (cellulose, polyester,polypropylene) and hydrated lime. Modifers were principally used to reduce or eliminate rutting. 90% indicated that modifier use would stay the same (23%) or increase (67%) in the next five years. The problem appears to be that AASHTO MP 1 was based on simplifying assumptions: that simple binders are homogeneous, isotropic, and non-thixotropic. Complex binders are non-homogeneous, anisotropic, strain dependent, and/or thixotropic. They added tests to further identify binders: LAST to measure homogeneity; PAT for isotropic behavior; DRS strain sweep to determine strain dependency; and DSR mechanical working to test thixotrophy.
In Phase 2 they tested 17 different modified binders and 2 base asphalt binders. The question was: Is there a separate specification needed for modified asphalt binders? There are two arguments against a separate specification. They are: It is difficult to define what constitutes a modified binder and if the specification is truly performance related then a separate specification is unnecessary.
The AASHTO modifications were to add a storage stability test (LAST), change the grade to include fatigue temperature (i.e. PF 76+10-22), traffic speed effects on DSR, cooling rate effects on BBR, and a modified RTFO test.
There were also MP 1 screening tests; PAT for the presence of particulate additives; DSR strain sweep for strain dependency; DSR time sweep for mechanical working (thixotropy) effects.
The mix validation phase under task 8 included mix testing to validate binder results using rutting-repeated shear (damage). Fatigue cracking-flexural beam fatigue, thermal crackling-indirect tensile creep/strength and stiffness test from 6 to 52 degrees C. They used 9 asphalt binders, 2 aggregates (limestone, gravel) with 2 gradations.
Task 8 Rutting

Sort by Binder

1B15	3.82%	A	10.7-mm
1B09	4.08%	A	11.4-mm
1B02	5.47%	B	15.3-mm

Sort by Mixture

LF	2.14%	A	6.0-mm
LC	3.34%	B	9.3-mm
GC	4.33%	B	12.1-mm
GF	8.02%	C	22.4-mm

Task 9

Task 9 looked at mixing and compaction temperatures. The research suggests using shear viscosity. They used a minimum of two temperatures and three shear ratios. They prepared a strawman specification for the Binder ETG meeting in Baltimore in September 1998. They also presented this at the Asphalt Institute Meeting in Chicago in February 1999. There was the general feeling that the proposed changes were **not** acceptable.

The impact of NCHRP 9-10 is the incorporation of some tests into ASSHTO PP-26 for Approved Supplier Certification. The users and producers do not want significantly greater testing time. They also ask the question: Are they warranted?

The future research questions are: Are the proposed changes warranted? They should be coordinated with the new DTT procedure. What is the effect on testing time? The research product impact is expected to be testing time:

- LAST, PAT, Strain Sweep, Time Sweep will be a part of the Approved Supplier Certification. Mixing and compaction temperature tests will not significantly increase the time even though they will make additional measurements using different shear rates. The testing time for BBR and DTT will increase testing time, DSR frequency sweep will increase slightly and we don't know about the DSR frequency sweep for fatigue.

There are positive impacts. It separates binders into simple and complex groups. Complex binders require mix testing to characterize. We will have a more complete characterization of asphalt binders. The procedure for the RTFOT has been improved and we will have more realistic mixing and compaction temperatures for modified asphalt binders.

The project completion has been extended to August of 2000. There will be a review of the proposed changes by the Binder ETG that will recommend action to AASHTO.

Report on Technician Workshop: Erv Dukatz, Mathy Construction

Erv Dukatz reported what happened at the one-day Technician Workshop (noon to noon, January 18-19). They had several presentations followed by vigorous discussions from the agency and contractor personnel. The feedback from everyone was good. They talked about what was going in the real world.

The workshop covered a review of the national program, the history of Superpave and where it is going. They talked about the influence of anti-stripping agents on the PG binders, the indirect tension test, and the effect of stiffness on mix performance.

They went over the aggregate quality test for manufactured sand, microDeval, Methylene blue, the fine aggregate specific gravity, and aggregate availability.

They discussed mix design, representative samples, aggregate breakdown through the plant, VMA and the use of SGC. The first mix design represents the starting point for mix production.

Placement of the mix in the field emphasized compaction. They talked about getting meeting more stringent base and subgrade compaction requirements, nuclear density devices, and the tender zone behind the paver with some mix designs and generally how they solved compaction problems.

Quality Control is sometimes ignored or mis-construed. They went over new methods of determining hot mix asphalt bulk and Rice specific gravities. They talked about split samples and correlation studies for QC/QA.

They emphasized the importance of technician training and the need insure that the technicians exhibit their ability to perform the tests so that a quality product is produced, We need certification for quality measurement to achieve that quality product. We need uniform reciprocity of certifications between agencies to maximize the effectiveness of our workforce. Uniform test procedures underlie whether or not the certification and reciprocity can be achieved.

The feedback between the participants was very good. It was very informative even though there was too much old information. The open forum was good. We need more technicians from the contractors and the states. We need to focus on the issues the technicians are concerned about and we need more information on new test equipment. Overall, it was a very successful workshop. (Editor's note: several contractors said they would send more of their technicians to a session next year.)

National Asphalt Research Program:
Prithvi (Ken) Kandhal, P.E., NCAT

Ken Kandhal is not new to the Midwest. He earned his Master's degree from Iowa State University in 1969. Ken discussed the research needs and the research in progress from the National perspective. This includes activities of the National Highway Research Program (NCHRP), the National Center for Asphalt Technology (NCAT), the Federal Highway Administration (FHWA) and the states.

NCHRP Projects

- Project 9-8, *Designing Stone Matrix Asphalt Mixtures*
  Research Agency: NCAT
  - Develop and validate a rational mix design procedure for stone matrix asphalt (SMA)
  - Completed. NCHRP Report 425

The SMA mixture relies on having the proper gradation, stone on stone contact, and the optimum asphalt content.

- Project 9-9, *Refinement of the Superpave Gyratory Compactor*

Research Agency: NCAT

- Recommended revisions to Superpave gyratory compaction procedures
- Completed NCHRP Research Results Digest 237. Recommendations adopted by AASHTO

The revisions included seven traffic levels to four and four temperatures to one. This is a short-term fix. It was recommended to determine air voids at N Design directly and not back calculate from N Max.

- Project 9-9(1), *Verification of Gyration Levels in the Ndesign Table*

Research Agency: Pending (It has now been awarded to NCAT)

- Verify through field evaluations and revise if necessary the current gyration levels for different traffic levels
- Project completion time: 2 years

This project will look at jobs underway to monitor density for different traffic levels. Are the numbers in the revised Ndesign table good numbers or do they need to be revised?

Project 9-10, *Superpave Protocols for Modified Asphalt Binders*
Research Agency: The Asphalt Institute

- Recommend changes to the MP1 asphalt binder specification and supporting test methods to handle modified asphalt binders
- Completion date: October 1999

Project 9-11, *Segregation in Hot Mix Asphalt Pavements*
Research Agency: NCAT

- Develop procedures for defining, locating, and measuring segregation and evaluate its effects on HMA pavement performance.
- Completion date: January 2000 (final report available)

An ROSAN laser system mounted on the bumper of a vehicle takes surface texture measurements. Texture ratios. Segregation classified: none, low, medium, high and their effect on pavement performance.
Infrared thermography can be used to establish temperature segregation during construction.
There will be an AASHTO test method. This will be a significant development.
Project 9-12, *Incorporation of Reclaimed Asphalt Pavement in the Superpave System*
Research Agency: North Central Superpave Center

- Develop a recommended practice and a technician level manual for incorporating RAP into Superpave mix designs
- Completion date: March 2000

They are evaluating binder extraction/recovery procedures and PG binder tests for recovered asphalt selective of virgin asphalt. Also they are developing quality control/quality acceptance procedures during production. This project was started in April of 1997.
Project 9-13, *Evaluation of Moisture Sensitivity Tests*
Research Agency: University of Nevada-Reno

- Confirm the applicability of AASHTO T 283 for moisture sensitivity of Superpave mix designs
- Completion date: August 1999. Suggested revision to AASHTO T 283 submitted to AASHTO subcommittee on materials

This is an attempt to make AASHTO compatible with Superpave systems including short-term aging, sample size (4"ns 6") and the compaction method. The last T 283 was the modified Lottman using the Marshall compaction device. We do need a new test method. NCHRP is planning a project for taking a fresh look at a new test method for stripping.

Project 9-14, *Investigation of the Restricted Zone in the Superpave Gradation Specification*

Research Agency: NCAT

- Determine whether the restricted zone is necessary when FAA and volumetric criteria are met
- Completion date: April 2000

. The question is, is it necessary to define a restricted zone when the FAA and the volumetric criteria are met? They are using 9 different fine aggregates and 2 different coarse aggregate sources. They will look at gradations of aggregate above, below and through the restricted zone and evaluate the mixes for rutting.

Project 9-15, *Quality Characteristics and Test Methods for Use in Performance-Related Specifications of HME Pavements*

Research Agency: Fugro-BRE

- Identify construction-related quality characteristics that affect pavement performance and recommend tests to measure these characteristics in the field
- Completion date: December 2001

This study includes compositional, volumetric, and fundamental engineering properties, which affect the long-term performance of asphalt pavements. This was started in January 1993. What are the effects of these properties on the durability of the pavement and what is their ranking on effectiveness?

Project 9-16, *Relationship Between Superpave Gyratory Compaction Properties and Permanent Deformation of Pavements in Service*

Research Agency: Asphalt Institute

- Determine the relationship between mix properties measurable with the SGC and permanent deformation of pavements in service ("simple performance test")
- Completion date: May 2001

They will look at the densification curve. The study also includes any practical modifications to existing SGC to measure the identified properties. Force or energy imparted to specimens, or measure of shear forces etc. They will try different things to establish some numbers for Superpave nixes; such as. Is the mix weak or tender; what is the slope of the densification curves; is the aggregate skeleton weak or strong? They will measure shear strength etc. This study looks promising and is sorely needed.

Project 9-17, *Accelerated Laboratory Rutting Tests: Asphalt Pavement Analyzer*

Research Agency: NCAT

- Evaluate the *Asphalt Pavement Analyzer* to determine it's suitability as a general method of predicting rutting potential ("simple performance test") and for the use in field QC/QA
- Completion date: August 2001

This is intended to be a proof tester for mix design and in the field. They will use mixtures from ALF, MnRoad and Westrack and make mixes at NCAT. They will try air voids from 4-7% and will compare their mixes with the actual field results from ALF, MnRoad and West Track. They will do field validation with additional test sections. This is a $350,000 study and was started in May 1999.

Project 9-18, *Field Shear Test for Hot-Mix Asphalt*
Research Agency: Pennsylvania State University

- Enhance and refine the field shear test (FST) device for Superpave QC/QA (follow-on to Project 9-7)
- Completion date: December 2001

This study will enhance and refine the mini-shear simple shear tester (SST) to conduct repeated shear at constant height (RSCH) developed in project 9-7. This test will be done at the mix design and the field construction phase.
This is a $200,000 study and was started in June 1999.

Project 9-19, *Superpave Support and Performance Models Management*
Research Agency: University of Maryland

- Develop a simple performance test and materials characterization model for HMA
- Completion date: November 2001

The goal of this study is to develop a simple performance test for rutting and if possible, fatigue, for incorporation in the Superpave Volumetric Mix Design (engineers want a strength test like the Marshall). Will we be able to come up with a test that works in 2000? This study has budgeted for $1,700,000 (previously funded by FHWA) and was started in May 1999.

Project 9-20, *Performance-Related Specifications for Hot-Mix Asphalt Construction*
Research Agency: Nevada Automotive Test Center

- Develop performance-related specifications for HMA pavement construction by examining the effect of mix composition and compaction on performance
- Completion date: January, 2000

This was the West Track study with fine and coarse aggregate gradation with low/high asphalt contents and compacted at 4, 8 and 12% VTM. The study cost $1,500,000 and was started December 1998. They varied the gradations, the asphalt content and the air voids. The aggregate source and the asphalt source were not changed.

National Center for Asphalt Technology Projects:

1. NCAT Test Track

   Permeable base course completed. Binder course being placed. Overall test plan developed by participating states. Test track should be completed by spring 2000. The project has a crushed granite base; 4" of ATPM; 15" HMA binder course (common to all)(3 lifts of 3" each plus 2 lifts of 3" each); followed by 4" thick test sections; Nine

sponsors including FHWA are committed to the project. The test sections will receive 10 million ESAL's in two years. This should start in May.

2. Workability of Hot Mix Asphalt
   Objective: Develop and evaluate a device to measure workability of HMA mixtures. They will be using a torque/blade device suited to establish mixing and compaction temperatures of mixtures with unconventional gradations, modified binders and additives. The rpm of the blade or torque will be a gauge of the workability of the mixtures. They will measure the temperature and torque as the mix is cooling down.

3. HMA Longitudinal Joint Field Study
   Objective: Evaluate the performance of the notched wedge longitudinal joint (Michigan wedge joint) in various states.

Program: Work done in ten states in 1998 and 1999. Data is on the Website.

4. Effect of Dust/Asphalt Ratio and VMA on Rutting Potential of Coarse-Graded Mixes
   Objective: Title is self explanatory, coarse-graded Superpave mixes and SMA mixes will be studied. The final report is due in January 2000. The variables are: the % passing the # 4 on the 50.40,30,and 20 sieve and the % passing the # 200 on the 4, 7 and 10. The binders will be PG 64-22 and PG 76-22(SBS) APA used. High VMA 2% more on the high limit. Increase dust/asphalt ratio from 0.6-1.2 to 0.8-1.5, no premature rutting.

5. Use of Screenings in HMA
   Objective: Determine if screenings can be used to produce HMA with satisfactory performance. They have a surplus of screenings due to more processed aggregates. They plan to use PG 64-22 and PG 76-22; 2 screenings (granite and limestone), (4,5,6%VTM); fiber and no fiber.

6. Miscellaneous Projects:

- Additives to reduce/mask odor in HMA; cherry, pine or vanilla flavor agents can be added in the storage tank or the transport.
- Evaluation of light ends in PG binders.
- Evaluation of CorelockTM for measuring the bulk specific gravity of compacted HMA. This is a vacuum sealing device, which should be better than the current method, especially for open-graded mixes and SMA. A round robin of the test method will be undertaken.

Superpave Center Studies (Pooled Funds)

1. Permeability of Superpave Mixtures
   Objective: Evaluate four field permeability devices and select the best device. Evaluate the in-place air void content at which pavements become excessively permeable. A round-robin study will be undertaken. They will use one device on 5 different HMA pavements using 10 equipment operators.

2. Effect of Flat and Elongated Particles (F&E) on Performance of HMA Mixtures
   Objective: Evaluate the effect of varying percentages of 3:1 F&E particles on rut and fatigue resistance of HMA mixtures. They will recommend the maximum permissible F&E percent using 2 aggregate types (granite and LS). The draft final report is ready.

FHWA Projects

1. Recycling of Asphalt Pavements (Training)
   Research Agency: NCAT
   - Develop a two-day course and conduct 12 workshops.
   - Completion date: May 1999
2. Measuring Bulk Specific Gravity of Fine Aggregates
   Research Agency: NCAT
   - Develop an automated testing device to achieve saturated surface dry (SSD) condition
   - Completion date: April 1999 (work is being continued to evaluate a commercial version of the NCAT SSD Device).

This device uses a rotating drum which circulates warm air through the drum. It measures the temperature of the airstream going in and out of the drum which gives you a temperature gradient. As the temperature gradient reduces and the relative humidity of the outgoing air reduces you reach a SSD condition. You the weigh the material in a SSD condition. The process is completely automated. Commercial versions of this device will be evaluated by NCAT in a few months. The dissemination of this information will be sent to the state DOT's and industry.

3. Binder Field Viscosity
   - Evaluate in-line viscometer for use of HMA plants

4. HMA Technology for Undergraduates
   - Develop a training program for teaching Superpave to undergraduate students. Three levels are needed (1-2 hours, 6-10 hours, and 15-20 hours)
   - Progress: 2 courses completed

Texas DOT

- HMA Performance from Measured Properties- $1 Million(August 2004)
- Evaluation of Superpave Aggregate Specifications- $300,000 (June 2000)

- Evaluation of PG Binders- $385,000 (August 2001)

Other States

- Visit NCAT Website

North Central Asphalt User/Producer Group

www.eng.auburn.edu/center/ncat

Click on “Research in Progress”

Over 50 NCAT research projects can be downloaded at no cost. If you have an article for a newsletter or want to receive the NCAT Newsletter, please contact:

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North Central Asphalt User/Producer Group Day 2 January 29, 2000

Moderator Gaylen Ghylin, Co-Chair NCAUPG

Gaylen is with Commercial Asphalt Co. in the Minneapolis/St Paul area and is Co-chair of the North Central Asphalt User/Producer Group and was the moderator for this morning’s session.

The North Central Asphalt User/Producer Group began as an idea in 1985 and had their first meeting – the Midwest Regional Users Conference on Asphalt Construction in March 1986, almost 14 years ago. And the idea was more uniformity in specification and design/construction procedures in the Midwest region.

A lot has happened in the last 14 years, and the North Central User/producer Group has been a vital part of the progress in this region and nationally.

Our goals have held steady. Our mission is to promote uniform and consistent principles for improved pavement performance through the partnership of industry, transportation agencies and academia (state, local, provincial and federal). And our purpose is to provide a forum to resolve or find solutions to the myriad of issues, concerns facing the asphalt industry,

Our efforts towards Superpave implementation continue. And this is what brings us to the topics for today. – Standardization of test procedures and Superpave construction issues and solutions.

North Central Asphalt User/Producer Group

Standardization of Test Procedures: Ken Archuleta, FHWA

When the North Central Asphalt User/Producer Group was formed in 1991, we had two annual meetings; we are now down to one annual meeting. One of the goals and objectives of the group is to promote the adoption of uniform and standard procedures meeting AASHTO requirements for the implementation of Superpave. . In 1993, Rich Wolters from the Minnesota Asphalt Pavement Association and Gerry Huber from Heritage were a part of the Superpave Technical Working Group (ETG) for Mix Design. The ETG provided national recommendations for AASHTO standards. The NCAUPG wanted to develop these standards for use on a regional basis. In 1995, an NCAUPG task force accepted a report on Test Procedure Standardization for Hot Mix Asphalt. This report summarized and compared the variations in selected test methods for hot mix asphalt. The report provided changes to AASHTO methods to meet Superpave criteria. All states and provinces in the NCAUPG agreed to these procedures. This information was forwarded to the AASHTO Subcommittee on Materials (SCOM) for action. No action was taken.

Since 1994, FHWA in Region 5&7 has held annual workshops that included state highway agencies, industry contractors, trade associations and academia. During these workshops, several decisions or recommendations were made that influenced and encouraged the formation of Regional Training and Certification Programs. It was also determined that to have a technician certification programs and for reciprocity, standard sampling and testing methods and procedures had to be developed.

In 1998, the states in Region 7 (Kansas, Iowa, Nebraska, Missouri) signed a Memorandum of Agreement for Hot Mix Asphalt. The States agreed to use: standard test methods and procedures, a training manual for technician training and certification and the levels of certification. The basis of this agreement was the initial report done by members of the NCAUPG, and the work done by the Midwest Training and Certification Group.

Once there was agreement on what the AASHTO test methods would be used, a task group was formed to develop a training and certification package.With the help of Tom Bryan, Ken Archuleta, Becky McDaniel, Tom Deddens, and others, this program is now completed and is available on CD-ROM. The standard AASHTO sampling and testing methods were rewritten to assist technicians to better understand why tests are run and how to run the tests. In addition to the Hot Mix Asphalt training and certification program, a Soils and Aggregate program is available. A PC Concrete training package is under development.

In September 1999, Tom Cackler, Iowa DOT, as Co-chair of the NCAUPG, wrote a letter to the states and provinces in the North Central Region stating that two specific agenda items of the NCAUPG are the use of standard test methods and reciprocal technician certification programs across the region, and that these two items must be accomplished in that order. He solicited support for the test method standardization and provided the Region 7 four state and a draft NCAUPG agreements.

He also requested a response to the following four questions:

1. Would your state support working towards test method standardization on a regional basis?

2. If you do not support standardization, what barriers do you face that restrict you from supporting this direction?

3. If you do support standardization, what institutional and technical challenges do we face, as a region, that need to be addressed and resolved before test standardization can be implemented in your state?

4. What provisions of the four-state or NCAUPG agreement need to be revised?

Tom Cackler received formal agreement form eight states to adopt the existing memorandum of agreement and revise as necessary to make it acceptable to all states. This will be discussed in a meeting that Iowa is hosting in April with state materials engineers.

Wade Culwell, P.E.: Kansas Asphalt Pavement Association

We are into standardization of testing- Certified technician training on going and adding lab tech training. Also, into certification of laboratories.

Aggregates- specifications

Bulk Specific Gravity results have been difficult to repeat. Solution: all aggregate production sites are assigned a bulk specific gravity for both Procedure I and Procedure II. This levels the playing field for bidding purposes. Also, our partner, KDOT will participate if there is a change in bulk specific gravity after the initial design.

We are actively pursuing changes in the KDOT specifications to improve the quality and prevent early failures (rutting&segregation).

The Association has a specification committee of key contractor personnel and KDOT personnel that meet frequently to overcome problems. This is working very well.

The Association concerns are for the small local units of government and how they adapt to the KDOT changes in specifications due to QC/QA program and Superpave. We are working on this and hope to design with QA/QC and volumetrics, but not necessarily Superpave.

Specifically, we're working on density, permeability, overlays on low-volume roads, and contractor pay (penalties/bonuses).

We expect to be changing specifications to produce a quality hot-mix with longer life and better life cycle costs.

Rodney G. Maag, P.E., Kansas DOT

We are continuing to rapidly implement Superpave. In 1999, we placed 1.5 million tons of Superpave, which was 50% of our total production. In 2000, we plan to be close to 85% of our production. All jobs over 20,000 tons will be Superpave. We still plan for nearly full implementation in 2001.

All Superpave projects have been built under the QC/QA process. This process is new to KDOT and our contractors and most of our problems are related to matching test results. We have found that AASHTO requirements may not be tight enough. Both KDOT and the contractor can be running the tests within test limits and obtaining different numbers.

Examples of Problems and solutions

1. Modified Lottman Test – Contractor obtain slightly over 80% TSR (Passing Results) and KDOT obtain less than 80% TSR (Failing Results).

   Mini study was conducted with one contractor's lab, two KDOT district labs and our central laboratory participating. Results of the study testing limits and procedures tightened. Example: air voids on plugs were 7%+or- 1%. Now, the limits are 7%+or-0.5%. Most of tests involved with Superpave have been tightened.

2. Sampling of the hot mix behind the paver was also contributing to the variable results. The sampling and splitting procedures were written in much greater detail.

3. Split sample comparisons will now be required at the start of the job. During pre-production, the first 200 tons will be obtained and split three ways, Contractor, KDOT field, and KDOT district laboratories test and compare results. During sublots 1 and 2 of lot 1 another three way split will be performed and results compared. Additional split samples will be taken if test comparisons are not acceptable.

Rest of the project, contractors and KDOT samples from behind the paver (roadway) are taken at different times and locations.

Problems that still need to be resolved:

1. Sag gradation mixes, such as SM-19B, are sometimes leaking in water.

2. Aggregate bulk specific gravity differences between contractors and KDOT.

3. Training and re-training personnel.

Jim Campbell, Field Materials Director: Missouri DOT

North Central Asphalt User/Producer Group

Missouri first started out in the 1996 construction season combining both Superpave and QC/QA together, which in hindsight may have not been the best way to go. However, 1996 through 1999 Missouri had 12 pilot projects both with Superpave and QC/QA. In 1999 Missouri had 15 Superpave projects and 39 Superpave projects planned for the 2000 construction season. In the 2000 construction season MoDOT will fully implement QC/QA with percent within limit pay factors for Superpave. Overall, Superpave and QC/QA has worked well in Missouri.

Missouri is not blessed with quality aggregates; therefore, we have a lot of soft limestone's and dolomites. As a result, the Superpave mix gradations in Missouri have always been below the maximum density line. Also "Sweeteners" have been used in our Superpave mixes. Consequently, MoDOT has tried using temperature sensors on rollers to try and give the contractor a better means of watching the density, The jury is still out on this but we will continue to work with the temperature sensors during the 2000 construction season. Also, MoDOT is looking into new methods in quantifying segregation with the use of the nuclear gage and this work will continue into the 2000 construction season.

Missouri has two major test areas where we are evaluating PG binders 64-22, 70-22,76-22 and 28. Currently, MoDOT uses PG 76-22 on all heavy traffic including intersections with stop and go traffic. All Missouri interstates use PG 70-22 with the remaining roadways using PG 64-22.

Missouri requires a test strip for Superpave mixes to pass both the volumetrics and density requirements. Several contractors lay 100 to 200 tons of Superpave on commercial jobs prior to laying any Superpave on a test strip. This is being done by the contractors to give them a better feel if the mix they truly designed will or will not work out in the field and determine what, if any, adjustments they may need to make prior to laying the test strip.

Missouri agrees with several other states that Fine Aggregate Angularity is a must with Superpave mixes. Also, MoDOT and several of our contractors are concerned with the Lottman Test (AASHTO T-283). Similarly to Kansas, MoDOT has reduced the air void content of the specimens from 7%+or -1 percent to 7%+or- 0.5 percent as well as the degree of saturation to 55-65 percent. This has all been done in an attempt to reduce variability of results during the verification process of the Superpave mixtures. Furthermore, since 1995 MoDOT has revised out Superpave requirements 22 times. The Superpave revisions have resulted from AASHTO recommendations and field experiences.

Training has been a major focus with MoDOT. Since 1996, Missouri has been training state inspectors and contractors with Superpave, aggregate training and general materials training. However, Missouri did get a late start with the FHWA mandate for training, but with all the hard work and effort put forth by our employees, we will meet the FHWA deadline. Overall, it will be the people out in the field laboratory's that will hold the key for Superpave.

North Central Asphalt User/Producer Group

Iowa DOT Superpave Experience: Mike Heitzman, Iowa DOT

In 1999, 50% of the HMA placed in Iowa used Superpave Technology. In 2000, Iowa DOT will fully implement Superpave Technology on State projects, with some specific exceptions for small projects and miscellaneous paving operations. Field density problems encountered in previous years were resolved in 1999 through intensive industry training on roller operations and design changes in pavement lift thickness. We are continuing to address gyratory calibration issues between the contractor's QC lab and the State's lab on a project by project basis.

A significant accomplish in 1999 was the development of an implementation plan for applying Superpave technology on low volume routes. A team representing the DOT, industry, and County Engineers identified five actions that need to be taken to successfully implement Superpave on low volume routes. The first action is training. In addition to formal training and certification for mix design and field technicians, we have developed a one-day program to give engineers and managers the basic understanding of Superpave Technology so they can make informed decisions during the design of the project. The second action is mix design. A process is being set up to evaluate currently used Marshall mixes for Superpave gyratory compaction characteristics. We are evaluating mix data from 1999 and 2000 to establish appropriate Superpave mix design criteria for low volume routes. These criteria will allow most currently used mixes to continue to be used. The third action is quality control. The use of a QC/QA program during construction is essential to achieve the desired performance of Superpave asphalt mixtures. For low volume routes the level of QC/QA requirements will be changed (reduced) to reflect the level of risk associated with the route. The fourth and fifth action involves the documentation and reporting of project constructability and cost experiences. The implementation plan targets completion of these items by late 2000 and early 2001. The target date for full implementation of Superpave in Iowa is the construction of 2002.

Superpave 2000: Steve Sorenson, Fred Carlson Co.

The Fred Carlson Co. is a small asphalt producer compared to many of the contractors in this room. We have two portable paving crews and two commercial crews. I am not a Superpave expert, but I would like to share our experiences with Superpave.

We are located in N.E. Iowa and do most of our work in Northern Iowa and Southern Minnesota. All of our Superpave experience has been in Iowa. In the area where we like to work, we are blessed with good quality aggregates.

We have placed 16 different Superpave mixes on nine different jobs in the last five years with a total of 630,000 tons. Of those mixes, 15 were ¾" mixes and 1 was ½" mix.

Some of the similarities of our projects:

- The mixes require more crushed particles than what is specified

- High volume roads with high crushed particle requirements-similar price as Marshall mix.
- Low volume primary and secondary roads with lower crushing requirements –higher price.
- Segregation has not been a problem, we did see some, it requires training for our dumpman and our paver operator.
- We have not experienced a tender zone problem in any of our mixes-all were designed below the restricted zone.
- We have experienced higher roadway voids and find it harder to get density with thinner lifts.
- It takes us longer to do a mix design.
- We find that aggregate consistency in both gradation and quality is very important.
- Management of Quality is the most important element in delivering the best quality product.

Summary of Superpave Projects

- 1995 Hardin County Hwy 175
  This was one of the first projects for Superpave in Iowa. We used a Marshall design by the Iowa DOT with field Marshall control by Fred Carlson Co. The Iowa DOT ran Gyratory and Marshall compactors for comparison studies. The project went very well. The Superpave mixes were more expensive than conventional mix.

- 1996 Howard County HWY 63
  Our forces did the project by Extra Work Order. The gyratory design was done by Iowa DOT with field Marshall control by us. Again, the Iowa DOT ran comparison tests between the gyratory and the Marshall compactors. The 4.0% voids specified were lowered to 3.5%. We adjusted mixes several times due to inconsistent aggregate material. We had segregation and minor rutting at an intersection. Again the Superpave mix was more expensive. This project won a NAPA Quality in Construction Award.

  - 1997 Franklin County HWY 3

  The Fred Carlson Co. did the project by Extra Work Order for the surface mix only. The gyratory design was by the Iowa DOT with field Marshall control by us. Also, Iowa DOT ran comparison test with the gyratory and the Marshall compactors. We had below minimum asphalt content, but the film thickness was O.K. The surface density was 1% lower than the Binder density. This time the Superpave was cheaper than conventional and used aggregates produced by us.

  - 1998 Cerro Gordo County

  This project was let as Superpave. This was the first project where the Fred Carlson Co. owned a gyratory compactor. The mix design and the field control were with the gyratory compactor owned by Fred Carlson Co. The project went ver well. On this

job the Superpave was more expensive than conventional mix. The Fred Carlson Co. again won a NAPA Quality in Construction Award.

- 1998&1999 Franklin County I 35

The Shoulder mix design was Marshall design and the Binder and Surface were Superpave design. The Fred Carlson Co. did the mix design and field control for all mixes. They used a different gyratory compactor in 1999 and got different results. On this project the Superpave mix was cheaper than conventional mix.

- 1999 Fayette County HWY 150

Fred Carlson Co did project by Extra Work Order. This project had one binder lift of 1.5" and a surface lift of 1.5" using ¾" minus aggregate. They used a 50 blow Marshall for both and used 75% crushed particles. Both lifts required 95% density; actual density was 95.5 for both lifts. The mix design and field control was with the gyratory compactor by Fred Carlson Co. It was hard to get density, however the Superpave cost was similar to conventional mix.

- 1999 Worth County Hwy 9

This project had ¾ minus binder with a thickness of 3" and was placed in 2 lifts. The surface was ½" minus with a thickness of 1.5" in one lift. The density required was 95% with an actual density of 96%. Fred Carlson Co. did the mix design and control. There were no problems on the project. Superpave was more expensive than conventional mix.

- 1999 Cerro Gordo County I 35

All aggregates were ¾" minus for the binder, surface and the shoulder. 85%-crushed particles were required for the binder and surface with the actual being 91%. The base and surface for the shoulders required 45% crushed particles, 65% was used. The asphalt was PG 64-22. Fred Carlson Co. did the mix design and field control. The job went very well. The Superpave base was more expensive, but the Superpave Binder and Surface had a price similar to conventional mix. This project won the Asphalt Pavement Association of Iowa Quality Management Award and the National Asphalt Pavement Association Quality in Construction Award.

- 1999 Floyd County Hwy 218

This project is under construction. It has 8" of hot mix asphalt base made up of3/4"minus aggregate with 45% crushed particles required with an actual 65% crushed particle aggregate used in the mix. 95% density was required with an actual 97% density acquired. They used PG 58-28 asphalt. Fred Carlson Co. did the mix design and field control. The project is going well. They will finish the base binder and surface in 2000. The Superpave base was more expensive than conventional base mix on this job.

Similarities we have seen:

- Superpave mixes require more crushed particles

- High volume roads-similar mix price
- Low volume and secondary roads-higher mix price
- Segregation has not been a problem
- We have not experienced a tender zone
- Harder to get density with thin lifts
- Takes longer to do mix design
- Aggregate consistency very important
- Quality Management for Asphalt is the most important element in producing a quality product

Superpave in Nebraska in 1999: Laird Weishahn, NE Dept. of Roads

1999 was a very successful year in NE for design and construction of Superpave mixes. We placed in excess of 1,000,000 tons of Superpave and half of it was a Level 5 mix placed on a number of projects on I-80 across the State. These and the remainder levels of design are performing well and we are starting to be complemented on the mixes now being used.

Rolling patterns is area where we've found that the old ways of doing things may no longer work as well. The biggest difference was with the level 5 mixes that were being placed on jointed plain PCC pavement. The rollers had to stay off the mat between 150 and 250 degrees F. If they did not do this the mix would shove and a bump would result over every joint. Those critical temperatures did very day to day and job to job but after a little work the patterns were figured out.

PG Binders did not cause us any problems until late in the season when a polymer modified binder was being used and no special storing and handling procedures were put in place. During the cooler temperatures and times of low production there was separation of the polymer out of the base binder and the mix was always doing something different during production depending on the time of the day and the separation that had taken place. The suppliers and the hot mix contractor have got to talk to each other as changes come along!

We feel the biggest benefit we are seeing in Superpave is the results of the Fine Aggregate Angularity (FAA) test procedure. In the past we had a very good feel for the volumetric properties of our mixes, but lacked the test method or specification to keep natural aggregates out of our mixes. The FAA test method has brought to our mixes a test method, which better insures that we are getting the angularity we need in our aggregates.

The Qualifying or Certifying of technicians has been something we have worked on for a number of years, both with Marshall designs and now with Superpave designs. During the winter of 1999/2000 we plan on qualifying 48 state and 48 industry technicians in the

proper sampling and testing of the volumetrics of plant produced hot mix. This training and evaluation will fit into the Quality Assurance Program for Construction that is being required by the FHWA to be in place by June 29, 2000. NE has always been pushing for the reciprocity of trained technicians across state borders. If someone wanting to become qualified in NE makes a request we will ask for training certifications and course outlines. If this person's training in the proper design and control was to AASHTO test methods, they will be awarded a qualified status in NE. Not many requests have been made, but ones that have are working out well.

Of Superpave mixes we have found that the contractors almost always submit a 5 aggregate design, sometimes 6. It really allows for their control and when offered a 2% incentive on both single test air voids and the moving average of 4 tests, there is money being spent for incentives and that's so important that NE is willing to reward that contractor that controls properties which help insure success.

Indiana DOT: David Andrewski, INDOT

The Indiana Department of Transportation (INDOT) and the Indiana Hot Mix Asphalt (HMA) industry have a very close working relationship. Ewe routinely sit down and discuss issues and future specifications. Indiana I s extremely fortunate to have this partnership and I believe that it is a result of strong leadership within the HMA industry. Lloyd Bandy, Executive Director of the Asphalt Pavement Association of Indiana does an outstanding job of getting the agency and industry to work toward the common goal of providing the best pavement. One of those meetings to prioritize pending issues occurred last Friday. (See attached meeting agenda).

One of the first things you might notice is that Superpave does not appear anywhere on the list. Indiana's HMA industry has moved past the implementation phase of Superpave as INDOT has been completely Superpave for two years. In fact, the 1998 INDOT Standard Specification Book was published with only Superpave referenced. Recently, the Specifications were updated to include all of the recent AASHTO changes. Gone are all references to Marshall mix design. Superpave is not new to the Indiana HMA industry any more.

These are the issues that face Indiana industry. Gone are the concerns about Superpave implementation. Sure there are a few concerns still on the horizon that may have not been realized in the past or just appear as part of "tweaking" the system. Take foe instance the recent AASHTO changes, specifically the requirement to gyrate pills to Ndes rather than N max. This change alone may obsolete many Superpave mix designs that have been used in the past few years. Our contractors have accepted these changes and are ready to move on to the issues that face us today.

VOLIMETRICS: The industry and INDOT have prepared a volumetric specification to be used on six contracts. These contracts will be controlled on the basis of binder content, air voids, VMA, density, and smoothness. Something new to INDOT of the inclusion of

incentives into these contracts when tighter tolerances are upheld during the production of HMA.

IGNITION OVEN: The ignition ovens were supposed to be the best thing to come along since the advent of sliced bread. I'm here to tell you that is not the case. INDOT went full scale into the use of ignition ovens last year and boy did we have problems. When the dust settled it appeared that most all of the problems occurred on mixes containing dolomites. And in actuality the ignition ovens appeared to give better results than extractions on mixes without dolomitic aggregates. We've been working with NCAT and the major manufacturer in an attempt to solve the "dolomite" problem. At a recent meeting in Baltimore and experiment to control the temperature during burn off was developed. No results are available to date; however, we hold hope that this glitch with the ovens can be overcome, as they appear to give more accurate results with other aggregates.

CONTRACTOR ACCEPTANCE SPRCIFICATIONS: The HMA industry and INDOT developed a specification where we used the contractor's test results for acceptance and payment. A verification process that minimizes department testing assures INDOT of quality material. Data was collected to statistically validate the verification factors. With the system validated, INDOT and industry are looking to implement on all applicable contracts.

WARRANTIES: INDOT and industry developed a warranty specification that was used on high traffic interstates with good results. We have 5 projects over the last three years, with more planned for 2000. Throughout this development process, the industry cooperated fully. It is now the intent of the agency and industry to expand the use of warranties to two lane facilities where traffic maintenance becomes a greater issue.

SMA: As time permits, INDOT and the HMA industry are developing a SMA specification. Industry Representatives and the Indiana FHWA representative visited Maryland DOT to observe the performance of SMA. The input brought back from that meeting point to greater use of SMA in Indiana.

PROBLEM PROJECTS: The investigation of projects that did not meet the expectations was a number one priority of both the agency and INDOT. An investigation team composed of FHWA, industry, and INDOT was formed to look into one particular project where half of the project was performing excellently and the other half experienced stability problems despite being constructed by the same contractor using the same materials.

DENSITY STUDY: A current research project is looking at the density measuring tools and increasing the density of the HMA field densities. The different measuring tools included the Pavement Quality Indicator (PQI gauge) gauge, the nuclear gauge, and the percent of the max of field cores. It was found that moisture and temperature influenced the PQI gauge and the nuclear gauge was only as accurate as a test strip for the mixture

being placed. Although cores are a destructive tool leaving a hole in the pavement, they gave the most accurate results. Currently INDOT uses cores as the measuring technique for field density.

Field experimentation indicates that roller speed, the tender zone, and lift thickness play important roles in attaining proper field densities. What might have been accepted practice in the past doesn't necessarily hold true today. For example, we have found that some mixtures with moisture contents near 0.10% are tender until their surface temperature reaches 120 degrees F. Yesterday, we didn't allow the mat to be compacted below 180 degrees F., today, we have to in order to be outside of the tender zone. We have also found that slowing the vibratory rollers down increases density while decreasing the number of passes required. Typically for a 66-inch roller with approximately 2500 VPM, the optimum forward speed would be about 1 to 1.5 MPH. The amount of material being placed also appears to impact the effort required to achieve field densities. Currently, it appears that lift thickness of 3 or 4 times the maximum particle size is the minimum lift thickness in order that higher field densities can be achieved.

TECHNICIAN CERTIFICATION: Mandated by law, this program is a big concern because we are not ready for it; however, both industry and INDOT continue to work towards its implementation.

SAMPLING PROCEDURE: In Indiana, the contractors are responsible for taking samples of materials in the presence of the Engineer. Recently, it has come to our attention that these samples are not always representative of the material being placed. Careless sampling may be responsible for many price adjustments that the contractor incurs as most times when out of specifications test results are appealed, they are overridden by the appeal tests.

NCAT TEST TRACK: INDOT has funded two sections of the NCAYT test track. We have joined with Alabama DOT and the FHWA to design an experiment that hopefully will develop a quick proof tester to test mixes prior to being placed. The test sections will be correlated to the FHWA ALF, the Georgia Loaded wheel tester, the PURWHEEL, the INDOT's accelerated test facility. the Hamburg, along with the actual loadings at the test facility. Pooling our resources gives the best opportunity that will give us a tool to validate our mixes.

APAI-INDOT PRIORITIZATION MEETING

January 14, 2000

North Central Asphalt User/Producer Group

Purpose: To identify the various pending issues developed through INDOT/APAI committees and/or partnerships to determine the status, and assign a priority to each.

VOLUMETRIC SPECIFICATIONS:
Testing, insertion into contracts

IGNITION OVEN:
Update of "study"
Future

CONTRACTOR ACCEPTANCE SPECFICATIONS:
Revisions
Applicable to all contracts

WARRANTIES:
Future use

SMA:
Specification development
Study plan

"PROBLEM PROJECTS"
Number and locations
Identify causes and develop cures

DENSITY STUDY
Final Report

TECHNICIAN ACCREDITATION
What, when, applicable to whom

PROPER SAMPLING PROCEDURE AND MAINTENANCE OF SAMPLES

NCAT TEST TRACK

JOINT COMMITTEES TO ADDRESS TECHNICAL ISSUES

North Central Asphalt User/Producer Group

Introduction of New Co-Chair Tom Cackler. Iowa DOT

Tom Cackler, Iowa DOT is passing the baton to **Wayne Teten. Wayne Teten, Deputy Director of Operations for the Nebraska Department of Roads**. He will be the new Co-chair representing the agency side of the NCAUPG.

Meeting Adjourned at Noon Thursday

Appendix

- NCAUPG Annual Meeting Agenda
- NCAUPG Management Committee Minutes and Agenda
- TRB Superpave Committee Slide Presentation
- TRB Superpave Committee Letter Report 15DEC99
- TRB Superpave Committee Membership
- Superpave Future Directions Slide Presentation FHWA
- Contractor Perspective on Superpave Implementation NAPA
- North Central Superpave Letter and Slide Presentation
- National Asphalt Research Program Slide Presentation NCAT
- Modified Asphalt Binders in Superpave AI
- Summary of Technician 2000 Workshop Mathy
- Superpave 2000 Fred Carlson Co.

If there are any additions or corrections to these minutes, please contact Dick Ingberg, Secretary of the NCAUPG at 651-429-2955.