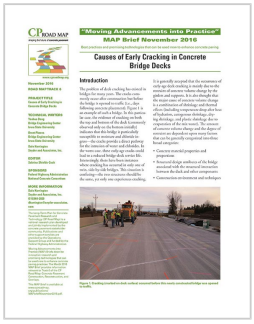
National Concrete Consortium (NCC) E-News November 2016

In association with the CP Road Map Program

The **NCC E-News** is the newsletter of the Long-Term Plan for Concrete Pavement Research and Technology (CP Road Map), a national research plan developed and jointly implemented by the concrete pavement stakeholder community. If you'd like to find out more about the CP Road Map or learn how you can get involved, contact Program Manager Steve Klocke (sklocke@snyder-associates.com, 515-964-2020) or Dale Harrington (dharrington@snyder-associates.com, 515-964-2020).

Moving Advancements into Practice (MAP) Brief

Moving Advancements into Practice (MAP) Briefs describe promising research and technologies that can be used now to enhance concrete paving practices.


"Moving Advancements into Practice"
MAP Brief November 2016
Causes of Early Cracking in Concrete Bridge Decks

The November 2016 MAP Brief, "Causes of Transverse Cracking in Concrete Bridge Decks" lays out the current understanding of what elements tend to increase or reduce bridge deck cracking.

Download the November 2016 MAP Brief.

NCC State Survey Summaries

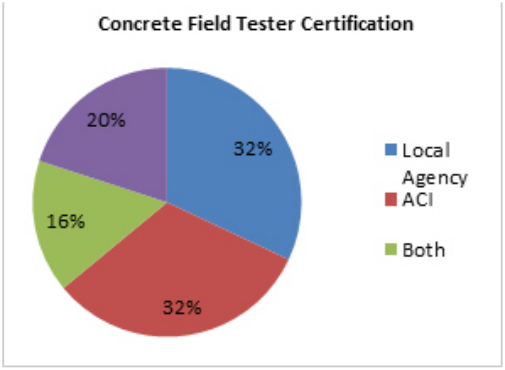
NATIONAL CONCRETE CONSORTIUM

Member states of the National Concrete Consortium (NCC) have the ability to poll other member states regarding specifications, materials, construction, research, or other issues related to concrete paving. This section highlights some of the questions posed and answers received through the NCC's ListServ feature.

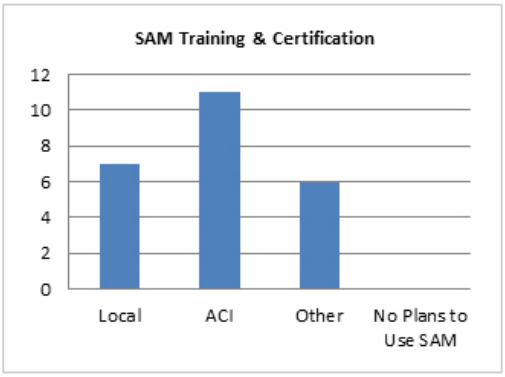
Field Tester Training and Certification and Implementation of the Super Air Meter

The Minnesota Department of Transportation polled the NCC group with two questions on concrete field tester certification. The first item asked agencies how they currently certify concrete field testers. Twenty-five agencies responded. The majority was evenly split between local agency certification and ACI. Four agencies require a combination of the ACI certification plus additional local requirements and five of the agencies accept either local certification or ACI.

The second item addressed the growing use of the Super Air



Meter (SAM). Agencies were asked how they plan to implement certification and training programs for the SAM. None of the agencies responded that they do not plan to implement the SAM, though many indicated that they are still in the beginning stages of evaluating the SAM and determining how they will use it. The largest number of agencies (11) plan to utilize ACI for training and certification. Seven agencies plan to do this at the local level, though several of those are doing so because they do not feel ACI will have a training program in place before they start widespread use of the SAM.



State Agency Research and Technology Transfer Needs

Attendees at the August 2016 NCC conference were asked for input on their top research and technology transfer needs. Thirty-one state DOTs responded. This feedback will help guide the future direction of the CP Tech Center. The following is a summary of the top priorities:

- Enhanced durability with focus on supplementary cementitious materials (SCM), air content, and admixtures
- Early opening mixes for traffic control (strength, load restriction, time requirement)
- Early-age cracking
- Design features: widened lanes, tied shoulders, base support, critical features, shrinkage cracking, cracking vs. joint spacing (is there a correlation?)
- Formation factor (resistivity and w/cm ratio)
- Joint durability

News from the Road

News from the Road highlights research around the country that is helping the concrete pavement community meet the research objectives outlined in the CP Road Map.

Field Testing of Internal Curing

Both Louisiana and Iowa recently constructed bridges utilizing internally cured concrete (ICC). Recent research has indicated several benefits to using lightweight fine aggregate (LWFA) in mixtures for bridge decks. Internal curing supplies curing water from the LWFA (approximately 20% absorption). This pre-wetted lightweight fine aggregate replaces approximately 30% of the conventional fine aggregate (sand), with the goal of providing a volume of internal curing water equivalent to the volume of chemical shrinkage of a typical cement. These unrelated projects investigated the effects that internal curing has on the fresh and hardened properties of the concrete as well as the effect on concrete shrinkage cracking and anticipated service life.

Both studies replaced a portion of the fine aggregate with saturated

LWFA. Both studies found that the fresh concrete properties were unaffected by the addition of the LWFA, though the Louisiana contractor reported the internally cured mixture was actually easier to finish.

LWFA stockpile

Testing of the hardened concrete properties indicated that the IC mix did not significantly affect the mechanical properties. Both studies found the ICC had a slight reduction in modulus of elasticity, but compressive strength was about the same as the control. The surface resistance of the ICC mixture was also higher than the control in both studies, indicating better hydration of the concrete mixture.

Both projects found that the ICC decks experienced less shrinkage cracking than the control sections. It is anticipated that this will translate to a longer service life and a more durable structure.

Bridge deck pour with ICC

The Iowa research was sponsored by the Iowa Highway Research Board and completed at the National Concrete Pavement Technology Center and Bridge Engineering Center at the Institute for Transportation, Iowa State University by Taylor, Hosteng, Wang, and Phares. Click here to access the full document.

The Louisiana research was sponsored by the Louisiana Department of Transportation and Development and completed at the Louisiana Transportation Research Center by Rupnow, Collier, Raghavendra, and Icenogl. Click here to access the full document.

This research is contributing to objectives identified in CP Road Map Track 1: Materials and Mixes for Concrete Pavements.

Cost-Effective Base Type and Thickness for Long-Life Concrete Pavements

The quality of a portland cement concrete (PCC) pavement foundation is vital for the successful construction and long-term performance of the pavement. Poor compaction, high moisture content, improper gradation, high fines content, insufficient particle shape, or particle degradation can increase slab tensile stresses and initiate slab cracking. In addition, low base permeability can result in pumping, faulting, and frost-heave. The objective of this study was to create a draft specification for the aggregate base/subbase, which provides a stable construction platform, prevents erosion of the pavement foundation, facilitates drainage, provides proper slab support, and provides a gradual vertical transition in layer moduli.

Gas permeability test apparatus

This study reviewed the performance of in-service pavements at the MnROAD facility. Data were obtained from the original pavement and foundation design and considered along with information from field testing of permeability, moisture, temperature, and dynamic concrete stain. Previous findings from field performance and MEPDG-based sensitivity training were also reviewed.

The research concluded, in part, that an open-graded aggregate base (OGAB) significantly reduced in situ moisture content levels in all pavement layers (especially the subgrade soil) as compared to a traditional dense graded base. A modified OGAB (OGAB special) with slightly more fines proved to be stable during construction while also remaining permeable and reducing in situ moisture content.

This research was sponsored by the Minnesota Department of Transportation and completed by Tutumluer,

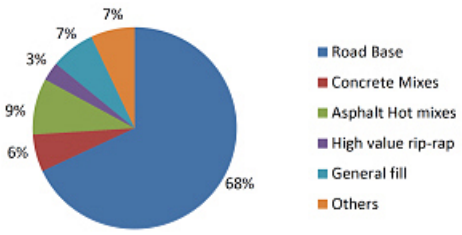
Xiao, and Wilde at the University of Illinois at Urbana-Champaign. Click here to access the full document.

This project is contributing to objectives identified in CP Road Map Track 10: Concrete Pavement Foundations and Drainage.

Concrete Debris Assessment for Road Construction Activities

The Florida Department of Transportation investigated two distinct issues related to the effect of concrete on the environment: Concrete Grinding Residue (CGR) and Recycled Concrete Aggregate (RCA).

The use of RCA as a roadway base is widespread across the country and is the most common use of this product in the road construction industry. Several past studies have suggested that leachate from this material may cause environmental issues due to elevated pH and heavy metals in the leachate. To investigate these concerns, laboratory tests were performed on eight RCA samples from various recycling facilities across Florida. Measured pH ranged from 10.5 to 12.3. Laboratory testing and chemical modeling indicate that some degree of pH reduction in the leachate due to carbonation from atmospheric carbon dioxide, neutralization of soil acidity, and neutralization with ground water is expected. The potential for leaching of heavy metals was evaluated as part of a literature review. The available information suggests that most trace elements leaching from RCA will be lower than regulatory thresholds.



Recycled concrete usage in road construction activities (1997)

This study also investigated the environmental effects of concrete grinding. Grooving and grinding operations of PCC pavements produce a residual slurry with a high moisture content and elevated pH. Testing of samples from this investigation found pH levels ranged from between 11.0 to 12.3, depending on the amount of liquid present; however, previous testing by FDOT found that CGR is not otherwise a hazardous waste. While levels of arsenic and barium in the waste were found to be elevated, they were sufficiently low that land application of waste could still be permitted if application rates are controlled.

The results of this study suggest that while leachate from RCA and CGR has an elevated pH, it does not contain high levels of heavy metals. Issues with elevated pH can be mitigated by the environment and through proper handling and application. The report cautions that more specific testing and evaluation of RCA and CGR is necessary to arrive at a definitive conclusion.

This project was sponsored by the Florida Department of Transportation and completed by Townsend, et al. at the University of Florida. Click here to access the full document.

This project is contributing to objectives identified in CP Road Map Track 12: Concrete Pavement Sustainability.

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