

National Research 2021					
NCC State	Discussion Date	Attendees	Active Research	Research Needs	Notes
Alabama	1/5/2022	Scott George, Drew Waldrup, John Jennings, Ryan Kelley, Dan King, Jerod Gross	1) Job site cylinder curing practices, UHPC for structures, soil-cement, friction retention after grinding	1) Fly ash alternatives	Alabama has very little concrete projects. Their emphasis is on concrete bridge decks and structural concrete applications. They do allow for alternate bidding to encourage concrete work but has not had a lot of success. Would like guidance on pavement design (have interest in Pavement ME but no calibration). They are hoping to learn about successful concrete sections from the Florida Test Track.
California	12/15/2021	Jerod Gross, Dulce Feldman	Performance models and ME calibration, LCCA, High Early Strength pavement on BCOAs	Curing in harsh dry environments, seal vs. no seal (pavements and bridge decks), chain and studded tire wear, resiliency (fires, floods)	CalTrans has a lot of concrete overlay projects coming up and they requested training for observation staff and engineers. Has overlay & inlay project coming up & specs require monitor evaporation rate
Colorado	1/4/2022	Eric Prieve, Jerod Gross	1) Part of Perdue study on optimal opening NDT (SPR-4210) for Concrete Early Age Properties, 2) Part of F-T study with Ley & Weiss. Internal test sections: 1) non-doweled acceleration lane with macrofibers, 2) surface wear test section at Vail Pass	1) Splitting tension (or relationship to flexural strength) in pavement design, 2) Optimization of load transfer (macrofibers in lieu of dowel bars)	No state research, they push for pooled fund research, doing internal testing on macrofiber performance for load transfer in lieu of dowel bars, surface wear from studded tires, they struggle with smoothness after initial construction (temp range and dry climate may be a factor), resorted to bridge deck overlays (asphalt or polyester concrete) as treatment for cracking, they have options for SCMs
Florida	12/21/2021	Jamie Greene, Charles Holzschuber, Amy Wedel, Jerod Gross	1) temp fluctuation in mass concrete, 2) testing protocol composite materials, 3) durability & corrosion in structures	1) Fly ash alternatives, 2) performance of high early strength mixes	Florida will be considering research needs as part of rigid pavement committee meetings. Construction is almost complete on Florida Test Track comprised of 52 test sections of varying pavement thickness and support foundations. Only PCC test track in southeastern US.
Georgia	11/1/2021	Peter Wu, Jason Waters; Ian Rish; Amanda Sheldon; Gordon Smith; Jeremy Daniel, Jerod Gross	1) Performance based specifications for next generation concrete (Georgia Tech), 2) Extend service life of ASR pavements (Georgia Tech)	1) Concrete Overlays, 2) PEM	Georgia Tech is currently evaluating their pavement spec with anticipated completion in 2023. GDOT will look at implementing PEM properties into new spec. They are interested in just in time training for upcoming PCC projects. Also interested in thin PCC overlays on fatigued interstate pavements. Georgia Transportation Institute solicits research needs statements annually.
Idaho	10/21/2021	Craig Wielenga; Gordon Smith; Peter Taylor	1) 56 day ASR testing (AASHTO T380 in line with ASTM C1293)	1) Fly ash alternatives, 2) implementation of RCA, 3) bridge deck cracking	Research showed that the 56 day ASR test results are in line with ASTM C1293. Not allowing the 14 day test. Interested in looking at options for deminishing fly ash supply including ES, lithium, natural pozzolans. Concern for recycling PCC that has ASR
Illinois	11/9/2021	James Krstulovich, Dan King, Gordon Smith, Jerod Gross	1) perform evaluation of stabilized support layers, 2) geosynthetic use in pavement foundation and effects on design, 3) Bridge decks - mitigation of cracking and increased durability	1) Fly ash alternatives, 2) guidance on pavements with ASR, 3) resistivity, 4) UHPC non-proprietary mix	Illinois ASR spec has only been in place for 10 years so they are dealing with older pavements just showing up with ASR. Looking at how PLC cements behave relating to opening strength.
Illinois Tollway	12/28/2022	Dan Gancarnz, Cindy Williams, Jerod Gross	1) resistivity (along with IL DOT), 2) SAM and hardened air comparison, 3) mix design reducing permeability	1) Bridge deck patching materials, 2) PEM, 3) Fly ash alternatives, 4) Implementation of E-ticketing	Illinois Tollway is spending a lot of time with two large projects; one is 22 mile (central tri-state) south of O'Hare, the other is new interstate I-90 to Rockford west of O'Hare (new I-490). CRCP study did not show conclusive benefits due to cost. Current mixes are slag heavy (was fly ash heavy 6-7 years ago), fly ash alternative research is great but how will industry implement the alternatives? They use all stainless steel reinforcement on bridge decks.
Indiana	11/1/2021 & 1/14/22 (Gross, Nantung, Nelson)	Tommy Nantung; Dan King; Peter Taylor; Gordon Smith	1) Air spacing factor (NDT) in real time, 2) W/cm ratio in effectiveness in curing, 3) Optimal traffic opening timing with in-situ NDT, 4) soil-cement treatments, 5) Improvement of scaling resistance of concrete using Titanium Dioxide and other Nano-additives, 6) liquid fly ash in bridge decks: SPR-4336 Scaling Resistance (using Tio2) maybe April 2022, SPR-4210 first project - Determining the Optimal Traffic Opening Timing through an in-situ NDT Method for Concrete Early Age Properties Monitoring, SPR-4513 Implementation of SPR-4210 (implement in project) in place concrete sensors (modulus of elasticity (stiffness) - model provides compressive and flex strength readings) Perdue website, (7 states in pooled fund, presenting at NCC in April), SPR-4620 Developing artificial ...Air spacing factor (NDT) in real time, currently using GPR, SPR-4418 ...W/c ratio in effectiveness in curing (similar to GPR & flex), SPR-4420 Soil treatment with cement (2 projects) 4.8% cement complete) SPR-4327 Drainage layer, permeability testing (350 ft/day allowable), SPR-4615 Geotextiles (woven and non-woven)	1) Evaluating pavement structural numbers for remaining service life - Tommy to send a list of others	Indiana is doing an internal study comprising of a proactive scan of pavements for asphalt stripping for PCC overlay candidates. They are considering increasing mixing time for better air bubble distribution (Kansas also has this concern). Studies that can be shared include pavement smoothness - zero speed inertial profiler, real time strength gain, bridge deck curing (ES) (Ohio is looking at this too). They are using combinations of fly ash and slag - fly ash supply not a concern yet. They do not have an ASR issue. Internal research: colloidal nano silica, ES Internal Cure (65 decks) & ES Liquid fly ash, 3 combination + reduced cement, 18 combination of 2 types. ~65 bridge decks, 18 bridge deck overlays Good placement, good workability, reduced cracking. Different than SAP and LWA concept. SPR-4617 Pavement smoothness approved for research, zero speed inertial profiler (Indiana DOT). Spec allows slag or fly ash as binary SCM. Ternary mix slag, fly ash & silica fume. Fly ash supply is affected, using more slag. Bridge decks and pavements all require SCMs, but emphasis on asphalt pavements recently. Looking into optimized aggregate gradation and tarantula curve - the challenge is with aggregate producers, paving companies are supportive. Use No. 8 (1" top size) base stone. Specs allow for intermediate size but the need is for more large size to meet the gradation.
Iowa	10/25/2021	John Hart, Jerod Gross	1) Evaluation of Polyester Polymer concrete overlays, 2) UHPC shrinkage for bridge decks and overlays, 3) Joint spacing and thickness on concrete overlay performance, 4) Penetrating Sealers, 5) PEM	1) vibration through the paver, 2) effective sawing practices 3) PAMS to limit curl and warp	Research needs 1 & 2 have been submitted as research ideas, PAMS could be a list serve or synthesis.
Kansas	12/10/2021	Dan Wadley, Sally Mayer, Erin Mcarort, Jerod Gross	1) SAM implementation, 2) Formation factor shadow testing, 3) Internal curing for bridge decks and paving (LWA), Durable high early strength concrete	1) Type II cement compatibility, 2) Fly ash alternatives, 3) Determining proper mixing time and energy, 4) Permeability and consolidation with 2-lift paving	Kansas is concerned with compatibility issues using Type II cements (due to different hydration curve) and specifically the % limit of limestone replacement. Kansas is close to adopting the SAM test for acceptance (awaiting purchase of new lab equipment).
Kentucky	12/20/2021	Michael Black, Wesley Glass, Gordon Smith, Dan King	1) approved list high friction surface and waterproofing, 2) Internal curing (LWA) and looking at admixture 3) Corrosion resistance - chloride ion penetration test for bridge decks & galvanic anode for maintenance and protection of reinforcing steel	1) list of approved surface sealers, 2) guidance on SCC (pre-stressed applications and maintenance projects with tight working areas)	Type II (interground) is allowed in KY specs. Would proposed changes to the ASTM blended cement spec open that up as an addition/substitute rather than interground? Geotechnical engineers in KY are a little worried about use of Type II for subgrade stabilization - right now they're approving it on a project-by-project basis, but it's not formally in their specifications. KY has a short list of approved sealers (11 products - all silanes). They have recently raised the LOI limits from 3% to 4% on fly ash.
Massachusetts	12/9/2021	Richard Mulcahey, Colin O'Brien, Carlos Flores-Munoz, Jerod Gross	1) Recycled glass pozzolans, 2) low carbon cement, blended hydraulic cements for SCMs, 3) UHPC, 4) natural pozzolans	1) Paste percentage vs. shrinkage, 2) Tarantula gradation curve mixes, 3) Fly ash alternatives	Ready mix industry and MassDOT working together on durability, pilot projects include intersections, ramps and roundabouts. Ready mix industry is comfortable with third aggregate. Learned a lot with sidewalk study on durability and performance.
Michigan	12/8/2021	John Staton, Ethan Bahmer, Gordon Smith, Jerod Gross	1) Penetrating sealers on bridge decks	1) Sustainability, 2) Reclaimed fly ash, 3) recycling	Michigan DOT soliciting research ideas with approval in spring. U of Michigan research, Will Hanson spending about \$80k annually. DOT is interested in training with new documents on overlays, preservation and QQ. D-cracking issues are diminishing which may open the door for RCA. Have had issues with polishing of aggregates after diamond grinding in soft limestones in upper peninsula. Have tried HFST but only 3 year life. Michigan has a circular wear track.
Minnesota	12/22/2021	Maria Masten, Rob Golish, Gordon Smith, Jerod Gross	NRRA: overlays, mix design-performance properties-construction, alternative pozzolans, use of CO2, geopolymer concrete, RCA, optimized mixes, joint faulting-BCOA-ME, joint repair, enhanced entrained air void system, early opening, steel propagated distress mitigation, FRC, RCC. Ley is working on bridge deck overlay mix design, coal combustion ash protocol to allow for bottom ash and materials for rapid patching.	1) ASR HWA rapid test, 2) Type II maximum % replacement and effects of Type II in current practice for paving and pumping.	Minnesota no longer requires slump test for hand placement. They are looking at reducing opening strength from 3,000 psi to 2,000 psi compressive (350 psi to 250 psi flexural). They are interested in the effects of PLC. How will it change the way we are placing concrete? Use of maturity method is slowing gaining attention. They have stopped testing on the paver since they are using SAM.
Missouri	12/3/2021	Brent Trautman, Jerod Gross	NRRA is focusing on 1) sustainability & reducing CO2, 2) alternative pozzolans and 3) geopolymers	1) Defoamer - admixture to reduce air, 2) Densifier (finishing aid).	Missouri participates in NRRA research. They are interested in effects of increased % limestone in Type II. They would like to do an internal curing bridge deck project. Interested in just in time training.
Montana	11/8/2021	Wesley Dess, Paul Bushnell, Matt Needham, Jerod Gross	1) Evaluation of thin polymer overlays for bridge decks, 2) Feasibility of UHPC in bridge decks, 3) Bridge Deck Cracking Evaluation	1) Studded tire wear on bridge decks and thin overlays	Montana has had a history of bridge deck cracking. WJE completed a study in 2017 and another current study. A change in curing methods and small changes in specs have delayed cracking to around a month instead of a few days. Montana also invested research efforts in chemically stabilized soils. They are interested in building concrete overlays.
Nebraska	12/16/2021	Lieska Halsey, Wally Heyen, Jerod Gross	1) Krytol Internal Membrane, 2) CarbonCure, 3) Type II cement, 4) Rapid patching materials, 5) Deicers & Winter Maintenance	Non Specified	Kryton KIM is an additive to concrete that forms crystals when it reacts with water, seals cracks. NDOT is interested for bridge rails. CarbonCure test section installed on shoulder of South Beltway, Nebraska has allowed 10% Type II since 2010 and have seen a rise in use in 2021. Using Tecomer to measure deicer performance
Nevada	12/15/2021	Peter Schmalzer, Joe Barreres, Dan King	No active research on concrete pavements	Improved practices and guidance on measuring dowel bar placement for acceptance. Synthesis on constructability and QA with dowel bars. Guidance on spall and crack repair without removing material as in partial-depth repair. Repairs for longitudinal cracking.	Currently doing field evaluation of diamond grindings vs. thin asphalt overlays - will be 10+ years before major takeaways.
New York	11/8/2021	Patrick Galarza, Nick Davis, Thomas Kane, Jerod Gross	1) PEM	1) New refined PEM test procedures (SAM, resistivity), 2) PEM for concrete overlays using fibers, 3) Alternate load transfer dowels, 4) Guidance on traffic control	New York has no active research due to staff shortage. They will lean on CP Tech for guidance, training and research data. Spec changes will include implementation of PEM and options for alternate dowels. Interested in shorter panels and revised sizing and placement of longitudinal tie bars. Discontinue use of permeable subbase material.
North Carolina	12/14/2021	Brian Hunter, Jerod Gross	1) Fiber reinforcement for latex concrete, 2) Thermal mechanical input for PavementME, 3) PEM, 4) ASR TP144-21 (Tfast), 5) Shrinkage reducing mixes	1) Fly ash alternatives, 2) ASR, 3) PEM	North Carolina mitigates ASR with type F ash in bridge decks, not required in paving. Looking at alternatives for fly ash including EdenCrete (carbon nano technology)
North Dakota	12/21/2021	T.J. Murphy, Jerod Gross	1) Evaluate SAM implementation and possibly resistivity at mix design, 2) interested in silane sealing research	1) Rehabilitation of PCC overlays, 2) Field ready fast w/cm ratio testing, 3) Field ready Vekly test or other workability test, 4) Fly ash alternatives	Increased SCM to allow Fly Ash Type C and Slag along with the currently allowed Type F fly ash @ 35% OPC replacement. They are looking to add SAM requirements and resistivity and possibly the V Kelly at the mix design phase. They have been running in house mix design verification data and are looking to collect data on a few projects in 2022 (SAM and resistivity) Construction issues: Mobile batch plant issues, aggregate supply problems, mix design workability and w/cm ratio and proper quality assurance methods at the plant and placement methods to assure quality concrete.
Ohio	1/6/2022	Dan Miller, Jerod Gross	1) Bacteria in concrete for healing cracks (OSU), 2) Premature failure of box beams, 3) concrete barrier median performance	1) Bridge deck cracking (LWA for internal curing not locally available), 2) fly ash alternatives (looking at reclaiming fly ash), 3) Effect of PEM properties using Type II cement	Ohio would benefit from just in time training for concrete paving to cover the basics including good practices and inspector guidance. There is not a lot of concrete paving at the state level. Dan uses the NCC Research Infrastructure Database
Oklahoma	12/3/2021	Matt Romero, Nairi Matevosyan, Victoria Jay (intern)	1) Development of UHPC mix, 2) Bridge deck research (Ley).		Oklahoma has interest in internal curing but bridge division is not in support. They would like to construct more PCC overlays in the future. They are interested in inspection training. In Oklahoma, researchers ask DOT for topics. Recently opened new state lab.
Oregon	12/15/2021	Justin Moderie, Austin Johnson, David Dobson, Scott Nelson, Dan King, Jerod Gross	1) Reducing cementitious content in mix, 2) Alternative cements for bridge deck overlays	1) EPDs & Sustainability, 2) COC-B (inlays), 3) Studded tire wear and increased traffic counts, 4) Design method/guidance for an unbonded CRCP over PCP overlays, 5) Best practices for cost effective implementation of internal curing on bridge decks	Feels their history and experience with CRCP has been extremely positive and beneficial for their pavement network. (Even after many original CRCP pavements have been covered with asphalt overlays, they're still benefiting from the original pavement structure.) Report should be finished this summer on reducing cementitious content in mix. They anticipate reducing from 600 lbs/cy to 550 lbs/cy.
Pennsylvania	12/13/2021	Neal Fannin, Josh Freeman, Seth Woffinger, dan King, Gordon Smith, Jerod Gross	1) Early opening strength (very early stages), 2) Pitt Rigid ME (simplified ME pavement design catalog), 3) joint sealant materials, 4) sinusoidal keyway, 5) skid resistance.	1) Better measurements of transport properties, 2) Fly ash alternatives, 3) Improving ride quality, 4) Improvements to bridge deck curing	PennDOT is implementing a long-life concrete pavement design spec - previously used only a handful of projects, will now be implemented in full. Includes optimized gradations, longer design life. Gradation changes have been going well.
South Carolina	1/6/2022	Eric Carroll, Dan King, Jerod Gross	1) Pavement ME, 2) Cement modified recycled base mixture design, 3) Patching materials for bridge decks, 4) Looking at resubmitting reduced cement durability mixtures for state research	1) Best practices for traffic control, 2) Best practices for pavement widening, 3) Bridge deck patching, 4) Bridge deck durability, 5) implementation of performance based specs, 6) local calibration of PavementME	South Carolina does not have a lot of concrete projects but the concrete has been winning LCCA on interstate projects. Planning a 15 mile reconstruction of interstate and will have the MCTC in March/April of 2022. They are interested in PEM and re-writing their pavement specs internally. Also have interest in internal curing.
South Dakota	10/26/2021	Thad Bauer, Darin Hodges, Peter Taylor, Gordon Smith, Dan King, Jerod Gross	1) MEPDG design strategy for SDDOT	1) Concrete resistivity, 2) Grinding of curled / warped pavement and maintaining smoothness, 3) Fly ash alternatives (class F)	SDDOT recently added Type II and blended cements to specifications. They will soon be writing a special provision to try some low shrinkage mixes on bridge decks as well as changing their well graded requirements to the Tarantula Curve Gradations. Contractors regularly request to adjust aggregate proportions during paving operations, they have allowable tolerances from the established mix design, or the mix needs reviewed to ensure moving back to original mix design parameters. Interested in how other states handle this - Research would be beneficial to quantify how much a mix can change before properties are affected (beyond current production tolerances). Other challenges include monitoring and determining what is working to lower and prevent bridge deck cracking. Able to share recent research on development of Type II specs and low shrinkage mixes.
Tennessee	12/9/2021	Jason Mellons, Jerod Gross	1) ASR, 2) RCA, 3) Chlorides in mixtures	1) Type II Cement compatibility, 2) Smoothness	Tennessee is working with local university to research SAM and RCA. They are pushing PEM and optimized gradation mixtures. Fly ash supply is good - used to mitigate ASR. They are letting industry drive fly ash alternatives. They are trying to push internal curing.
Texas	1/4/2022	Andy Naranjo, Rachel Cano, Gordon Smith, Dan King, Jerod Gross	1) NCRCP - Optimization of reinforcing steel (horiz. delamination), 2) CRCP - Transverse Const. Joint Performance, High Performance Mixture	1) CRCP performance, 2) Smoothness	A lot of interest on CRCP, pushing the % limits for limestone cement in Type II (up to 30%), on top of fly ash alternatives, planning more CRCP overlays, doing internal performance evaluation since 2010
Utah	12/13/2021	Jason Simmons, Jason Richins, Dan King	1) UHPC for bridge decks, 2) F-T durability of rapid set concrete, 3) low permeability concrete for structures, 4) maturity measurements for rapid setting concrete, 4) measurement of air voids in pumped concrete, 5) early age bridge deck cracking	1) Early bridge deck cracking, 2) Improving performance and durability of joints (durability of materials & identifying best construction practices / joint designs, 3) Guidance on base materials, 4) Guidance on dowel bar designs & alternate dowel materials, 5) Steel placement durability issues	Utah allows use of natural pozzolans with ASR test required in the mix approval stage - good test results and performance so far. However, fly ash is generally available right now.
Washington	11/2/2021	Schofield, Kim; Carlie, Karen; Dan King	1) Improved rapid construction practices for high early strength mixes, 2) Alternative cementitious materials and polymer/epoxy materials for partial depth repairs, 3) Mitigating buckling caused by high temperatures, 4) Fly ash alternatives, 5) Alternative dowel bars, 6) Mitigation of tire wear on JPCP pavements.		WSDOT has observed that local contractors lack expertise and experience. Basic issues such as late sawing have been problems. Nature of design-build projects has made this problem difficult to address and parties do not take accountability. WSDOT currently requires just-in-time training for concrete paving projects. Lead state for SPS-2 preservation pooled fund to be finished in 2021 and looking for next phase.
West Virginia	12/1/2021	Mike Mance, Vincent Allison, Perry Keller, Suman Thapa, Jerod Gross	No active research on concrete pavements	1) Fly ash alternatives, 2) Early age cracking in bridge decks	West Virginia recently improved their specs for ASR. They have interest in SAM and resistivity and plan for surface resistivity to replace RCP. They have been using MIT scanner T2 and no longer coring. They have indicated an interest in just in time training for CPR patching. They have had a lot of partial depth repair failures and indicated a need to improve inspection. They did some work on shrinkage reducing mixtures with CT5 with good results.
Wisconsin	12/14/2021	Mark Finnell, Jim Parry, Leslie Ashauer, Gordon Smith, Jerod Gross	1) Performance and Chemistry of SCMs	1) Fly ash alternatives, 2) Alternatives to wet curing of bridge decks, 3) SCM chemistry related to concrete performance	method and analysis of hardened air content, non-cementitious repair materials. SAM implemented as shadow spec in 2019 and will continue until parameters and spec language is defined Also interested in increased use of manufactured sands in the next 5-10 years. Spec changes include shadow spec of surface resistivity, testing frequencies of aggregate and fresh mix, MIT scan for pavement thickness, flexural strength evaluation, optimized gradation (tarantula curve) &
Wyoming	12/20/2021	Whitney Wise, Ethan Crockett, Dan King, Gordon Smith	Two projects through University of Wyoming - 1) ASR 2) bridge deck shrinkage. Also in-house laboratory work on gradations and mix design (evaluating tarantula curve) and use of maturity meter.	1) Bridge decks - overlays and toppings, 2) Implementing optimized gradations, 3) GPR and related technologies for evaluating bridge decks, approach slabs, and pavements.	WY is interested in potentially reducing the number of dowels across joints (a contractor previously made a VE proposal), however they aren't aware of how much information is available about doing this.