Minutes and Q&A Day 1 ALF Webinar on August 16, 2010

**Aug 2010 ALF 1 opening.pptx**

German Claros (presenters): There is a lot of echo can you get close the microphone.

**Aug 2010 ALF 2 problem statement.pptx**

**Aug 2010 ALF Key Findings & Reccomend.pptx**

German Claros (presenters): What happens with the HWT testing data?

German Claros (presenters): HWT was a good indicator on the NCAT last experiment.

This will be presented on Day 2 “Aug 2010 ALF 7 Rank Mixture Perf Test.pptx”; wheel tracking by either Hamburg or French Rut tester were weaker tests to discriminate rutting – for this ALF study

**Aug 2010 ALF 3 exp design.pptx**

Ted Flannigan: Comments on the terminal blended crumb rubber asphalt used in Lane 5.

Pointed out that CR-TB is a hybrid of tire crumb rubber ground to pass the solubility requirement plus SBS polymer

FDOT: How were the variations in air voids and thickness etc. considered in your findings?

This is presented later this day in “Aug 2010 ALF 5 MEPDG analysis.pptx”, changes in the rank order of the predicted rutting and fatigue were assessed when three different analyses were considered: As Built where MEPDG inputs were faithful to HMA thickness and HMA density (via dynamic modulus Level 1) and localized FWD back calculation moduli, As Designed where HMA thickness was fixed at exactly 100mm or 150mm and dynamic modulus were all lab fabricated to fixed 7% air voids and single fixed average value for Base and Subgrade, and As-Built HMA with Average Unbound Stiffness.

German Claros (presenters): What were the modulus values for the subgrade and granular base? Did you do strain calculations?

Average FWD back calculated moduli of the base and subgrade were 82 MPa and 77 MPa respectively. The low stiffness of the acknowledged and HMA tensile strains were measured and evaluated using layered elastic models; if typical expected moduli of crushed stone base (30 ksi = 207 MPa) were used the strains would be even more under predicted.

German Claros (presenters): Why did you use different load levels for rutting and fatigue?

It is very easy to induce rutting and initially all fatigue and rutting was going to occur at 10,000 pound wheel load and 100 psi inflation. Exploratory shake-down ALF fatigue testing under these conditions indicated this may take a very long time to achieve fatigue cracking, thus the load and inflation pressure were increased to 16,000 lb and 120 psi.

FDOT: How could you get cracking at 10,000 passes? What was the asphalt type? There has to be something fundamentally wrong with the mix to crack that early?

The point is acknowledged, but there are several facts to consider. The lanes which cracked very fast were unmodified asphalt; an unmodified control and an air blown which the materials were selected by design to be not fatigue resistant while the modified binders did very well, the wheel load levels were large (10,000 pounds on a single wheel). Also, 100 mm (4-inch) thickness HMA has been anecdotally identified as worst case scenario for susceptibility to fatigue cracking in that thicker HMA reduces strain levels and fatigue cracking while thinner HMA can also offer fatigue cracking advantages – this was in between.

German Claros (presenters): But overloading is not realistic

FDOT: were all the sections built at the same time? If so, what was the time difference between the first and last section testing?

The report and companion database CD outlines the construction times (June to November 2002) and testing dates. Rutting was faster and completed first for both thicknesses (began between June 2003 to December 2003 and ended between June 2003 and January 2004). Thinner 100 mm fatigue cracking was completed next (began between Feb 2004 to December 2005). Thicker 150 mm fatigue cracking was then completed generally after the thinner 100 mm lanes (i.e. lane 12 started March 2005 but was tested on and off up to July 2006).

Frank Fee: This is not lime rock base. (Limerock base in Florida can be very stiff)

German Claros (presenters): Since you used different loads you should use ESALs.

**Aug 2010 ALF 4 ALF performance.pptx**

German Claros (presenters): You also need to take in consideration that aging will increase modulus (when the PSPA data are analyzed).

See the slide in presentation “Aug 2010 ALF 4 ALF performance.pptx” that raised this point from German. We used differences in PSPA tests on loaded and unloaded sections measured at the same point in time to determine whether lane 11 or lane 12 receive more or less damage because no surface cracking or cracking in cores were observed. Thus aging is not a factor since the PSPA tests were conducted at the same time.

Ota Vacin: Why there is a difference in Terpolymer between 150 mm Lane 12 and 100 Lane 6?

Discussed later on in Presentation “Aug 2010 ALF 4 ALF performance.pptx” and section in final report that illustrates why the anomalous rutting was observe in lane 6; combination of density and gradation variation

German Claros (presenters): did you do CT of the cores to substantiate the claim of higher voids?

No. We did not, but used x-ray CT to confirm cracks were bottom up.

German Claros (presenters): Air void distribution in depth has a lot of influence on cracking

**BREAK…**

**Aug 2010 ALF 5 MEPDG analysis.pptx**

FDOT: Why would you want a soft base by design when the study is focused on the asphalt layer?

To ensure distress is achieved quicker; to avoid an overly stiff base that would take longer to induce fatigue cracking. Anecdotally we have heard the historical base under the ALF was selected and designed for its relative softness. We need to confirm this is true or a result of the base with this amount of fines (9.4%) weakening over time or simply a characteristic of this particular crushed stone base (Virginia 21-A/B). We have also seen in an NCAT report they have observed softer base than subgrade being by FWD back calculation.

German Claros (presenters): Which lanes represent this? (plot of predicted vs. measured strain) There are groups of data.

Yes there are groups of data. The data points on the measured and predicted strain graph are for all thicknesses and lanes where the thicker lanes have the smaller strains (group) and the thinner lanes have the larger strain (group). The exception being 150 mm Lane 9 SBS 64-40 which was the softest and exhibited strain magnitudes similar to the 100 mm lanes

FDOT: I would agree with your assessment for cracking but not for rutting.

Comment was on a softer base to achieve distress quickly. Good point; rutting in asphalt would still be induced with a very stiff crushed stone base.

German Claros (presenters): This strain data was affected by temperature?

The measured strains were taken at controlled 19 C.

German Claros (presenters): Explain the table. Where is the observed data? (table of ranking for rutting).

The table is shown on slide 10 after the strain graph. There are no measure data; this was to explore expected sensitivity to perturbations in stiffness and

FDOT: How confident are you with these ranking, considering the MEPDG is still being refined?

The confidence lies in the MEPDG’s ability to show changes in performance for small perturbations in stiffness and thickness where these conditions were well represented in the LTPP data used in the national calibration. We will show later there is less confidence in the magnitude of predicted distress; this is what is being refined in the MEPDG. But the many data points in the LTPP database used for MEPGD calibration contained many different thicknesses and base stiffness so it should be very capable to show changes in trends.

German Claros (presenters): We need to compare to observed data to see if the simulation is okay or not.

Indeed. This will be done on Day 2 in presentation “Aug 2010 ALF 7 Rank Mixture Perf Test.pptx”

German Claros (presenters): The data show no trends. They seem to be horizontal for each thickness. (plot of MEPDG predicted cracking vs. measured cracking).

Indeed. The MEPDG has weaknesses to capture performance of polymer modified binders. Not a criticism of MEPG because the calibration did not contain a robust number of modified asphalt data points.

German Claros (presenters): It seems to be too much emphasis to compare to the MEPDG. Why is that?

Understood. The primary objective laid out for the pooled fund experiment was to identify better binder tests. However, there were secondary objectives in the pooled fund work plan that were to be fulfilled; evaluation of AMPT (SPT) and evaluation of the MEPDG and case study for FWD back calculation

German Claros (presenters): This project was done to look at the Superpave spec for modified asphalts. We may want to do that first.

Understood. We get to this on day 2.

**Aug 2010 ALF 6 Ranking Approach.pptx**

German Claros (presenters): The CR-AZ was placed only 5 cm because the normal thickness that we use.

German Claros (presenters): Show the data on this indicator.

All the different components of the composite score are shown in tables assessing the ranking on Day 2 in Aug 2010 ALF 7 Rank Mixture Perf Test.pptx and Aug 2010 ALF 8 Rank Binder Perf Test.pptx

**Q&A**

Eileen Sheehy (privately): I can't download the files.

Hal Panabaker 2 (privately): I was downloading but the window disappeared.

Minutes and Q&A Day 2 ALF Webinar on August 17, 2010

**Q&A**

Jim Sherwood: Were the variations in air voids in Lanes 6 Terpolymer and 12 Terpolymer due to reconstruction?

No. Due to less compaction in the top lift and variation in gradation. Better compaction overcomes the variation in gradation.

**Aug 2010 ALF 7 Rank Mixture Perf Test.pptx**

Sean Li: Why was the field core E\* lower while the field core’s air void was lower?

This effect is documented in the literature (and report with citations) that field compaction creates softer material than gyratory compacted specimens; in this case the increased density does not overcome the effect of compaction

Ted Flannigan: (In the plot of permanent strain from Flow Number vs. different mixes) Some samples have more variations than others. What does that mean?

Understood. The coefficient of variation for flow number (large strain) test is larger but still acceptable than coefficient of variation for dynamic modulus (small strain). Sensitivity has been quantified by NCHRP 9-29. Also, every so often a test results can be out even when a lot of care goes into the specimen preparation.

Jim Sherwood: It may be good to show variations for ALF rutting from 7 measurements.

Report and slides from yesterday show error bars standard deviation of rutting. Database contains additional data.

Xicheng Qi: Are the total rutting or only AC layer rutting in the figure of predicted rutting vs. measured rutting?

AC only rutting from 50% reliability

Jim Sherwood: why the indirect strength has small variation?

It has been discussed in the community that direct tension would provide more differences between materials and that the IDT test tends to show less difference possibly in part due to the localized failure that occurs directly under the “knives” of the loading heads.

Frank fee: Are you allowing for the reduced frequency of loading underneath the ALF?

The wheel speed of the ALF is 11 mi/hr and the effective frequency in the MEPG was between 18Hz and 3.1 Hz depending on depth and stiffness. When the predicted HMA tensile strain was determined at intermediate 19C temperatures using either 10 Hz or 0.1 Hz, the ranking and trends in predicted strains did not change. This is why the raking of the binder with mix uses both 10 Hz and 0.1 Hz

Road Science: What test protocol was used for the overlay test?

Tests were conducted by Texas Transportation Institute; see TRB paper. The standard protocol temperature is 25 C and the standard protocol opening and closing displacement is 0.025 inches. The ALF mixtures were tested at 19C (same as ALF) and the opening and closing displacement was 0.48 mm (0.019 mm)

German Claros: 0.025 inches.

**BREAK…**

German Claros: Why you did not continue the testing to get cracking on the 150 mm sections?

Nelson Gibson: Good question - we estimated it would require a very large amount of passes (an time) and the aging conditions would have been different from other data points by the time that was done.

Nelson Gibson: This is where we decided to explore accelerated aging.

Nelson Gibson: Accelerated aging would double our data points (require solvent extraction).

Nelson Gibson: We completed accelerated aging and loading of the thinner ALF sections and well on our way through the solvent extraction and binder characterization. The benefit of accelerated aging is we get cracking faster and once aged time is less sensitive.

German Claros: Nelson: I was not able to copy the PP files yesterday. Can you put them up so we can download?

Nelson Gibson: Certainly - can you see them now. It is called a File Share Pod.

German Claros (presenters): This includes the ones for yesterday?

Florida DOT: We came in late - did you cover the accelerated aging earlier? How was this accomplished?

Nelson Gibson: The slides in the File Share pod are the ones from yesterday and today. I gave them better names.

German Claros (presenters): Okay thanks.

Nelson Gibson: We did not cover accelerated aging yesterday or today. I did not want to take away from the main content, but I will bring that up in the discussion section.

**Aug 2010 ALF 8 Rank Binder Perf Test.pptx**

German Claros (presenters): What happen with the CR-AZ binder?

CR-AZ binder had its High and Intermediate PG temperature estimated by technique developed by Shenoy (see report) without having to use RTFO and PAV aging.

German Claros (presenters): The best test (Calculated Critical Tip Opening Displacement CTOD) is also related to viscosity.

I disagree because the double edged notched tension (DENT) for CTOD testing mobilizes the polymer network and then goes even further by failing and destroying the polymer network by tearing the binder across the notches; ductile fracture . This phenomenon does not occur in ‘gentle’ viscosity testing; i.e. capillary tubes. To calculate CTOD one must calculate total work of fracture, essential work of fracture and plastic work of fracture. This separates what energy goes into tearing or ductile fracturing the material and what goes into plastic yielding. Plastic yielding, plastic work of fracture may share more in common with viscosity, but not essential work of fracture and CTOD

Adrian Andriescu: comments on CTOD test method. The material property measured from CTOD is a strain tolerance in the presence of a crack

German Claros (presenters): What is the temperature of testing? (Binder tests from Ontario field test sections used to further find strengths in CTOD)

The Ontario binders were tested at 25C - the standard temperature called for in the Ontario test method - while the ALF binders were tested at 19C – the temperature of ALF fatigue

German Claros (presenters): How about the OT? Axial fatigue was used to compare binder test strengths

The strengths of the Overlay Tester are acknowledged. We chose the axial fatigue testing because we felt it has greater implement-ability because it can be conducted in the AMPT and provides a mechanistic failure law material property; number of cycles to failure under certain strain and temperature conditions which the OT does not provide (at the moment)

German Claros (presenters): We need to look into the OT tests since it can get cracking parameters and implemented into pavement structure to predict fatigue performance.

Acknowledged that Texas DOT is pursuing this

Frank fee 2: Need to recognize that these results are based on the conditions at the ALF (e.g. slow speed, continuous high temp, artificial 'aging').

Acknowledged

Frank fee 2: How about comparing with full scale test tracks?

Yes. This has been a long sought after experiment that would need a great deal of coordinated time and effort.

**Aug 2010 ALF 8 Rank Binder Perf Test.pptx**

**Aug 2010 ALF Key Findings & Reccomend.pptx**

**Aug 2010 ALF Next Stakeholder Input.pptx**

Frank fee 2: I'm not getting the 'file share'.

German Claros (presenters): I downloaded and see the file share.

German Claros (presenters): So what is next?