National Concrete Consortium (NCC) E-News May, 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. To find out more about the CP Road Map, or to get involved, contact Steve Klocke or Dale Harrington (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.

The May 2016 MAP Brief, "Performance of Thin Roller Compacted Concrete Pavement under Accelerated Loading," summarizes a recent research program to test thin (4 in. to 8 in.) roller compacted concrete (RCC) pavements. The results show that a thin RCC pavement over a soil cement structure can still have high load-carrying capability.

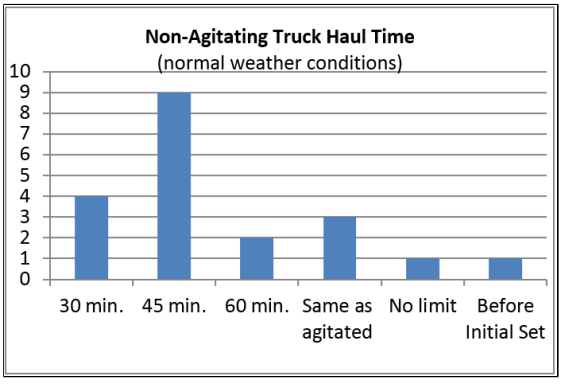
Download the May 2016 MAP Brief.

NCC State Survey Summaries

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.

Discharge Time Limits for Non-Agitating Trucks

The Illinois DOT polled the NCC group regarding time limits between mixing and discharge for non-agitating trucks. Twenty states responded to the question. The table summarizes the maximum transport times for "normal" weather conditions (generally less than 85 or 90 degrees). Most states set the maximum transit time at 45 minutes. Three states do not differentiate between haul times for agitating and non-agitating trucks. One state had limits for agitating trucks but not for non-agitating, and one state simply requires discharge prior to initial set, which it noted can be subjective. Several states reduce transport times



during hot weather (generally to 30 minutes).

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.

Evaluation of Fiber-Reinforced Concrete for New Highway Pavement

Currently, pavement designers have two primary options for concrete pavements: continuously reinforced concrete pavements (CRCP) and jointed plain concrete pavement (JPCP). Both have their strengths and weaknesses. Continuously reinforced concrete pavements provide superior ride quality and longevity while JPCP provide greater economy through reduced material and labor costs. The concept of a continuously fiber-reinforced concrete pavement (CFRCP) seeks to take advantage of the superior qualities of a CRCP and the cost effectiveness of a JPCP while avoiding the limitations currently experienced with corrosion of steel reinforcement.

This study evaluated the use of polypropylene fibrillated, polypropylene macro, carbon, and steel fibers as the primary reinforcement in concrete pavements. The results of the study are summarized as follows:

- Polypropylene fibrillated fibers offer increased fatigue performance but do not offer any significant support to the concrete after the sample has cracked.
- Carbon fibers provide the greatest toughness and post crack performance, but do not necessarily correlate to greater fatigue performance.
- Polypropylene macro fibers, in the range of 7.5 pcy to 10.5 pcy, provide the greatest combination of fatigue, toughness, and pre-cracked fatigue performance.
- The use of fiber reinforcement has an effect on the thickness design of pavements and can result in a reduced pavement thickness for low-stress, high-volume pavements.
- Results showed that fiber reinforcement improves the fatigue performance of concrete, with polypropylene fibers providing more benefit than steel fibers.

This research was sponsored by the Louisiana DOT and completed at the Louisiana Transportation Research Center by Kevern, Rupnow, Mulheron, Collier, & Icenogle. 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.

Reducing Pavement Temperature with Glass Beads

It is generally accepted that high pavement temperature gradients increase the risk of curling and thermal cracking. Replacing a portion of the aggregate with materials having lower thermal conductivity and heat capacity should lead to reduced pavement temperature gradients. This project investigated the replacement of fine aggregate with various proportions of glass beads to determine the

effect on temperature gradient and mechanical properties of the pavement.

Fine aggregate was replaced in various proportions (0%, 9%, 19%, and 31%) with spherical glass beads used for road marking. All mix designs were evaluated for ASR potential and compressive strength. While all of the mixes passed the ASR requirements of ASTM C1260, the compressive strength results indicated a drop in strength for the mixture with 31% glass bead content.

The effects on temperature gradient were investigated by measuring the temperature in the top and bottom of a 10 in. concrete slab constructed with 19% glass bead replacement to that of a slab constructed of standard concrete. Pavement temperatures were monitored continuously throughout the day while air temperature climbed to approximately 90°F. The peak temperature differential between the top and bottom of the conventional concrete slab was 25°F. The peak differential for the glass bead mix was only 6°F, indicating that the addition of the glass beads had a significant impact on reducing temperature gradient.

This research was completed by Pancar and Akpinar and published in the March 2016 International Journal of Concrete Structures and Materials, Volume 10, Issue 1. Click here to access the full document.

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

FHWA Tech Brief on Supplementary Cementitious Materials

The FHWA has issued a highly informative Tech Brief highlighting the types, availability, benefits, and proper use of supplementary cementitious materials (SCMs). The brief describes the benefits of SCMs in concrete, including increased durability, lower cost, reduced carbon footprint, increased workability, and decreased shrinkage and permeability. This brief focuses primarily on the mainstream SCMs, such as coal fly ash, slag cement, and silica fume, and describes the source, history of usage in concrete, method of specification, and performance of these materials. Natural pozzolans, alternative pozzolans, and ternary mixes are also discussed.

The brief also discusses trends in the industry, including the fact that the use of and demand for fly ash in concrete has remained steady, while the production of fly ash is simultaneously decreasing.

This project was sponsored by the FHWA and completed by Lawrence L. Sutter at Michigan Technological University. Click here to access the full document.

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

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