Comments to Florida Department of Transportation
Pavement Type Selection Process

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COMMENTS:
To the "Summary of Issues and Department's Position"

Comments to "FDOT Summary of Issues and Department's Position":

Issue #6 - When validated for FDOT materials, use MEPDG for preparing equivalent pavement design alternatives.

As correctly stated, there is an issue with the values used for the coefficient of thermal expansion (COTE) for concrete. However, the issue is not a fatal issue and it should not slow FDOT's efforts on adopting MEPDG. The error associated with the COTE value is a systematic error or shift due to using the wrong calibration coefficients for the COTE of the reference materials in the standard test procedure. That is, in the calibration of the MEPDG, all COTE values were calibrated to a reference material with an assumed COTE value of 17.3 microstrain/°C when they should have been using the actual measure COTE value of the reference material.

The net result is that there is a systematic shift (all values shifted equally) between the values obtained using AASHTO TP-336 Standard and the values used to calibrate MEPDG. To adjust for that systematic shift, FDOT needs to add to the COTE values they calculate with AASHTO TP-336 test method the difference between their machine's reference material and the assumed 17.3 microstrain/°C reference used in calibrating MEPDG.[1]

In FDOT's Report "Draft Summary of CTE Measurement Results for Pavement Cores and FHWA Samples" by Dale DeFord and Charles Ishee, May 19, 2010, the reported COTE value of the FDOT reference material is 16.1 microstrain /°C. As such, to correct any COTE value that FDOT calculates for use in the current version of MEPDG (MEPDG Ver 1.1), FDOT needs to add 17.3 – 16.1 = 1.2 microstrain /°C to their calculated COTE value. Converting this to °F to be used in the MEPDG, the addition is 0.667 microstrain /°F.

Example:

Calculated COTE Value per AASHTO TP-336	= 7.53 microstrain /°C
Converting COTE Value to °F	= 4.18 microstrain /°F
Addition to account for Systematic Shift	Add 0.667 microstrain /°F
Final COTE Value to use in MEPDG	= 4.85 microstrain /°F

[1] Phone conversation with Gary Crawford, FHWA

Issue #14 - Require OGFC on PCC.

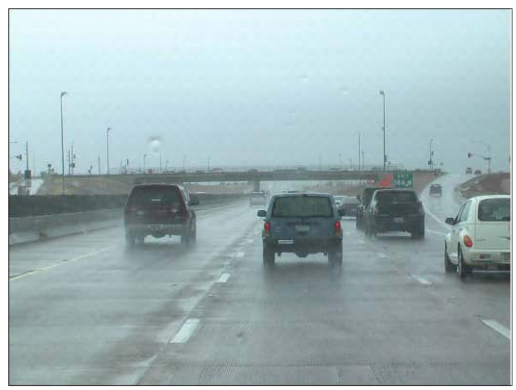
The Department's response is they are "*reviewing projects in the next two fiscal years to find a candidate concrete project to test the addition of a bonded open graded friction course.*"

Our industry's question is "what is the problem that is trying to be solved?" The asphalt industry states that OGFC is good for noise reduction and splash and spray. While we agree that an OGFC does do that, we also have procedures, such as diamond grinding, longitudinal grooving and/or an NGCS (Next Generation of Concrete Surface) to achieve the similar results that last longer and cost less.

For example, the pictures below show the splash and spray difference between two pavements in Phoenix AZ during a rainstorm on March 11, 2006. One is Asphalt Rubber Friction Course (ARFC) that is approximately 5 years old. The second is longitudinally grooved concrete pavement. The pavements are on the same stretch US 60 and the pictures were taking within 5 minutes of each other. As can be seen, the splash and spray is considerably less for the longitudinally grooved concrete pavement.

ARFC - US 60 EB, Phoenix AZ

Longitudinally Grooved PCCP - US 60 EB, Phoenix AZ



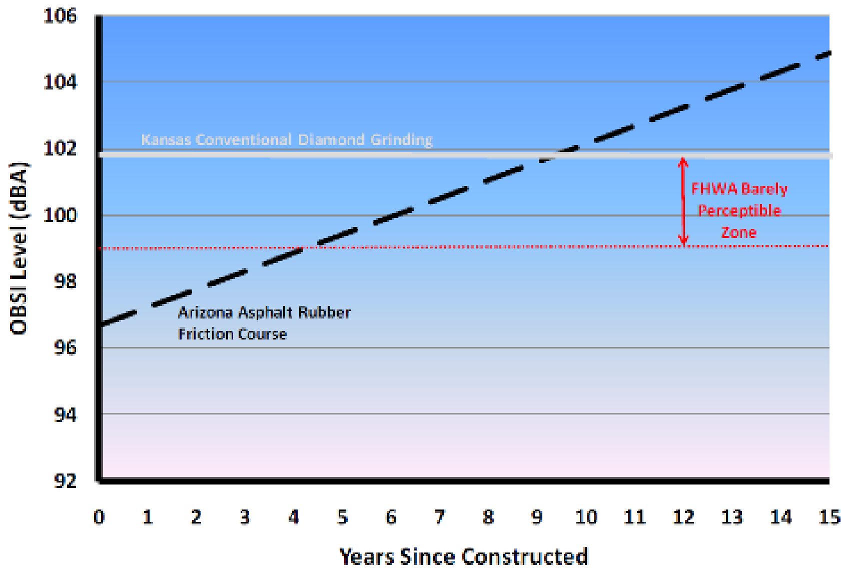
With respect to noise, we do agree that OGFC can be very quite pavements, and in general, the quietest new OGFC is about 2 to 3 dbA quieter than the quietest new concrete pavement[2]. However, as important as initial noise is, "acoustic durability" is also desired (how the acoustic property of a pavement surface changes over time).

As an example, Figure 1 shows the predicted ARFC acoustic longevity as reported by ADOT in 2003 (according to the Arizona DOT, their ARFC increase about 0.5 dbA in noise each year) and the actual Kansas diamond grinding OBSI data measured by the ACPA in 2008. The Arizona ARFC is arguably the quietest AC pavement placed in the US and that is why it was selected for comparison. The ARFC was also evaluated using the ACPA OBSI system in 2008 and the ADOT prediction is fairly close except for about a 5 mile section of freeway which has exceeded 103 dBA after just 8 years.

[2] Typical Noise levels for new surfaces of various pavement types using the On-Board Sound Intensity (OBSI) Method: OGFC ~ 96 to 98 dbA, Dense Grade AC ~ 100 to 102 dbA, NGCS ~ 99 to 101 dbA, Conventional Diamond Ground Concrete ~ 100 to 104, Long, Tine Concrete pavements ~ 101 to 106 dbA, Transverse Tine ~103 to 110 dbA

As indicated in Figure 1, the Arizona ARFC is very quiet when constructed, however after only 4-6 years of service it begins to approach the 100 dBA level which is attainable by concrete pavements placed for the purpose of noise reduction. By the 4th year it is already within the limits of the FHWA barely perceptible difference. After only 8-9 years it is approaching the diamond grinding values that exist on the conventional diamond ground pavements used in Kansas for typical rehabilitation projects. Beyond that period the ARFC level begins to exceed the diamond ground texture levels. The only way to get the ARFC lower is to remove and replace the surface which creates a significant expense and disruption to the freeway system.[3] *Note that if the NGCS were plotted on Figure 1, it would be at approximately the red line indicating the bottom the "Barely Perceptible Zone"*

Figure 1 - Acoustic Longevity of the Arizona ARFC and the Kansas Diamond Grinding



As such, similar to the discussion on requiring a Diamond Grinding for the final surface, we agree that there are times that some type of modified surface will be required. However, for those cases, we ask that the appropriate solution be developed that addresses the "site specific requirement," not use a "one size fits all policy." Furthermore, in such instances we would also like the opportunity to show the advancements that have been made with our product and surface characteristics so that the long term benefits and costs between the two can be adequately determined.

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[3] Transportation Noise and Concrete Pavements: Using Quiet Concrete Pavements as the Noise Solution, by Larry Scoffied, American Concrete Pavement Association, http://www.igga.net/File/TransportNoiseAndConcPvmts.pdf

Issue #21 - The viability of Whitetopping as an option to asphalt resurfacing will be investigated once the concrete models have been completed and locally calibrated to Florida materials.

How much investigation or proof is required to show the viability of Whitetopping an asphalt surfacing?

The first Whitetopping was done on South 7th street in Terre Haute, Indiana in 1918. It consisted of a 3 - 4 in. of reinforced concrete overlay of existing flexible pavement. During 1940's and 1950's, whitetopping overlays were used to upgrade military and civil airports for jet use. Highway use started in approximately 1960 and they have included all type of concrete pavements (JPCP, JRCP, CRCP, Fiber reinforced concrete). Ultra-thin & Thin Whitetoppings usage started in the 1990's. It is estimated that there are over 600 whitetopping overlay projects throughout the US (there are 160 whitetopping projects in Iowa alone and over 300 Ultra-thin whitetopping projects as of 2003).

The American Concrete Pavement Association has recently developed a The National Concrete Overlay Explorer which shows the use of concrete overlays on specific highway and roadway sections throughout the contiguous United States[4]. Their database has 186 concrete overlays of asphalt in the US ranging from as thin as 2 inches to as thick as 13 inches (the majority are between 4 and 9 inches). The ages of these whitetopping overlays ranges from newly constructed just this year to 50 years.

Though not in this database yet, in 2009, over 2.8 M square yards of whitetopping overlays were placed on county road market in Iowa (2 times more than any previous year). Most of these overlays were in the 5 to 7 inch range.[5]

Florida has at 4 whitetopping projects (none of which are in the ACPA Database). The first is the US 1 Thin Whitetopping LTPP test sections South of Edgewater. This project consists of 6", 7" and 8" whitetoppings built in 1988. After 22 years of service, there has been minimal maintenance (0 slabs cracked, max 0.04" fault) while a nearby HMAC section has had 2 mill/fill operations since the PCC overlay[6]. The other 3 whitetoppping projects are airport applications. The first is an Ultra-thin Whitetopping in New Smyrna Beach (constructed 1997). The second is a 5 and 6-inch whitetopping in Fernandina Beach (constructed 2002) and the third is a 5.25-inch whitetopping at Williston Municipal Airport (constructed 2006). All three are performing well.

[4] http://overlays.acpa.org/webapps/overlayexplorer/index.html#
[5] Iowa Concrete Pavement Association
[6] FDOT District 5 Concrete Pavement Tour, May 2009. Tour for the TRB Rigid Pavement Construction Committee

Appendix A:
"Maintenance Schedules" from ODOT Pavement Design Manual

702.2 Maintenance Schedules

The maintenance strategies and schedules given below are for informational purposes only. This information is intended to give designers some reasonable guidance when deciding the maintenance actions for an LCCA. Wide latitude is given on both the timing and the work predicted. The designer is not restricted to these schedules; but, because of the wide latitude given, anything outside the schedules may be questioned. All thicknesses given are approximate but overlays much thicker or much thinner than those listed are not expected.

The schedules list only major items of work. The designer may need to include additional items. For instance, tack coats are not listed but are required with all overlays. It is not intended that every item listed be used in a given year. For example, concrete pavement shows both an asphalt overlay and diamond grinding as options but never would the two of them be done at the same time. It is further not intended that actions must take place in every one of the years listed. Depending on the expected performance and the actions predicted for the early years, the later rehabilitation(s) may not be necessary.

702.2.1 Flexible Pavement

Flexible pavement includes new pavement on a new alignment and complete replacement of existing pavement.

- Year 10 - 15: Thin overlay, 1.25" - 3" (~32 - 75 mm), with or without milling.
- Year 18 - 25: Thick overlay, 3" - 7" (~75 - 175 mm), with milling, possibly pavement repairs.
- Year 28 - 32: Thin overlay or micro-surfacing or crack sealing.

Many times the third treatment would not be necessary at all depending on the timing of the first two and the thickness of the overlays and their expected performance.

702.2.2 Rigid Pavement

Rigid pavement includes new pavement on a new alignment and complete replacement of existing pavement. Percentages given are of the total mainline pavement area not including shoulders or ramps or turn lanes, etc.

- Year 18 - 25: 2% - 10% full-depth rigid repairs, 1% - 5% partial depth bonded repairs, diamond grinding, 3" - 6" (~75 - 150 mm) overlay, sawing and sealing.
- Year 28 - 32: 1% - 3% full- and/or partial-depth repairs, 1.25" - 2" (~32 - 50 mm) second overlay with or without milling, 3" - 4" (~75 - 100 mm) first overlay, sawing and sealing, micro-surfacing, crack sealing, diamond grinding.

Best practice dictates the use of diamond grinding for the first treatment. Placing an asphalt overlay on a concrete pavement brings on a new set of problems and is discouraged as the first predicted maintenance action. Remember, this is the predicted performance of pavements built to current specifications, not 1960's specifications.

Again, in many cases the second treatment may not be necessary at all.

702.2.3 Composite Pavement

Composite pavement is a hybrid of rigid and flexible pavement and requires the maintenance actions of both. It is generally expected to receive full-depth rigid repairs, milling and an overlay every 8 - 12 years.

702.2.4 Unbonded Concrete Overlay

An unbonded concrete overlay is in essence a new concrete pavement built on top of the old. It will require maintenance similar to that for a rigid pavement. It may be reasonable to expect slightly less repair for an unbonded concrete overlay versus new rigid pavement due to the much thicker pavement section.

702.2.5 Fractured Slab Techniques
Fractured slab techniques include crack & seat, and rubblize & roll.

- Year 8 - 12: Thin overlay, 1.25" - 4" (~32 - 100 mm) with or without milling.
- Year 16 - 22: Thick overlay, 4" - 8" (~100 - 200 mm) with milling, pavement repair.
- Year 24 - 32: Thin overlay, 1.25" - 4" (~32 - 100 mm) with or without milling, micro-surfacing, crack sealing.

Fractured slab techniques are more likely to require the third maintenance action than is flexible pavement.

702.2.6 Whitetopping
Whitetopping is in essence a new concrete pavement built over an existing flexible pavement. It is expected to perform similar to a rigid pavement or an unbonded concrete overlay.

For more information, see
http://www.dot.state.oh.us/Divisions/HighwayOps/Pavement/Pavement%20Design%20%20Rehabilitation%20Manual/Sect700.pdf