

National Concrete Consortium Q&A - April 13-15, 2021

April 13, 2021 Questions	Responses	Speaker
Could you please share the opening to traffic criteria?	On slides.	Masten
Are the results of this survey published in a report? Can we get a link to that?	On slides.	Masten
Great job Maria! Thank you so much for working with me on this.	Comment	Masten
It is better to express sustainability (GHG emission) in EPDs comparing do nothing and reduced portland cement.	Comment	Praul
Are the one pagers available for download somewhere?	Mobile technology center page. www.fhwa.dot.gov/mctc	Praul
From Jim Parry at WisDOT: Can I nominate a consultant concrete engineer that works for me to be a rep for our region?	We sent out for nominations for this a while back. We can look at the individual for next time.	Miller
Can anyone on the call vote?	Yes	Taylor
How is the axle load spectra forecast?	PMED forecasts traffic using AADTT (volume of truck traffic) and a growth rate (increase in # of trucks over time). The truck classes can each have a different growth rate but the rate is constant over the design life and the NALS (load distribution of a truck class) are constant over time also.	Geary
Are linear elastic models use to predict the impact of the load spectra?	PMED uses mechanistic-empirical models, these are described in the synthesis at a high level. The loads are transmitted to the foundation using a spring model (Winkler) instead of an elastic (Boussinesq) model (See MEPDG Appendix QQ, page QQ-23). Limitations in the foundation models were recognized in the original MEPDG documentation and improvements are still needed.	Geary
A number of states have struggled to do local calibration due to a lack of data on concrete pavements. In your opinion, would the best path forward be to utilize national calibrations, regional data from surrounding states for a "regional calibration" or a neighboring state's calibrations, or to continue using AASHTO93?	As a minimum, verify the global calibration factors with your data if possible. There is a benefit in regional calibrations if you do similar designs as neighboring states. Some states use their old program (i.e. AASHTO '98) to set minimum or maximum thicknesses. Good to have a check (i.e. parallel designs) in the beginning to see where things are different and where they are the same, to understand what is driving the changes. We do need more data, even a number of the LTPP sites still do not have any cracked slabs. The old AASHTO design methods have too many limitations to continue to design future pavements efficiently.	Geary

<p>Is local calibration necessary to use Pvt ME or is ME design a better Pvt design tool than AASHTO 93 even when using the national default coefficients?</p>	<p>Right now local calibration is not required. The recent FHWA AID-PT Annual Report (FHWA-HIF-21-024) highlighted that some considered that local calibration 'must' be done. Many local calibration research reports note that they do not have enough data to calibrate and therefore use the global factors as a default until they have enough data to calibrate. Not having the data to calibrate PMED should not be a reason to not use the software, since if we never use it we will never have the data! I know some states did not go to AASHTO 93 since they felt it gave them unrealistically thick results. It is good to be cautious and compare to previous results, but now (like in 1993) we do have methods and some data to verify the results. I often wonder how they verified their results when they started using the old AASHTO simple design methods back in the 70s?</p>	<p>Geary</p>
<p>Pertaining to the 14 states that have implemented Pavement ME, are most using default input values? Or local calibrated ones?</p>	<p>Not every state responded to the survey every year - but based on the latest survey: 6 of 10 states had noted local calibration for cracking and 7 of 10 noted local calibration for faulting, 5 of 10 noted local calibration for IRI, the others noted global (defaults). (3 of the 10 states used global calibration defaults for all three distresses)</p>	<p>Geary</p>
<p>What is status of base influence in pavement design?</p>	<p>There is a need to improve the base model in PMED for concrete pavements to better model soils and climate effects. Research is needed for these improvements.</p>	<p>Wathne</p>
<p>When designing an overlay using CBR converted to Resilient Modulus, should there be a lower correlation factor? For example CBRx1500 for normal design, or CBRx1000 for overlay designs.</p>	<p>I am not sure I understand the question. If this question is related to inundation and saturated subgrades, I don't necessarily think the correlation factor (relationship between CBR and Resilient Modulus) changes. The reality is that the CBR drops when the soil is saturated (e.g. submerged for a longer period) which means the Resilient Modulus also drops. I think the rate at which these strength or stiffness suffogates drop in response to moisture increases is not necessarily different for any given soil. Of course, for a different soil that rate would be different.</p>	<p>Wathne</p>
<p>As part of the World Road Association PIARC committee on Pavements, we are putting together a collection of case studies on Resilient Pavements. I think we may include the example for the flooded CRC pavement in TX. Many counties have not done much in this area to be proactive in terms of handling climate changes.</p>	<p>Comment - Good Idea. Its an important case study that illustrates one possible approach to enhance pavement resilience for critical roadway corridors.</p>	<p>Wathne</p>

<p>If State is trying to select rehab treatment for HMA pavement at frequently flooded area, what do you suggest to consider first?</p>	<p>Great question! I think the answer depends a bit on specifics related to the location and any constraints you might have. However, a good option to 'harden' the pavement structure and make it less susceptible to inundation-related fatigue loss (i.e. loss of pavement life related to accelerated damage due to loss of strength in underlying layers after being submerged), where you do not have profile constraints (curbs, low underpasses etc.) a simple concrete overlay. It makes the pavement structure insensitive to (i.e. resilient) inundation events. If the existing asphalt section is severely deteriorated, using techniques such as FDR to stabilize the pavement structure is a good approach. This also makes the pavement structure less sensitive to moisture related loss of strength.</p>	<p>Wathne</p>
<p>The weather conditions have a large impact, region analysis may not cover this.</p>	<p>Comment</p>	<p>Wathne</p>
<p>With the global commitment to net zero carbon emissions by 2050 the industry will need to look at every opportunity. One could be the increase of truck loading on pavements. Is anyone aware of the FHWA increasing load limits to permit less trucks to deliver larger payloads?</p>	<p>I am not aware of FHWA overtly looking to increasing truck loading as a way to reduce the number of trucks and thereby lowering CO2 emissions. I do think this deserves some consideration however, as we likely will need to embrace a host of solutions to reach that goal. As pointed out during the presentation discussion, bridges are a significant challenge as they were designed with 80,000 pound semi trucks in mind. If we embark on an ambitious Critical Commerce Corridors program (new truck lanes in the median of the most critical interstate routes) these should be designed and constructed to with increased truck weights in mind however. This would help us move more freight with fewer trucks and lower the CO2 footprint per ton of freight moved as a result.</p>	<p>Wathne</p>
<p>The trouble is that when you calibrate you have created a black box.</p>	<p>Comment - the artificial neural networks were needed for speed-if you do not calibrate you will still have a black box that is not calibrated</p>	<p>Wathne</p>
<p>Leif - You mentioned the FHWA peer exchanges last year, will they eventually be sharing some design concepts (tools) that will help boost pavement resiliency?</p>	<p>I am not sure what tools FHWA is planning to develop as part of or as a follow up to last fall's peer exchanges. I do know however that FHWA is focused on pavement resilience and hope that part of those efforts will culminate in a set of tools that can aid agencies in making informed decisions about designing and rehabilitation pavements in a manner that makes them resilient to inundation.</p>	<p>Wathne</p>
<p>Axle configurations could be changed or sets of axles added to distribute the loads such that too heavy of a load is not placed in one axle or axle configuration.</p>	<p>Comment - good point. This should be considered when contemplating strategies to increase truck weights in order to move more freight with fewer trucks and lower the CO2 footprint per ton of freight moved.</p>	<p>Wathne</p>

April 14, 2021 Questions	Responses	Speaker
Will slides for this PPT be available?	Yes. https://cptechcenter.org/nc2-meetings/	Sutter
Question regarding your 'Ash production" slide... is this fly ash or ash in general.. (including bottom ash, ash deposited in ponds etc.)	Fly Ash	Sutter
Can you talk about the geographic distribution of the ash, e.g., availability.	I do not have that data. Contact ACAA	Sutter
I recall a recent NCHRP study (it may be ongoing) on using non spec fly ash. What is the status of this?	It is ongoing. I think there is one more year. Chris Shearer at the SD School of Mines is PI	Sutter
Who is conducting the NCHRP study and when will it be available?	It is ongoing. I think there is one more year. Chris Shearer at the SD School of Mines is PI	Sutter
For Larry Sutter...for fineness/coarse material...any thought by the fly ash group on placing some limits on oversize material due to the potential for bottom ash co-mingling? CSA has recently passed harvesting ash specification and will be published by July 2021.	It is being discussed at ASTM but no proposal has been balloted.	Sutter
Is this effort to harvest pond ash a viable effort, or are we grasping out a matured technology that has seen its day and should be laid to rest? With everything you're talking about with reclamation, processing, and benefiting is this a Fly Ash or a Frankenstein's monster on cost per ton and carbon cost?	I don't know the answer about cost. In terms of the technology there may be alternatives but seeing those accepted in the market may take 10-20 years. In the meantime harvested ash can fill the void. But long term it is also a viable solution. The issue with fly ash currently is variability. But by harvesting, and processing, we have the opportunity to make fly ash more uniform. However, we as an industry need to demand it and our tests and specifications need to enforce it. Current tests and specifications do not.	Sutter
Deterioration of bridges - generally we do it well. The issue of impaired infrastructure is primarily related to structures that have considerably exceeded their service life.	Agreed Colin. We are working on tech to solve that problem. Please shoot me an email to chat - Jon@Intelligent-concrete.com	Belkowitz
How is the nano silica QC'd if it can vary from 15-50% solids content?	Two different products shouldn't change more than 1%.	Belkowitz
Can nano silica admixture provide the same internal curing benefit to the concrete mixture as 20% LW sand?	Can get similar benefits, but not sure if it is the same as 20%. have gone to standard concrete instead of lightweight by using nano-silica but don't want to say that 100%.	Belkowitz
Is the reference cement 100% OPC or does it contain some level of SCM?	Did use up to 19.5% SCM in a mix. But did go to 100% replacement.	Belkowitz

Are Nano silica materials considered sustainable (i.e. recycled materials)?	Able to get 50 to 100 pound cement reduction in mix designs. ,Howdy Tom, there are some production methods where nano silica is made from recycled materials. While other nano silica are not made from recycled materials, the nano silica allows for a cementitious reduction which leads to a concrete with a lower carbon footprint.	Belkowitz
What is the difference between silica fume and nano silica?	Howdy John, Check this video out for more info on your question. https://www.youtube.com/watch?v=y1zqcrnywWE	Belkowitz
For Jon - how does nano silica compare with other nano materials - nano cellulose, the various nano-carbon fiber, etc.?	Howdy James, nano silica differs in chemical and physical characteristics. B/c of that there are different benefits.	Belkowitz
What's cost increase % for nano ?	The cost of using nano silica varies Rukesh. In some mixes there is a cost reduction due to cementitious (powder) reduction.	Belkowitz
Thank you Dr. Belkowitz for the outstanding presentation! I would like to ask Dr belkowitz if we CS in RMC could that reduce the price of concrete comparing with the use of SCM?	Howdy Elkhali!!!! Yes there can be a major cost reduction when using nano silica due to powder (cementitious) reduction.	Belkowitz
How does PLC affect shrinkage and permeability of mix designs?	Shrinkage is comparable and may turn to an admixture to assist during mix development. Similar to OPC.	Farny
In comparing to the normal PCC, is there any difference in flexural strength?	Comparable to flexural and compressive strength with a 10% PLC and fly ash still meet specifications. There are some indications that flexural strength with PLC mixtures improves by a little over 10% when slag cement is part of the mix.	Farny
Does decreased bleeding mean less bleeding or slowing the bleeding process? If slower bleeding, it could require finishers to delay the finish timing or result in surface crusting? Please explain if there are any differences in the finishing process using PLC.	Decreased not delayed bleeding. Limestone particles are finer than cement particles and increase packing, which reduces channels for bleeding. The reduction in bleeding may allow for slightly faster finishing. But in general, finishing is similar to OPC concrete.	Farny
Is there any data on PLC and thaumasite formation?	PCA report SN3285a talks about sulfate resistance of PLC concrete. http://www2.cement.org/pdf_files/sn3285a.pdf	Farny
Comment - Agree. Harmonized cement standards between AASHTO and ASTM has been a 20 year effort that has worked out greatly for the transportation community. We are also doing this with other materials and looking to do this with other materials.	PCA's Paul Tennis has been involved with the harmonization effort for at least 10 of the last 20 years. Great progress and alignment.	Farny

Any concerns with using PLC for soil stabilization?	Not aware or expect any. One consideration would be with sulfate soils. Use same techniques as with concrete. We are looking for examples of testing and project installations and will develop case studies on greenercement.com website to show how it works with granular and fine-grained soils.	Farny
Do we have any cost information by using PLC compared to the plain Portland cement?	As a trade association, we do not comment on material cost for antitrust reasons. You should speak with your cement supplier.	Farny
What is the deadline for the PCA carbon map?	At this time, we have heard that members are targeting its approval by the 3rd or 4th quarter of 2021.	Farny
Our PLC use has been limited to PCCP. Many concrete suppliers will not stock PLC due to the building sector not accepting it. If you can convince architects and building engineers to use it, it would universally replace C150.	We have heard different experiences in acceptance and how PLC is provided, but our members have confirmed that if a customer is interested in using PLC, it will be available. You are correct that as more users specify it, this should no longer be an issue anywhere.	Farny
We have noticed that the replacement of cement by limestone affects the initial time of setting.	<p>The PCA research report SN3148.02 states that cements with limestone may have a slight effect on setting time but that it is generally not a concern at current addition rates of up to 15%. As the limestone is ground finer, the set time decreased. This can be an issue with coarse limestone fillers, but generally not for PLC. The PCA report, State-of-the-Art Report on Use of Limestone in Cements at Levels of up to 15%, SN3148.02, was written about 10 years ago as a brief literature review to help summarize a vast amount of research on PLCs that has been conducted over many years. Although it was current at the time, and much of the data is still relevant, some of the content is now outdated. ASTM C595 and AASHTO M 240 have been revised based on subsequent research and no longer include requirements based on methylene blue index (Section 5.1.2) or total organic carbon content (Section 5.1.3). ASTM C595 and AASHTO M 240 do include provisions for sulfate resistance (Section 5.2.1, for example) based on ASTM C1012 testing. The report is being updated (SN3148.03), but it is uncertain when it will be available.</p> <p>http://www2.cement.org/pdf_files/sn3148.pdf</p>	Farny

Jared, you expressed improved service life for asphalt and concrete pavements (due to increased initial smoothness) as a percentage of service life. It would seem better (or at least equally interesting) to express the increase in terms of absolute years of service. If concrete has longer service life to start with, then the increase in *years* of service will be more relevant to agencies than the increase in percent service life ... agreed?	I agree.	Gross
Were any of the IRI trends after grinding for concrete overlays on asphalt?	I do not know at this time but I will check into this.	Gross/Karamihas
What durability attributes of the material would you look at? Coulomb results, surface resistivity, other? What length of time the patch needs to last would these durability properties become more important?	Shrinkage, freeze thaw, permeability (I would use salt ponding testing to look at diffusion coefficient. RCPT and resistivity can give you very different numbers that don't compare to OPC.) 15 years.	Ley
Could you please explain a bit more why drying shrinkage is an issue for repair materials?	Patches are highly restrained and so any movement that occurs can cause debonding and future cracking.	Ley
What is the name of the report you mentioned earlier?	Placed in chat box. <i>Novel Alternative Cement Binders for Highway Structures and Pavements</i>	Ley
Isn't the repair material only as good as the production, applicators, and curing?	Agree with that and have best practices in place for the placement of the patching material.	Ley
Can PLC be used as a repair material?	Not an issue in repairs. Similar to OPC, no issues with that and be designed correctly.	Ley
Is carbonation an issue for concrete pavement without steel?	Not worried about carbonation in pavements. This is only an issue for bridge decks.	Ley
Tyler, time is always an issue. You aren't going to get away from that-if anything it is more pertinent today now than ever.	Do we need the fastest time for every repair? I don't think so. I do agree that many of them need to be done fast and that is where these rapid materials shine. If we could even get a few more hours back to the contractor that would really help.	Ley
What is your #1 choice material for repairing concrete?	Every binder can be successful. Some are better than others. CSA with a latex or polymer added. Souped up portland cement. Depends on materials and needs.	Ley
8 hour work windows are the norm-2 hours for traffic control that leaves 6 hours for demo, placement, finish/cure.	That is great. Wouldn't be cool to have 10 hour work windows and give the contractor a little more time to get this done? Working with more time allows them to give the owner more quality.	Ley

Have you looked at internal cure in patch material? Should it be beneficial?	Fibers, internal curing, are all awesome tools and can help repairs last longer and improve performance.	Ley
Doesn't carbonation affect chemical bond strength? The chemical bond strength between the old concrete to the patch.	Portland cement shrinks a lot when it carbonates but I don't think this is true with some of these rapid patching materials. I think more work is needed on this.	Ley
Thanks - wanted that to be stated out loud... :)	Thanks!	Ley
What durability tests should we have for repair materials when placed in cold state?	I would just use ASTM C 666. There is a European test called the CIB that a lot of folks like. I think it would also be good.	Ley
How do you feel about the role of thermosetting patching materials for partial-depth repairs?	I am not sure what you mean.	Ley

April 15, 2021 Questions	Responses	Speaker
If this was a COA, why the interest in using an interlayer?	Response from county engineer was concern of reflective cracking. Was hoping geotextile would help with that.	Taylor/White
How was the fabric secured to the base layer if at all? Truck traffic tends to cause movement and wrinkling which can lead to issues in thin sections particularly.	The geotextile was secured using adhesive.	Taylor/White
The geotextiles info is good, but why was a geotextile used on a AC pavement before overlay? What was it being used for? What was its purpose & what issues were you trying to improve?	See above.	Taylor/White
For Dr. White. Do you think this test regime could be used to assess both post inundation strength loss as well as pre-inundation vulnerabilities? Could this be used to characterize an agencies network vulnerability to flooding and inundation from a resilience perspective?	Short answer is yes. Allows to characterize load and deformation response. Tells what is happening in the system. Work done involves changes in moisture content and testing before and after as s resiliency measurement. Hoping to develop insitu test to measure amount of water in the layers.	Taylor/White
Why are you putting fabric on asphalt?	See above.	Taylor/White
Have you tried doing a dynamic analysis	Next steps in the process for summer.	Taylor/White

Would macro fiber reinforced concrete have the same effect at a cost less or more than fabric?	Less stress concentration in the overlay layer. Can we get the same benefit? Peter: doing different things. Fibers keep the cracks tight, not sure if comparable.	Taylor/White
Did you cold plane the asphalt on poor condition prior to placing the geotextile or asphalt inter layer?	There was no milling.	Taylor/White
Was the APT able to predict elastic modulus on PCC, AC and foundation layers ? The deflection basin data seemed so little effect on load.	Yes, that is what we will do for both the dynamic/cyclic and static loading results. Analyzing deflection data now. Also have DCP profiles at each point as a check on results.	Taylor/White
Did you compare with FWD testing?	We often do - not this project. If interested in white paper on APLT vs. FWD, let me know. david.white@ingios.com	Taylor/White
Why did you not use geogrid instead of geotextile ?	Geogrid does not act as a separation layer, which was the goal of this application.	Taylor/White
Since your device is a low frequency, wouldn't you agree that it is more sensitive to the lower layers?	APLT allows for loading frequencies from 0.1 second to static. Typically, we find that PCC pavement sections show << frequency dependent behavior compared to HMA. Specific to foundation layers, they are more sensitive to loading frequency than most consider, so I really like your question.	Taylor/White
Mark is not allowed to retire! Period!	Thank you for the information on planned test cells at MnROAD. Please contact me if you'd like any input into the design of those test cells and experiment, and let us all know what you learn!	Snyder
Field validation of this concept has been proposed as part of new test cells at MnROAD in 2022.	Evaluation of corrosion and chemical attack effects are included in the proposed specification through the abrasion/corrosion test, the chemical resistance test, the cathodic disbondment test, and the optional inclusion of deicing chemicals as a component of the dowel pullout test. These tests will provide an indication of the impact of deicing and other chemicals on coating integrity and pullout force - general measures of dowel function. These tests probably provide the most effective measure of potential performance. Other tests of corrosion resistance (e.g., salt spray test, etc.) may provide better measures of corrosion rate and material loss, but may not translate directly into performance measures since different corrosion products expand and inhibit joint movement differently. However, there may be interest in pursuing such studies after the currently proposed specifications have been accepted and implemented.	Snyder

<p>Is there interest in pursuing the corrosion resistance aspect of approving alternative dowel bars?</p>	<p>It is important to recognize that these load-deflection tests (both current AASHTO T253 and the proposed test protocol) are not simulating field conditions in any way and the resulting deflection measurements are intended only to provide an indicator of potential structural behavior. Also, these tests are measuring relatively pure dowel function, while field deflections include contributions of soil support (which is not present under the loaded slab in these tests), aggregate interlock, varying slab thickness, and curl/warp (as the question indicates). All things being constant, the proposed load-deflection tests will provide an indication of the ability of any given dowel load transfer system to perform relative to other systems under any given set of field conditions (including curl/warp).</p>	<p>Snyder</p>
<p>Measured deflections at pavement joints can be much higher than deflections in the study and can vary tremendously depending on the time of day (curling and warping) that measurements are taken. The dowel bar concrete interaction can develop looseness that can also vary with concrete mix. Some things to consider for worst case scenarios for future research.</p>	<p>OK I can mark it as reviewed.</p>	<p>Snyder</p>
<p>I can help with AASHTO Coordination. mfelag@hotmail.com For AASHTO Coordination just have Mark send me an email. Thanks!</p>	<p>That would be great!!! Thanks, Mark!</p>	<p>Snyder</p>
<p>Do SRA admixtures only delay the cracking that would happen or do they actually reduce the cracking of the concrete for its life compared to the same mix without SRA?</p>	<p>SRA can either dramatically reduce or delay cracking and there are benefits in both approach. We typically see a dramatic reduction in cracking. We also see a reduction in curl and a reduction in chloride ingress. As such the life has been projected to be substantially longer when the specs are met.</p>	<p>Weiss</p>
<p>Rick, you mentioned in performance specification comparison, the contractor has maximum use of materials they need to get the performance characteristics. I am not sure if that is quite true as some states may require the materials available to be off of approved materials lists.</p>	<p>Great point. I think agencies would still need to specify aggregate properties to ensure durability. As far as cements, pozzolans, admixtures, etc., if a supplier wants to use a product not currently on a QPL, they'd need to work with the agency to get it approved. Pilot projects would be a good way to identify issues like this.</p>	<p>Bradbury</p>
<p>Will content be made available to revisit and review? Thanks! Greetings from Guatemala</p>	<p>All presentations will be added to the CP Tech Center web page. at the link included herein. https://cptechcenter.org/nc2-meetings/</p>	<p>Bradbury</p>
<p>We have performance problems in start-of-the-day pavement. Does this document cover best practices for pulling off of the header?</p>	<p>I believe the guide discusses how to get started with the project (Day 1 paving), and some of that may apply to start-of-each-day. However, we may be able to improve this. I'll bring it up to the team and perhaps we can include some information on start-of-the-day best practices in the final version. I'll reach out separately to you to discuss further.</p>	<p>Cavalline</p>

<p>How important is contractor incentive / disincentive clauses and pay items to improving quality? What type of incentives made the most impact to your company concrete paving .</p>	<p>Contractors with effective quality programs are able to build incentives into their bids, thus winning the contracts while delivering pavements that meet the specification.</p>	<p>Hughes</p>
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