

Minutes for QIC Structural Design/Materials Selection Task Group January 18, 2005

Present: Pat Turpen, Jim Huddleston, Cole Mullis, Liz Hunt and Jim Lundy.

Our initial discussion focused on specifying target air voids by layer at the design stage. Knowing that mix type, layer thickness, oil type and other material choices impact pavement performance, how do we incorporate our desired end properties into the design and contract?

A key variable in the field will be minimum compactive effort required to get target air voids. Mike Remily has a database documenting different compactive efforts used. If we choose the mix design and minimum field targets correctly the effort issue will take care of itself. That is a contractor will still have to work to get the minimum density required in the spec.

We discussed thinner versus thicker overlays. We could possibly change the overlay performance with binder selection. Caution is needed when picking the binder for thin overlays. If you “bump” a grade to a PG70 in thin overlays some loss of flexibility may occur, and the stiffer binder may not be sufficient to offset the loss with reduced deflection.

New work sections allow us to design pavement layers that are more durable and resist fatigue. We discussed the impacts of loading and layer location (wearing surface versus base course) on overall pavement performance. Different sections of the mat will experience different stresses and strains. This would be different too for a dense mix versus an open graded mix.

Rehabilitation work includes consideration of reflective cracking. Considerations for design include layer thickness and binder type. We possibly could provide general guidelines for design. For now, we should be looking at how best to track binder type versus performance for all projects. PMS and/or LIMS?

During the discussion about depth of rutting, Jim Huddleston noted that NCAT, WESTrack and MNRoad have dug trenches to identify rutting zones. He stated that the rutting is primarily confined to the top 2” +/- and that no secondary compaction can be expected below 4”. A few days later, Jim looked up the results of the NCAT report with the following findings:

I downloaded the NCAT rutting report from their website. Conclusion number 3 states “most of the rutting observed from trench cuts of rutted pavements occurred in the top 3-4 inches of the HMA. Hence, high quality mixtures should be required in the top two layers.” I think we can assume that with c-mixes and 2 inch lifts that a conservative approach would be to designate the top 4 inches as the “rut zone” and utilize normal surface mix design criteria. Below that level we could specify lower air voids in both the mix design and the field per our discussions. If you want to view the reports go the following link. <http://www.eng.auburn.edu/center/ncat/>. The report is 92-5.

You could argue that 2 inches is enough in most cases because the mixes we are designing with PG binders and bumping are much more rut resistant than those in the NCAT study. In fact our proposed higher asphalt/lower void mixes with the stiffer PG binders are very probably more rut resistant than the mixes in the study. Plus we can measure rut resistance with the APA.

Proper Design of Bases

We identified five action items/questions to answer in order to develop a proper design for bases.

1. Identify the field air void target for base layers. $V_a=5\%$ (Average)
2. What are shear zones—depth of concern for permanent deformation for open and dense mixes? Cole to check NCHRP Report; Jim Huddleston to poll experts.
 - Mix Design Group: What is target field density if lab V_a target is 3%? Now a target V_a of 4% results in an average field density of 93.3%.
3. If we want 95% compaction in the field, and maintain minimum compactive effort, what is the minimum spec density based on current std deviations and maximum pay factor.? What does the normal distribution for field densities look like? Jim Lundy
4. Do we need different VMA requirements for bases to allow for changes in V_a ? What is the downside to loosening VMA requirements? Jim Huddleston
5. With two tanks allowed on a project, what is the best selection for the base? Can we drop the cold side of the binder grade in the base? At what depth can we drop it? Liz and Cole to check LTPP Bind.

Jim Huddleston will talk with the mix design group to discuss the issue of designing mixes by geographic zones for ultimate durability. Also, he will talk with them about establishing mix design criteria adjustments without change in compactive effort.

See attached table for issues list.

Our next meeting is February 22nd at 1:00 PM at APAO.

QIC Task Group Worksheet

Issue/Problem	Timeframe (immediate solution?)	Tasks needed to understand/solve problem. By whom?	Implementation (change process? change spec?) By whom?	Deliverable (revised spec? training? other?) By whom?
Matching target air voids per desired performance for a variety of applications.	Yes	Can modify pavement designs (mix design level)	<ul style="list-style-type: none"> • Initially from Pavement Designs. • Requires change in mix design process/acceptance. 	
Fine tune relationship between target to mix design to construction.		<ul style="list-style-type: none"> • 		
Implement lift thickness changes.	Yes	Change pavement design; modify ODOT Pavement Design Guide.		
How to allow contractor to achieve smoothness?		<ul style="list-style-type: none"> • Consider min. lifts and leveling materials. • Input from contractors—what can you do and not do? • Consider profile of pavement. • Identify proper aggregate mix size. • Admin. Barriers include the additional time to two lifts. 	Change in Pavement Services Unit Pavement Design approach.	
Need to improve density and reduce permeability for dense graded mixes.	Yes	Review NCHRP Report #531—Mike (1/18: 4X Nom. Max. Agg. Size)	Provide information to pavement designers; construction offices; contractors.-- Mike	None—assign individuals to make sure information is relayed. -- Mike
Void targets based on environment: <ul style="list-style-type: none"> • Mountain passes 		<ul style="list-style-type: none"> • Ask the question: Are we comfortable with mix levels? • Review NCATs work on test 	Change mix design process at the start. Ndesign=100 for all and then do field	

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<ul style="list-style-type: none"> • Decrease voids to increase durability (sand, plowing) • Specialized applications • 1/18: Need to get voids that are not interconnected. 		<p>track.</p> <ul style="list-style-type: none"> • Need Mix design group to look at one mix design (starting point). Set min void target for each layer. • 1/18: Liz to identify geographic zones that are chain up areas. (Done—see handout from Karen Morrison). 	adjustments.	
Stiffer Binders		<ul style="list-style-type: none"> • Review LTPP Degree Days • What is appropriate AC grade? • 58's vs 64 ok? • Determine if stiffer binder will increase fatigue cracking: • Stiffer binders will reduce strains on thicker applications; thinner sections could be a problem with fatigue. 		