FHWA Binder Expert Task Group Meeting
May 8th & 9th, 2006
Denver, CO

The Binder Expert Task Group (ETG) was convened on May 8th and 9th by Binder ETG Chairman Gaylon Baumgardner, with Paragon Technical Service, Inc., and Binder ETG Co-Chairman Raymond Robertson of the Western Research Institute (WRI). Those members of the Binder ETG attending were:

Gaylon Baumgardner, Paragon Technical Service, Inc. (Chairman)
Raymond Robertson, WRI (Co-Chairman)
John D'Angelo (Secretary), Federal Highway Administration (FHWA)

Chris Abadie, Louisiana Transportation Research Center/Louisiana Department of Transportation (DOT)
David Anderson, Penn State University
David R. Jones, Turnbull Asphalt (A Division of Owens Corning)
Gayle King, GHK, Inc.
Bruce Morgenstern, Wyoming DOT
Ioan I. Negulesque, Louisiana State University
Gerald Reinke, Mathy Construction

Not in Attendance
Jim Barnat, SemMaterials, L.P.
Mark S. Buncher, Asphalt Institute (Binder ETG Liaison)
Edward Harrigan, Transportation Research Board (Binder ETG Liaison)
Darren G. Hazlett, Texas DOT
Mihai Marsteanu, University of Minnesota
Bob McGinnes, Holly Asphalt Company
David E. Newcomb, National Asphalt Pavement Association (Binder ETG Liaison)
Eileen C. Sheehy, Bureau of Materials
Dean Weitzel, Nevada DOT
Ludo Zanzotto, University of Calgary

Those "friends of the Binder ETG" attending were:

Imad Al-Qadi, University of Illinois at Urbana-Champaign
Terry Arnold, FHWA-Turner Fairbank Highway Research Center (TFHRC)
Ernie Bastian, FHWA-TFHRC
Gabriel Bazi, PRI Asphalt Technologies
Satish Belagutti, FHWA-TFHRC
John Casola, Malvern
Matthew Corrigan, FHWA
Raj Dongré, FHWA-TFHRC
Frank Fee, Citgo

Andrew Hanz, University of Wisconsin–Madison
Tom Harman, FHWA
Mike Harnsberger, WRI
Rick Holmgreen, Conoco Phillips
Shin-Che Huang, WRI
Doug Jennings, Chevron Asphalt
Ken Thomas, WRI
Eric Kalbever, WRI
Richard Kim, North Carolina State University
Dave Klen, BP Products NA
Bob Kluttz, Kraton Polymers
Jenelle Lewis, Citgo
Richard W. May, SemMaterials, L.P.
Troy Pauli, WRI
Claire Petersen, Consultant (WRI–Retired)
Mark Pooler, WRI
Olga Puzic, Exxon Mobil
Cheryl Richter, FHWA
Henry Romagosa, SemMaterials
Steve Salmans, WRI
Tom Scarpas, TU Delft
Scott Smith, WRI
Bob Statz, Consultant
Fred Turner, WRI
Pamela Turner, National Center for Asphalt Technology
Linbing Wang, Virginia Tech

DAY 1

Welcome and Introductions—D'Angelo (FHWA)
Secretary John D'Angelo welcomed the group and introduced the chairs.

Reformation of the ETG and Scope—Baumgardner (Paragon)
Chair Gaylon Baumgardner indicated that it was difficult selecting members because of the surplus of good candidates. Selection criteria of members included being willing to work, being able to attend meetings, bringing knowledge to meetings, and having a diverse assembly of industry, research, and state professionals. Baumgardner recognized new members and attendees, called for self-introductions, and stated the scope of the Binder ETG:

The intent of the ETG is to facilitate the discussions by the overall industry on current and planned research in the area of asphalt binder characterization. The ETG shall be a forum for the exchange of ideas on what research and technology are needed to provide basic knowledge of how binders affect pavement performance and will provide their ideas on the applicability of research and possible future direction for the planned and

current research. The ETG will provide ideas on how research should be moved forward into application in standard practice. The ETG will provide their ideas on the need for standards and test procedures for asphalt binders to improve the overall performance of asphalt pavements.

A draft agenda was distributed and reviewed.

Action Item from 7/5/2005 Meeting
LTPP Bind V 3.1, High Temperature Task Group, Fatigue Task Group, and FHWA Acid Study—D'Angelo (FHWA)

Secretary John D'Angelo spoke about the reformation of the ETGs with the new authorization. He stated that the Expert Task Group meeting will continue to operate but with a different emphasis:

1. ETG will be focusing on asphalt program in general, not specifically geared towards SHRP implementation and concentrate on future asphalt research.
2. ETG will continue to address the issues from the previous ETGs such as LTPP Bind V 3.1, High Temperature, Fatigue issues and FHWA acid study.

The ETG had recommended that LTPP bind version 3.1 be accepted and forwarded to AASHTO as a new procedure to evaluate the asphalt binder grade. The LTPP Bind Version 3.1 is available for download at www.ltppbind.com. Some bugs have been worked out from Version 3.0 to Version 3.1. An update will be given on the High temperature task group. Because of the short notice of the meeting, many key members of the Fatigue Task Groups were unable to attend the ETG meeting or to even send along any materials. An update will be given reporting exactly where we stand with the FHWA Acid Study.

High Temperature Task Group—D'Angelo (FHWA) and Reinke (Mathy Construction)

High Temperature Binder Criteria—D'Angelo (FHWA)
Secretary John D'Angelo provided an overview on high temperature binder criteria.

The existing Superpave binder specification does not capture the true performance characteristics of polymers at high temperature. HTTG is trying to develop a new high temperature criterion that can be related to performance. In the current specifications G* and phase angle are measured in the linear range. For viscous materials the material response is linear even under high stress and strain levels, where as for the polymer networks the response is non linear. He pointed out that, in order to address the mixture failure accurately the non-linear binder properties of the binder have to be evaluated. Creep and recovery tests have been used to describe binder properties during the SHRP research and were continued under NCHRP 9-10 project. The same approach is being

used to capture the non-linear response to determine the criteria. Creep and recovery testing of the binder at different stress levels is needed to describe binder properties in the non-linear range. Creep and recovery test at multiple stress levels on one sample can be used to describe the stress dependency of asphalt binder and the non-recoverable compliance of the binder describes the stress dependency of the binder. The new multiple stress creep recovery testing involves the running creep and recovery test at 1s loading and 9s unloading for 10 cycles at each stress levels with no rest periods. Eight stress levels considered are 25, 50, 100, 200, 400, 800, 1600 and 3200 Pa. The non-recoverable compliance is determined by dividing the average non-recovered strain by the initial stress at a specific stress level. Most of the MSCR testing is being conducted at the FHWA-Office of Pavement Technology asphalt binder testing laboratory. Several asphalt binders have been evaluated to-date. He presented the comparison of non recoverable compliance versus the rutting from different studies which showed good correlation. However more asphalt binders will be evaluated with various modification systems to finalize the test procedure. The asphalt binder results were also compared against the mix testing to determine the relationship of rate of change of compliance to mix performance. The comparisons of ALF binder data and Mix rutting data showed good correlation with an exception of couple of binders which were considered outliers. The data from old I-55 Mississippi project also showed good correlation.

He briefly discussed the modeling of creep and recovery curves. Burger model was used to model the creep and/or recover portion of the curve which showed that even at low stress levels the asphalt binder are not linear and emphasizing that the creep and recovery tests capture the non-linear behavior of asphalt binders at high temperature.

Other topics discussed include the multiple stress creep recovery testing on mix slivers. Mix slivers specimens of dimension 12mmx10mmx70mm cut from gyratory pills are used to run the creep and recovery (1sec load and 9 sec recovery) in the dynamic shear rheometer similar to asphalt binder creep and recovery testing. He showed the preliminary test results of mix sliver testing conducted at multiple stress levels and at individual stress levels. The compliance from the preliminary multi-step sliver tests showed hardening which is most likely due to increased aggregate contact. He concluded saying that more testing needs to be conducted to evaluate that effect. There was a discussion on repeatability of the mix sliver testing. Gerry suggested using 5 test specimens and considering the average of three specimens leaving high and low out.

Binder Rheology and Rutting Study: Phase 3—Reinke (Mathy Construction)

Gerry Reinke presented results from Phase 3 of the Binder Rheology and Rutting study. Phase 1 & 2 test results were presented at the previous ETG meetings. The objective of this study was to obtain Rheological characteristics of the binders that strongly correlate to the rutting behavior of the mixtures in the Hamburg Wheel tracking test. Phase 3 study included the following:

1. Nine binders (includes un-modified, modified, and acid modified binders)

2. Three mix levels (E-1 Fine Blend, E-10 Fine Blend, E-10 Coarse Blend)
3. Three rutting load levels at different temperatures using dry Hamburg
4. Binder tests: PG Grade, Frequency Sweep testing, Multiple Stress Creep Recovery and stress sweeps
5. Gyratory Specimens prepared at 4% and 7% air voids and sliced to run DSR creep testing at 68000 Pa at 3 different temperatures, frequency sweep testing to measure complex modulus.

He reported the test results of completed testing to-date. The remaining testing is expected to take a few more months.

Reinke presented the comparisons of Hamburg Rut depth versus the binder non-recoverable compliance at 15000 Pa stress level for E-1 fine, E-10 fine and E-10 coarse mixes which showed good correlation capturing both the effects of asphalt binder and mixture. The non-recoverable compliance increased with coarseness of the mix however maintaining the same level rut resistance. Stress sweeps were conducted to determine the stress at which the viscosity drops to 70% of linear range of viscosity. The effects of stress levels with the temperature were evaluated to show the stress dependency of both un-modified and modified binders. A new factor was developed in this study that best describes the stress dependency of asphalt binders and mixtures which is a combination of stress and viscosity. This factor is obtained as follows:

SVF = Eta* @10 Hz x Stress at which Eta* = 70% of Eta* at 400 Pa/10^6

The comparisons of Rut depth vs. stress viscosity factor (SVF) of the three mixes showed very good correlation. The finer mix had the higher SVF factor and the coarser mix had the lower SVF at 8 mm rut depth level which clearly differentiated the mixes. He suggested the SVF is a good indicator in evaluating rut resistance for mixtures. Multiple stress creep recovery test on slivers showed that, there hardly any recovery at very high stress levels which supported the data showed by John D'Angelo. Lastly he showed the impact of rutting at different load levels for E-1 fine, E-10 fine and E-10 Coarse mixes. It was found that there is approximately 1 PG grade change by temperature for 25 percent change in rutting load. This holds true for different mixes and polymer modified materials. There were several discussions as to whether the structure of the polymer is destroyed at higher stress levels. Reinke reported that at certain stress level depending on the binder the structure indeed will be destroyed

The next step is to complete the remaining testing of the phase 3 study. John D'Angelo suggested that more binders and mixes have to be evaluated with the actual performance data. Also need to evaluate the creep and recovery of mix slivers in the DSR to see if the responses are similar to that of asphalt binders.

High Temperature Task Group: Development of Standard Practice for Superpave® Plus Specifications—D'Angelo (FHWA)

John D'Angelo (FHWA) presented the proposed Development of AASHTO/ASTM Standard Practice for Superpave Plus Specifications. Following were the main reasons that lead to the development of Superpave Plus specifications:

1. The existing specifications do not identify the performance characteristics of the performance
2. The existing specifications do not have a criteria for fatigue and durability
3. Agencies look to other tests to identify modifiers

The purpose of this practice is to provide users with an alternative to the empirical Superpave Plus tests such as Elastic recovery, forced ductility, and Toughness & Tenacity to identify modifiers. The approach in developing the AASHTO/ASTM standard practice for Superpave plus specifications is to use existing DSR equipment to develop a criterion that allows the users to identify the modifiers in the asphalt binder systems. The DSR approach is to run the multiple stress creep recovery testing at two stress levels (100 Pa and 3200 Pa) for 10 cycles per stress level on RTFO aged material at high PG temperature and determine the percent strain recovery of the binders. This test can be run on the same sample after the RTFOT grading with a rest period of 1 minute. Several asphalt binders were evaluated to look at the percent strain recovery. John presented the test results on several binders both modified and unmodified showing how the percent recovery changed from a low stress level of 100 Pa to a high stress level of 3200 Pa. The difference in percent recovery between the low stress and high stress showed how sensitive the formulation of asphalt binders is to stress. He recommended the following two criteria's that will identify the modifiers in asphalt binders:

1. The percent recovery at 3200 Pa should be a minimum of 15 percent
2. The difference in percent recovery between 100 Pa and 3200 Pa should not be greater than 50 percent.

However, additional analysis of the available percent strain recovery test data is required to finalize the above limits. John reported that the coefficient of variation of percent recovery from a multiple laboratory round robin conducted by the South West User producer group was found to be 3 percent. In summary he said that, the DSR MSCR percent strain recovery criterion can replace the Forced Ductility (FD), Elastic Recovery(ER) and Toughness & Tenacity (T&T) tests. Future steps will be 1) to analyze available MSCR percent recovered strain data to finalize creep stress level and test protocol and 2) show relationships with existing ER, FD, and T&T data. Discussions continued after his presentation. The issues were related to the limits of the SHRP Plus criteria, test equipment issues and high temperature criteria. John recommended conducting more analysis to finalize the limits.

Action: The criteria limits will be finalized after the analyzing the available data. John D'Angelo will submit proposed test procedure to AASHTO for approval. The finalized test protocol and criteria will be presented at the next meeting.

FHWA Acid Study – Terry Arnold (FHWA)

Terry Arnold (FHWA-TFHRC) presented an update on the FHWA study, Phosphoric Acid Modification of Asphalt Binders. Acid modification has been shown to be a low cost way to increase the high temperature stiffness of asphalt binders. Currently there are no guidelines for State agencies on how acid modification of asphalt binders should be used. A detailed study will be conducted by FHWA to evaluate various aspects of acid modification.

This study includes

1. 4 SHRP asphalt binders (AAD-1, AAK-1, AAM-1 & ABM-1)
2. Five grades of phosphoric acid: 115% Polyphosphoric acid, 105% Superphosphoric acid, 85% Orthophosphoric acid, 75% Orthophosphoric acid, 50% Green Acid
3. 3 addition levels: 0.25%, 0.5% and 1.0% were used as additives.

The stiffness of the four asphalt binders was evaluated at 24 hrs after modification at 165c at 1.0% addition level. It was found that the AAK had the highest increase in stiffness and stiffness on ABM was unchanged. Arnold also reported the preliminary results on PAV aging; solvent separation; the effect of water on asphalt BBR beams, gyratory cores, and mastics; pH meters; and addressed the ways in which moisture absorption by asphalt is measured. The following proposed work plan will be continued and presented at the next meeting:

The proposed work plan included:

1. Forensic method of determining the type and level of phosphate additive
2. Durability of acid modification - Effect of environment: actinic light, water, etc.
3. Address corrosion and handling issues
4. Optimization of acid modification
    a. Chemical / mechanistic considerations
    b. Different Asphalts
    c. Physical Properties

Fatigue Task Group Report—Dongré (FHWA-TFHRC)

Raj Dongre *(FHWA)* gave a progress report on the Surrogate Fatigue test for binders using the DTT. The ultimate goal of this study is to develop a surrogate test or criterion to specify binder's fatigue resistance based on the DT testing. The research approach is based on the Visco Elastic Plastic Continuum Damage (VEPCD) concepts developed for hot-mix fatigue characterization by Richard Kim. Evaluation includes conducting DT testing on asphalt binders from the California Fatigue study for which the laboratory performance data is available. Finally the binder DT strains will be compared with the number of cycles to failure (N_f) of asphalt mixture. Dongré briefly explained the concepts of damage analysis, damage components, and the definition of damage.

The experimental plan includes:

1. Fatigue Life Data on 9 asphalt binders, 1 mix design, 2 strain levels, three temperatures
2. DTT testing on the 9 CA binders – 3 strain rates, 3 temperatures
3. Relaxation Modulus master curves on the 9 CA binders – from the Frequency sweep 0.1-100 rad/s at 11 temperatures

The visco-elastic strain, visco-plastic strain and reserve strain limits were determined on three asphalt binders. He briefly explained how the visco-plastic strain (ε_{vp}) is determined and the tests that were conducted to measure the required parameters. Raj showed the comparison of measured visco-plastic strain versus predicted visco-plastic strain which has very good agreement. Analysis of reserve strain and hot mix conducted on three asphalt binders was presented. It was found that binder with more reserve strain before failure will have the higher fatigue life based on the results of three asphalt binders. The goal is to compute the reserve strain from G*/sinδ or MSCR testing and DTT testing to predict the fatigue life without having to run additional testing. The next steps are to

1. Finish analyzing all 9 Binders
2. Establish Correlation between Hot-Mix and Binder Reserve Strain
3. Try to Estimate Binder Reserve Strain from Other Binder Properties
4. New test may not be required.

Dave Anderson expressed concerns about the three point bending beam data that was used to correlate the reserve strain to predict the fatigue life. Raj reported that this is a starting point and it looks promising. Analysis of the remaining binders will be completed and presented at the next meeting. No action was taken.

Action: continue evaluation

FHWA ALF (Accelerated Loading Facility) Experiment—Harman (FHWA)

Tom Harman provided a history of the Superpave® implementation, discussed ongoing refinement challenges, provided the background and status of ALF, and provided an outline of future meetings for the Consortium of Accelerated Performance Testers (CAPT). Other issues discussed included the four types of test sites used for ALF testing, rutting test sites and fatigue test data, the mechanistic–empirical design guide, stress testing, and ALF products. Harman indicated that the intent of the experiment is to determine how the Specific Pavement Study (SPS) ranks, and that within a pavement structure, selecting the right confinement is going to rank the material.

Verification Study: Short-Term Aging with SAFT
Status Report on NCHRP 9-36—David Anderson (Consultant)

Dr. Dave Anderson provided a status report on NCHRP 9-36. The project objective is to develop an improved method for the short-term laboratory aging of asphalt binders. He reported that the research has produced many "unexpected twists and turns." The stirred air flow test (SAFT) was chosen for further study because of its ability to be extended to

long-term aging. The SAFT was compared with the rolling thin-film oven test (RTFOT) to determine binder aging, and the RTFOT was compared with the modified German rolling flask test (MGRF) to study viscosity effects (there was an implication that MGRF may have a no viscosity effect). It has yet to be determined whether the SAFT or the MGRF is a better tool for determining aging. Dr. Anderson reported that water, not many volatiles, is coming off of the volatile collection system. A discussion ensued, and Dr. Anderson assured the group that water is not going into the system, that it is being generated, and that there's no way to distinguish where in the system the water is being generated. As yet, there are no definitive conclusions that can be made on the basis of the studies conducted. Final analysis is expected to be completed within the next three months and will be presented to the NCHRP panel. Definitive conclusions will be made at that time. Meanwhile the possible scenarios for the short term aging are to:

1. Abandon SAFT for MGRF
2. Continue with RTFOT
3. or Do more work on SAFT.

DAY 2

Chairman Baumgardner again welcomed the group and indicated some changes to the agenda for the day.

Olga Puzic (Exxon Mobil) opened the day with a brief and entertaining presentation about the professional elegancy of engineering by use of math equations.

Gerry Reinke addressed questions that were brought up the day before in regard to the interrelationship between viscosity and stress and the repeatability of running the test over again in the Binder Rheology and Rutting Study. Reinke reported that if you take the stress test to a point where it drops off and before the data becomes very erratic, and you leave it at rest for a half hour, from the test's beginning, you get exactly the same data. As a result, there's a degrading of the binder temporarily, which is recoverable. Reinke also reported that there are good relationships between stress value and rut depth but different values of the curves relating the two variables. Even if a curve was fitted, there would still be independent curves for each of the materials. There's an impact of stress and an impact of viscosity. When the two are combined, there is a fairly consistent line, which impacts rutting values as a result.

Development of a Strategic National Plan— Tom Harman (FHWA)

Tom Harman briefed the ETG on the working group meeting of the development of a National Asphalt Pavement Roadmap. The focus of the group was to come up with vision statement and to find a way to layout strategic roadmaps. The vision statement that was developed was presented as follows:

> *Vision*: Develop and deliver improved asphalt pavement technologies that provide the public with safe, long-lasting, smooth pavements. These innovations will

advance the nation's mobility and economic security while minimizing user inconvenience and environmental impacts.

Harman indicated that a clear plan will get results and that roadmapping involves partnership and a common shared vision. Harman discussed the Strategic National Plan for Asphalt Pavement Technology and the various constituents of this plan. The Strategic National Plan Timeline is an aggressive one, and Harman hopes to have a document to share within a year.

D'Angelo indicated that the vision statement was not impacting enough and that it should be more specific. There are four areas addressed in the vision statement, but only one area deals with pavement performance. As a result, the pavement performance emphasis is at risk of getting lost. Gayle King (GHK, Inc.) indicated that asset management and pavement preservation should be captured in the vision statement. There was discussion regarding how DOTs do not have the capacity to adopt this program because they are too managerial. Discussion continued about training the entire industry so that all agencies are more open to such programs.

ACTION: Reinke suggested that Harman provide an e-mail outline to all experts for their review and input. Baumgardner supported Reinke's suggestion and indicated that the second iteration of the National Asphalt Pavement Roadmap will be given more time at the next ETG meeting.

WRI CONSORTIUM

Secretary D'Angelo introduced the WRI consortium. He indicated that in the past ETGs most of the efforts were geared towards SHRP implementation. The new ETGs will be focusing on asphalt research and the outstanding issues. As part of this WRI and the consortium managed by WRI has begun a major research program. Members of the ETG concluded that, it will be ideal for this group to be involved in this research effort and the project activities, critique and provide suggestions or comments. He mentioned that the WRI consortium activities will be included as a major part of the ETGs going forward.

Flexible Pavements Consortium—Harnsberger (WRI)

Mike Harnsberger presented on the need to develop new materials and test methods based on sound fundamental science, not empirical testing, in response to increasing highway demands. Harnsberger showed that in regard to research funding by industry, only 8% of net sales are spent on research and development for highway systems. Harnsberger identified research needs and spoke of how a consortium of multi-disciplinary members with key contacts has been assembled to address these needs.

Two key areas of SAFETEA-LU (Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users) funding were presented: Section 5204 (Training and Education) and Section 5513 (Research Grants). Flexible pavements research was divided into two separate contracts: Fundamental Properties and Flexible Pavements. Research and work elements have been established and assigned for research by the different consortium members. Harnsberger spoke about the research scope, which involves how fundamental science can be put into practice, and provided examples of fundamental research that has evolved into instruments more useful to the industry. Harnsberger indicated that information should flow between the various organizations and that work presented to the consortium will be presented to the ETGs.

There was discussion that there has to be coordination and a focus among all ETGs. There was further talk about how Congress wants to see the consumer relation in any kind of user or producer work.

Moisture Damage: Binder ETG—Pauli (WRI)

Troy Pauli presented on the need for research in regard to moisture effects on binder adhesion and cohesion and touched on a variety of topics (e.g., work of adhesion on the basis of surface energy, polyphosphoric acid [PPA] in asphalt and mixes, nitrogen-containing polymers, aging and moisture susceptibility, microorganism influences on performance, aging influence on adhesive strength, and moisture effects), as part of the WRI consortium presentation on future research initiatives. Pauli spoke of how recent work has identified two procedures by which to measure the surface energy of a binder or asphalt and the aggregate and of how to predict the performance of pavement in the presence of moisture by measuring surface energies of component asphalts and aggregates and then calculating both dry and wet bond strengths.

There was a discussion on the need for new technology in this area to be practical, applicable to the whole industry, cost effective, simple to apply, and straight-forward. Mike Harnsberger noted that asphalts are not going to get better, they're going to get worse and that there is a need to understand how asphalts work ("The more we know, the better we're going to be.")

Asphalt and Fatigue Behavior— Dr. Dallas Little (TTI)

Dallas Little presented on methods that can be used to analyze fatigue. He opened with four fatigue hypotheses and the different issues associated with these hypotheses. He then carried the hypotheses to research objectives, focusing on the mix and the mastic and the binder. Little indicated that dynamic mechanical analysis (DMA) is a good, quick, and reliable system to evaluate the fatigue life of wet and dry systems and the impact of healing and moisture damage. DMA can predict and evaluate healing potential, can quantify moisture, and can predict the life cycle of the mastic. Little informed the group that calculating the dry bond strength between the asphalt and the aggregate gives an excellent indicator of moisture damage and is a fair predictor of fatigue life. The Paris Fracture Law for Viscoelastic Materials is a key method for understanding fatigue

behavior, the DSR can be used to identify the crack propogation potential within the binder itself, and adhesive and cohesive bond strengths can determine fatigue behavior. Little informed the group that the properties of the aggregate itself will influence stress distribution and expressed the need to develop component selection and binder guidelines for perpetual pavements.

High Performance Materials—Bonaquist (Advanced Asphalt Testing, Inc.)

Ray Bonaquist presented for Dr. Hussain Bahia (University of Wisconsin–Madison) on high performance materials. Bonaquist presented an overview on developing projects and described the details associated with these projects. The first project is the Vehicle–Pavement Interaction Model, which emphasizes that a material cannot be designed if there is no knowledge about the critical stresses and strains to which the material will be exposed. Bonaquist stated that evaluating the behavior of the pavement can help determine a design guide. From this, an Integrated Model can be formed, in which the question is asked from a design perspective, Are the stresses and strains that would be used in characterization reasonable? The ultimate goal is to incorporate this into a type of framework that would be similar to a mechanistic–empirical design model, which would be enhanced to include design loading.

The second project is the Model for Mechanical Behavior of Asphalt Mixtures. The Texas Transportation Institute (TTI) has developed this model that accounts for how an asphalt mixture responds with respect to asphalt concrete. The main issue is to implement the model in some empirical form to solve realistic pavement design problems and to develop some experimental programs to calibrate model parameters.

The third project identified is the Micro-Mechanics for Modified Mastic Systems. The concept behind this model is that there is perhaps some interaction occurring between the binder and aggregate and the mastic, and this interaction could predict stiffening properties in mixtures for modified modeling systems. This type of model would be used to design higher and better-performing materials.

The fourth project is the Damage Resistance Modeling of Binders. These procedures are going to be more demanding and more difficult. Bahia will try to simplify these procedures, which will allow them to be used in some type of purchase specification. The fifth project was a Comparison of Modification Techniques in which the effectiveness of the various modification techniques will be evaluated. This is a very global look at modified systems. The sixth project is a Binder Selection for High Load, Low Speed Applications. The application with this project is to, for example, adapt PG binder specifications for pavements at intersections, airports, marine ports, multimodal facilities—areas where there is much stress due to the machines used in these areas—in an effort to select the right binder for use in these areas.

The seventh project is the Critically Designed HMA Mixtures, the focus of which is to characterize the mixture to determine what application is really the maximum amount of application that should be exposed. The idea here is to identify the critical condition and

look at the factors that influence it in an effort to improve the critical condition. The eighth project is Thermal Cracking Resistant HMA Mixes for Intermountain States to address the severe thermal cracking in these regional areas, and the ninth project is the Design of Fatigue and Rut Resistant Mixtures, which addresses how to design mixtures to have enhanced resistance. This extends work on models that have been developed to address composition, rutting, and fatigue. These models were developed from a specific database, and the idea is to expand these models to incorporate a much broader database.

There was discussion about the Comparison of Modification Techniques, with the suggestion that guidelines be developed in regard to modified materials. Concern was expressed regarding how this project addresses the issue of recycled asphalt. Harnsbeger noted that this would fall into the blending asphalt areas.

Technology Development—Bonaquist (Advanced Asphalt Testing, Inc.)

Ray Bonaquist posed the question, How can new things move from fundamental research to practice? Bonaquist stated that the idea of this research is to refine selected research products that are developed during the study into tools that can be used by the profession. Bonaquist presented on the specific work elements in the area of technology development.

R&D Validation—Savali (University of Nevada—Reno)

Peter Sabali presented an introduction to research and development validation and presented on those topics specific to the Binder ETG (these topics are colored red on the slide "R&D Validation"). Savali discussed the technology transfer of the information gained in these areas and informed the group that there are training courses forecasted at the University of Nevada–Reno in January or February of 2007.

There was a question about the reality of producing all of the work that was addressed in the presentation. The answer was that other contractors may be engaged and the scope of time may be lengthened. There was discussion about ETG meetings being part of the peer-review process and about showcasing the work that's been done at other conferences beyond the ETG meetings. The information presented at the Binder ETG meeting should be reviewed by all, and feedback should be provided.

ETG Meeting Wrap-Up

D'Angelo suggested that the next ETG meeting be scheduled for the last week of September (26th); however, many individuals will be in Edmonton that week. There was a suggestion that one week be chosen in each of the fall months (September, October, and November) in an effort to include all participating ETG members who may not currently be present. ETG members can then collaborate and coordinate about which week works best. The week of October 30th was suggested, no weeks were suggested for the month of November, and the week of December 11 was suggested.

Action Items—Baumgardner

1. The High Temperature Task Group will focus on trying to make some progress. If an individual needs help from other areas, let the ETG know so that the work can move forward.
2. Fatigue Task Group: Hussain Bahia will continue this work, which ties into the WRI Consortium.
3. Acid Study at FHWA: A decision needs to be made on whether the MGRF or the SAFT test is the best device. This decision will determine where "we need to go from there."
4. John D'Angelo will move the Multi-Stress Creep Recovery Test Method to AASHTO so that it can be available for use as an accepted test method.
5. Hussain Bahia is asked to bring a presentation or comment to the next ETG meeting to address the differences between DTT strength and cohesive strength.

Discussion

1. Marketing Task Force—Baumgardner

Baumgardner suggested a move to develop a marketing task force within the ETG that can address the following:

- Identify the products and determine whether they are products or services.
- Identify the customer.
- How do we put this into practice?
- How do we fund it?

Baumgardner suggested the following volunteers: Gayle King, Chris Abadie, Dave Jones, Gerald Reinke, and Mike Harnsberger. Baumgardner provided the example of Dr. Dave Anderson's work with aging, specifically in determining whether the MGRF or the SAFT Test is the best device to use in his work. This decision ultimately needs to move forward, and with the current state of practice, it could be 3 years before anyone starts using either one of the devices.

2. Recycled Asphalt Pavements (RAP) Consortium—D'Angelo

D'Angelo spoke of the push for a consortium on recycled asphalt pavements. What's going on in the real world? With the economic/political situation being what it is, a bigger effort needs to be placed on how to get good performance out of recycled materials. There is a need for a deeper understanding of how RAP blends in regard to fatigue and durability. This issue will be placed on the agenda for the next meeting. Ray Robertson was asked to present his work in this area at the next meeting. Ray Robertson will be involved or will be asked for guidance.

Baumgardner asked attendees to ensure that his or her name and contact information was recorded on the sign-up sheet. An e-mail will be sent so that attendees will receive a file transfer for access to meeting minutes.

END OF SESSION

The next meeting is scheduled for Washington, DC September 27 & 28. Detailed information will follow.

For the coming meeting in September please provide any comments on the proposed Consortium research program to the secretary John D'Angelo before the meeting.