2008-09 Research and Technology Transfer Committee-Iowa
January 22, 2009

MINUTES

Present

Adam, John	Iowa DOT
Brakke, Chris	Iowa DOT
Cable, Jim	ISU
Dawson, Bob	Iowa DOT
Dunn, Mark	Iowa DOT
Grove, Jim	FHWA
Hanson, Todd	Iowa DOT
Keierleber, Brian	Buchanan County
Knoche, Ron	City of Iowa City
Larson, Sandra	Iowa DOT
Merryman, Kevin	Iowa DOT
Nambisan, Shashi	CTRE-Director
Reeder, Greg	City of Council Bluffs
Rold, Lisa	FHWA-Iowa Division
Smith, Gordon	ICPA

Absent

Alleman, Jim	ISU CCEE
Allender, Harry	Allender/Butzke
Anderson, Chris	Iowa DOT
Berger, Jim	Iowa DOT
Clendenen, Joe	Holcim
George, Jim	Dallas County
Green, Tom	Allied Construction
Hanson, Jon	City of Ankeny
Joiner, John	City of Ames
Kieffer, Robert	Boone County
King, James	Fayette County
May, Jeff	City of Knoxville
Osipowicz, Denny	Lee County
Patterson, David	Washington County
Quinones, Lubin	FHWA, Iowa Division
Rohe, Tom	Plymouth County
Stevens, Larry	SUDAS-CTRE
Suchorski, Dave	Ash Grove Cement Co.
Trueblood, Mark	Martin Marietta Aggregates
Webb, James	Iowa DOT
White, Rick	HR Green

Admin Group

Cackler, Tom	CP Tech Center
Ceylan, Halil	ISU CCEE
Harrington, Dale	CP Tech Center/Snyder's
Shields-Cook, Sabrina	CTRE-Publications
Steffes, Bob	CP Tech Center
Taylor, Peter	CP Tech Center
Wagner, Denise	CP Tech Center
Wang, Kejin	ISU CCEE
Wiegand, Paul	CP Tech Center

The Research and Tech Transfer-Iowa Committee of the National Concrete Pavement Technology Center met on Thursday, January 22, 2009, at the ISU Center for Transportation Research in Ames.

Research in Progress

Information was shared by CP Tech Center staff and Civil Engineering faculty on various projects that are underway at the CP Tech Center. A project booklet was included in the meeting packets and is also available on the CP Tech web site at: www.cptechcenter.org.

Iowa Highway Research Board Process

Mark Dunn informed the group that the IHRB is collecting proposals from January 1 through February 28, 2009, for funding consideration. The Board will rank the proposals at its April meeting and select those to be funded. Mark suggested we would have a better chance if we turned in 2 or 3 subject proposals. Additional information regarding the IHRB process and guidelines is available on their web site: http://www.iowadot.gov/operationsresearch/iowa_highway_research_board.html.

New Proposals for IHRB Consideration

Paul Wiegand shared a list of 14 potential ideas for new proposals (attached) and invited committee members to add other topics to the list. Committee members suggested the following six topics be added for consideration:

- Using recycled PCC to replace coarse aggregates
    - Phase 1 Literature Search
    - Phase 2 Iowa Pavements
- Use of recycled composite aggregate.
- Low-volume roads cementitious stabilization
- Smoothness-alternate methods of construction and measurement & time changes.
- Thermal stresses in full depth patching.
- Shrinkage minimization.

Committee members cast their votes and the following five topics received the most votes:

Potential Project	#Votes
• Use of recycled PCC to partially replace coarse aggregate. o Phase 1 Literature Search o Phase 2 Iowa Pavements	15
• *Design Catalog for Overlays***	*13*
• Opening Strength	10
• Low-volume road cementitious stabilization	10
• Joint Sealing	9

***** It was decided to hold the design catalog for a potential 2010 submittal since the CP Tech Center Cooperative Agreement with FHWA will develop the initial design information under the

Guidance for Existing Concrete Overlays Design Methodology project. Once that project is completed in 2009 this information can be used to develop the Iowa Overlays Design Catalog.

The CP Tech Center will put together problem statements on the remaining four topics and submit them to the IHRB for funding consideration.

Technology Transfer

Dale Harrington provided a list of potential topics (attached) for the upcoming Iowa District Regional Forums. Participants were asked to choose their top five. The following topics received the most votes and will be covered in future "lunch and learn" forums offered quarterly in each Iowa district.

1. Overlay Design
2. Pavement Preservation
3. Surface characteristics: Balancing safety, noise and economics
4. Finishing of pavement & texturing
5. Jointing Sawing

Note: Please see the attached summary for additional information.

Iowa Presentations--A total of 597 people have attended the quarterly lunch and learn workshops offered in each of the six Iowa districts in 2008; that number is up from 436 in 2007. Topics covered were

- Pervious Concrete
- Concrete Pavement Trouble Shooting-Phase I
- Concrete Pavement Trouble Shooting-Phase II
- Subgrades and Subbases for Concrete Pavements (continuing through winter 2009)

Other Iowa one and two-day workshops offered in 2008 included

- Iowa Concrete Pavement Preservation Workshop (March 20-21 in Ames)
- Municipal Streets Seminar (November 13 in Davenport)
- Municipal Streets Seminar (November 20 in Clear Lake)
- Intelligent Compaction Workshop (April 2-4 in West Des Moines)

An Intelligent Construction Workshop is planned for this coming April 14-16 in West Des Moines.

The meeting adjourned at 2 pm. The committee meets annually and will meet again in the fall of 2009.

Attachments (2)

POTENTIAL CONCRETE PAVEMENT RESEARCH TOPICS for IHRB

Overlays

Opening Strength Development of a method to determine opening strength for concrete overlays. The current methods involve time and strength based on standard pavement requirements. With the value of the underlying pavement, it is possible to open an overlay project earlier to local traffic and minimize project impact to adjacent businesses/residents. Methods, such as maturity meters, will be evaluated to determine a strength for opening to local traffic without damage to the new overlay.

Bonding Development of a model to determine the stresses between the base pavement and an overlay at the bond plane, the degree of bonding, its expected life span, and the impact that the bonding that is present has on the thickness of a PCC overlay. The model needs to address the above items for bonded resurfacing overlays and also the incidental bonding that occurs on unbonded overlays.

Bond Breakers Research on the required thickness and specific characteristics of effective bond breaking interlayers for unbonded overlays. Materials evaluated should include hot mix asphalt, synthetic materials, and other products that have proven successful.

Fibers Determination of the value of different types of fibers in PCC overlays in relationship to extending service life and allowing the joint spacing to be increased

Mix Design Improvements Quantify mix design improvements for thinner PCC overlays, such as use of ternary mixes, in terms of impact on reduced shrinkage, improved bond, and improvements to workability, curing timing/methods, and sawing techniques

Design Catalog for Overlays Guidance for concrete overlay thickness design has been published by ACI, AASHTO, FHWA, ACPA, NCHRP, PCA, U.S. Army Corp of Engineers, FAA, and various state departments of transportation. Many of these publications and corresponding computer programs have been in existence for over fifteen years and have been utilized in the design and construction of numerous highway and airport pavement projects. However, limitations do exist with the use of these design methodologies. First, due to the lack of data on the interaction between the underlying pavement, interlayer, and concrete overlay, a conservative design approach has been taken which results in increased overlay construction costs. Second, some of the programs are not user friendly to the average engineer and the programs take a significant amount of input to arrive at a reliable and reasonable pavement thickness.

The objective of this research project is to provide roadway users with enhanced and formalized concrete overlay thickness design procedures and guidelines. This can be accomplished by developing a design catalog for concrete bonded and unbonded overlays using existing design methods with a limited number of required inputs. The design catalog would be derived from currently accepted programs for various thicknesses, joint and shoulder types, conditions and design life of existing subbases/bases, and asphalt/concrete pavements. Once the design runs are

completed, recognized design experts in overlays would review and check the reasonableness of the results before the select thickness is accepted. This design catalog would be web based and updated from the completed research as it occurs and thus would be considered a "living" catalog.

Full Depth Pavement

Joint Sealing Determination of the value of continuing maintenance of joint sealers on concrete pavements would be studied, including drainable and undrained bases and with and without subdrains, particularly with respect to the use of salt brine as an anti-icing agent.

Tie Steel The subgrade drag theory which is currently used for the longitudinal tie steel requirements is broadly thought to not reflect actual in-service conditions. The research would be to instrument and document the actual tie steel requirements for various base and climate conditions. This research effort could result in more effective tie steel requirements. One of the potential benefits would be to make the longitudinal joint less susceptible to random cracking during the initial curing process as well as reducing the number of tie bars required.

Variable Section In the past trapezoidal and variable thickness pavement designs have been used and have performed very successfully. These concepts have not been widely used in recent times and have the potential to significantly reduce the material requirements without impacting performance. With current construction processes it is relatively easy to construct these optimized cross sections. Good design procedures are one of the things that is lacking. The goal of this project would be to develop design guidance and refine the design procedures on actual projects. Also, guidance on how to deal with thickness and grade control will be addressed. This project could be done concurrently with the longitudinal tie steel research.

Two-Lift Use of sustainable paving practices is going to be a bigger and bigger issue for DOTs in the future as regulators adopt requirements to reduce the environmental impact as much as possible, as well as to conserve the depleting stockpiles of premium materials. This project would be to demonstrate two-lift paving technology while addressing areas of interest such as recycling, use of marginal aggregates, special surface courses, etc.

Joint Condition Determination of non-destructive test procedure to determine the structural condition and functionality of longitudinal and transverse joints in the underlying pavement as input into the preservation project design process.

Subgrade/Subbase Preservation Determination of cost-effective methods to improve subgrade/subbase pavement support prior to undertaking a preservation project.

Mix Properties

Workability It is common practice for concrete batch plants to control mix consistency (workability) by monitoring the electric current drawn by the motor driving the mixer unit. Output is used to estimate whether extra water is required and whether sufficient mixing has occurred. This approach with existing equipment tends to be variable and insensitive, leading to unacceptably large variances between batches. It is suggested that work be conducted to evaluate and modify equipment and analysis techniques at a batch plant, including correlating the electrical monitoring equipment output with properties and performance of the concrete mixture.

Mix Design It is common for concrete specifications to impose minimum cement content for various grades of concrete mixture. This practice discourages innovation in concrete mixture design and likely increases costs of concrete construction unnecessarily, as well as increasing environmental impact. This practice is often based on the perception that increasing cement content in a mixture increases strength and permeability. Once sufficient cement is provided in a mix (for paste to fill the voids between aggregate particles and to lubricate the mix for workability), no more is required to meet strength and durability, which is rather controlled by adjusting the water-cement ratio and the type of cementitious system. It is suggested that this project be a combination of laboratory and field tests. Phase 1 would be to review data from the Iowa DOT for various mix classes. Phase 2 would be to conduct tests on laboratory mixtures to verify the premises of the proposal.

Regional Forums – Potential Topics

Cumulative 10 8 6 4 2 1 2 3 4 5	Possible Topics	Choose Top 5 with 1 being the highest				
		1	**2**	**3**	**4**	**5**
68	Overlay Design	3	3	2		1
56	Pavement Preservation ▪ Preventive Maintenance and Pavement Preservation Concepts ▪ Concrete Pavement Evaluation ▪ Slab Stabilization and Slab Jacking ▪ Partial-Depth Repairs ▪ Full-Depth Repairs ▪ Retrofitted Edge Drains ▪ Load Transfer Restoration ▪ Diamond Grinding and Grooving ▪ Joint Resealing and Crack Sealing ▪ Strategy Selection	5		1		
48	Surface characteristics: Balancing safety, noise, and economics	1	3	1	1	2
36	Finishing of pavement & texturing	1	2		2	1
28	Jointing Sawing	1		2	1	1
24	Subbase & Subgrades	1		2		1
22	The latest in smoothness measurement and technology	1		2		
18	Specifying correct mix design and mix design principles and DOT mixes			2	1	1
16	Innovative construction techniques and equipment		1		2	
14	Subdrains – How they help Concrete Pavements	1			1	
14	Basics of Concrete Materials (aggregates, reinforcement)		1		1	1
10	SUDAS - Concrete Pavement updates		1			1
10	Concrete Properties			1	1	
10	QA/QC for Concrete Pavements				1	3
8	IMCP Manual ▪ Concrete Pavement Design ▪ Concrete Materials Basics ▪ Materials Incompatibilities ▪ Plastic (Fresh) Concrete Properties ▪ Hardened Concrete Properties (Durability) ▪ Development of Concrete Mixtures ▪ Preparation for Pavement Construction ▪ Concrete Pavement Construction ▪ Quality Assurance and Quality Control		1			
8	Low Volume Cement		1			
4	Building the contractor/owner cooperative spirit				1	
4	Contractor input/suggestions for design, construction, etc.				1	
2	Supplementary Cementitious Materials					1